USDA Natural Resources
Conservation Service

Ecological site R063AY016SD
Very Shallow

Accessed: 05/04/2024

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.

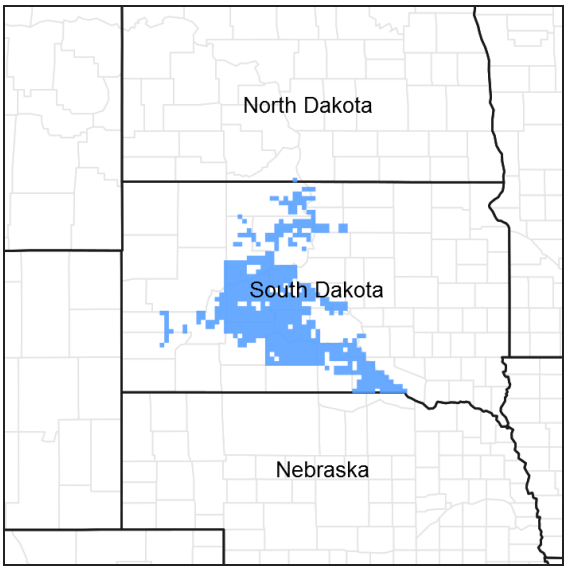


Figure 1. Mapped extent

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): 063A–Northern Rolling Pierre Shale Plains

MLRA 63A is approximately 10,160 square miles in size, the majority of which is in South Dakota and a very small portion in North Dakota. The MLRA extends west of the northern half of the South Dakota reach of the Missouri River. All five of the major rivers draining western South Dakota cross this area. From north to south, these are the Grand, Moreau, Cheyenne, Bad, and White Rivers.

Elevation range from 1,300 to 1,640 feet on the bottom land along the Missouri River to 1,640 to 2,950 feet on the shale plain uplands. Cretaceous Pierre Shale underlies almost all of this area. This is a marine sediment having layers of volcanic ash that has been altered to smectitic clays. These clays shrink as they dry and swell as they get wet. Tertiary and Quaternary river deposits, remnants of erosion from the Black Hills uplift, cap isolated highlands in this area. Deposits of alluvial sand and gravel occur on the valley floors adjacent to the major streams in the area. The average annual precipitation in this area is 15 to 20 inches.
The vegetation in this area is a transition from eastern tall grass prairie to a western mixed grass prairie, (USDA-NRCS, Ag Handbook 296).

Classification relationships

Land Resource Region (LRR): G - Western Great Plains Range and Irrigated Region, Major Land Resource Area (MLRA): 63A Northern Rolling Pierre Shale Plains, (USDA-NRCS, Ag Handbook 296).

Level IV Ecoregions of the Conterminous United States, 2013: 43c – River Breaks and 43f – Subhumid Pierre Shale Plains.

Ecological site concept

The Very Shallow site occurs throughout MLRA 63A. It is located on level to steep, late Pleistocene terraces and terrace remnants that cap ridges, crests, and upper slopes of undulating or rolling uplands. Slopes range from 0 to 80 percent and the soil surface texture is gravelly 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

R063AY009SD	**Sandy**
R063AY017SD	**Shallow Clay**
R063AY024SD	**Shallow**

Similar sites

R063AY024SD	**Shallow** [less needleandthread, western wheatgrass, and sideoats grama; higher production]

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Bouteloua gracilis* (2) *Bouteloua hirsuta*

Physiographic features

This site typically occurs on gently to steeply sloping terraces or terrace remnants that cap ridges, crests, and upper slopes of undulating or rolling uplands.

Table 2. Representative physiographic features

Landforms	(1) Terrace (2) Knoll (3) Ridge
Flooding frequency	None
Ponding frequency	None
Elevation	488–823 m
Slope	0–80%
Water table depth	203 cm
Aspect	Aspect is not a significant factor

Climatic features

MLRA 63A is considered to have a continental climate – cold winters and hot summers, low humidity, light rainfall, and abundant sunshine. Extreme temperature fluctuations are also common. The climate is the result of this MLRA's location near the geographic center of North America. There are few natural barriers on the Northern Great Plains and air masses move freely across the plains and account for rapid changes in temperature.

Annual precipitation ranges from 16 to 20 inches per year. The average annual temperature is about 47°F. January is the coldest month with average temperatures ranging from about 11°F (Pollock, South Dakota (SD)), to about 22°F (Cedar Butte, SD). July is the warmest month with temperatures averaging from about 72°F (Pollock, SD), to about 76° F (Cedar Butte, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 58°F. This large annual range attests to the continental nature of this area's climate. 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 are generally 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 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 (average)	130 days
Freeze-free period (average)	151 days
Precipitation total (average)	483 mm

Climate stations used

- (1) POLLOCK [USC00396712], Pollock, SD
- (2) CEDAR BUTTE 1NE [USC00391539], White River, SD
- (3) COTTONWOOD 2 E [USC00391972], Kadoka, SD
- (4) KENNEBEC [USC00394516], Kennebec, SD

Influencing water features

No riparian areas or wetland features are directly associated with this site.

Soil features

The soils are on level to steep terraces or terrace remnants that cap ridges, crests, and upper slopes of undulating or rolling uplands. They have sand to clay loam textured subsoil and slopes of 0 to 80 percent. The soils in this site are well to excessively drained and formed in calcareous gravelly alluvium from mixed sources. The gravelly loam surface layer is two to six inches thick and contains up to 50 percent gravel by volume. The soils have a moderate to very rapid infiltration rate and negligible to high runoff depending upon slope. This site should show no evidence of rills, wind scoured areas, or pedestalled plants. If present, water flow paths are broken, irregular in appearance, or discontinuous. The soil surface is very unstable but intact and little soil formation has occurred because of erosion. Subsurface soil layers are restrictive to root penetration because of the skeletal subsoil.

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. Loss of the soil surface layer can result in a shift in species composition and/or production.

Soils correlated to the Very Shallow site include: Schamber and Nihill

Access Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app/) for specific local soils information.

Table 4. Representative soil features

Surface texture	(1) Gravelly loam (2) Sandy loam
Family particle size	(1) Sandy

Drainage class	Well drained to excessively drained
Permeability class	Moderate to very rapid
Soil depth	10–25 cm
Surface fragment cover <=3"	15–50%
Surface fragment cover >3"	0–5%
Available water capacity (0-101.6cm)	2.54–10.16 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	35–70%
Subsurface fragment volume >3" (Depth not specified)	0–5%

Ecological dynamics

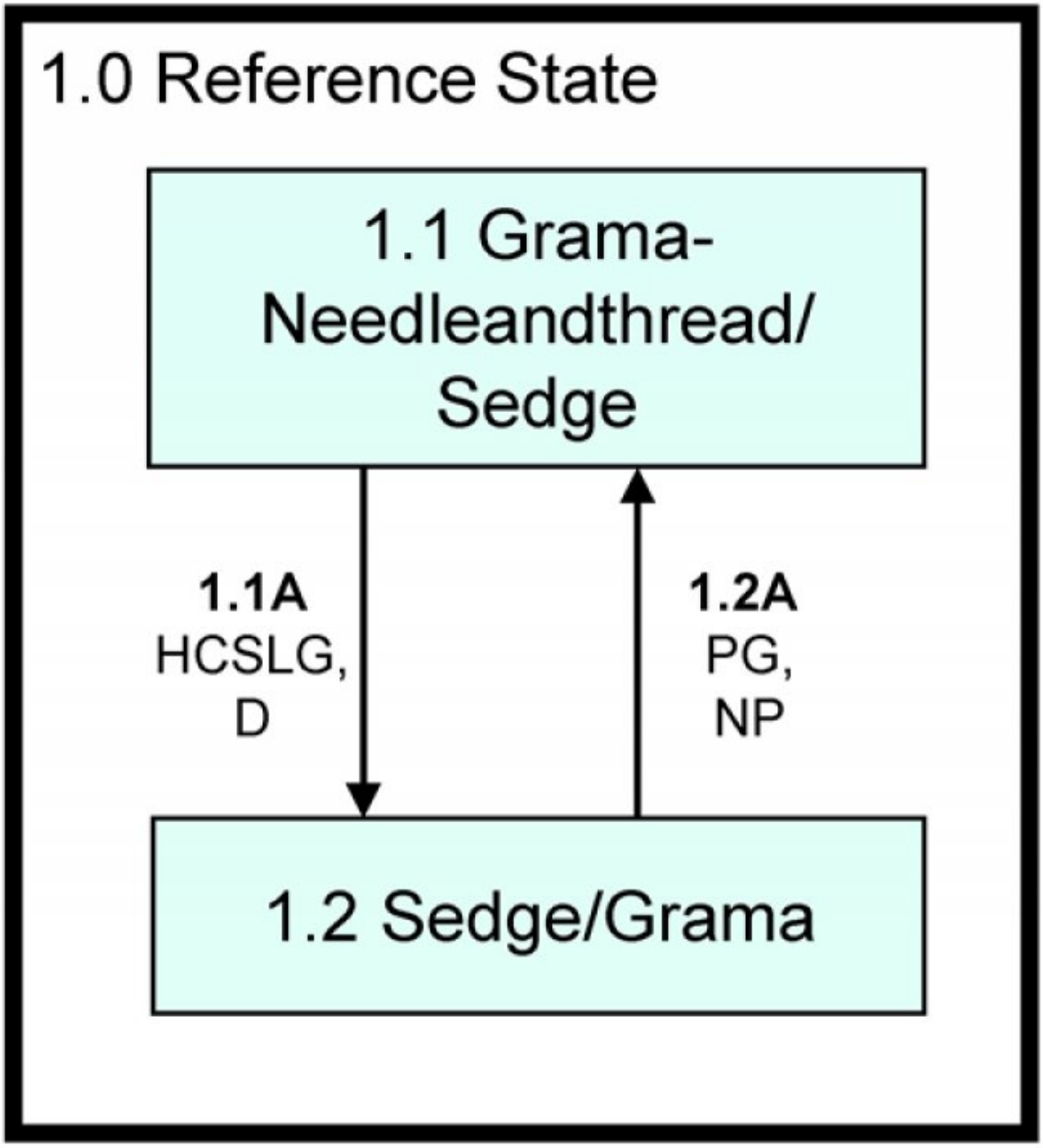
This site developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfire (often of light intensities), and other biotic and abiotic factors that typically influence soil/site development. Changes will occur 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.

Interpretations are primarily based on the Grama-Needleandthread/Sedge Plant Community, which is considered to be the reference plant community phase. 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 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 will be discussed in more detail in the plant community descriptions following the diagram.

State and transition model

Very Shallow – R063AY016SD 6/9/16



D – Drought
HCSLG – Heavy, continuous season-long grazing
NP – normal precipitation patterns
PG – Prescribed grazing

Figure 6. Very Shallow - R063AY016SD

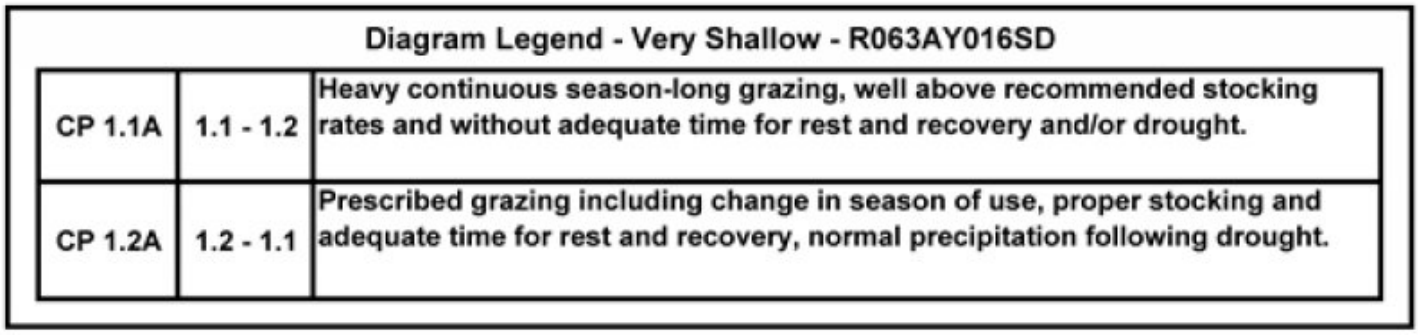


Figure 7. Very Shallow - R063AY016SD

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 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
Grama-Needleandthread/Sedge Plant Community

The Grama-Needleandthread/Sedge Plant Community is the plant community upon which interpretations are primarily based. 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 or grass-likes dominates this plant community. The major grasses or grass-likes include blue and/or hairy grama, needleandthread, threadleaf sedge, western wheatgrass, little bluestem, and sideoats grama. Other grasses occurring on the site include threeawn, buffalograss, plains muhly, and prairie Junegrass. The significant forbs include dotted gayfeather, hairy goldaster, purple coneflower, prairie clover, and stemless hymenoxys. Significant shrubs are fringed sagewort, rose, skunkbush sumac, and yucca. This plant community is moderately resistant to change. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term. This plant community is stable and protected from excessive erosion.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	684	925	1278
Forb	50	112	174
Shrub/Vine	50	84	118
Total	**784**	**1121**	**1570**

Figure 9. Plant community growth curve (percent production by month). SD6303, Pierre Shale Plains, cool/warm-season codominant.. Cool-season, warm-season codominant..

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

Community 1.2
Sedge/Grama Plant Community

This plant community can develop from the adverse effects of heavy, continuous season-long grazing. Shortgrasses 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, buffalograss, prairie Junegrass, and threeawn. Significant forbs include green sagewort, cutleaf ironplant, scurfpeas, white prairie aster, and woolly Indianwheat. Common shrubs include cactus, yucca, 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 Grama-Needleandthread/Sedge Plant Community. Runoff has increased and infiltration has decreased. Soil erosion does not increase substantially.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	381	647	1026
Forb	34	78	123
Shrub/Vine	34	59	84
Total	**449**	**784**	**1233**

Figure 11. Plant community growth curve (percent production by month). SD6303, Pierre Shale Plains, cool/warm-season codominant.. Cool-season, warm-season codominant..

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

Pathway 1.1A
Community 1.1 to 1.2

Heavy continuous season-long grazing (grazing the same area for the entire growing season well above recommended stocking rates) and/or drought will convert the plant community to the Sedge/Grama Plant Community (1.2). Mid stature warm-season grasses decrease, while short warm-season grasses blue grama, hairy grama, buffalograss, and sedges increase.

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing that includes, proper stocking rates, change in season of use and adequate recovery time following grazing and/or return to normal precipitation patterns will move this plant community to the Grama-Needleandthread/Sedge Plant Community.

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Short Warm-Season Grasses**			168–504	
	blue grama	BOGR2	*Bouteloua gracilis*	112–392	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	56–336	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–56	–

	threeawn	ARIST	*Aristida*	11–56	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–56	–
2	**Cool-Season Bunchgrasses**			56–280	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	56–224	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	11–90	–
3	**Rhizomatous Cool-Season Grasses**			22–90	
	western wheatgrass	PASM	*Pascopyrum smithii*	22–90	–
4	**Other Native Grasses**			56–112	
	sideoats grama	BOCU	*Bouteloua curtipendula*	22–90	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–56	–
	Grass, perennial	2GP	*Grass, perennial*	0–56	–
5	**Grass-likes**			56–168	
	threadleaf sedge	CAFI	*Carex filifolia*	56–168	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–56	–
Forb					
7	**Forbs**			56–168	
	prairie clover	DALEA	*Dalea*	11–34	–
	Forb, native	2FN	*Forb, native*	11–34	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	11–22	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	11–22	–
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	11–22	–
	spiny phlox	PHHO	*Phlox hoodii*	11–22	–
	woolly plantain	PLPA2	*Plantago patagonica*	11–22	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–22	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	11–22	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	11–22	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	11–22	–
	milkvetch	ASTRA	*Astragalus*	11–22	–
	dotted blazing star	LIPU	*Liatris punctata*	11–22	–
	lacy tansyaster	MAPI	*Machaeranthera pinnatifida*	0–11	–
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	0–11	–
	buckwheat	ERIOG	*Eriogonum*	0–11	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–11	–
	bush morning-glory	IPLE	*Ipomoea leptophylla*	0–11	–
	pussytoes	ANTEN	*Antennaria*	0–11	–
	field sagewort	ARCA12	*Artemisia campestris*	0–11	–
Shrub/Vine					
8	**Shrubs**			56–112	
	prairie sagewort	ARFR4	*Artemisia frigida*	11–56	–
	soapweed yucca	YUGL	*Yucca glauca*	11–45	–
	rose	ROSA5	*Rosa*	11–34	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–34	–

	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–22	–
	pricklypear	OPUNT	*Opuntia*	11–22	–

Table 8. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Short Warm-Season Grasses**			196–432	
	blue grama	BOGR2	*Bouteloua gracilis*	157–353	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	39–314	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	8–78	–
	threeawn	ARIST	*Aristida*	8–78	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–63	–
2	**Cool-Season Bunchgrasses**			8–63	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	8–39	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–39	–
3	**Rhizomatous Cool-Season Grasses**			0–16	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–16	–
4	**Other Native Grasses**			0–39	
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–31	–
	Grass, perennial	2GP	*Grass, perennial*	0–24	–
5	**Grass-likes**			78–196	
	threadleaf sedge	CAFI	*Carex filifolia*	78–196	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–39	–
6	**Non-Native Grasses**			0–39	
	bluegrass	POA	*Poa*	0–31	–
	cheatgrass	BRTE	*Bromus tectorum*	0–24	–
Forb					
7	**Forbs**			39–118	
	Forb, introduced	2FI	*Forb, introduced*	0–31	–
	Forb, native	2FN	*Forb, native*	8–24	–
	field sagewort	ARCA12	*Artemisia campestris*	0–24	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–24	–
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	8–24	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	8–24	–
	common dandelion	TAOF	*Taraxacum officinale*	0–24	–
	woolly plantain	PLPA2	*Plantago patagonica*	8–24	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–24	–
	lacy tansyaster	MAPI	*Machaeranthera pinnatifida*	0–16	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	8–16	–
	spiny phlox	PHHO	*Phlox hoodii*	8–16	–
	dotted blazing star	LIPU	*Liatris punctata*	0–8	–
	milkvetch	ASTRA	*Astragalus*	0–8	–

	prairie clover	DALEA	*Dalea*	0–8	–
	pussytoes	ANTEN	*Antennaria*	0–8	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–8	–
Shrub/Vine					
8	**Shrubs**			39–78	
	prairie sagewort	ARFR4	*Artemisia frigida*	16–63	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–24	–
	pricklypear	OPUNT	*Opuntia*	8–24	–
	soapweed yucca	YUGL	*Yucca glauca*	8–24	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–16	–
	rose	ROSA5	*Rosa*	8–16	–

Animal community

Animal Community – Grazing Interpretations

The following table lists annual, suggested initial stocking rates with average growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of conservation planning. Often, the current plant composition does not entirely match any particular plant community (as described in this ecological site description). Because of this, a resource inventory is necessary to document plant composition and production. More accurate carrying capacity estimates should eventually be calculated using the following stocking rate information along with animal preference data and actual stocking records, particularly when grazers other than cattle are involved. With consultation of the land manager, more intensive grazing management may result in improved harvest efficiencies and increased carrying capacity.

Grama-Needleandthread/Sedge Plant Community (1.1)
Average Annual Production(lbs./acre, air-dry): 1000
Stocking Rate* (AUM/acre): 0.27

Sedge/Grama Plant Community (1.2)
Average Annual Production (lbs./acre, air-dry):
700
Stocking Rate* (AUM/acre): 0.19

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

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide yearlong forage. During the dormant period, the forage for livestock will likely be lacking protein to meet livestock requirements, and added protein will allow ruminants to better utilize the energy stored in grazed plant materials. A forage quality test (either directly or through fecal sampling) should be used to determine the level of supplementation needed.

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group A, with localized areas in group B. Infiltration varies from moderately slow to 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, hiking, photography, bird watching, and other opportunities. The wide varieties 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

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

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 requirement as an Approved ESD as laid out in the 2003 National Range and Pasture Handbook (NRPH). The document fully describe 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, to validate the information in this Provisional Ecological Site Description is needed. 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. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed 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: April Boltjes, Range Management Specialist (RMS), NRCS; Stan Boltz, RMS, NRCS; Kent Cooley, Soil Scientist, NRCS; Rick Peterson, RMS, NRCS; and L. Michael Stirling, RMS, NRCS. No SCS-RANGE-417 clipping records have been collected on this ecological site.

Other references

High Plains Regional Climate Center, University of Nebraska. (http://www.hprcc.unl.edu/)
USDA, NRCS. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296, 2006
USDA, NRCS. National Ecological Site Handbook, 1st Ed. January, 2014
USDA, NRCS. National Water and Climate Center. (http://www.wcc.nrcs.usda.gov/)
USDA, NRCS. National Range and Pasture Handbook, September 1997
USDA, NRCS. National Soil Information System, Information Technology Center. (http://nasis.nrcs.usda.gov)
USDA, NRCS. 2001. The PLANTS Database, Version 3.1 (http://plants.usda.gov). National Plant Data Center.
USDA, NRCS, Various Published Soil Surveys

Contributors

Betty Bisch
Stan Boltz

Acknowledgments

Peterson, Rick L. ESD update 6/9/16

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
Contact for lead author	stanley.boltz@sd.usda.gov, 605-352-1236
Date	05/09/2010
Approved by	Stan Boltz
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%.

---

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%.

---

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

---

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.

---

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

---

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

---

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.

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.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** A-horizon should be 3 to 6 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.

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.

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.

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 warm-season grasses >> Cool-season bunchgrasses >

    Sub-dominant: Grass-likes = Forbs >

    Other: Mid warm-season grasses = Shrubs > Mid cool-season rhizomatous grasses

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very little evidence of decadence or mortality. Bunch grasses have strong, healthy centers and shrubs are vigorous.

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 700-1,400 lbs./acre (air-dry weight). Reference value production is 1,000 lbs./acre (air-dry weight).

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

---

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.
