

Ecological site R053CY016SD Very Shallow

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General information

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

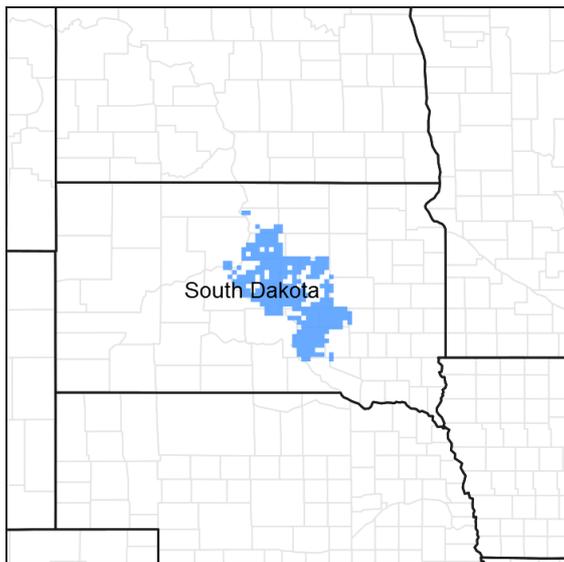


Figure 1. Mapped extent

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): 053C–Southern Dark Brown Glaciated Plains

The Southern Dark Brown Glaciated Plains (53C) is located within the Northern Great Plains Region. It is entirely in South Dakota encompassing about 3,990 square miles (Figure 1). The elevation ranges from 1,300 to 2,300 feet. The MLRA is level to gently rolling till plains including many areas of potholes. A terminal moraine occurs in the southern end of the MLRA. Moderately steep and steep slopes are adjacent to the major valleys. The headwaters of many creeks in central South Dakota occur in the high-lying MLRA. (USDA-NRCS 2006).

The dominant soil orders in this MLRA are Mollisols and Inceptisols. The soils in the area dominantly have a mesic soil temperature regime, an ustic soil moisture regime, and mixed or smectitic mineralogy. They generally are very deep, well drained or moderately well drained, and are loamy or clayey. This area supports natural prairie vegetation characterized by western wheatgrass (*Pascopyrum smithii*), big bluestem (*Andropogon gerardii*), needleandthread (*Hesperostipa comata*), and green needlegrass (*Nassella viridula*). Little bluestem (*Schizachyrium scoparium*), sideoats grama (*Bouteloua curtipendula*), and prairie sandreed (*Calamovilfa longifolia*) are important species on steeper sites. Western snowberry (*Symphoricarpos occidentalis*) and prairie rose (*Rosa arkansana*) are commonly dispersed throughout the area. (USDA-NRCS 2006).

Classification relationships

Major Land Resource Area (MLRA): Southern Dark Brown Glaciated Plains (53C) (USDA-NRCS 2006)

USFS Subregions: Northeastern Glaciated Plains Section (331E); Missouri Coteau Subsection (331Ea); Western Great Plains Section (331F); Missouri Breaks Subsection (331Fe); Western Glaciated Plains Section (332B); Southern Missouri Coteau Slope Subsection (332Bd, 332Be); North Central Great Plains Section (332D); Southern Missouri Coteau Slope Subsection (332Dd); Southern Missouri Coteau Subsection (332De) - (Cleland et al. 2007).

US EPA Level IV Ecoregion: Missouri Coteau (42a); Southern Missouri Coteau (42e); Southern Missouri Coteau Slope (42f) - (USEPA 2013)

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 is co-dominated by cool and warm season grasses including needle and thread, little bluestem and western wheatgrass. Common forbs include dotted gayfeather, hairy goldaster, purple coneflower, and prairie clover. Non-native grasses such as Kentucky bluegrass and annual bromes may invade due to shifts in disturbance regime.

Associated sites

R053CY010SD	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. The central concept soil series is Oahe, but other series are included.
R053CY014SD	Shallow To 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. The central concept soil series is Delmont, but other series are included.

Similar sites

R053CY014SD	Shallow To Gravel The Shallow To 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 vegetative community has more bluestem and higher production.
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Table 1. Dominant plant species

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

Physiographic features

This site typically occurs on gently to steeply sloping uplands.

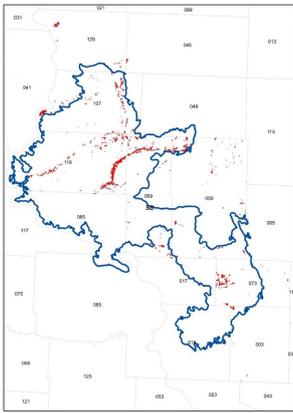


Figure 2. Distribution map

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Knoll (3) Ridge
Flooding frequency	None
Ponding frequency	None
Elevation	1,300–2,300 ft
Slope	1–38%
Water table depth	80 in
Aspect	Aspect is not a significant factor

Climatic features

MLRA 53C is considered to have a continental climate – cold winters and hot summers, low humidity, light rainfall, and much sunshine. Extremes in temperature may also abound. 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 typically ranges from 15 to 25 inches per year. The average annual temperature is about 45°F. January is the coldest month with average temperatures ranging from about 15°F (Stephan, South Dakota (SD)), to about 16°F (Onida 4 NW, SD). July is the warmest month with temperatures averaging from about 72°F (Stephan, SD), to about 74°F (Onida 4 NW, 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 12 miles per hour (mph) annually, ranging from about 13 mph during the spring to about 11 mph 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 mph.

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. Greenup 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)	107-127 days
Freeze-free period (characteristic range)	128-150 days
Precipitation total (characteristic range)	20-21 in
Frost-free period (actual range)	104-129 days

Freeze-free period (actual range)	127-159 days
Precipitation total (actual range)	19-24 in
Frost-free period (average)	117 days
Freeze-free period (average)	139 days
Precipitation total (average)	21 in

Climate stations used

- (1) GETTYSBURG 13W [USC00393302], Gettysburg, SD
- (2) GETTYSBURG [USC00393294], Gettysburg, SD
- (3) HIGHMORE 23 N [USC00393838], Highmore, SD
- (4) ONIDA 4 NW [USC00396292], Onida, SD
- (5) PIERRE RGNL AP [USW00024025], Pierre, SD
- (6) HARROLD 12 SSW [USC00393608], Pierre, SD
- (7) STEPHAN 2 NW [USC00397992], Highmore, SD
- (8) WESSINGTON SPRINGS [USC00399070], Wessington Springs, SD

Influencing water features

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

Soil features

The Very Shallow 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. In some areas the surface layer may consist of stony to extremely stony. The central concept soil series is Talmo, but other series are included. The common features of soils in this site are the gravelly loam to extremely gravelly sand textured subsoil and slopes of 1 to 38 percent. The loam or gravelly loam surface layer is 4 to 10 inches thick. The soils have a moderate to rapid infiltration rate. 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. Subsurface soil layers are restrictive to root penetration.

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.

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

Table 4. Representative soil features

Surface texture	(1) Loam
Family particle size	(1) Loamy
Drainage class	Well drained to excessively drained
Permeability class	Moderately slow to moderately rapid
Soil depth	5–10 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0–2%
Available water capacity (0-40in)	2–3 in
Calcium carbonate equivalent (0-40in)	0–5%

Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	6.1–7.8
Subsurface fragment volume <=3" (Depth not specified)	5–41%
Subsurface fragment volume >3" (Depth not specified)	2–10%

Ecological dynamics

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 1.1 Needleandthread-Blue Grama-Western Wheatgrass Plant Community Phase. Sedges (Cyperaceae) 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, green needlegrass, needleandthread, porcupine grass (*Hesperostipa spartea*), and western wheatgrass]. 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.

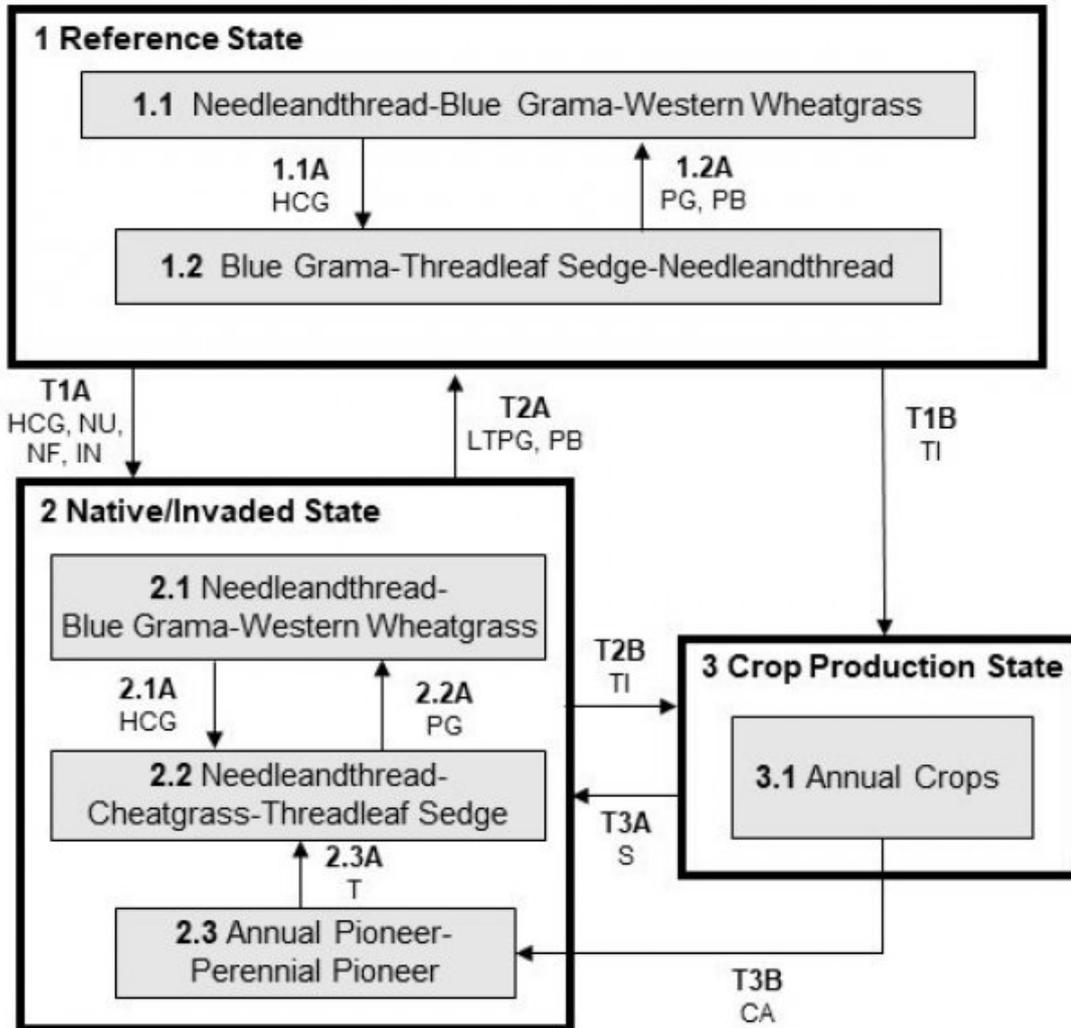
Following the state and transition diagram are narratives for each of the described states and community phases. These may not represent every possibility, but they are the most prevalent and repeatable states/community phases. The plant composition tables shown below have been developed from the best 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.

The following is a diagram that illustrates the common plant community phases that can occur on the site and the transition and community pathways between them. The ecological processes will be discussed in more detail in the plant community descriptions following the diagram.

The vegetative pie charts may not add up to 100 percent due to internal rounding error.

State and transition model

Very Shallow – R053CY016SD



LEGEND

Very Shallow – R053CY016SD

- CA – Cropped and abandoned
- HCG – Heavy continuous grazing
- IN – Invasion
- LTPG – Long-term prescribed grazing
- NU – Non-use
- NF – No fire
- PB – Prescribed burning
- PG – Prescribed grazing
- S – Seeding
- T – Time w/wo disturbances
- TI – Tillage

Figure 9. State-And-Transition model

Code	Process
T1A	Heavy continuous grazing, inundation, non-use, no fire
T1B	Tillage
T2A	Long term prescribed grazing, prescribed burning
T2B	Tillage
T3A	Seeding
T3B	Abandonment of cropping
1.1A	Heavy continuous grazing
1.2A	Prescribed grazing with recovery periods, prescribed burning
2.1A	Heavy continuous grazing
2.2A	Prescribed grazing with recovery periods
2.3A	Time w/wo disturbance

Figure 10. Matrix

State 1 Reference State

This state represents the natural range of variability that dominates the dynamics of this ecological site (ES). This state is dominated by cool-season grasses with warm-season grasses being subdominant. In pre-European times, the primary disturbance mechanisms for this site in the reference condition included grazing by large herding ungulates and fluctuations in levels of precipitation. Grazing coupled with weather events dictated the dynamics that occurred within the natural range of variability. Today, this state can be found on areas that are properly managed with grazing and prescribed burning and sometimes on areas receiving occasional short periods of rest. The dominant tall and mid-grass species can decline and a corresponding increase in short-statured species will occur.

Community 1.1 Needleandthread-Blue Grama-Western Wheatgrass

Interpretations are based primarily on the 1.1 Needleandthread-Blue Grama-Western Wheatgrass Plant Community Phase. This plant community evolved with grazing by large herbivores, frequent surface fires, and periodic flooding events and is suited for grazing by domestic livestock. 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 percent grasses or grass-like plants, 15 percent forbs, and 10 percent shrubs. Cool-season grass and grass-like species dominate this plant community, with warm-season grasses being subdominant. The major grass or grass-like species include needleandthread, blue grama (*Bouteloua gracilis*), threadleaf sedge (*Carex filifolia*), green needlegrass, porcupine grass, hairy grama (*Bouteloua hirsuta*), sideoats grama, and needleleaf sedge (*Carex duriuscula*). Other grasses occurring on the site include threeawn (*Aristida*), plains muhly (*Muhlenbergia cuspidata*), little bluestem (*Schizachyrium scoparium*), and prairie Junegrass (*Koeleria macrantha*). The significant forbs include dotted gayfeather (*Liatris punctata*), hairy goldaster (*Heterotheca villosa*), purple coneflower (Echinacea), and silverleaf scurfpea (*Psoralea argophylla*). Significant shrubs are fringed sagewort (*Artemisia frigida*), leadplant (*Amorpha canescens*), rose (Rosaceae), skunkbush sumac (*Rhus trilobata*), and snowberry (*Symphoricarpos*). 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 (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	770	1155	1405
Forb	65	140	240
Shrub/Vine	65	105	155
Total	900	1400	1800

Figure 12. Plant community growth curve (percent production by month). SD5302, Southern Dark Brown Glaciated Plains, cool-season dominant, warm-season subdominant.. Cool-season dominant, warm-season subdominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	23	34	15	6	5	4	0	0

Community 1.2 Blue Grama-Threadleaf Sedge-Needleandthread

This plant community can develop from the adverse effects of heavy, continuous grazing in conjunction with extended periods of below average precipitation. Short-grass and grass-like species increase to dominate the site and annual production decreases. 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. Blue grama, threadleaf sedge, and needleandthread are the dominant grass and grass-like species. Other grasses may include western wheatgrass, prairie Junegrass, and threeawn. Significant forbs include green sagewort (*Artemisia campestris*), cutleaf ironplant (*Machaeranthera pinnatifida*), silverleaf scurfpea, white prairie aster (*Symphyotrichum falcatum*), and woolly Indianwheat (*Plantago patagonica*). Common shrubs include fringed sagewort and cactus (Cactaceae). Nonnative species such as Kentucky bluegrass (*Poa pratensis*), cheatgrass (*Bromus tectorum*), and crested wheatgrass (*Agropyron cristatum*) may begin to invade this phase. 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 1.1 Needleandthread-Blue Grama-Western Wheatgrass Plant Community Phase. Runoff has increased and infiltration has decreased. Soil erosion does not increase substantially.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	510	825	1125
Forb	45	100	165
Shrub/Vine	45	75	110
Total	600	1000	1400

Figure 14. Plant community growth curve (percent production by month). SD5302, Southern Dark Brown Glaciated Plains, cool-season dominant, warm-season subdominant.. Cool-season dominant, warm-season subdominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	23	34	15	6	5	4	0	0

Pathway 1.1A Community 1.1 to 1.2

Heavy continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, or during periods of below normal precipitation when grazing frequency and intensity increases on these sites due to limited forage availability on adjacent upland sites will shift this community to the 1.2 Blue Grama-Threadleaf Sedge-Needleandthread Plant Community Phase.

Pathway 1.2A Community 1.2 to 1.1

Prescribed grazing, and prescribed burning occurring at relatively frequent intervals (3 to 5 years) and a return to normal disturbance regime levels and frequencies or periodic light to moderate grazing possibly including periodic rest convert this plant community to the 1.1 Needleandthread-Blue Grama-Western Wheatgrass Plant Community Phase.

Conservation practices

Prescribed Grazing

State 2

Native/Invaded State

This state represents the more common range of variability that exists with higher levels of grazing management but in the absence of periodic fire due to fire suppression. This state is dominated by cool-season grasses. It can be found on areas that are properly managed with grazing and prescribed burning and sometimes on areas receiving occasional short periods of rest. Taller cool-season species can decline and a corresponding increase in short-statured grass will occur. Nonnative species such as cheatgrass, Kentucky bluegrass, and crested wheatgrass can become dominant at times and influence the biotic and hydrologic ecological processes of the State.

Community 2.1

Needleandthread-Blue Grama-Western Wheatgrass

This plant community is the result of encroachment of nonnative species, often as a result of fluctuations in precipitation cycles, typically extended periods of below average precipitation followed by a mild winter or a cool wet spring. The potential vegetation is about 80 percent grasses or grass-like plants, 10 percent forbs, and 10 percent shrubs. Cool-season grass and grass-like species dominate this plant community, with warm-season grasses being subdominant. The major grass or grass-like species include needleandthread, blue grama, western wheatgrass, green needlegrass, porcupine grass, hairy grama, threadleaf sedge, and needleleaf sedge. Other grasses occurring on the site include threeawn, plains muhly, little bluestem, prairie Junegrass, and nonnative species such as Kentucky bluegrass, cheatgrass, and crested wheatgrass. The significant forbs include dotted gayfeather, green sagewort, cudweed sagewort, purple coneflower, and hairy goldaster. Significant shrubs are fringed sagewort, leadplant, rose, and yucca (*Yucca glauca*). This plant community is very similar to the 1.1 Needleandthread-Blue Grama-Western Wheatgrass Plant Community Phase. The main difference is that this plant community will have a minor amount on nonnative grasses, up to about 10 to 15 percent by weight. 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.

Figure 15. Plant community growth curve (percent production by month). SD5302, Southern Dark Brown Glaciated Plains, cool-season dominant, warm-season subdominant.. Cool-season dominant, warm-season subdominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	23	34	15	6	5	4	0	0

Community 2.2

Needleandthread-Cheatgrass-Threadleaf Sedge

This plant community can develop from the adverse effects of heavy, continuous grazing in conjunction with extended periods of below average precipitation. This plant community phase is further impacted by the invasion of nonnative species such as cheatgrass, Kentucky bluegrass, or crested wheatgrass. Needlegrasses are evident on the aspect of this phase but will be reduced in vigor and production. Cheatgrass and sedge make up the bulk of the composition on this plant community phase. The dominant grass and grass-like species include needleandthread, cheatgrass, threadleaf sedge, needleleaf sedge, green needlegrass, and porcupine grass. Other grasses present include western wheatgrass, blue grama, threeawn, Kentucky bluegrass, hairy grama, and prairie Junegrass. Significant forbs include green sagewort, cutleaf ironplant, silverleaf scurfpea, white prairie aster, and woolly Indianwheat. Common shrubs include cactus, snowberry, yucca, and fringed sagewort. Lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and higher evaporation, which gives sedges and annual brome grass a competitive advantage over cool- and warm-season mid-grasses. 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 1.1 Needleandthread-Blue Grama-Western Wheatgrass Plant Community Phase. Runoff has increased and infiltration has decreased. Soil erosion does not

increase substantially.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	340	578	810
Forb	30	70	115
Shrub/Vine	30	52	75
Total	400	700	1000

Figure 17. Plant community growth curve (percent production by month). SD5302, Southern Dark Brown Glaciated Plains, cool-season dominant, warm-season subdominant.. Cool-season dominant, warm-season subdominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	23	34	15	6	5	4	0	0

Community 2.3 Annual Pioneer-Perennial Pioneer

This plant community developed under continuous heavy grazing or other excessive disturbances (e.g., heavy use areas, defoliation by rodents, etc.). The potential plant community is made up of approximately 40 to 80 percent grasses and grass-like species, 20 to 60 percent forbs, and 0 to 5 percent shrubs. The species present in this phase are highly variable, but often include nonnative invasive and early seral species. Plant diversity is low (plant richness may be high but areas are often dominated by a few species). The ecological processes are difficult to restore because of the loss of plant diversity and overall soil disturbance. Soil erosion is potentially very high because of the bare ground and shallow rooted herbaceous plant community. Water runoff will increase and infiltration will decrease due to animal related soil compaction and loss of root mass due to low plant diversity and vigor. This plant community will require significant economic inputs and time to move towards another plant community. This movement is highly variable in its succession. This is due to the loss of diversity (including the loss of the seed bank), within the existing plant community, and the plant communities on adjacent sites. This community can be renovated to improve the production capability; however, if management changes are not made the vegetation could revert back invasive or early seral species.

Pathway 2.1A Community 2.1 to 2.2

Heavy continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, or during periods of below normal precipitation when grazing frequency and intensity increases on these sites due to limited forage availability on adjacent upland sites and no surface fire for extended periods of time (typically for 10 years or more) causing litter levels to become high enough to reduce native grass vigor, diversity, and density will shift this community to the 2.2 Needleandthread-Cheatgrass-Threadleaf Sedge Plant Community Phase.

Pathway 2.2A Community 2.2 to 2.1

Prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest will convert this plant community to the 2.1 Needleandthread-Blue Grama-Western Wheatgrass Plant Community Phase. This pathway could also occur with a return to more normal precipitation levels and frequencies.

Conservation practices

Prescribed Grazing

Pathway 2.3A
Community 2.3 to 2.2

This community pathway occurs with the passage of time as successional processes take place and perennial plants gradually begin to establish on the site again. This pathway will lead to the 2.2 Needleandthread-Cheatgrass-Threadleaf Sedge Plant Community Phase.

State 3
Crop Production State

This state is characterized by the production of annual crops using a variety of tillage and cropping systems along with management practices.

Community 3.1
Annual Crops

This plant community developed with the use of a variety of tillage systems and cropping systems for the production of annual crops including corn, soybeans, wheat, and a variety of other crops.

Transition T1
State 1 to 2

Non-use or no surface fire for extended periods of time (typically for 10 or more years) causing litter levels to become high enough to reduce native grass vigor, diversity, and density, or heavy continuous grazing or invasion of non-native plant species will likely lead this state over a threshold resulting in the Native/Invaded State (State 2).

Transition T1B
State 1 to 3

Tillage will cause a shift over a threshold leading to the 3.1 Annual Crops Plant Community Phase within the Crop Production State (State 3).

Restoration pathway T2A
State 2 to 1

Long-term prescribed grazing (moderate stocking levels coupled with adequate recovery periods, or other grazing systems such as high-density, low-frequency intended to treat specific species dominance, or periodic light to moderate stocking levels possibly including periodic rest) coupled with prescribed burning occurring at relatively frequent intervals (3 to 5 years) and a return to normal disturbance regime levels may lead this plant community phase over a threshold to the Reference State (State 1).

Conservation practices

Prescribed Grazing
Integrated Pest Management (IPM)

Transition T2B
State 2 to 3

Tillage will cause a shift over a threshold leading to the 3.1 Annual Crops Plant Community Phase within the Crop Production State (State 3).

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
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Grass/Grasslike					
1	Needlegrass			280–490	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	140–420	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	70–210	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	28–140	–
2	Short Warm-Season Grasses			140–280	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	70–210	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	28–140	–
	threeawn	ARIST	<i>Aristida</i>	14–42	–
3	Wheatgrass			70–210	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	70–210	–
4	Mid Warm-Season Grasses			42–140	
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	28–98	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–70	–
5	Other Native Grasses			14–70	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–56	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	14–42	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes var. scribnerianum</i>	0–28	–
	fall rosette grass	DIWI5	<i>Dichanthelium wilcoxianum</i>	0–28	–
6	Grass-likes			70–140	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	28–112	–
	needleleaf sedge	CADU6	<i>Carex duriuscula</i>	14–70	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–42	–
Forb					
7	Forbs			70–210	
	Forb, native	2FN	<i>Forb, native</i>	14–42	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	14–42	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	14–42	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	14–42	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	14–28	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	0–28	–
	prairie spiderwort	TROC	<i>Tradescantia occidentalis</i>	14–28	–
	American vetch	VIAM	<i>Vicia americana</i>	14–28	–
	silverleaf Indian breadroot	PEAR6	<i>Pediomelum argophyllum</i>	14–28	–
	false boneset	BREU	<i>Brickellia eupatorioides</i>	0–28	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	14–28	–
	white prairie clover	DACA7	<i>Dalea candida</i>	0–14	–
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	0–14	–
	fewflower buckwheat	ERPA9	<i>Eriogonum pauciflorum</i>	0–14	–
	scarlet beeblossom	GACO5	<i>Gaura coccinea</i>	0–14	–
	milkvetch	ASTRA	<i>Astragalus</i>	0–14	–
	ruessvtoes	ANTEN	<i>Antennaria</i>	0–14	–

	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0–14	–
	slimflower scurfpea	PSTE5	<i>Psoraleidium tenuiflorum</i>	0–14	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–14	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0–14	–
	lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	0–14	–
Shrub/Vine					
8	Shrubs			70–140	
	leadplant	AMCA6	<i>Amorpha canescens</i>	14–42	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	14–42	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–28	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0–28	–
	rose	ROSA5	<i>Rosa</i>	14–28	–
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0–28	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0–14	–

Table 9. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Needlegrass			20–150	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	0–150	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0–150	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0–100	–
2	Short Warm-Season Grasses			150–300	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	100–250	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	30–150	–
	threeawn	ARIST	<i>Aristida</i>	20–80	–
3	Wheatgrass			10–100	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	10–100	–
4	Mid Warm-Season Grasses			0–50	
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	0–50	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–30	–
5	Other Native Grasses			10–40	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–30	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	10–20	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes var. scribnerianum</i>	0–10	–
	fall rosette grass	DIWI5	<i>Dichanthelium wilcoxianum</i>	0–10	–
6	Grass-likes			150–300	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	100–200	–
	needleleaf sedge	CADU6	<i>Carex duriuscula</i>	50–150	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–50	–
7	Non-Native Grasses			0–100	

	brome	BROMU	<i>Bromus</i>	0–100	–
	bluegrass	POA	<i>Poa</i>	0–50	–
	crested wheatgrass	AGCR	<i>Agropyron cristatum</i>	0–50	–
Forb					
8	Forbs			50–150	
	Forb, introduced	2FI	<i>Forb, introduced</i>	0–50	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	10–50	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	10–40	–
	Forb, native	2FN	<i>Forb, native</i>	10–30	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	0–30	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	0–30	–
	silverleaf Indian breadroot	PEAR6	<i>Pediomelum argophyllum</i>	10–30	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0–20	–
	slimflower scurfpea	PSTE5	<i>Psoralidium tenuiflorum</i>	0–20	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0–20	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0–20	–
	pussytoes	ANTEN	<i>Antennaria</i>	0–20	–
	milkvetch	ASTRA	<i>Astragalus</i>	0–10	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0–10	–
	lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	0–10	–
	fewflower buckwheat	ERPA9	<i>Eriogonum pauciflorum</i>	0–10	–
	prairie spiderwort	TROC	<i>Tradescantia occidentalis</i>	0–10	–
	American vetch	VIAM	<i>Vicia americana</i>	0–10	–
Shrub/Vine					
9	Shrubs			50–100	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	10–60	–
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0–40	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–20	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0–20	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0–10	–
	rose	ROSA5	<i>Rosa</i>	0–10	–

Table 10. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Needlegrass			35–140	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	21–140	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0–105	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0–70	–
2	Short Warm-Season GRasses			35–105	
	threeawn	ARIST	<i>Aristida</i>	14–84	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	14–70	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–49	–

3	wheatgrass			0-21	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0-21	-
4	Other Native Grasses			0-21	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0-21	-
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0-14	-
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes var. scribnerianum</i>	0-7	-
	fall rosette grass	DIWI5	<i>Dichanthelium wilcoxianum</i>	0-7	-
5	Grass-likes			105-210	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	70-140	-
	needleleaf sedge	CADU6	<i>Carex duriuscula</i>	35-105	-
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0-35	-
6	Non-Native Grasses			70-210	
	crested wheatgrass	AGCR	<i>Agropyron cristatum</i>	0-140	-
	brome	BROMU	<i>Bromus</i>	14-140	-
	bluegrass	POA	<i>Poa</i>	0-56	-
Forb					
7	Forbs			35-105	
	Forb, introduced	2FI	<i>Forb, introduced</i>	7-56	-
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	7-49	-
	field sagewort	ARCA12	<i>Artemisia campestris</i>	7-42	-
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	0-21	-
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0-21	-
	Forb, native	2FN	<i>Forb, native</i>	0-14	-
	pussytoes	ANTEN	<i>Antennaria</i>	0-14	-
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	0-14	-
	fewflower buckwheat	ERPA9	<i>Eriogonum pauciflorum</i>	0-7	-
	silverleaf Indian breadroot	PEAR6	<i>Pediomelum argophyllum</i>	0-7	-
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0-7	-
Shrub/Vine					
8	Shrubs			35-70	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	14-56	-
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0-35	-
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0-28	-
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0-21	-
	snowberry	SYMPH	<i>Symphoricarpos</i>	0-7	-

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/Western Wheatgrass (1.1)
Average Annual Production (lbs./acre, air-dry): 1,400
Stocking Rate* (AUM/acre): 0.38

Sedge/Grama/Needlegrass (1.2)
Average Annual Production (lbs./acre, air-dry): 1,000
Stocking Rate* (AUM/acre): 0.27

Needlegrass/Grama/Western Wheatgrass (2.1)
Average Annual Production (lbs./acre, air-dry): 700
Stocking Rate* (AUM/acre): 0.19

Needlegrass/Annual Bromegrass/Sedge (2.2)
Average Annual Production (lbs./acre, air-dry): 500
Stocking Rate* (AUM/acre): 0.14

*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 typically dominated by soils in Hydrologic Group A. Infiltration and runoff potential for this site varies from moderate to high depending on soil hydrologic group, slope, and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where shortgrasses form a strong sod and dominate the site. Dominance by blue grama, buffalograss, bluegrass, and/or smooth bromegrass 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 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

Ecological Site Correlation Issues and Questions:

- SD107 Potter County, SD did not use the (OhB) Oahe-Talmo loams, 2 to 6 percent slopes (national symbol cvfb) as used in the adjoining SD119 Sully County, SD.
- SD069 Hyde County, SD did not use the (OhB) Oahe-Talmo loams, 2 to 6 percent slopes (national symbol cvfb) as used in the adjoining SD119 Sully County, SD.
- SD119 Sully County, SD did not use the (TaE) Talmo loam, 6 to 25 percent slopes (national symbol cw6j) (R63BY016SD ESD) as used in the adjoining SD069 Hyde County. SD069 Hyde County, SD (TaE) Talmo loam, 6 to 25 percent slopes (national symbol cw6j) (R63BY016SD ESD) will need to be split correlated to match SD119 Sully County, SD ESD.
- SD065 Hughes County, SD did not use the (TaE) Talmo loam, 6 to 25 percent slopes (national symbol cw6j) as used in the adjoining SD119 Sully County. Note: The SD065 Hughes County, SD (Sf) Schamber-Orton complex (R53CY016SD) has the majority of the map unit in MLRA63A. The (Sf) Schamber-Orton complex (R53CY016SD) will need to be split correlated to match (TaE) Talmo loam, 6 to 25 percent slopes (national symbol cw6j) (R53CY016SD). Note: The SD065 Hughes County, SD (Sf) Schamber-Orton complex will need to be investigated in the field to determine the correct map unit.
- SD059 Hand County, SD did not use the (TaE) Talmo loam, 6 to 25 percent slopes (national symbol cw6j) (R63BY016SD ESD) as used in the adjoining SD069 Hyde County. SD069 Hyde County, SD (TaE) Talmo loam, 6 to 25 percent slopes (national symbol cw6j) (R63BY016SD ESD) will need to be split correlated to match SD059 Hand County, SD ESD.
- SD073 Jerauld County, SD did not use the (ScE) Schamber loam, 9 to 30 percent slopes (national symbol cxz6) (R63BY016SD ESD) as used in the adjoining SD017 Buffalo County, SD (SD603 Brule and Buffalo Counties Soil survey). SD017 Buffalo County, SD (ScE) Schamber loam, 9 to 30 percent slopes (national symbol cxz6) (R63BY016SD ESD) will need to be split correlated to match SD073 Jerauld County, SD ESD.
- SD073 Jerauld County, SD did not use the (OwE) Orton-Schamber loams, 9 to 25 percent slopes (national symbol cxyx) (R63BY016SD ESD) as used in the adjoining SD015 Brule County, SD (SD603 Brule and Buffalo Counties Soil survey). SD015 Brule County, SD (OwE) Orton-Schamber loams, 9 to 25 percent slopes (national symbol cxyx) (R63BY016SD ESD) will need to be split correlated to match SD073 Jerauld County, SD ESD.
- SD003 Aurora County, SD did not use the (ScE) Schamber loam, 9 to 30 percent slopes (national symbol cxz6) (R63BY016SD ESD) as used in the adjoining SD015 Brule County, SD (SD603 Brule and Buffalo Counties Soil survey). SD015 Brule County, SD (ScE) Schamber loam, 9 to 30 percent slopes (national symbol cxz6) (R63BY016SD ESD) will need to be split correlated to match SD003 Aurora County, SD ESD.
- Reference and alternative states within the state and transition model are may not be fully documented and may require additional field sampling for refinement.

Inventory data references

There is no NRCS clipping data and other inventory currently available for this site. Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range-trained personnel were also used. Those involved in developing this site include: Stan Boltz, Range Management Specialist (RMS), NRCS, Shane Deranleau, RMS, NRCS, Bruce Kunze, Soil Scientist, NRCS, and Mitch Faulkner, RMS, NRCS.

Other references

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Approval

Suzanne Mayne-Kinney, 1/22/2024

Acknowledgments

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This Provisional Ecological Site concept has passed both Quality Control and Quality Assurance processes. Quality Assurance was approved by David Kraft, NRCS Regional Ecologist as of 11/12/2020.

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem

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

Author(s)/participant(s)	Stan Boltz, Mitch Faulkner, Shane Deranleau
Contact for lead author	Stan Boltz, stanley.boltz@sd.usda.gov, 605-352-1236
Date	03/15/2011
Approved by	Suzanne Mayne-Kinney
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:** Barely observable, or not present.

3. **Number and height of erosional pedestals or terracettes:** Not present.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground typically 5 to 20 percent.

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 present.

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):** Soil aggregate stability normally a 5 to 6 rating. 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):** Soil surface structure is typically granular, and mollic (higher organic matter) colors of the A-horizon are roughly 2-5 inches in depth. If conditions are other than this, refer to map unit component descriptions for component on which the site occurs.

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: Needlegrasses (mid and tall, cool-season bunchgrasses) >

Sub-dominant: Short, warm-season grasses > wheatgrasses (mid, cool-season bunchgrasses) = forbs >

Other: Mid, warm-season grasses = grass-like species = shrubs

Additional: Other native grasses occur in other functional groups in minor amounts.

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):** 35-65 percent plant litter cover, roughly 0.25 to 0.5 inches in depth. Litter cover is in contact with the soil surface.
-

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 1,400 pounds/acre (air-dry basis)
-

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:** Perennial grasses have vigorous rhizomes and/or tillers.
-