

Ecological site R102DY016SD

Very Shallow

Last updated: 8/14/2024
Accessed: 09/04/2026

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): 102D–Prairie Coteau

This area makes up about 7,867 square miles (20,375 square kilometers), consisting mostly of nearly level to undulating till plains with potholes and moraines. Elevation ranges from 1,150 to 2,130 feet (350 to 650 meters). The average annual precipitation is 22 to 29 inches (559 to 734 millimeters). The average annual temperature is 42 to 45 degrees F (6 to 7 degrees C). The dominant soil order in this MLRA is Mollisols. The soils in this area dominantly have a frigid temperature regime, and an aquic or udic moisture regime. They are generally very deep and loamy. Soils range from well drained to very poorly drained. Parent materials are dominantly fine-loamy till to clayey material, with smaller amounts of outwash, glaciofluvial deposits, eolian deposits, alluvium, and, to a lesser extent, loess and organic materials.

Classification relationships

Fenneman (1916) Physiographic Regions Division - Interior Plains East: Province - Central Lowland Section - Western Lake / Dissected Till Plains (12b/12e) *USFS (2007) Ecoregions* Domain - Humid Temperate Division - Prairie Province - Prairie Parkland (Temperate) Section - North-Central Glaciated Plains (251B) *EPA Ecoregions (Omernik 1997)* I - Great Plains (9) II - Temperate Prairies (9.2) III - Aspen Parkland/Northern Glaciated Plains (9.2.1)

Ecological site concept

The Very Shallow ecological site occurs on the shoulder slopes in the upland areas. Soils are well to excessively drained and have root restricting layer, such as sand and gravel or bedrock within 10 inches of the soil surface. Along with the root restricting layer, precipitation tends to runoff, leaving less soil moisture for plant growth, production is lower, and species composition will tend towards more drought tolerant. In some areas the surface layer may consist of stony to extremely stony. Slopes can range from 0 to 40 percent. Vegetation in the Reference State includes needleandthread, blue grama, and threadleaf sedge. Forbs include dotted gayfeather, hairy goldaster, purple coneflower, and prairie clover. Non-native grasses such as Kentucky bluegrass and annual bromes may invade the site due to changes in disturbance regime.

Associated sites

R102DY010SD	Loamy These sites occur on upland areas. The soils are well drained and have sand and gravel at a depth of greater than 20 inches below the soil surface.
R102DY014SD	Shallow Gravel These sites occur on upland areas. The soils are excessively drained and have sand and gravel within 10 to 20 inches of the soil surface.

Similar sites

R102DY014SD	Shallow Gravel The Shallow Gravel site occurs in a backslope landscape position and does not have a root restricting layer, such as sand and gravel within 10 inches of the soil surface. The Shallow Gravel site will have more bluestem and higher production than the Very Shallow site.
--------------------	--

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Hesperostipa comata ssp. comata</i> (2) <i>Bouteloua gracilis</i>

Physiographic features

This site primarily occurs on outwash plains in upland areas.

Table 2. Representative physiographic features

Landforms	(1) Outwash plain
Runoff class	Low to high
Flooding frequency	None
Ponding duration	Very long (more than 30 days)
Ponding frequency	None to occasional
Elevation	310 – 610 m
Slope	0 – 30 %
Water table depth	0 cm
Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation is 22 to 28 inches. Half or more of the precipitation falls during the growing season. Rainfall typically occurs during high-intensity, convective thunderstorms in summer. In the western part of the MLRA, rainfall is less abundant and not always adequate for full maturation of crops. Precipitation in winter is typically snow. The average annual temperature is 42 to 45 degrees F. The freeze-free period averages 144 days and ranges from 137 to 151 days.

Table 3 Representative climatic features

Frost-free period (characteristic range)	120-130 days
Freeze-free period (characteristic range)	140-150 days
Precipitation total (characteristic range)	610-690 mm
Frost-free period (actual range)	110-130 days
Freeze-free period (actual range)	140-150 days
Precipitation total (actual range)	560-710 mm
Frost-free period (average)	120 days
Freeze-free period (average)	140 days
Precipitation total (average)	640 mm

- (1) ROY LAKE [USC00397326], Lake City, SD
- (2) WAUBAY NWR [USC00398980], Waubay, SD
- (3) WEBSTER [USC00399004], Webster, SD
- (4) WATERTOWN RGNL AP [USW00014946], Watertown, SD
- (5) WATERTOWN 1W [USC00398930], Watertown, SD
- (6) CLEAR LAKE [USC00391777], Clear Lake, SD
- (7) ARLINGTON 1 W [USC00390281], Arlington, SD
- (8) ASTORIA 4S [USC00390422], White, SD
- (9) BROOKINGS 2 NE [USC00391076], Brookings, SD
- (10) TYLER [USC00218429], Tyler, MN

Influencing water features

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

Soil features

Soils are formed in outwash. Surface textures are primarily gravelly loam and sandy loam. Soils are somewhat excessively to excessively drained.

Table 4. Representative soil features

Parent material	(1) Outwash
Surface texture	(1) Gravelly loam (2) Sandy loam

Drainage class	Somewhat excessively drained to excessively drained
Permeability class	Moderately rapid to rapid
Depth to restrictive layer	20 cm
Soil depth	20 – 200 cm
Surface fragment cover ≤3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	6.35 – 7.11 cm
Soil reaction (1:1 water) (0-25.4cm)	6.6 – 8.4
Subsurface fragment volume ≤3" (0-152.4cm)	20 – 50 %
Subsurface fragment volume >3" (0-152.4cm)	Not specified

Table 5. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Depth to restrictive layer	10 – 30 cm
Soil depth	Not specified
Surface fragment cover ≤3"	Not specified
Surface fragment cover >3"	Not specified

Available water capacity (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-25.4cm)	Not specified
Subsurface fragment volume <=3" (0-152.4cm)	Not specified
Subsurface fragment volume >3" (0-152.4cm)	Not specified

Ecological dynamics

The site which is located in the Prairie Pothole Region developed under Northern Great Plains climatic conditions and included natural influence of large herding herbivores and occasional fire. Changes will occur in the plant communities due to weather fluctuations and/or management actions. Under adverse impacts, a relatively rapid decline in vegetative vigor and composition can occur. Under favorable conditions the site has the potential to resemble the Reference State. Interpretations for this site are based primarily on the 1.1 Needleandthread-Blue Grama-Threadleaf Sedge Plant Community Phase. This community phase and the Reference State have 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 considered.

This ecological site (ES) has been grazed by domestic livestock since they have been introduced into the area. This ecological site is naturally resilient, and quite resistant to change. Also, due to the relatively steep slopes and naturally low fertility of the soils, this site generally avoids more intensive disturbances such as farming. However, continuous season-long grazing (during the typical growing season of May through October) and/or repeated seasonal grazing (e.g., every spring, every summer) without adequate recovery periods following each grazing occurrence can cause this site to depart from the Needleandthread-Blue Grama-Threadleaf Sedge Plant Community Phase. Sedges and gramas can increase and eventually develop into a sod while many of the tall and mid-statured grasses will decrease [e.g., little bluestem (*Schizachyrium scoparium*), green needlegrass (*Nassella viridula*), needleandthread, porcupine grass (*Hesperostipa spartea*), and western wheatgrass, (*Pascopyrum smithii*)]. Even with these disturbances, many of the tall- and mid-statured grasses will remain in the community at reduced levels, allowing recovery to occur once the disturbances are removed.

Following the state and transition diagram are narratives for each of the described states and community phases. These may not represent every possibility, but they are the most prevalent and repeatable states/community phases. The plant composition tables shown below have been developed from the best available knowledge at the time of this revision. As more data are collected, some of these community phases and/or states may be revised or removed, and new ones may be added. The main purpose for including the descriptions here is to capture the current knowledge and experience at the time of this revision.

State and transition model

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	Needlegrass			426-958	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	213-639	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	106-426	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0-170	–
2	Short Warm-season Grasses			213-532	

	blue grama	BOGR2	<i>Bouteloua gracilis</i>	106-426	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	43-213	–
	threeawn	ARIST	<i>Aristida</i>	21-64	–
3	Mid Warm-season Grasses			106-319	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	43-213	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	43-213	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0-106	–
4	Other Native Grasses			21-106	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0-85	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	21-64	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes</i> var. <i>scribnerianum</i>	0-43	–
	fall rosette grass	DIWI5	<i>Dichanthelium wilcoxianum</i>	0-43	–
5	Grass-like s			106-319	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	43-213	–
	sun sedge	CAINH2	<i>Carex inops</i> ssp. <i>heliophila</i>	0-106	–
	needleleaf sedge	CADU6	<i>Carex duriuscula</i>	21-106	–
Forb					
6	Forbs			106-319	
	American vetch	VIAM	<i>Vicia americana</i>	21-429	–
	Forb, native	2FN	<i>Forb, native</i>	21-64	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	21-64	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	21-64	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	21-64	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	21-43	–
	silverleaf Indian breadroot	PEAR6	<i>Pediomelum argophyllum</i>	21-43	–
	false boneset	BREU	<i>Brickellia eupatorioides</i>	0-43	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	21-43	–
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	21-43	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	21-43	–
	prairie spiderwort	TROC	<i>Tradescantia occidentalis</i>	21-43	–
	white prairie clover	DACA7	<i>Dalea candida</i>	0-21	–
	milkvetch	ASTRA	<i>Astragalus</i>	0-21	–
	pussytoes	ANTEN	<i>Antennaria</i>	0-21	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0-21	–
	slimflower scurfpea	PSTE5	<i>Psoraleidium tenuiflorum</i>	0-21	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0-21	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0-21	–
	lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	0-21	–
	scarlet beeblossom	GACO5	<i>Gaura coccinea</i>	0-21	–
Shrub/Vine					
7	Shrubs			106-213	
	leadplant	AMCA6	<i>Amorpha canescens</i>	21-64	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	21-64	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0-43	–
	rose	ROSA5	<i>Rosa</i>	21-43	–
	snowberry	SYMPH	<i>Symphoricarpos</i>	21-43	–

	pricklypear	OPUNT	<i>Opuntia</i>	0-21	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0-21	–

Table 7. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	Needlegrass			73-219	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	0-219	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0-219	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0-219	–
2	Short Warm-season Grasses			219-437	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	146-364	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	44-219	–
	threeawn	ARIST	<i>Aristida</i>	29-117	–
3	Mid Warm-season Grasses			15-146	
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	15-146	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0-73	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0-29	–
4	Other Native Grasses			15-58	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0-44	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	15-29	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes var. scribnerianum</i>	0-15	–
	fall rosette grass	DIWI5	<i>Dichanthelium wilcoxianum</i>	0-15	–
5	Grass-likes			219-437	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	146-291	–
	needleleaf sedge	CADU6	<i>Carex duriuscula</i>	73-219	–
	sun sedge	CAINH2	<i>Carex inops ssp. heliophila</i>	0-146	–
6	Non-Native Grasses			0-146	
	field brome	BRAR5	<i>Bromus arvensis</i>	0-146	–
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0-146	–
	bluegrass	POA	<i>Poa</i>	0-146	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	0-73	–
Forb					
7	Forbs			73-219	
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	15-73	–
	Forb, introduced	2FI	<i>Forb, introduced</i>	0-58	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	15-58	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	15-58	–
	Forb, native	2FN	<i>Forb, native</i>	15-44	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	15-44	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0-29	–
	silverleaf Indian breadroot	PEAR6	<i>Pedimelum argophyllum</i>	15-29	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0-15	–
	slimflower scurfpea	PSTE5	<i>Psoraleidium tenuiflorum</i>	0-15	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0-15	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0-15	–

	dotted blazing star	LIPU	<i>Liatris punctata</i>	0-15	–
	lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	0-15	–
	pussytoes	ANTEN	<i>Antennaria</i>	0-15	–
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	0-15	–
	prairie spiderwort	TROC	<i>Tradescantia occidentalis</i>	0-15	–
	American vetch	VIAM	<i>Vicia americana</i>	0-15	–
Shrub/Vine					
8	Shrubs			73-146	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	15-73	–
	pricklypear	OPUNT	<i>Opuntia</i>	0-29	–
	snowberry	SYMPH	<i>Symphoricarpos</i>	0-29	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0-29	–
	leadplant	AMCA6	<i>Amorpha canescens</i>	0-15	–
	rose	ROSA5	<i>Rosa</i>	0-15	–

Table 8. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Table 9. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	Needlegrass			50-202	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	0-202	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0-202	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0-202	–
2	Short Warm-season Grasses			50-151	
	threeawn	ARIST	<i>Aristida</i>	20-121	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	20-101	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0-71	–
3	Mid Warm-season Grasses			0-30	
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	0-30	–
4	Other Native Grasses			0-30	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0-30	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0-20	–
5	Grass-likes			151-303	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	101-202	–
	needleleaf sedge	CADU6	<i>Carex duriuscula</i>	50-151	–
	sun sedge	CAINH2	<i>Carex inops ssp. heliophila</i>	0-101	–
6	Non-Native Grasses			101-303	
	field brome	BRAR5	<i>Bromus arvensis</i>	50-202	–
	cheatgrass	BRTE	<i>Bromus tectorum</i>	50-202	–
	bluegrass	POA	<i>Poa</i>	0-101	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	0-50	–
Forb					
7	Forbs			50-151	
	Forb, introduced	2FI	<i>Forb, introduced</i>	10-81	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	10-71	–

	field sagewort	ARCA12	<i>Artemisia campestris</i>	10-61	–
	white heath aster	SYER	<i>Symphotrichum ericoides</i>	10-40	–
	Forb, native	2FN	<i>Forb, native</i>	0-20	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	10-20	–
	silverleaf Indian breadroot	PEAR6	<i>Pediomelum argophyllum</i>	0-10	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0-10	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0-10	–
	pussytoes	ANTEN	<i>Antennaria</i>	0-10	–
Shrub/Vine					
8	Shrubs			50-101	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	2-9	–
	pricklypear	OPUNT	<i>Opuntia</i>	0-4	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0-3	–
	snowberry	SYMPH	<i>Symphoricarpos</i>	0-1	–

Table 10. Community 2.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

Table 11. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
-------	-------------	--------	-----------------	----------------------	------------------

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 ES 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. Needlegrass/Grama/Sedge (1.1 & 2.1) Average Annual Production (lbs./acre, air-dry): 1900 Stocking Rate* (AUM/acre):0.52 Sedge/Grama/Needlegrass (1.2) Average Annual Production (lbs./acre, air-dry): 1300 Stocking Rate* (AUM/acre):0.36 Needlegrass/Annual Brome/Sedge (2.2) Average Annual Production (lbs./acre, air-dry): 900 Stocking Rate* (AUM/acre):0.25 *Based on 912 lbs./acre (air-dry weight) per Animal Unit Month (AUM), and on 25 percent harvest efficiency (refer to United States Department of Agriculture (USDA) Natural Resources Conservation Service (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. Infiltration is typically moderate to rapid and runoff potential for this site varies from negligible to low depending on soil hydrologic group, slope, and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where shortgrasses form a strong sod and dominate the site. Dominance by blue grama and/or sedge will result in reduced infiltration and increased runoff. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff (refer to 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 esthetic 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.

Inventory data references

MLRA 102D was created in 2022 with Agricultural Handbook 296 updated. This area was MLRA 102A prior to this time. Information was copied from MLRA 102A ESDs to create the MLRA 102D ESDs. There is no NRCS clipping data and other inventory currently available for this site. Information presented here has been derived using field observations from range-trained personnel. Those involved in developing this site include: Stan Boltz, Range Management Specialist, NRCS; and Bruce Kunze, Soil Scientist, NRCS.

Other references

Cleland, D.T., J.A. Freeouf, J.E. Keys, G.J. Nowacki, C. Carpenter, and W.H. McNab. 2007. Ecological Subregions: Sections and Subsections of the Conterminous United States. USDA Forest Service, General Technical Report WO-76. Washington, DC. 92 pps.

Gilbert, M. C., Whited, P. M., Clairain Jr, E. J., & Smith, R. D. (2006). A Regional Guidebook for Applying the Hydrogeomorphic Approach to Assessing Wetland Functions of Prairie Potholes. Washington DC.

Samson, F. B., & Knopf, F. L. (1996). Prairie Conservation Preserving North America's Most Endangered Ecosystem. Washington D.C.: Island Press.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Official Soil Series Descriptions. Available online. Accessed March 2018.

United States Department of Agriculture – Natural Resource Conservation Service (USDA-NRCS). 2003. National Range and Pasture Handbook, Revision 1. Grazing Lands Technology Institute. 214 pps.

United States Department of Agriculture – Natural Resource Conservation Service (USDA-NRCS). 2006. 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. 672pps.

United States Department of Agriculture, Natural Resources Conservation Service. 2022. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture, Agriculture Handbook 296.

USDA, NRCS. National Soil Information System, Information Technology Center, 2150 Centre Avenue, Building A, Fort Collins, CO 80526. (<http://soils.usda.gov/technical/nasis/>)

USDA, NRCS. 2018. The PLANTS Database (<http://plants.usda.gov>, 27 March 2018). National Plant Data Team, Greensboro, NC 27401-4901 USA.

U.S. Environmental Protection Agency [EPA]. 2013. Level III and Level IV Ecoregions of the Continental United States. Corvallis, OR, U.S. EPA, National Health and Environmental Effects Research Laboratory, map scale 1:3,000,000. Available at <http://www.epa.gov/ecoresearch/level-iii-and-iv-ecoregions-continental-united-states>. (Accessed 1 March 2018).

Contributors

Megan Baxter
Stan Boltz
Lance Howe
Steve Winter

Approval

Suzanne Mayne-Kinney, 8/14/2024

Acknowledgments

Contact for Lead Authors: Natural Resources Conservation Service (USDA-NRCS), Redfield Soil Survey Office Redfield, SD; Lance Howe (Lance.Howe@usda.gov), Soil Survey Office Leader, USDA-NRCS, Redfield, SD; and Steve Winter (Steven.Winter@usda.gov),

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)	David Schmidt, Tim Nordquist, Stan Boltz
Contact for lead author	
Date	12/04/2007
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. Number and extent of rills: Rills should not be present.

2. Presence of water flow patterns: Typically not observable.

3. Number and height of erosional pedestals or terracettes: None.

4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):
Bare ground 20-40%.

5. Number of gullies and erosion associated with gullies: Active gullies should not 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): Little to no plant litter movement.

8. Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values): Stability class usually 4-6. Moderately high root content. Soil surface is resistant to erosion, in large part due to high rock/gravel content.

9. Soil surface structure and SOM content (include type of structure and A-horizon color and thickness): Use soil series description for depth and color of A-horizon.

10. Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff: Healthy, native grasses enhance infiltration and reduce runoff.

11. Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site): No compaction layer should be evident.

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: Mid cool-season bunch grass > short warm-season grass

Sub-dominant: > short cool-season grass > mid warm-season rhizomatous grass > mid warm-season bunch grass = forb > shrub

Other:

Additional:

13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence): Very little to no evidence of decadence or mortality.

14. Average percent litter cover (%) and depth (in): 20-40%, less than 0.5 inch thick. Litter cover is in contact with soil surface.

15. Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production): 1600 – 2200 lbs./acre air-dry weight, average 1,900 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: Refer to State and Local Noxious Weed List

17. Perennial plant reproductive capability: All species are capable of reproducing.
