USDA Natural Resources Conservation Service

Ecological site R063BY024SD
Shallow

Last updated: 9/10/2018
Accessed: 05/17/2024

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.

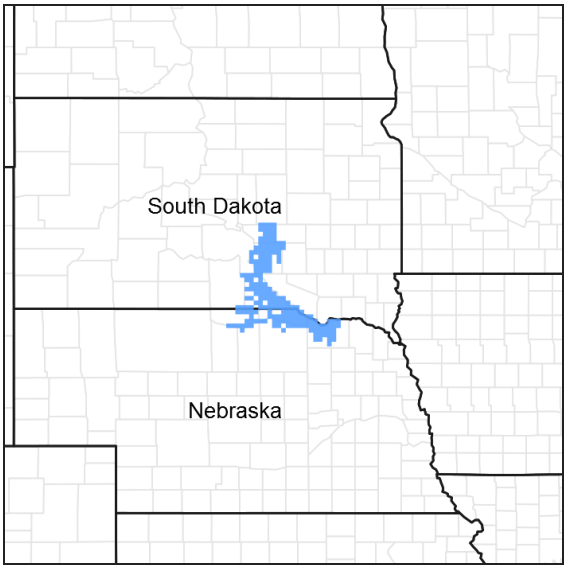

Figure 1. Mapped extent

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): 063B–Southern Rolling Pierre Shale Plains

MLRA Notes:
The Southern Rolling Pierre Shale Plains (MLRA 63B) is approximately 4,460 square miles in size. The majority of the MLRA is located in South Dakota (82 percent), and the remaining 18 percent is located in Nebraska. Interstate 90 crosses the northern portion through Chamberlin, SD. There are several Indian Reservations, including the Lower Brule, Crow Creek, Santee, and Yankton Reservations.
This MLRA is an area of old plateaus and terraces that have been deeply eroded, with nearly level to rolling long slopes and well-defined dendritic drainage systems. The rivers and creek valleys have smooth floors and steep walls. The majority of the MLRA is located in the unglaciated section of the Missouri Plateau, Great Plains Province. The northeast corner of the MLRA, east of the Missouri River, is located in the glaciated section with higher areas having deposits of glacial drift. The southwestern tip is located in the High Plains Section. Elevations range from 1,310 feet to 1,640 feet on the bottom lands along the Missouri River, and from 1,310 feet to 1,970 feet on the shale plains uplands.
The Missouri and Niobrara Rivers, and the confluence of the White and Missouri Rivers, occur within this MLRA. Lake Francis Case, Fort Randall Dam, and Lewis and Clark Lake are also within MLRA's borders.
Cretaceous Pierre Shale underlies most of the area. This is a marine sediment with layers of volcanic ash that has been altered to smectitic clays. These clays shrink as they dry and swell as they become wet, causing significant problems for road and structural foundations. Younger Niobrara chalk occurs in the southern part of the MLRA.

Alluvial sand and gravel underlie the valley floors along major streams.

Soils are shallow to very deep, generally well drained, and with loamy or clayey textures. Annual precipitation is 19 to 26 inches, mostly falling during the growing season, as frontal storms during the spring and convective thunderstorms in summer. The average annual temperature is 45°-50°F. The freeze-free period averages 165 days, and ranges from 145 to 185 days.

Vegetation is a transition between tall prairie grasses and mixed prairie grasses. Green needlegrass, porcupinegrass, western wheatgrass, and big bluestem are the major species. Little bluestem, buffalograss, sideoats grama, and sedges are dominant on the shallow soils. Buffaloberry, skunkbush sumac, and prairie rose are common on steep slopes along the major streams. Prairie cottonwood and a variety of willow species are common on flood plains along the major streams. Green ash, boxelder, chokecherry, bur oak, and buffaloberry occur in draws and narrow valleys. Encroachment of Rocky Mountain juniper and eastern redcedar on to the river breaks is becoming a concern.
The majority of the land is utilized for ranching (60 percent) and farming (27 percent). Major resource concerns for the area are wind erosion, water erosion, maintenance of the content of organic matter and soil productivity, and management of soil moisture.

Classification relationships

USDA - Land Resource Region G – Western Great Plains Range and Irrigated Region, Major Land Resource Area (MLRA) 63B – Southern Rolling Pierre Shale Plains (USDA-NRCS, Ag Handbook 296).

EPA - Level IV Ecoregions of the Continental United States:

Northwestern Glaciated Plains - 42f – Southern Missouri Coteau Slopes, 42g – Ponca Plains, 42h – Southern River Breaks, 42p – Holt Tablelands

North Western Great Plains - 43C – River Breaks, 43f – Subhumid Pierre Shale Plains, 43r – Niobrara River Breaks.

Ecological site concept

The Shallow ecological site occurs throughout MLRA 63B. It is located on hills and ridges, and does not receive additional moisture from run off or overflow. Typical slopes range from 0 to 60 percent. The soils are formed in residuum derived from siltstone or calcareous shales. They are shallow, between 10 and 20 inches deep, with a loam to silty clay loam surface textures, 4 to 7 inches thick. Soils are typically calcareous to the surface.
The vegetation in the Reference State (1.0) consists of a mix of warm- and cool-season grasses. Little bluestem, sideoats grama, and blue grama are dominant. Cool-season grasses and grass-like species including needle and thread, rhizomatous wheatgrass, and threadleaf sedge, make up a significant portion of the composition. Forbs are common and diverse, and shrubs are common, and trees can occur but in minor amounts.

Associated sites

R063BY010SD	**Loamy** The Loamy site can be found adjacent to the Shallow site but usually on a lower landscape position and less steep slopes.
R063BY011SD	**Clayey** The Clayey site can be found adjacent to the Shallow site but usually on a lower landscape position and less steep slopes.
R063BY012SD	**Thin Upland** The Thin Upland site can be found on slopes below the Shallow site.

Similar sites

R063BY011SD	**Clayey** The Clayey site will have less big bluestem and higher forage production.

R063BY012SD	**Thin Upland** The Thin Upland site will have more little bluestem, less needlegrass, and higher production.
R063BY010SD	**Loamy** The Loamy site will have less little bluestem, less big bluestem, and higher forage production.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Andropogon gerardii* (2) *Schizachyrium scoparium*

Physiographic features

This site occurs on moderately to steeply sloping uplands.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge
Flooding frequency	None
Ponding frequency	None
Elevation	396–610 m
Slope	3–60%
Water table depth	203 cm
Aspect	Aspect is not a significant factor

Climatic features

MLRA 63B is considered to have a continental climate – cold winters and hot summers, low humidity, light rainfall, and ample 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 18 to 25 inches per year. The average annual temperature is about 48°F. January is the coldest month with average temperatures ranging from about 15°F (Stephan, SD), to about 22°F (Winner, SD). July is the warmest month with temperatures averaging from about 73°F (Stephan, SD), to about 76°F (Winner, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 56°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 (mph) annually, ranging from about 13 mph during the spring to about 10 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. Green-up of cool-season plants may occur in September and October when adequate soil moisture is present.

Table 3. Representative climatic features

Frost-free period (characteristic range)	113-122 days
Freeze-free period (characteristic range)	130-154 days
Precipitation total (characteristic range)	533-610 mm
Frost-free period (actual range)	110-126 days

Freeze-free period (actual range)	127-155 days
Precipitation total (actual range)	508-635 mm
Frost-free period (average)	118 days
Freeze-free period (average)	141 days
Precipitation total (average)	584 mm

Climate stations used

- (1) LYNCH [USC00255040], Lynch, NE
- (2) NIOBRARA [USC00255960], Niobrara, NE
- (3) GANN VALLEY 4NW [USC00393217], Gann Valley, SD
- (4) WINNER [USC00399367], Winner, SD
- (5) WOOD [USC00399442], Wood, SD
- (6) PICKSTOWN [USC00396574], Lake Andes, SD
- (7) STEPHAN 2 NW [USC00397992], Highmore, SD

Influencing water features

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

Soil features

The common features of soils in this site are the silt loam, loam, or silty clay textured surface soils with slopes of 3 to 45 percent. The soils in this site are shallow (10 to 20 inches in depth), well-drained, and formed in residuum weathered from shale or siltstone. The surface layer is 4 to 7 inches thick and has moderate to slow permeability and moderately high to low saturated hydraulic conductivity. These soils are typically calcareous at or near the surface; however, carbonates are not always distinguishable in the surface layer. The texture of the subsoil ranges from clay to loam to silt loam, depending on parent material. Carbonates, gypsum, or other salts are typically found in the subsoil or underlying layers in these soils. The subsoil has a moderate to slow permeability rate and moderately high to low saturated hydraulic conductivity. The bedrock, which occurs at 10 to 20 inches, is typically made up of siltstone or shale. The siltstone forms a restrictive layer which inhibits plant roots, but the upper part of the shale is typically highly degraded and soft which allows some plant roots to penetrate. Available water capacity ranges from moderate to low throughout the soil depending on the soil and parent material.

This site should show slight to no evidence of rills, wind scoured areas, or pedestalled plants. Water flow paths are broken, irregular in appearance, or discontinuous with numerous debris dams or vegetative barriers. The soil surface is stable and intact. Subsurface soil layers are restrictive to water movement and root penetration.

Major soils correlated to the Shallow ecological site is Bristow and Mariaville.

The Bristow soil is derived from weathered calcareous shale whereas the Mariville soil is derived from calcareous siltstone. The Mariaville soil is correlated to Shallow Limy in the adjoining MLRA 66.

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 and slow permeability strongly influences the soil-water-plant relationship.

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

Table 4. Representative soil features

Parent material	(1) Residuum–calcareous siltstone

Surface texture	(1) Loam (2) Sandy loam (3) Sandy clay
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow
Soil depth	41–46 cm
Surface fragment cover <=3"	0–4%
Available water capacity (0-101.6cm)	7.62 cm
Calcium carbonate equivalent (0-101.6cm)	3–15%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–4%

Ecological dynamics

This site developed under Northern Great Plains climatic conditions, natural influences of large herbivores, occasional fire, and other biotic and abiotic factors that typically influence soil/site development. Changes will occur in the plant communities due to short-term weather variations, impacts of native and/or exotic plant and animal species, and management actions. While the following plant community descriptions specify 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.

This ecological site is naturally resilient and quite resistant to change. 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 Bluestem-Grama-Needlegrass Plant Community (1.1). Sedges and grama species can increase and eventually develop into a sod, while many of the tall and mid-statured grasses will decrease (e.g., big bluestem, little bluestem, green needlegrass, needle and thread, porcupine grass, 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. This site is also susceptible to encroachment of conifer species, primarily eastern redcedar and Rocky Mountain juniper, but ponderosa pine can also occur in some areas of the MLRA.

Interpretations are based on the Bluestem-Grama-Needlegrass Plant Community (1.1). 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 community phases, states, transitional pathways, and thresholds have been determined through similar studies and experience.

The following is a diagram that illustrates the common plant community phases that can occur on the site and the transition pathways between communities. These are the most common plant community phases based on current knowledge and experience, and changes may be made as more data is collected. Narratives following the diagram contain more detail pertaining to the ecological processes.

State and transition model

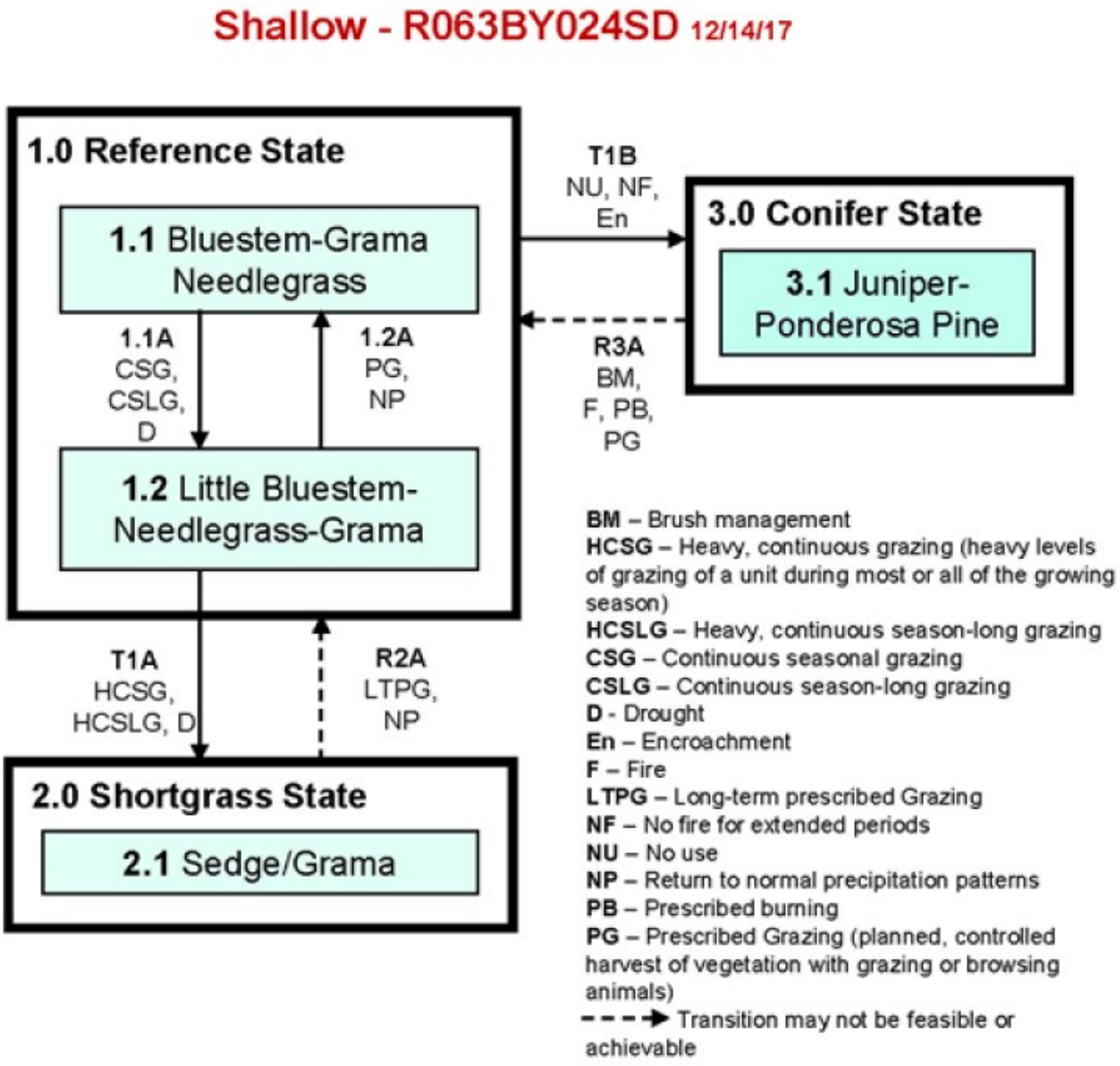

Diagram Legend - Shallow - R063BY024SD		
T1A	Heavy, continuous seasonal grazing or heavy, continuous season-long grazing with high stocking rates. Grazing in combination with extended periods of drought.	
T1B	No use and no fire, and encroachment and establishment of conifers from adjacent sites.	
R2A	Long-term prescribed grazing with proper stocking, change in season of use and adequate recovery, return to normal precipitation patterns.	
R3A	Mechanical brush management, fire or prescribed burn followed by prescribed grazing.	
CP 1.1A	1.1 - 1.2	Continuous seasonal grazing with no change in season of use or adequate recovery, or continuous season-long grazing or heavy grazing in combination with drought.
CP 1.2A	1.2 - 1.1	Prescribed grazing with proper stocking, change in season of use and time for adequate recovery, and/or normal precipitation following drought.

State 1
Reference State

This State represents the natural range of variability that dominates the dynamics of this site. This State is dominated by warm-season grasses and subdominant cool-season grasses. In pre-European times, the primary disturbance mechanisms for this site in the reference condition included relatively frequent fire and grazing by large herding ungulates. Timing of fires and 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/or 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
Bluestem-Grama-Needlegrass

Interpretations are based primarily on the Bluestem-Grama-Needlegrass Plant Community. This is also considered to be Reference Plant Community. The potential vegetation is about 80 percent grasses or grass-like plants, 10 percent forbs, 10 percent shrubs and a trace amount of trees. The community is dominated by tall and mid-stature warm-season grasses, and needlegrasses. The major grasses include big bluestem, little bluestem, porcupine grass, needle and thread, green needlegrass, and sideoats grama. Other grass and grass-like species include prairie sandreed, western wheatgrass, blue grama, sedges, switchgrass, Canada wildrye, and buffalograss. This plant community is resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allows for high drought tolerance. This is a sustainable plant community in regards to site/soil stability, watershed function, and biologic integrity.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1121	1786	2315
Forb	95	151	224
Shrub/Vine	17	61	106
Tree	–	20	45
Total	**1233**	**2018**	**2690**

Figure 9. Plant community growth curve (percent production by month). SD6304, Pierre Shale Plains, warm-season dominant, cool-season subdominant. Warm-season dominant, cool-season subdominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	7	17	25	25	15	7	1	0	0

Community 1.2
Little Bluestem-Needlegrass-Grama

This plant community developed under continuous seasonal grazing, continuous season-long grazing, or from over utilization during extended drought periods. This community can also develop where this site occurs near to water sources. The potential plant community is made up of approximately 75 percent grasses and grass-like species, 15 percent forbs, and 10 percent shrubs and a trace amount of trees. Dominant grass and grass-like species include little bluestem, needle and thread, sideoats grama, blue grama, and threadleaf sedge. Grasses of secondary importance include big bluestem, green needlegrass, porcupine grass, hairy grama, western wheatgrass, and buffalograss. Forbs commonly found in this plant community include cudweed sagewort, goldenrod, heath aster, scurfpea, and western ragweed. When compared to the Bluestem-Grama-Needlegrass Plant Community Phase (1.1), little bluestem, blue grama, sideoats grama, sedge, and buffalograss have increased. Tall warm-season grasses have decreased and production has also been reduced. Needle and thread will persist in this phase. This plant community is moderately resistant to change. This is due in part to the shallow rooted nature of the shortgrass species which decreases infiltration especially to the deeper rooted tall and mid-grass species. The herbaceous species present are well adapted to grazing; however, species composition can be altered through continued overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	964	1388	1883
Forb	78	168	286
Shrub/Vine	78	127	185
Total	**1120**	**1683**	**2354**

Figure 11. Plant community growth curve (percent production by month). SD6304, Pierre Shale Plains, warm-season dominant, cool-season subdominant. Warm-season dominant, cool-season subdominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	7	17	25	25	15	7	1	0	0

Pathway 1.1A
Community 1.1 to 1.2

Continuous seasonal grazing (grazing at moderate to heavy stocking levels at the same time of year each year), continuous season-long grazing (grazing at light to moderate stocking levels for the entire growing season), or a

combination of disturbances such as extended periods of below average precipitation coupled with periodic heavy grazing will shift this community to the Little Bluestem-Needlegrass-Grama Plant Community (1.2). In all cases, recovery periods are inadequate for health and vigor of dominant grass species.

Pathway 1.2A
Community 1.2 to 1.1

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 Bluestem-Grama-Needlegrass Plant Community (1.1). A return to normal precipitation patterns will help with recovery.

Conservation practices

Prescribed Grazing

State 2
Shortgrass State

This State is dominated by shortgrass species, upland sedges, and fringed sagewort. It is the result of grazing practices that remove the mid- and tall warm-season grasses and mid-stature cool-season grasses, giving a competitive advantage to shortgrasses and grass-like species that are grazing resistant. Water infiltration has decreased and runoff has increased in this state. This state is very resilient and resistant to change.

Community 2.1
Sedge/Grama

This plant community evolved under heavy, continuous seasonal grazing, heavy continuous season-long grazing, or from over utilization during extended drought periods. The potential plant community is made up of approximately 75 percent grasses and grass-like species, 10 percent forbs, 15 percent shrubs and a trace amount of trees. Dominant grass and grass-like species include threadleaf sedge, blue grama, sideoats grama, threeawn, and buffalograss. Grasses of secondary importance include big bluestem, little bluestem, western wheatgrass, and needle and thread. Forbs commonly found in this plant community include cudweed sagewort, green sagewort, and western ragweed. When compared to the Bluestem-Grama-Needlegrass Plant Community (1.1), short-statured species are dominant on this plant community. Tall and mid-grasses have decreased significantly. This vegetation state is very resistant to change due to the increase in the root mat near the surface of the soil which further reduces infiltration. The herbaceous species present are well adapted to grazing; however, composition can be altered through long-term prescribed grazing. This plant community is less productive than other plant community phases. The thick sod prevents other species from getting established. Lack of litter and reduced plant vigor causes higher soil temperatures, poor water infiltration rates, and high evapotranspiration which gives the short statured species a competitive advantage. Soil erosion will be minimal due to the sod forming habit of dominant species in this phase.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	583	833	1295
Shrub/Vine	45	100	168
Forb	45	76	106
Total	**673**	**1009**	**1569**

Figure 13. Plant community growth curve (percent production by month). SD6304, Pierre Shale Plains, warm-season dominant, cool-season subdominant. Warm-season dominant, cool-season subdominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	7	17	25	25	15	7	1	0	0

State 3
Conifer State

This State occurs when, eastern redcedar, and/or Rocky Mountain juniper, and possibly ponderosa pine encroach onto the site. As the juniper/pine become established, the herbaceous component declines and more bare ground is exposed. As bare ground increases juniper/pine establishes more readily. Grazing can contribute to this transition but it can also occur independently without human influence other than through fire suppression.

Community 3.1
Juniper-Ponderosa Pine

Historically, juniper and ponderosa pine were confined to rocky ridges and steep shallow slopes with rock outcrops, located adjacent to this ecological site. Currently, juniper and to a lesser extent, ponderosa pine are expanding onto this ecological site due to the suppression of fire. The juniper/ponderosa pine canopy is greater than 15 percent of mature trees. The understory is made up of about 60 to 85 percent grasses and grass-like species, 5 to 10 percent forbs, and 2 to 10 percent shrubs. Dominant grasses and grass-likes include needle and thread, little bluestem, sideoats grama, blue grama, and sedge. Grasses of secondary importance include Canada wildrye, green needlegrass, western wheatgrass, and big bluestem. As the canopy increases, warm-season grasses tend to decrease as the cool-season grasses initially increase. Forbs commonly found in this community include green sagewort, western yarrow, and pussytoes. Non-native species such as cheatgrass and bluegrass will tend to invade this plant community. When compared to the Bluestem-Grama-Needlegrass Plant Community (1.1), juniper and/or ponderosa pine increases significantly. The grass component decreases dramatically as the buildup of needles increases. Annual herbaceous production also decreases significantly. While the tree canopy provides excellent protection from the weather for both livestock and wildlife, it is not capable of supporting large numbers of wildlife or livestock due to decreased herbaceous production. This plant community is resistant to change. A significant reduction of juniper can be accomplished through brush management or fire. Eastern redcedar mortality, due to fire, decreases as tree size increases. This is due to the relatively thicker bark, sparse fine fuels beneath the canopy, and greater vertical distance of the upper foliage from lethal temperatures. Prescribed burning can result in an 88 percent mortality when juniper are less than 4 feet in height but only a 35 percent mortality when trees exceed 7 feet in height (Owensby et.al. 1973, Ortmann et.al. 1998). Because eastern redcedar and Rocky Mountain are non-sprouting species, mechanical removal is near 100 percent effective if the stem is cut at ground level. Reclamation of tree dominated areas can be costly and prove to be temporary without proper management (i.e., prescribed burning, and prescribed grazing).

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	454	746	1110
Tree	247	437	673
Shrub/Vine	62	101	140
Forb	22	61	95
Total	**785**	**1345**	**2018**

Figure 15. Plant community growth curve (percent production by month). SD6311, Pierre Shale Plains, heavy conifer canopy.. Mature eastern redcedar overstory..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	3	7	11	24	27	12	5	4	3	2	1

Transition T1A
State 1 to 2

Heavy, continuous seasonal grazing (stocking levels well above carrying capacity for extended portions of the growing season, and at the same time of year each year, typically beginning early in the season) or heavy, continuous season-long grazing, and/or drought, will convert this plant community (1.2) to the Shortgrass State

(2.0).

Transition T1B
State 1 to 3

Non-use, and no fire, and encroachment (or escaped) of conifer species will lead to the Conifer State (3.0). This occurs when this plant community is protected from natural fires, or controlled burning.

Restoration pathway R2A
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) and a return to normal precipitation patterns, may lead this plant community phase over a threshold to the Reference State (1.0). This will likely take a long period of time, possibly up to 10 years or more, and recovery may not be attainable.

Conservation practices

Prescribed Grazing

Restoration pathway R3A
State 3 to 1

Mechanical brush management, wildfire (hot, crown fires) or prescribed burning, followed with prescribed grazing can move this plant community to the Reference State (1.0). This transition may not be feasible or meet management goals unless treatment occurs early in the encroachment phase, prior to trees reaching a height of five feet.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm-Season Grasses**			404–605	
	big bluestem	ANGE	*Andropogon gerardii*	303–605	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	40–202	–
	switchgrass	PAVI2	*Panicum virgatum*	0–101	–
	Indiangrass	SONU2	*Sorghastrum nutans*	0–101	–
2	**Mid Warm-Season Grasses**			303–605	
	little bluestem	SCSC	*Schizachyrium scoparium*	202–504	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	101–303	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	20–101	–
	prairie dropseed	SPHE	*Sporobolus heterolepis*	0–101	–
3	**Cool-Season Bunchgrasses**			202–605	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	101–504	–

	porcupinegrass	HESP11	*Hesperostipa spartea*	40–504	–
	green needlegrass	NAVI4	*Nassella viridula*	101–504	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–101	–
4	**Wheatgrass**			101–202	
	western wheatgrass	PASM	*Pascopyrum smithii*	101–202	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–101	–
5	**Short Warm-Season Grasses**			20–101	
	buffalograss	BODA2	*Bouteloua dactyloides*	0–101	–
	blue grama	BOGR2	*Bouteloua gracilis*	20–101	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–101	–
	threeawn	ARIST	*Aristida*	0–40	–
6	**Other Native Grasses**			20–101	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–101	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	20–61	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–40	–
7	**Grass-likes**			20–101	
	threadleaf sedge	CAFI	*Carex filifolia*	20–101	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–61	–
Forb					
8	**Forbs**			101–202	
	Forb, native	2FN	*Forb, native*	20–81	–
	purple prairie clover	DAPU5	*Dalea purpurea*	20–40	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	20–40	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	20–40	–
	dotted blazing star	LIPU	*Liatris punctata*	20–40	–
	field sagewort	ARCA12	*Artemisia campestris*	0–40	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	20–40	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	20–40	–
	large Indian breadroot	PEES	*Pediomelum esculentum*	0–40	–
	beardtongue	PENST	*Penstemon*	0–40	–
	scurfpea	PSORA2	*Psoralidium*	20–40	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	20–40	–
	compassplant	SILA3	*Silphium laciniatum*	0–40	–
	goldenrod	SOLID	*Solidago*	20–40	–
	white heath aster	SYER	*Symphyotrichum ericoides*	20–40	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–20	–
	yellow sundrops	CASE12	*Calylophus serrulatus*	0–20	–
	lacy tansyaster	MAPI	*Machaeranthera pinnatifida*	0–20	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–20	–
Shrub/Vine					
9	**Shrubs**			20–101	
	leadplant	AMCA6	*Amorpha canescens*	20–61	

	leadplant	AMCA6	*Amorpha canescens*	20–61	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–40	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–40	–
	rose	ROSA5	*Rosa*	20–40	–
	snowberry	SYMPH	*Symphoricarpos*	20–40	–
	soapweed yucca	YUGL	*Yucca glauca*	0–40	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–20	–
	smooth sumac	RHGL	*Rhus glabra*	0–20	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–20	–
Tree					
10	**Trees**			0–45	
	eastern redcedar	JUVI	*Juniperus virginiana*	0–40	–
	ponderosa pine	PIPO	*Pinus ponderosa*	0–20	–
	Tree	2TREE	*Tree*	0–20	–
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	0–20	–

Table 10. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm-Season Grasses**			84–252	
	big bluestem	ANGE	*Andropogon gerardii*	84–252	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–84	–
	switchgrass	PAVI2	*Panicum virgatum*	0–34	–
	Indiangrass	SONU2	*Sorghastrum nutans*	0–34	–
2	**Mid Warm-Season Grasses**			252–420	
	little bluestem	SCSC	*Schizachyrium scoparium*	168–336	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	84–252	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–34	–
3	**Cool-Season Bunchgrasses**			84–336	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	84–336	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–84	–
	green needlegrass	NAVI4	*Nassella viridula*	0–84	–
4	**Wheatgrass**			0–84	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–84	–
5	**Short Warm-Season Grasses**			168–336	
	blue grama	BOGR2	*Bouteloua gracilis*	84–252	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–168	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–135	–
	threeawn	ARIST	*Aristida*	17–84	–
6	**Other Native Grasses**			17–84	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–84	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	17–50	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–34	–

			scribnerianum		
7	**Grass-likes**			84–252	
	threadleaf sedge	CAFI	*Carex filifolia*	84–252	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–84	–
Forb					
8	**Forbs**			84–252	
	Forb, native	2FN	*Forb, native*	17–84	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	17–67	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–50	–
	field sagewort	ARCA12	*Artemisia campestris*	17–50	–
	scurfpea	PSORA2	*Psoralidium*	17–50	–
	Forb, introduced	2FI	*Forb, introduced*	0–50	–
	goldenrod	SOLID	*Solidago*	17–50	–
	white heath aster	SYER	*Symphyotrichum ericoides*	17–50	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	17–34	–
	dotted blazing star	LIPU	*Liatris punctata*	17–34	–
	lacy tansyaster	MAPI	*Machaeranthera pinnatifida*	0–17	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–17	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–17	–
	large Indian breadroot	PEES	*Pediomelum esculentum*	0–17	–
	beardtongue	PENST	*Penstemon*	0–17	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–17	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–17	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–17	–
Shrub/Vine					
9	**Shrubs**			84–168	
	prairie sagewort	ARFR4	*Artemisia frigida*	17–67	–
	smooth sumac	RHGL	*Rhus glabra*	0–50	–
	snowberry	SYMPH	*Symphoricarpos*	17–50	–
	soapweed yucca	YUGL	*Yucca glauca*	17–50	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–34	–
	rose	ROSA5	*Rosa*	17–34	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–34	–
	leadplant	AMCA6	*Amorpha canescens*	0–17	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–17	–
Tree					
10	**Trees**			0–39	
	eastern redcedar	JUVI	*Juniperus virginiana*	0–34	–
	ponderosa pine	PIPO	*Pinus ponderosa*	0–17	–
	Tree	2TREE	*Tree*	0–17	–
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	0–17	–

Table 11. Community 2.1 plant community composition

				Annual Production	Foliar Cover

Group	Common Name	Symbol	Scientific Name	(Kg/Hectare)	(%)
Grass/Grasslike					
1	**Tall Warm-Season Grasses**			10–50	
	big bluestem	ANGE	*Andropogon gerardii*	10–50	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–20	–
2	**Mid Warm-Season Grasses**			20–101	
	sideoats grama	BOCU	*Bouteloua curtipendula*	20–101	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–81	–
3	**Cool-Season Bunchgrasses**			0–50	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–50	–
4	**Wheatgrass**			0–50	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–50	–
5	**Short Warm-Season grasses**			202–353	
	blue grama	BOGR2	*Bouteloua gracilis*	151–303	–
	threeawn	ARIST	*Aristida*	20–101	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–101	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–50	–
6	**Other Native Grasses**			10–50	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–50	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–20	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	10–20	–
7	**Grass-likes**			151–353	
	sedge	CAREX	*Carex*	151–353	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–101	–
Forb					
8	**Forbs**			50–101	
	Forb, native	2FN	*Forb, native*	10–50	–
	field sagewort	ARCA12	*Artemisia campestris*	10–40	–
	Forb, introduced	2FI	*Forb, introduced*	0–40	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	10–30	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	10–30	–
	goldenrod	SOLID	*Solidago*	10–20	–
	white heath aster	SYER	*Symphyotrichum ericoides*	10–20	–
	dotted blazing star	LIPU	*Liatris punctata*	0–10	–
	scurfpea	PSORA2	*Psoralidium*	0–10	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–10	–
Shrub/Vine					
9	**Shrubs**			50–151	
	prairie sagewort	ARFR4	*Artemisia frigida*	20–61	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–50	–
	snowberry	SYMPH	*Symphoricarpos*	10–50	–
	soapweed yucca	YUGL	*Yucca glauca*	10–50	–

	plains pricklypear	OPPO	*Opuntia polyacantha*	10–40	–
	smooth sumac	RHGL	*Rhus glabra*	0–40	–
	rose	ROSA5	*Rosa*	10–20	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–10	–
Tree					
10	**Trees**			0–22	
	eastern redcedar	JUVI	*Juniperus virginiana*	0–20	–
	ponderosa pine	PIPO	*Pinus ponderosa*	0–11	–
	Tree	2TREE	*Tree*	0–11	–
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	0–11	–

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). Therefore, a resource inventory is necessary to document plant composition and production. More accurate carrying capacity estimates should eventually be calculated using the following stocking rate information along with animal preference data and actual stocking records, particularly when grazers other than cattle are involved. With consultation of the land manager, more intensive grazing management may result in improved harvest efficiencies and increased carrying capacity.

Plant Community: Bluestem-Grama-Needlegrass (1.1)
Average Annual Production (lbs./acre, air-dry): 1,800
Stocking Rate (AUM/acre): 0.49

Plant Community: Little Bluestem-Needlegrass-Grama (1.2)
Average Annual Production (lbs./acre, air-dry): 1,500
Stocking Rate (AUM/acre): 0.41

Plant Community: Sedge/Grama (2.1)
Average Annual Production (lbs./acre, air-dry): 900
Stocking Rate (AUM/acre): 0.25

Plant Community: Juniper-Ponderosa Pine (3.1)
Average Annual Production (lbs./acre, air-dry): Variable
Stocking Rate (AUM/acre): Variable

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

Total annual production on-site may contain vegetation deemed undesirable or untargeted by the grazing animal. Therefore, AUM values may have been reduced to reflect only preferred or desirable forage species.

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

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group

D. Infiltration is moderately slow and runoff potential for this site varies from high to very 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 higher 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, 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 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 requirements as an “Approved” ESD as laid out in the 1997, rev.1, 2003 National Range and Pasture Handbook (NRPH). The document fully described the Reference State and Community Phase in the State-and-Transition model. All other alternative states are at least described in narrative form. The “Previously Approved” ESD has been field-tested for a minimum of five years and is a proven functional document for conservation planning. The “Previously Approved” ESD does not contain all tabular and narrative entries as required in the current “Approved” level of documentation, but it is expected that the “Previously Approved” ESD will continue refinement toward an “Approved” status.

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

available online and at any USDA office, or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632- 9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov.

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; and Dana Larsen, RMS, NRCS.

There are 5 SCS-RANGE-417s collected from 1971-1982 in Boyd, and Knox Counties, Nebraska and Tipp County, South Dakota.

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Contributors

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Approval

David Kraft, 9/10/2018

Acknowledgments

ESD updated by Rick L. Peterson on 12/19/17

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	Stan Boltz, stanley.boltz@sd.usda.gov, 605-352-1236
Date	02/20/2009
Approved by	Stan Boltz
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Typically non-existent.

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2. **Presence of water flow patterns:** Non-existent or barely visible.

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3. **Number and height of erosional pedestals or terracettes:** Typically none, few pedestalled plants may be present, but no roots exposed.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is typically less than 10 percent.

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

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

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7. **Amount of litter movement (describe size and distance expected to travel):** Little to no plant litter movement.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Plant cover and litter is at 60% or greater of soil surface and maintains soil surface integrity. Stability class anticipated to be 5 or greater.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface structure is typically granular, with mollic (dark, organic matter) colors roughly 4 to 6 inches in depth.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Combination of deep-rooted perennial grasses and forbs enhance infiltration.

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 would be expected except for the naturally occurring rooting restriction occurring at 10 to 20 inches.

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: Tall, warm-season rhizomatous grasses = mid, warm-season grasses = mid and tall, cool-season bunchgrasses >>

    Sub-dominant: Wheatgrasses (mid, cool-season rhizomatous) >

    Other: Forbs > short, warm-season grasses = grass-like species = shrubs

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

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Little to no plant decadence or mortality, bunchgrasses have healthy centers.

14. **Average percent litter cover (%) and depth (in):** Litter cover typically 50 to 70 percent. 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):** Total annual production ranges from 1,400 to 2,800 pounds/acre, with the reference value being 2,200 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:** State and local noxious, Kentucky bluegrass, smooth bromegrass.

17. **Perennial plant reproductive capability:** Rhizomatous grasses have healthy, vigorous rhizomes and tillers.