USDA Natural Resources Conservation Service

Ecological site R064XY176WY
Very Shallow Hartville Uplift

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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): 064X–Mixed Sandy and Silty Tableland and Badlands

The Mixed Sandy and Silty Tableland and Badlands (MLRA 64) is shared almost equally between South Dakota (42 percent) and Nebraska (41 percent). A small portion is in Wyoming (17 percent). The MLRA consists of 11,895 square miles. The towns of Kadoka and Pine Ridge, South Dakota; Chadron and Alliance, Nebraska; and Lusk, Wyoming, are all within the boundaries of this MLRA.

The following areas of special interest are in this MLRA: Agate Fossil Beds National Monument, Chadron State Park, Fort Robinson State Park, and the Pine Ridge Indian Reservation; parts of the Oglala and Buffalo Gap National Grasslands, which are in the Nebraska National Forest; and nearly all of Badlands National Park. The Badlands are internationally renowned for their Oligocene vertebrate fossils.

The northern section of the MLRA consists of old plateaus and terraces that have been deeply eroded by wind, water, and time. The southern section consists of nearly level to broad intervalley remnants of smooth fluvial plains. These two sections are separated by the Pine Ridge escarpment. Elevations gradually increase from 2,950 to 5,073 feet from east to west. The main drainageway through Badlands National Park is the White River. The headwaters of both the White and Niobrara Rivers are in MLRA 64. The Pine Ridge escarpment is at the northernmost extent of the Ogallala Aquifer.

Tertiary continental sediments consisting of sandstone, siltstone, and claystone underlie most of the area. Many of the bedrock units in the southern third of the MLRA are covered by loess. Soils range from shallow to very deep and from generally well drained to excessively drained. They are loamy or sandy. The Badlands consist of stream-laid layers

of silt, clay, and sand mixed with layers of volcanic ash.

Average annual precipitation for the area is 14 to 20 inches. Most of the rainfall occurs as frontal storms in the spring and early summer. This area supports a mixture of short-, mid-, and tall-statured warm- and cool-season grasses. On the Pine Ridge escarpment, these plants grow in association with ponderosa pine, Rocky Mountain juniper, western snowberry, skunkbush sumac, common chokecherry, and rose. Wyoming big sagebrush grows in minor amounts in the drier, far western portion of the MLRA; however, small remnant stands can be found in the eastern portion of the Oglala National Grassland in Nebraska.

Sixty percent of the MLRA is grassland, 11 percent of which is under Federal management. Twenty-two percent of the area is used as cropland, and 4 percent is forested. Major resource concerns include wind erosion, water erosion, and surface water quality (USDA-NRCS, 2006, Ag Handbook 296).

For development of ecological sites, MLRA 64 is divided into two precipitation zones (PZ): 14 to 17 inches per year and 17 to 20 inches per year. The wetter zone extends from the western end of the Pine Ridge escarpment near Lusk, Wyoming, eastward along the escarpment through Nebraska and into the Big Badlands area of South Dakota. The drier zone extends from Wyoming eastward to Alliance and Oshkosh, Nebraska, south of the Pine Ridge escarpment. MLRA 64 stops at the western edge of the Nebraska Sand Hills (MLRA 65).

A unique geologic area known as the Hartville Uplift is in the far southwest corner of the 14 to 17 inch precipitation zone. The Hartville Uplift is an elongated, north-northwest-oriented, broad domal arch of Laramide age (70-50 million years ago). It extends approximately 45 miles between Guernsey and Lusk, Wyoming, and is 15 miles wide at its widest point. Erosion has exposed a core of granite and Precambrian metasedimentary and metavolcanic rocks (Steele et al., 2018). In addition to the ecological sites in the 14 to 17 inch precipitation zone of MLRA 64, three unique ecological site descriptions were developed to describe the soils and plant community dynamics in the Hartville Uplift.

Classification relationships

►USDA◄
Land Resource Region G—Western Great Plains Range and Irrigated Region:
Major Land Resource Area (MLRA) 64—Mixed Sandy and Silty Tableland and Badlands

►U.S. Environmental Protection Agency (EPA)◄
Level IV Ecoregions of the Conterminous United States:
High Plains—25:
Pine Ridge Escarpment—25a.
Flat to Rolling Plains—25d.
Pine Bluffs and Hills—25f.

Sandy and Silty Tablelands—25g.
Northwestern Great Plains—43:
White River Badlands—43h.
Keya Paha Tablelands—43i.

►USDA Forest Service◄
Ecological Subregions: Sections and Subsections of Conterminous United States:
Great Plains and Palouse Dry Steppe Province—331:
Western Great Plains Section—331F:
Subsections:
Shale Scablands—331Fb.
White River Badlands—331Fh.
Pine Ridge Escarpment—331Fj.
High Plains—331Fk.
Hartville Uplift—331Fm.
Western Nebraska Sandy and Silty Tablelands—331Fn.
Keye Paha Tablelands—331Ft.
Powder River Basin Section—331G:
Subsection: Powder River Basin—331Ge.

Ecological site concept

The Very Shallow HU ecological site is in the Hartville Uplift (HU) area of MLRA 64. The site is on hills, escarpments, and knolls. Slopes range from 0 to 60 percent. The surface layer of the soil is channery loam. The soil formed in 4 to 10 inches of residuum weathered from sandstone or limestone.

The site is a run-off site and does not receive additional moisture from run-in or overflow. It is typically very droughty due to the depth (less than 10 inches) of the soil and the amount of rock in the profile.

Vegetation of this ecological site consists primarily of needle and thread, little bluestem, grama, upland sedges, and a variety of perennial forbs, shrub, and half-shrub species. Alderleaf mountain mahogany is common as are a few scattered junipers. North- and east-facing slopes tend to be wetter, cooler, and support more vegetation than south- and west-facing slopes, which are drier and have more exposed bare ground.

Associated sites

R064XY162WY	**Shallow Hartville Uplift** The Shallow HU ecological site is adjacent to or intermingled with the Very Shallow HU site.
GX064X01X015	**Loamy 14-17" PZ** The Loamy 14-17” PZ ecological site is on lower landscape positions adjacent to the Very Shallow HU site.

Similar sites

R064XY162WY	**Shallow Hartville Uplift** The Shallow HU ecological site is in landscapes positions and on slopes similar to those of the Very Shallow HU site. Soils in the Shallow HU site are greater than 10 inches deep. The plant community has less needle and thread, more bluestems, and higher forage production than the Very Shallow HU site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Cercocarpus montanus*
Herbaceous	(1) *Schizachyrium scoparium* (2) *Hesperostipa comata*

Physiographic features

The Very Shallow HU site is on nearly level to steeply sloping uplands and escarpments.

Table 2. Representative physiographic features

Landforms	(1) Upland > Hill (2) Escarpment (3) Knoll
Runoff class	Medium to very high
Elevation	1–2 m
Slope	0–60%
Water table depth	203 cm
Aspect	Aspect is not a significant factor

Climatic features

►Climate 14-17” Hartville Uplift◄
MLRA 64 has a continental climate consisting of cold winters and hot summers, low humidity, light rainfall, and ample sunshine. Extremes in temperature are common in some years. The climate results from MLRA 64 being near the geographic center of North America. There are few natural barriers on the Northern Great Plains. Air masses move freely across the plains and account for rapid changes in temperature.

Average annual precipitation for the Hartville Uplift area is 15.4 inches per year. The normal average annual temperature is about 46 °F. January is the coldest month with

average temperatures around 24 °F (Lusk 2 SW, WY). July is the warmest month with average temperatures around 69 °F (Lusk 2 SW, WY). The range of normal average monthly temperatures between the coldest and warmest months is about 50 °F. This large annual range attests to the continental nature of the climate of this area. 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, strong 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. Growth of warm-season plants begins about mid-May and continues 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)	85 days
Freeze-free period (characteristic range)	108-114 days
Precipitation total (characteristic range)	356-432 mm
Frost-free period (actual range)	85 days
Freeze-free period (actual range)	107-116 days
Precipitation total (actual range)	356-432 mm
Frost-free period (average)	85 days
Freeze-free period (average)	111 days
Precipitation total (average)	381 mm

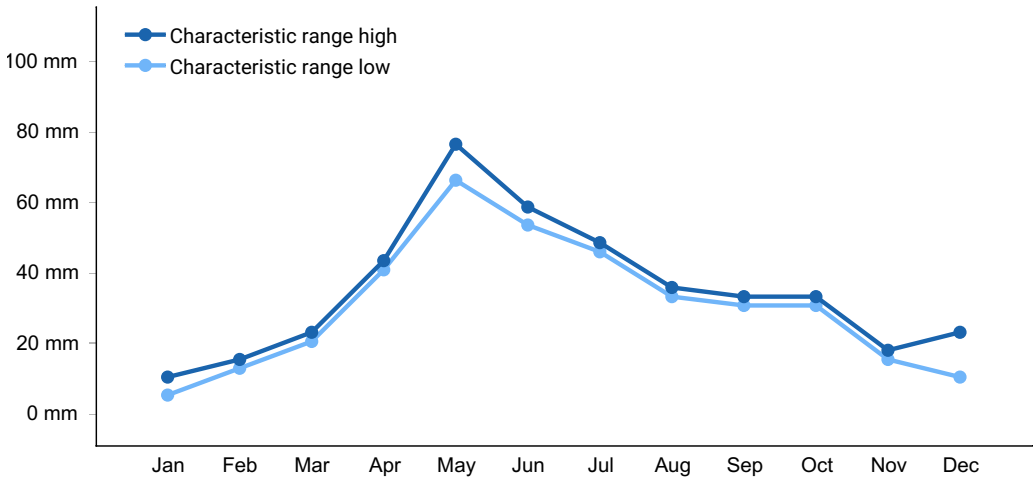


Figure 1. Monthly precipitation range

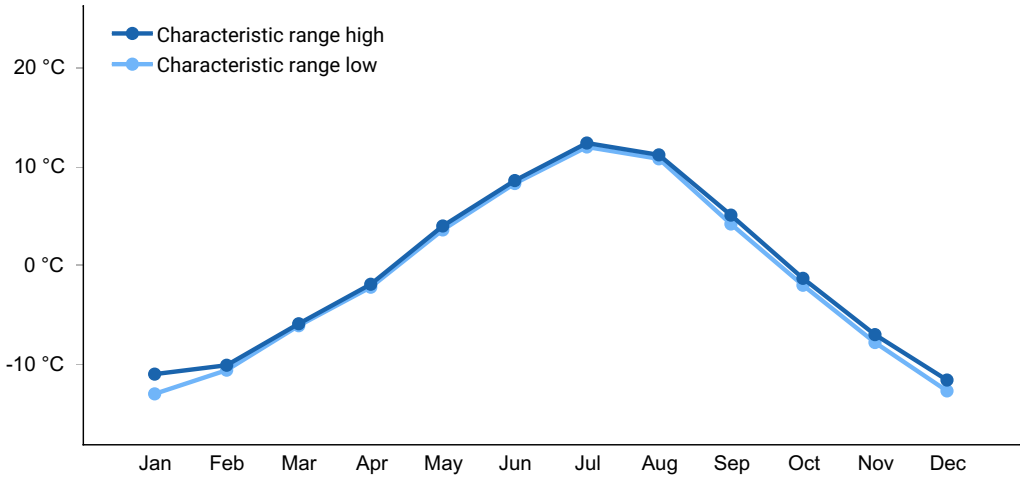


Figure 2. Monthly minimum temperature range

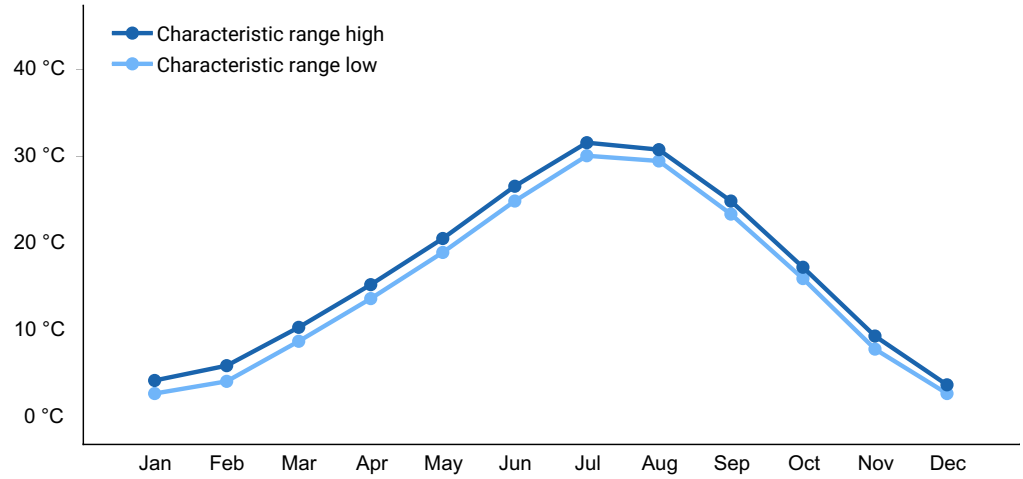


Figure 3. Monthly maximum temperature range

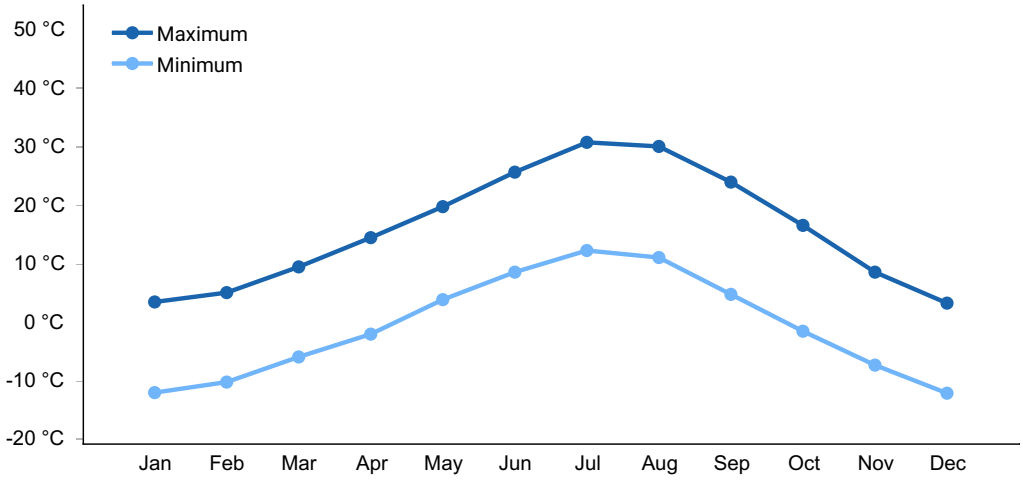


Figure 4. Monthly average minimum and maximum temperature

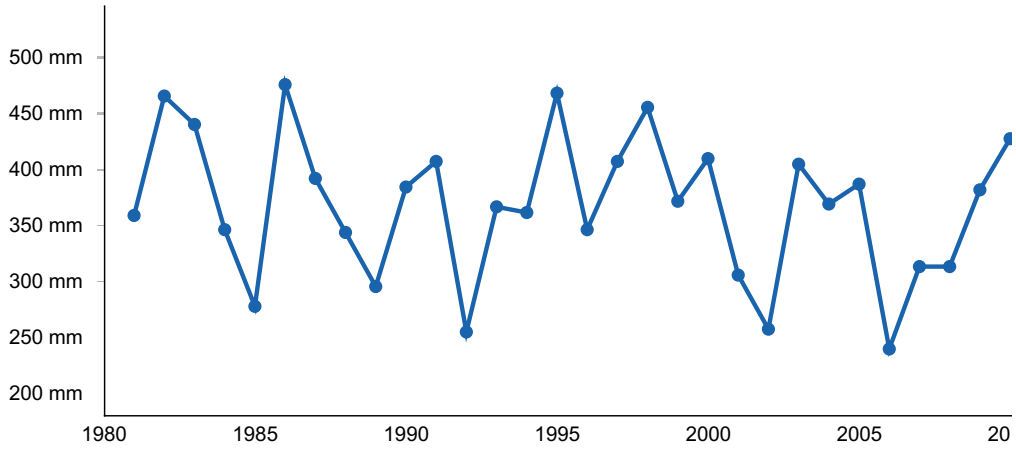


Figure 5. Annual precipitation pattern

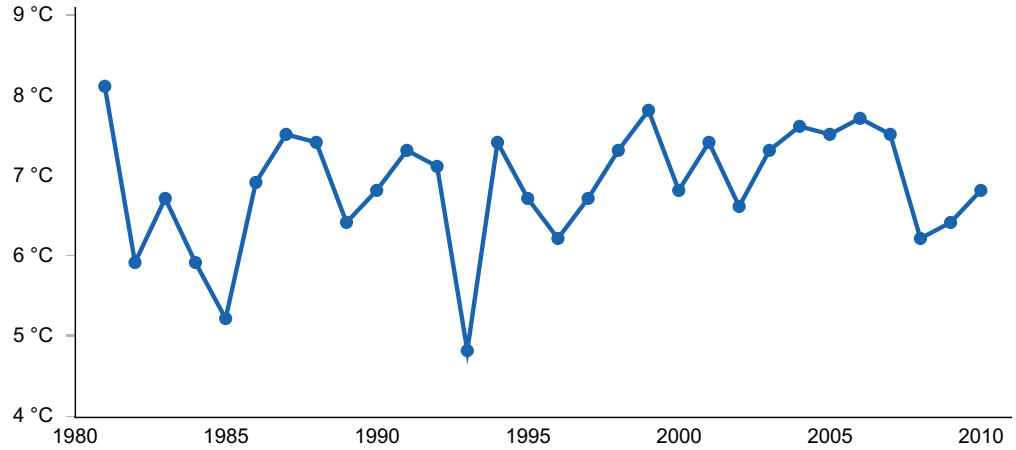


Figure 6. Annual average temperature pattern

Climate stations used

- (1) GLENDO 6NE [USC00483936], Glendo, WY
- (2) LUSK 2 SW [USC00485830], Lusk, WY
- (3) OLD FT LARAMIE [USC00486852], Yoder, WY

Influencing water features

No riparian or wetland features are directly associated with the Very Shallow HU ecological site.

Soil features

The soils of this site are 4 to 10 inches deep. The surface layer is fine sandy loam, sandy loam, or very channery loam. The subsoil is sandy loam, fine sandy loam, or very channery clay loam. Infiltration rates are moderate. The soils are well drained and formed in residuum weathered from sandstone or limestone.

This site shows slight to no evidence of rills, wind-scoured areas, or pedestalled plants.

Water flow paths are broken, are irregular in appearance, or are discontinuous and have numerous debris dams or vegetative barriers. The soil surface is stable and intact. Subsurface soil layers restrict water movement and root penetration.

Major Soils Correlated to the Very Shallow HU Ecological Site: Sunup, Taluce, Treon, and an unnamed Lithic Haplustoll.

Water erosion is the main hazard affecting the soils of this site. Wind erosion is also a hazard in areas of bare ground. Low available water capacity caused by the shallow rooting depth strongly influences the soil-water-plant relationship.

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

Table 4. Representative soil features

Parent material	(1) Residuum–sandstone (2) Residuum–limestone
Surface texture	(1) Channery loam
Family particle size	(1) Loamy-skeletal
Drainage class	Well drained to excessively drained
Permeability class	Moderate to moderately rapid
Depth to restrictive layer	13–25 cm
Soil depth	13–25 cm
Surface fragment cover <=3"	0–50%
Surface fragment cover >3"	0–20%
Available water capacity (25.4cm)	2.54–7.62 cm
Calcium carbonate equivalent (25.4cm)	0–40%
Electrical conductivity (25.4cm)	0–4 mmhos/cm
Sodium adsorption ratio (25.4cm)	0
Soil reaction (1:1 water) (25.4cm)	6.1–8.4
Subsurface fragment volume <=3" (25.4cm)	0–70%

Subsurface fragment volume >3" (25.4cm)	0–25%

Ecological dynamics

The Very Shallow HU 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, 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 Bunchgrass/Mountain Mahogany Plant Community (1.1). Species such as threadleaf sedge and blue grama initially increase in abundance. Needle and thread, plains muhly, bluebunch wheatgrass, little bluestem, and sideoats grama decrease in frequency and production and eventually disappear. Heavy, continuous grazing causes blue grama and threadleaf sedge to dominate the plant community and causes the extent of bare ground to increase. Some areas of the Very Shallow HU ecological site are inaccessible to livestock but typically do not produce enough litter to adversely affect plant community dynamics. Alderleaf mountain mahogany is common on this site and provides browse and cover for wildlife. Rocky Mountain juniper and ponderosa pine may also grow in minor amounts.

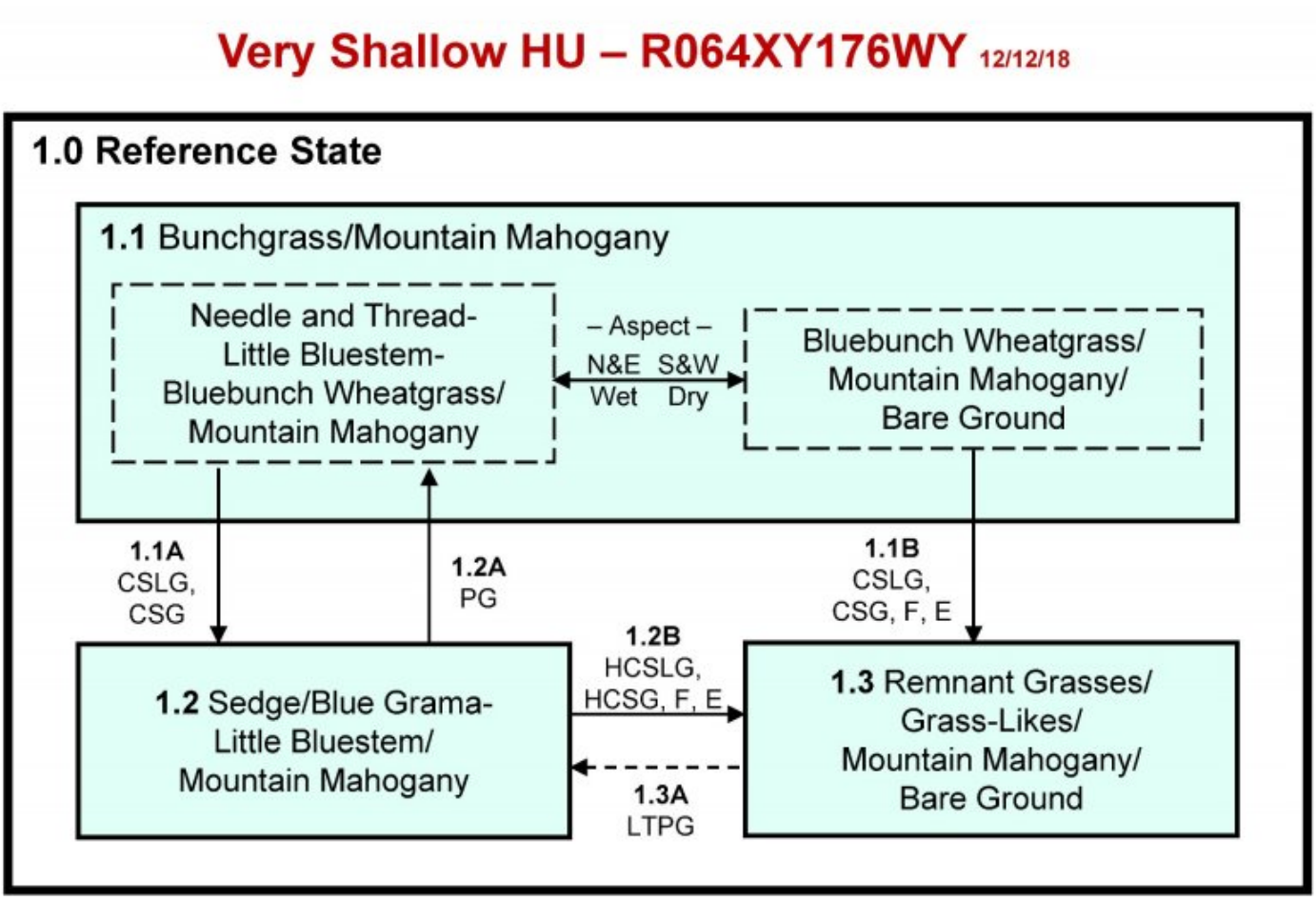
In some areas, the Very Shallow HU ecological site is highly dissected due to landscape position and slope aspect. Slope aspect can have a significant effect on the makeup of a plant community. However, because this site is of small extent in the Hartville Uplift, the reference plant community is treated as one plant community. North- and east-facing slopes tend to be wetter, cooler, and support more vegetation than south- and west-facing slopes, which are drier and have more exposed bare ground.

Interpretations are primarily based on the Bunchgrass/Mountain Mahogany Plant Community (1.1). The community was determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Also studied were trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts. Plant communities, states, transitional pathways, and thresholds were 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 the communities. The ecological processes are discussed in more detail in the plant community descriptions following the diagram.

State and transition model



CSG – Continuous seasonal grazing
CSLG – Continuous season-long grazing
E – Erosion
F – Fire
HCG – Heavy continuous grazing
HCSLG – Heavy, continuous season-long grazing
LTPG – Long-term prescribed grazing
PG – Prescribed grazing
- - → Pathway will likely take an extend period of time

Diagram Legend: Very Shallow HU - R064XY176WY

1.1A	1.1 to 1.2	Continuous seasonal grazing that includes stocking above the recommended rates and inadequate time for rest and recovery following grazing; or continuous season-long grazing.
1.1B	1.1 to 1.3	Continuous seasonal grazing that includes stocking above the recommended rates and inadequate time for rest and recovery following grazing; or soil erosion following fire.
1.2A	1.2 to 1.1	Prescribed grazing that includes proper stocking rates, change in season of use, and adequate time for rest and recovery following grazing.
1.2B	1.2 to 1.3	Heavy, continuous season-long grazing; heavy, continuous seasonal grazing; soil erosion.
1.3A	1.3 to 1.2	Long-term prescribed grazing that includes proper stocking rates, change in season of use, and adequate time for rest and recovery following grazing. Extended periods of non-use may also be needed. This pathway is likely to take an extended period of time.

State 1
Reference State

The Reference State (1.0) represents the best estimate of the natural range of variability that dominated the dynamics of the Very Shallow HU ecological site prior to European settlement. In pre-European times, the primary disturbances included grazing by large ungulates and small mammals, periodic fire, and drought. In the Reference State, north- and east-facing slopes are dominated by a mix of cool-season needlegrass, warm-season bunchgrass, warm-season shortgrasses, sedge, and shrubs. On some steep, south- and west-facing slopes, alderleaf mountain mahogany is the dominant species. Rocky Mountain juniper and ponderosa pine may also grow in minor amounts in some areas adjacent to rock outcrops. Heavy grazing causes the plant community to transition to a community dominated by the upland sedges and warm-season shortgrasses. Erosion of the surface horizon is a potential outcome in areas that are heavily grazed. Favorable growing conditions occur during the spring and the warm months of June through August. This state is in areas that have a history of proper grazing management and in areas with moderate to light wildlife use.

Dominant plant species

- alderleaf mountain mahogany (*Cercocarpus montanus*), shrub
- needle and thread (*Hesperostipa comata ssp. comata*), grass
- little bluestem (*Schizachyrium scoparium*), grass
- bluebunch wheatgrass (*Pseudoroegneria spicata*), grass
- threadleaf sedge (*Carex filifolia*), grass
- sideoats grama (*Bouteloua curtipendula*), grass
- blue grama (*Bouteloua gracilis*), grass
- ricegrass (*Oryzopsis*), grass
- thickspike wheatgrass (*Elymus lanceolatus*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- plains muhly (*Muhlenbergia cuspidata*), grass
- prairie Junegrass (*Koeleria macrantha*), grass

- dotted blazing star (*Liatris punctata*), other herbaceous
- purple prairie clover (*Dalea purpurea*), other herbaceous
- hairy false goldenaster (*Heterotheca villosa*), other herbaceous
- phlox (*Phlox*), other herbaceous
- prairie sagewort (*Artemisia frigida*), other herbaceous
- skunkbush sumac (*Rhus trilobata*), other herbaceous
- creeping juniper (*Juniperus horizontalis*), other herbaceous
- yucca (*Yucca*), other herbaceous

Community 1.1
Bunchgrass/Mountain Mahogany - (Two Slope Phases), (N&E-Facing) and (S&W-Facing)

Interpretations are based primarily on the Bunchgrass/Mountain Mahogany Plant Community. This plant community is also considered to be the Reference Plant Community (1.1). On the wetter and cooler, north- and east-facing slopes, this plant community consists of needle and thread, little bluestem, bluebunch wheatgrass, and alderleaf mountain mahogany. The drier and warmer, south- and west-facing slopes can have up to 30 percent bare ground or exposed rock and a plant community consisting of bluebunch wheatgrass, little bluestem, and alderleaf mountain mahogany. The reference plant community evolved with very light to moderate grazing and occasional fire. It is in areas that are properly managed with prescribed grazing that includes proper use, changes in season of use, and adequate recovery periods following each grazing event. The potential vegetation is about 75 percent grasses or grass-like plants, 10 percent forbs, and 15 percent shrubs and trees. An even mix of both cool- and warm-season grasses or grass-like plants dominates this plant community. The major grasses or grass-like plants include needle and thread, bluebunch wheatgrass, threadleaf sedge, little bluestem, sideoats grama, and blue grama. Other grasses on the site include Indian ricegrass, thickspike wheatgrass, western wheatgrass, plains muhly, and prairie Junegrass. The significant forbs include dotted gayfeather, prairie clover, hairy false goldenaster, and phlox. Significant shrubs are alderleaf mountain mahogany, fringed sagewort, skunkbush sumac, creeping juniper, and yucca. Rocky Mountain juniper and ponderosa pine may grow in minor amounts. This plant community is well adapted to the Northern Great Plains climatic conditions. Production of individual species can vary greatly depending on growing conditions (timing and amount of precipitation and temperature). Community dynamics, nutrient cycle, water cycle, and energy flow are functioning at the potential for the site. Plant litter is properly distributed with some movement offsite. Natural plant mortality is low. The diversity in plant species allows for high drought tolerance.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	443	488	527
Shrub/Vine	28	84	140
Forb	62	84	106
Tree	–	17	39
Total	**533**	**673**	**812**

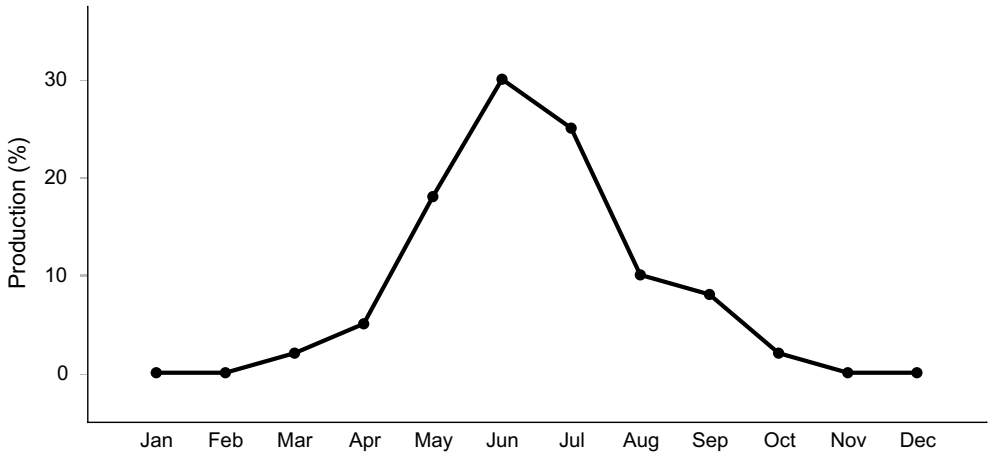


Figure 8. Plant community growth curve (percent production by month). WY6403, Pine Ridge/Badlands, cool-season/warm-season codominant. Hartville Uplift - Cool-season/warm-season codominant.

Community 1.2
Sedge/Blue Grama-Little Bluestem/Mountain Mahogany

On the wetter, north- and east-facing slopes, this plant community can develop from continuous season-long grazing, from annual, spring-seasonal grazing, or from heavy grazing in combination with drought. Short grasses and sedges dominate the site, and annual production is decreased dramatically compared to the reference community. Lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and high evaporation. These conditions give blue grama a competitive advantage over cool-season mid-grasses. Blue grama and threadleaf sedge are the dominant grass and grass-like species. Little bluestem grows in remnant patches. Other grasses may include plains muhly, bluebunch wheatgrass, needle and thread, prairie Junegrass, and threeawn. Significant forbs include hairy goldaster, pussytoes, and phlox. Major shrubs are alderleaf mountain mahogany, fringed sagewort, ground juniper, and yucca This plant community is relatively stable. The competitive advantage of blue grama and threadleaf sedge prevents other species from establishing. This plant community is less productive than the Bunchgrass/Mountain Mahogany Plant Community (1.1). Runoff is increased, and infiltration is decreased. The extent of soil erosion is not appreciably increased.

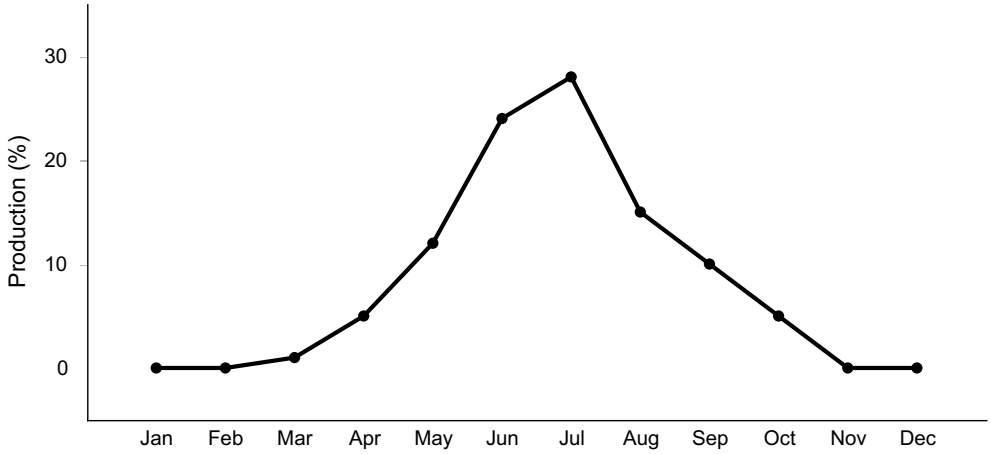


Figure 9. Plant community growth curve (percent production by month). WY6404, Pine Ridge/Badlands, warm-season dominant, cool-season subdominant. Hartville Uplift, warm-season dominant, cool-season subdominant.

Community 1.3
Remnant Grasses/Grass-Likes/Mountain Mahogany/Bare Ground

On the drier, south- and west-facing slopes, this plant community can develop from continuous season-long grazing, from annual, spring-seasonal grazing, or from erosion following fire. On north- and east-facing slopes, this plant community can develop from heavy, continuous season-long grazing or from heavy, annual, spring-seasonal grazing and erosion following fire. Grasses, sedges, and shrubs are decreased in extent compared to the reference community. The extent of bare ground and exposed rock are increased. The areas of bare ground are very susceptible to invasion by annual brome. Lack of cover results in higher soil temperatures, poor water infiltration rates, high evaporation, and increased runoff.

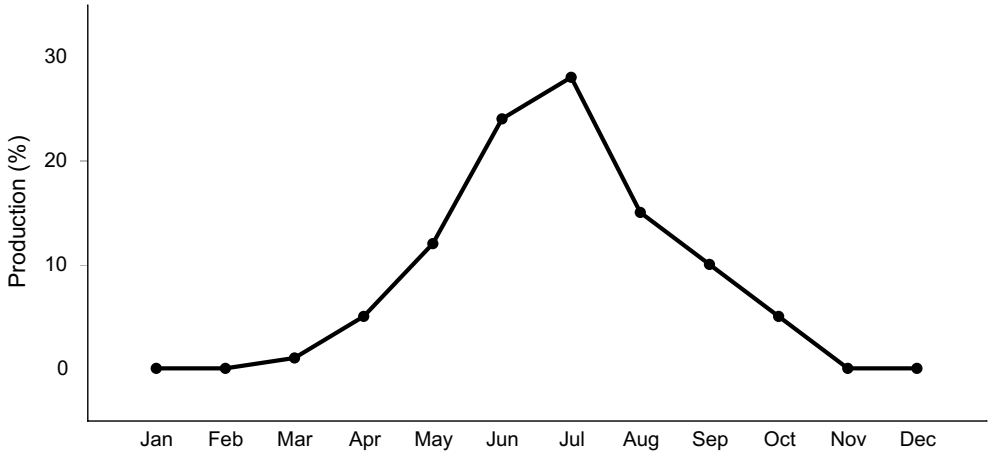


Figure 10. Plant community growth curve (percent production by month). WY6404, Pine Ridge/Badlands, warm-season dominant, cool-season subdominant. Hartville Uplift, warm-season dominant, cool-season subdominant.

Pathway 1.1A

Community 1.1 to 1.2

The Needle and Thread-Little Bluestem-Bluebunch Wheatgrass/Mountain Mahogany Plant Community (1.1), which is on the wetter, north- and east-facing slopes, converts to the Sedge/Blue Grama-Little Bluestem/Mountain Mahogany Plant Community (1.2) if subject to continuous season-long grazing or to continuous seasonal grazing.

Pathway 1.1B
Community 1.1 to 1.3

The Bluebunch Wheatgrass/Mountain Mahogany/*Bare Ground* Plant Community (1.1), which is on the drier, south- and west-facing slopes, converts to the Remnant Grasses/Grass-Likes/Mountain Mahogany/*Bare Ground* Plant Community (1.3) if subject to continuous season-long grazing, to continuous seasonal grazing, or to soil erosion following fire.

Pathway 1.2A
Community 1.2 to 1.1

On north- and east-facing slopes, prescribed grazing that includes proper stocking rates, change in season of use, and adequate time for plant recovery following grazing commonly convert plant community 1.2 to the Bunchgrass/Mountain Mahogany Plant Community (1.1).

Conservation practices

Prescribed Grazing

Pathway 1.2B
Community 1.2 to 1.3

Heavy, continuous season-long grazing; heavy, continuous seasonal grazing; and soil erosion will convert plant community 1.2 to the Remnant Grasses/Grass-Likes/Mountain Mahogany/*Bare Ground* Plant Community (1.3).

Pathway 1.3A
Community 1.3 to 1.2

Depending on the amount and composition of the remnant native vegetation and on the condition of the topsoil, long-term prescribed grazing or extended periods of non-use may move plant community 1.3 to the Sedge/Blue Grama-Little Bluestem/Mountain Mahogany Plant Community (1.2). This pathway is likely to take an extended period of time.

Conservation practices

Prescribed Grazing

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Mid- Warm-Season Grasses**			135–202	
	little bluestem	SCSC	*Schizachyrium scoparium*	67–168	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	34–67	–
2	**Cool-Season Bunchgrasses**			67–202	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	67–135	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	13–101	–
3	**Rhizomatous Wheatgrass**			0–101	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–67	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–67	–
4	**Short- Warm-Season Grasses**			34–67	
	blue grama	BOGR2	*Bouteloua gracilis*	34–67	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–34	–
5	**Other Native Grasses**			34–101	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	13–67	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–34	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	7–34	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–13	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	7–13	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–13	–
6	**Native Grass-Likes**			34–101	
	threadleaf sedge	CAFI	*Carex filifolia*	34–101	–
	sedge	CAREX	*Carex*	0–13	–
7	**Non-Native Cool-Season Grasses**			–	

	cheatgrass	BRTE	*Bromus tectorum*	–	–
	field brome	BRAR5	*Bromus arvensis*	–	–
	crested wheatgrass	AGCR	*Agropyron cristatum*	–	–
Forb					
8	**Forbs**			67–101	
	dotted blazing star	LIPU	*Liatris punctata*	7–34	–
	pussytoes	ANTEN	*Antennaria*	0–34	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	7–34	–
	spiny phlox	PHHO	*Phlox hoodii*	7–34	–
	Forb, perennial	2FP	*Forb, perennial*	0–34	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	7–20	–
	purple prairie clover	DAPU5	*Dalea purpurea*	7–13	–
	field sagewort	ARCA12	*Artemisia campestris*	0–13	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–13	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–13	–
	scurfpea	PSORA2	*Psoralidium*	7–13	–
	milkvetch	ASTRA	*Astragalus*	0–13	–
	beardtongue	PENST	*Penstemon*	0–13	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–13	–
	sandwort	ARENA	*Arenaria*	0–7	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–7	–
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	0–7	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–7	–
	Indian breadroot	PEDIO2	*Pediomelum*	0–7	–
Shrub/Vine					
9	**Shrubs**			34–135	
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	13–135	–
	soapweed yucca	YUGL	*Yucca glauca*	7–34	–
	prairie sagewort	ARFR4	*Artemisia frigida*	7–34	–
	black sagebrush	ARNO4	*Artemisia nova*	0–13	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–13	–
	winterfat	KRLA2	*Krascheninnikovia*	0–13	–

			lanata		
	creeping juniper	JUHO2	*Juniperus horizontalis*	0–13	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–7	–
Tree					
10	**Trees**			0–34	
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	0–34	–
	ponderosa pine	PIPO	*Pinus ponderosa*	0–27	–

Animal community

►Wildlife Interpretations◄

MLRA 64 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 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, species composition and abundance were influenced by livestock grazing, cropland conversion, elimination of fire, energy development, and other anthropogenic factors. 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 64, the Very Shallow HU ecological site provides upland grassland cover with an associated forb, shrub, and tree component. The site was typically part of an expansive grassland landscape that included combinations of Badlands, Thin Breaks, Clayey, Claypan, Dense Clay, Loamy, Saline, Sandy, Overflow, Subirrigated, and Terrace ecological sites.

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

The majority of the Very Shallow HU ecological site remains intact and provides increasingly important habitat for grassland and shrub steppe nesting birds, small rodents, coyote, and a variety of reptiles, amphibians, and insects. Invasive species, such as cheatgrass and field brome, have impacted the biological integrity of the site for some grassland birds. Changes in historic fire regime and domestic grazing have impacted the relative extent of forbs, shrubs, and grasses.

Bunchgrass/Mountain Mahogany (1.1).—The predominance of grasses in this community favors herbivores. Insects, including pollinators, play a role in maintaining the forb community and provide a forage base for grassland birds and other species. The structural diversity of plant populations 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. 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 provides high nutrition levels for small and large herbivores including voles, mice, spotted ground squirrel, white-tailed jackrabbit, black-tailed jackrabbit, and deer. The higher stature of this plant community provides thermal, protective, and escape cover for herbivores and grassland birds. Predators that use this plant community include coyote, American badger, red fox, and long-tailed weasel. This plant community provides habitat for amphibians and reptiles, such as the gopher snake, milk snake, and prairie rattlesnake.

►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: Bunchgrass/Mountain Mahogany Plant Community (1.1)
Average Production (lb/acre, air-dry): 600
Stocking Rate (AUM/acre): 0.14

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 have been 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 herbage production on this site. The site is dominated by soils in hydrologic group B. The infiltration rate is moderate. Runoff potential varies from moderate to high depending on soil hydrologic group and ground cover. In many cases, areas that have greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An exception occurs where shortgrasses form a dense sod and dominate the site. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff. Refer to the USDA-NRCS National Engineering Handbook, Part 630, for hydrologic soil groups, runoff quantities, and hydrologic curves.

Recreational uses

This site provides opportunities for hunting upland game species. The wide variety of plants that bloom from spring until fall have aesthetic value that appeals to visitors.

Wood products

No appreciable wood products are 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 standards in the 2014 National Ecological Site Handbook for a provisional ecological site description.

►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 was 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; George Gamblin, RMS, NRCS; Rick Peterson, RMS, NRCS; and Kent Cooley, conservation soil scientist, NRCS.

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Acknowledgments

This provisional ecological site description was updated by Rick L. Peterson and George Gamblin on December 27, 2018.

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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	03/11/2026
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:**

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

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

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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):**

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

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

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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:**

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17. **Perennial plant reproductive capability:**
