

## Ecological site R060AY016SD Very Shallow

Last updated: 6/25/2024  
Accessed: 05/12/2025

### 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.

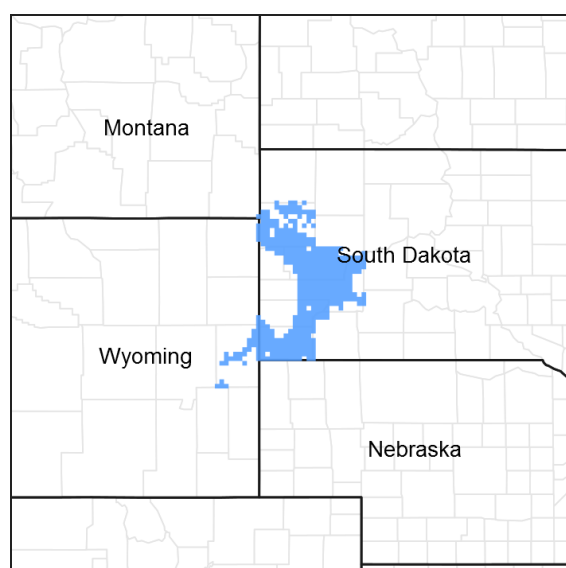


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

### MLRA notes

Major Land Resource Area (MLRA): 060A–Pierre Shale Plains

The Pierre Shale Plains (MLRA 60A) consists of approximately 10,150 square miles, the majority of which is in South Dakota (70 percent) and small portions are in Montana (2 percent), Nebraska (8 percent), and Wyoming (20 percent). It encircles the Black Hills (MLRA 62) and the Dakota Hogback (MLRA 61). MLRA 60A includes portions of the Oglala, Buffalo Gap, and Thunder Basin National Grasslands. It also includes small sections of the Pine Ridge Indian Reservation, Badlands National Park, and Black Hills National Forest. The Cheyenne and Belle Fourche Rivers flow through the MLRA.

MLRA 60A is in the unglaciated section of the Missouri Plateau, of the Great Plains Province of the Interior Plains. It is an area of old plateaus and terraces that have been deeply eroded. Cretaceous Pierre Shale underlies almost all of this MLRA. This is a marine sediment with layers of volcanic ash that has been altered to smectitic clay. These clays shrink as they dry and swell as they receive moisture. Soils are shallow to very deep and generally are well drained and clayey.

Elevations generally range from 2,620 to 3,610 feet throughout the MLRA, but can range up to 4,260 feet. The average annual precipitation for the western side of the MLRA is 13 to 16 inches, whereas the eastern side receives 16 to 18 inches. A suite of ecological sites has been written specifically for these two precipitation zones. The Locator Map shows the break between the two precipitation zones.

This area supports a mixed natural prairie vegetation consisting of both cool- and warm-season grasses and forbs. Wyoming big sagebrush occurs primarily in the drier western portion of the MLRA, however, small remnant stands can be found in the eastern portion. Dominant land uses of the area are primarily ranching and, to a lesser extent, farming. Major resource concerns to this MLRA are wind erosion and surface water quality.

## Classification relationships

USDA - Land Resource Region G – Western Great Plains Range and Irrigated Region, Major Land Resource Area (MLRA) 60A – Pierre Shale Plains.

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

## Ecological site concept

The Very Shallow site occurs throughout MLRA 60A. It is located on level to steep, terrace remnants, knolls, and ridges on upper slopes of undulating or rolling uplands. Slopes range from 0 to 50 percent and the soil surface texture is loam. The soil formed in 3 to 10 inches of gravelly alluvium. The site is considered a run-off site and does not receive additional moisture from run-in or overflow.

Vegetation in the Reference State consists primarily of warm-season shortgrasses, upland sedges, cool-season needlegrasses, and a wide variety of perennial forbs and several shrub and half-shrub species.

## Associated sites

R060AY009SD	<b>Sandy</b>
R060AY017SD	<b>Shallow Clay</b>
R060AY024SD	<b>Shallow Loamy</b>
R060AY044SD	<b>Shallow Sandy</b>

## Similar sites

R060AY024SD	<b>Shallow Loamy</b> Less needleandthread, porcupine grass, western wheatgrass, & sideoats grama; higher production.
R060AY044SD	<b>Shallow Sandy</b> More sandreed/bluestem; less plains muhly/sideoats grama; higher production

**Table 1. Dominant plant species**

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Hesperostipa comata</i> (2) <i>Schizachyrium scoparium</i>

## Physiographic features

This site typically occurs on gently to steeply sloping uplands.

**Table 2. Representative physiographic features**

Landforms	(1) Terrace (2) Knoll (3) Ridge
Flooding frequency	None

Ponding frequency	None
Elevation	2,500–4,300 ft
Slope	6–50%
Aspect	Aspect is not a significant factor

## 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, for the entire MLRA, 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 the more severe occur during late fall, 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, 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 annually, ranging from about 13 miles per hour during the spring to about 10 miles per hour during the summer. Daytime winds generally are stronger than nighttime, and occasional strong storms may bring brief periods of high winds with gusts to more than 50 miles per hour.

Growth of cool-season plants begins in early to mid-March, slowing or ceasing in late June. Warm-season plants begin growth about mid-May and can continue to early or mid-September. Green-up of cool-season plants may occur in September and October when adequate soil moisture is present.

**Table 3. Representative climatic features**

Frost-free period (characteristic range)	98-105 days
Freeze-free period (characteristic range)	123-129 days
Precipitation total (characteristic range)	15-18 in
Frost-free period (actual range)	76-108 days
Freeze-free period (actual range)	113-133 days
Precipitation total (actual range)	14-18 in
Frost-free period (average)	97 days
Freeze-free period (average)	124 days
Precipitation total (average)	16 in

## Climate stations used

- (1) WASTA [USC00398911], Owanka, SD
- (2) UPTON [USC00489205], Upton, WY
- (3) BELLE FOURCHE [USC00390559], Belle Fourche, SD
- (4) MOORCROFT 3S [USW00024088], Moorcroft, WY
- (5) REDBIRD [USC00487555], Lance Creek, WY
- (6) ARDMORE 1 NW [USC00390236], Edgemont, SD

## Influencing water features

No significant water features influence this site.

## Wetland description

Not Applicable.

## Soil features

The soils in this site are well drained and formed in soft siltstone, sandstone, porcelanite, or alluvium. The loam surface layer is 3 to 6 inches thick. The soils have a moderate infiltration rate. This site should show slight to no evidence of rills, wind-scoured areas, or pedestalled plants. Water flow paths are broken, irregular in appearance, or discontinuous with numerous debris dams or vegetative barriers. The soil surface is stable and intact. Sub-surface soil layers are restrictive to water movement and root penetration.

Soil correlated to the Very Shallow ecological site: Nihill, Samsil, Schamber, Sunup, Vivian

These soils are mainly susceptible to water erosion. The hazard of water erosion increases on slopes greater than about 15 percent. Low available water capacity caused by the shallow rooting depth strongly influences the soil-water-plant relationship.

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

**Table 4. Representative soil features**

Surface texture	(1) Gravelly loam (2) Very gravelly
Family particle size	(1) Loamy
Drainage class	Well drained to excessively drained
Permeability class	Moderately rapid to rapid
Soil depth	0–10 in
Surface fragment cover <=3"	0–25%
Surface fragment cover >3"	0–10%
Available water capacity (0-40in)	1–3 in
Calcium carbonate equivalent (0-40in)	0–10%
Electrical conductivity (0-40in)	0–4 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	6.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	20–70%
Subsurface fragment volume >3" (Depth not specified)	6–65%

## Ecological dynamics

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

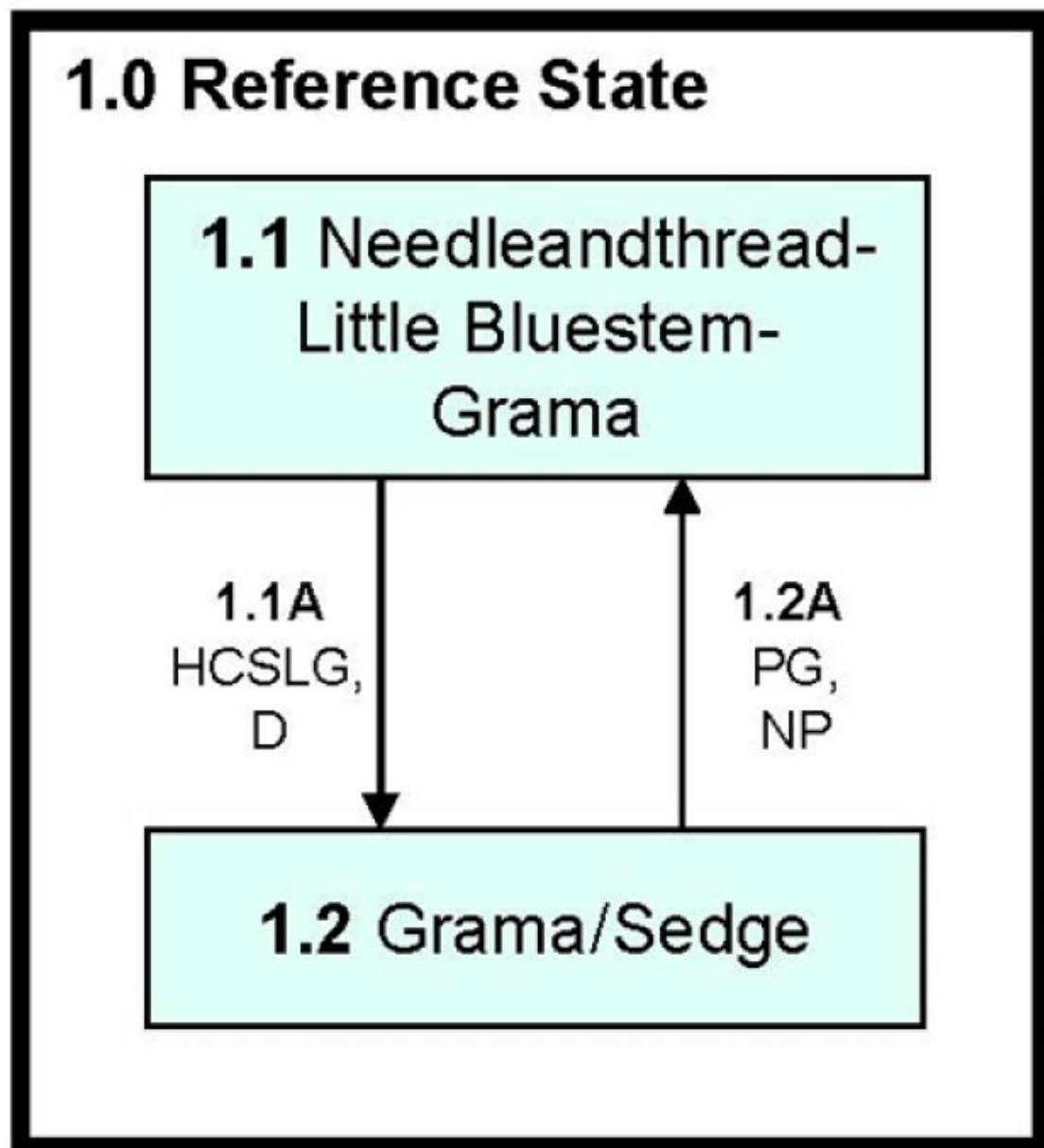
more typical transitions between communities that will occur, severe disturbances, such as periods of well-below average precipitation, can cause significant shifts in plant communities and/or species composition.

Continuous grazing without adequate recovery periods following each grazing occurrence over several years causes this site to depart from the Needle and thread-Little Bluestem-Grama Plant Community Phase (1.1). Species such as threadleaf sedge and blue grama will initially increase. Plains muhly, western wheatgrass, bluebunch wheatgrass, little bluestem, and sideoats grama will decrease in frequency and production and later disappear. Heavy, continuous grazing causes blue grama and/or threadleaf sedge to dominate.

The plant community upon which interpretations are primarily based is the Reference Plant Community (1.1). The Reference Plant Community 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 diagram illustrates the common plant communities and vegetation states commonly occurring on the site and the transition pathways between communities and states. The ecological processes are discussed in more detail in the plant community descriptions following the diagram.

## **State and transition model**



**D** – Drought

**HCSLG** – Heavy, continuous season-long grazing

**NP** – normal precipitation patterns

**PG** – Prescribed grazing

Diagram Legend - Very Shallow - R060AY016SD		
CP 1.1A	1.1 - 1.2	Heavy continuous season-long grazing, above recommended stocking rates and without adequate time for rest and recovery and/or drought.
CP 1.2A	1.2 - 1.1	Prescribed grazing including change in season of use, proper stocking and adequate time for rest and recovery, normal precipitation following drought.

Figure 9. Very Shallow - R060AY016SD

State 1  
Reference State

This state represents what is believed to show the natural range of variability that dominated the dynamics in this ecological site prior to European settlement. This site, in reference, is dominated by a mix of warm-season shortgrasses, warm-season bunch grasses, sedges and, cool-season needlegrass. Heavy grazing will cause 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 with heavy grazing. In pre-European times the primary disturbances included grazing by large ungulates and small mammals, and drought. Favorable growing conditions occurred during the spring, and warm months of June through August. Today a similar state can be found in areas where proper livestock use has occurred.

Community 1.1  
Needleandthread-Little Bluestem-Grama

The plant community upon which interpretations are primarily based is the Needleandthread-Little Bluestem-Grama Plant Community (1.1). This is also considered to be the Reference Plant Community. This plant community can be found on areas that are properly managed with prescribed grazing that allows for proper utilization, changes in season of use, and adequate recovery periods following each grazing event. The potential vegetation is about 75 to 90 percent grasses or grass-like plants, 5 to 15 percent forbs, and 5 to 10 percent shrubs. An even mix of both warm- and cool-season grasses and grass-likes dominates this plant community. The major grasses or grass-likes include needleandthread, western wheatgrass, threadleaf sedge, little bluestem, and both sideoats and blue grama. Other grasses occurring on the site include thickspike wheatgrass, bluebunch wheatgrass, plains muhly, and prairie junegrass. The significant forbs include dotted gayfeather, purple coneflower, prairie clover, and lacy tansyaster. Significant shrubs are fringed sagewort, rose, skunkbush sumac, and yucca. 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 the sites potential. Plant litter is properly distributed with some movement off-site, and 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 (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	380	660	890
Forb	35	80	125
Shrub/Vine	35	60	85
Total	450	800	1100

Figure 11. Plant community growth curve (percent production by month).  
SD6003, Pierre Shale Plains, cool-season/warm-season co-dominant.. Cool-season, warm-season co-dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	20	28	21	10	5	3	0	0

Community 1.2  
Grama/Sedge

This plant community can develop from the adverse effects of heavy, continuous season-long grazing. Short grasses and forbs increase to dominate the site and annual production decreases dramatically. Lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and higher evaporation, which gives blue grama and sedges a competitive advantage over cool and warm-season mid-grasses. Blue grama and threadleaf sedge are the dominant grass/grass-like species. Other grasses may include western wheatgrass, needleandthread, little bluestem, prairie junegrass, and threeawn. Significant forbs include green sagewort, lacy tansyaster, rush skeletonweed, hairy goldaster, pussytoes, Hood’s phlox, and scarlet globemallow. The significant shrubs include broom snakeweed, cactus, and fringed sagewort. 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 HCPC. Runoff has increased and infiltration has decreased. Soil erosion does not increase appreciably.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	150	300	450
Forb	35	60	85
Shrub/Vine	15	40	65
Total	200	400	600

Figure 13. Plant community growth curve (percent production by month).  
SD6003, Pierre Shale Plains, cool-season/warm-season co-dominant.. Cool-  
season, warm-season co-dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	20	28	21	10	5	3	0	0

Pathway 1.1A  
Community 1.1 to 1.2

Heavy, continuous season-long grazing without adequate recovery and/or drought will convert the plant community to the Grama/Sedge Plant Community.

Pathway 1.2A  
Community 1.2 to 1.1

Prescribed grazing and a return to normal precipitation patterns will shift this plant community back to the Needleandthread-Little Bluestem-Grama Plant Community.

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Needleandthread			80–160	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	80–160	–
2	Mid Warm-Season Grasses			80–160	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	80–120	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	16–40	–
3	Grama			160–320	
	sidecocks grama	BOCH1	<i>Bouteloua curtipendula</i>	80–200	



	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	80–200	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	40–160	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	40–80	–
4	<b>Wheatgrass</b>			40–80	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	40–80	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus</i> ssp. <i>lanceolatus</i>	0–40	–
5	<b>Other Native Grasses</b>			8–40	
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–40	–
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	0–40	–
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	0–40	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	8–40	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	8–16	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–16	–
	threeawn	ARIST	<i>Aristida</i>	0–8	–
6	<b>Grass-like</b> s			40–120	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	40–120	–
	sedge	CAREX	<i>Carex</i>	0–16	–
<b>Forb</b>					
8	<b>Forbs</b>			40–120	
	dotted blazing star	LIPU	<i>Liatris punctata</i>	8–40	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	8–32	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	8–24	–
	white prairie clover	DACA7	<i>Dalea candida</i>	8–24	–
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	8–24	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	8–24	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–24	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	8–24	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	8–24	–
	stemless four-nerve daisy	TEAC	<i>Tetraneuris acaulis</i>	0–16	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0–16	–
	scarlet beeblossom	OESU3	<i>Oenothera suffrutescens</i>	0–16	–
	large Indian breadroot	PEES	<i>Pedimelum esculentum</i>	0–16	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	8–16	–
	eastern pasqueflower	PUPA5	<i>Pulsatilla patens</i>	0–16	–
	pussytoes	ANTEN	<i>Antennaria</i>	8–16	–
	tarragon	ARDR4	<i>Artemisia dracunculul</i>	0–16	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0–16	–
	lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	0–16	–
	buckwheat	ERIOG	<i>Eriogonum</i>	0–8	–
	milkvetch	ASTRA	<i>Astragalus</i>	0–8	–
	onion	ALLIU	<i>Allium</i>	0–8	–
<b>Shrub/Vine</b>					

9	<b>Shrubs</b>			40–80	
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0–24	–
	rose	ROSA5	<i>Rosa</i>	8–24	–
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0–24	–
	Subshrub (<.5m)	2SUBS	<i>Subshrub (&lt;.5m)</i>	0–24	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	8–24	–
	pricklypear	OPUNT	<i>Opuntia</i>	0–16	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–8	–

Table 8. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Needleandthread</b>			4–20	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	4–20	–
2	<b>Mid Warm-Season Grasses</b>			8–20	
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	4–20	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	4–20	–
3	<b>Grama</b>			120–180	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	80–140	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	40–80	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0–20	–
4	<b>Wheatgrass</b>			4–20	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	4–20	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus ssp. lanceolatus</i>	0–4	–
5	<b>Other Native Grasses</b>			4–20	
	threeawn	ARIST	<i>Aristida</i>	4–20	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	4–20	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	4–12	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–12	–
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	0–8	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–8	–
6	<b>Grass-likes</b>			80–140	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	80–140	–
	sedge	CAREX	<i>Carex</i>	4–20	–
7	<b>Non-native Grasses</b>			4–8	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	4–8	–
<b>Forb</b>					
8	<b>Forbs</b>			40–80	
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	4–20	–
	pussytoes	ANTEN	<i>Antennaria</i>	4–20	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	4–20	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	4–20	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	4–20	–

	spiny phlox	PHHO	<i>Phlox hoodii</i>	8–20	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	4–20	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0–16	–
	lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	4–12	–
	onion	ALLIU	<i>Allium</i>	0–12	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	4–12	–
	buckwheat	ERIOG	<i>Eriogonum</i>	0–12	–
	curlycup gumweed	GRSQ	<i>Grindelia squarrosa</i>	0–12	–
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	4–12	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	4–12	–
	milkvetch	ASTRA	<i>Astragalus</i>	4–12	–
	white prairie clover	DACA7	<i>Dalea candida</i>	0–8	–
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	0–8	–
	scarlet beebllossom	OESU3	<i>Oenothera suffrutescens</i>	0–8	–
	large Indian breadroot	PEES	<i>Pedimelum esculentum</i>	0–8	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0–8	–
	stemless four-nerve daisy	TEAC	<i>Tetranneuris acaulis</i>	0–8	–
	eastern pasqueflower	PUPA5	<i>Pulsatilla patens</i>	0–4	–
<b>Shrub/Vine</b>					
9	<b>Shrubs</b>			20–60	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	8–24	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	4–20	–
	pricklypear	OPUNT	<i>Opuntia</i>	0–20	–
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0–20	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0–12	–
	rose	ROSA5	<i>Rosa</i>	4–12	–
	Subshrub (<.5m)	2SUBS	<i>Subshrub (&lt;.5m)</i>	0–12	–

## Animal community

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 = Needleandthread-Little Bluestem-Grama (1.1)

Average Annual Production (lbs./ac, air-dry) = 800

Stocking Rate (AUM/ac) = 0.22

Plant Community = Grama/Sedge (1.2)

Average Annual Production (lbs./ac, air-dry) = 400

Stocking Rate (AUM/ac) = 0.11

\*Based on 912 lbs./acre (air-dry weight) per Animal Unit Month (AUM), and on 25 percent harvest efficiency of preferred and desirable forage species (refer to USDA NRCS, National Range and Pasture Handbook).

Total annual production on-site 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. 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.

## **Hydrological functions**

Water is the principal factor limiting herbage production on this site. The site is dominated by soils in hydrologic group A. Infiltration varies from rapid to very rapid and runoff varies from low to medium depending on slope and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An exception would be where shortgrasses form a dense sod and dominate the site. Normally, areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff (refer to Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic curves).

## **Recreational uses**

This site provides hunting opportunities for upland game species. The wide varieties of plants, which bloom from spring until fall, have an esthetic value that appeals to visitors.

## **Other products**

Selected seed harvest of certain unique native plant species can provide additional income.

## **Other information**

Revision Notes: "Previously Approved" Provisional

This Provisional ecological site concept has passed Quality Control (QC) and Quality Assurance (QA) to ensure that the site meets the 2014 NESH standards for a Provisional ecological site. This is an updated "Previously Approved" ESD which represents a first-generation tier of documentation that, prior to the release of the 2014 National Ecological Site Handbook (NESH), met all requirements as an "Approved" ESD as laid out in the 1997, rev.1, 2003 National Range and Pasture Handbook (NRPH). The document fully described the Reference State and Community Phase in the State-and-Transition model. All other alternative states are 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 does not contain all tabular and narrative entries as required in the current "Approved" level of documentation but it is expected that the "Previously Approved" ESD will continue refinement towards an "Approved" status.

### **Site Development and Testing Plan:**

Future work, as described in a Project Plan, is needed to validate the information in this Provisional Ecological Site Description. This will include field activities to collect low-, medium-, and high-intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. The final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document.

### **Non-discrimination Statement**

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## **Inventory data references**

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

## **Other references**

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## **Contributors**

Stan Boltz

## **Approval**

Suzanne Mayne-Kinney, 6/25/2024

## **Acknowledgments**

ESD updated by Rick L. Peterson, 4/3/17

MLRA 60A Provisional Level Quality Control (QC) Process  
9/28/17

Ecological Sites from MLRA 60A were Previously Approved ESDs and meet the requirements as stated in the 2003 National Range and Pasture Handbook.

The Sites were updated to the Provisional Level by Rick L. Peterson, ESS, Rapid City, SSO in FY17.

The sites were reviewed by George Gamblin, RMS, Wheatland, WY and Mitch Faulkner, RMS, Belle Fourche, SD. Mitch Faulkner acted as the Provisional QC. The Sites were then reviewed and approved at the Provisional Level by David Kraft, Regional ESS, Salina, KS.

Worked closely with Kent Cooley, Area SS, with MLRA key development and soils narratives

## 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)	Stan Boltz, Thad Berrett, Cheryl Nielsen
Contact for lead author	stanley.boltz@sd.usda.gov, 605-352-1236
Date	06/27/2008
Approved by	Suzanne Mayne-Kinney
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

## Indicators

1. **Number and extent of rills:** None on slopes of about 15% or less, slight to none and discontinuous on slopes greater than 15%.

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2. **Presence of water flow patterns:** None on slopes of about 15% or less; barely visible and discontinuous with numerous debris dams on slopes greater than 15%.

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3. **Number and height of erosional pedestals or terracettes:** Few pedestalled plants typically on steeper slopes.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 5 to 25 percent is typical.

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5. **Number of gullies and erosion associated with gullies:** None should be present.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None.

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7. **Amount of litter movement (describe size and distance expected to travel):** Small size litter classes will generally move short distances, some medium size class litter will move very short distances. Litter debris dams are occasionally present.
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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):** Soil aggregate stability ratings should typically be 3 or greater. Surface organic matter adheres to the soil surface. Soil surface fragments will typically retain structure for 1 minute or longer when dipped in distilled water.
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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** A-horizon should be 1 to 3 inches thick with light to dark brownish gray colors, but not typically mollic. Structure should typically be weak fine granular at least in the upper A-horizon.
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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Combination of shallow and deep rooted species (mid rhizomatous and tufted perennial cool- and warm-season grasses) with fine and coarse roots positively influences infiltration. Infiltration is typically high due to gravelly nature of soils.
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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):** None – very shallow to gravel, but no platy structure will be present.
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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: Short/mid warm-season rhizomatous grasses >
- Sub-dominant: Short/mid cool-season bunchgrasses > mid warm-season bunchgrasses > grass-likes = forbs >
- Other: Mid cool-season rhizomatous grasses = shrubs
- 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):** Production ranges from 450-1,100 lbs./acre (air-dry weight). Reference value production is 800 lbs./acre (air-dry weight).

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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: State and local noxious weeds
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17. **Perennial plant reproductive capability:** Species exhibit somewhat lower vigor than what would normally be expected for these species on other ecological sites. The droughty nature of the soils of this site causes plant stress even in typical precipitation patterns. Do not rate based solely on seed production.
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