USDA Natural Resources Conservation Service

Ecological site R063AY009SD
Sandy

Last updated: 6/26/2024
Accessed: 05/21/2025

General information

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

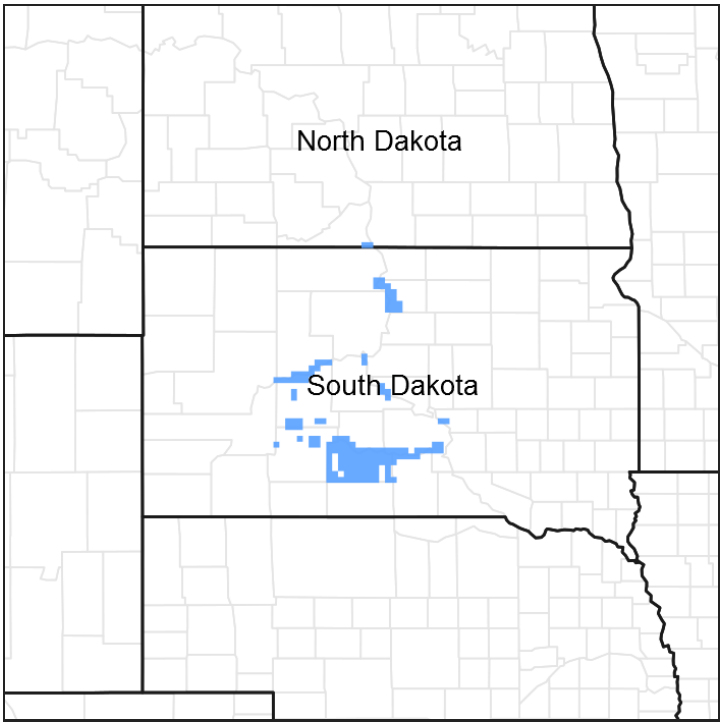

Figure 1. Mapped extent

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

MLRA notes

Major Land Resource Area (MLRA): 063A–Northern Rolling Pierre Shale Plains

MLRA 63A is approximately 10,160 square miles in size, the majority of which is in South Dakota and a very small portion in North Dakota. The MLRA extends west of the northern

half of the South Dakota reach of the Missouri River. All five of the major rivers draining western South Dakota cross this area. From north to south, these are the Grand, Moreau, Cheyenne, Bad, and White Rivers.

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

Classification relationships

Land Resource Region (LRR): G - Western Great Plains Range and Irrigated Region, Major Land Resource Area (MLRA): 63A Northern Rolling Pierre Shale Plains, (USDA-NRCS, Ag Handbook 296).
Level IV Ecoregions of the Conterminous United States, 2013: 43c – River Breaks and 43f – Subhumid Pierre Shale Plains.

Ecological site concept

The Sandy Ecological Site occurs throughout the MLRA. It is located on upland landscapes and does not receive additional moisture from runoff or overflow. Typical slope ranges from 0 to 30 percent. Soils are deep, (greater than 20 inches) with surface textures ranging from fine sandy loam to sandy loam. Subsurface textures range from loamy sand to clay loam. Vegetation in the reference plant community consists of a mix of cool- and warm-season grasses. Dominant grasses include big or sand bluestem, prairie sandreed, little bluestem, western wheatgrass and needleandthread. Other grasses include sideoats grama, switchgrass and prairie junegrass. Forbs are common and diverse, common shrubs include leadplant and rose. This site is susceptible to invasion of non-native, cool-season grasses.

Associated sites

R063AY008SD	**Sands**
R063AY010SD	**Loamy**
R063AY020SD	**Loamy Overflow**

Similar sites

R063AY008SD	**Sands** Sands [more sand bluestem; less western wheatgrass; steeper slopes]

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Andropogon gerardii* (2) *Calamovilfa longifolia*

Physiographic features

This site typically occurs on gently to steeply sloping uplands.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Plain (3) Terrace
Flooding frequency	None
Ponding frequency	None
Elevation	1,600–2,700 ft
Slope	0–30%
Water table depth	80 in
Aspect	Aspect is not a significant factor

Climatic features

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

Annual precipitation ranges from 16 to 20 inches per year. The average annual temperature is about 47°F. January is the coldest month with average temperatures ranging from about 11°F (Pollock, South Dakota (SD)), to about 22°F (Cedar Butte, SD). July is the warmest month with temperatures averaging from about 72°F (Pollock, SD), to about 76° F (Cedar Butte, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 58°F. This large annual range attests to

the continental nature of this area's climate. Hourly winds are estimated to average about 11 miles per hour annually, ranging from about 13 miles per hour during the spring to about 10 miles per hour during the summer. Daytime winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 50 miles per hour.

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

Table 3. Representative climatic features

Frost-free period (characteristic range)	108-117 days
Freeze-free period (characteristic range)	129-131 days
Precipitation total (characteristic range)	17-20 in
Frost-free period (actual range)	104-120 days
Freeze-free period (actual range)	127-132 days
Precipitation total (actual range)	17-20 in
Frost-free period (average)	113 days
Freeze-free period (average)	130 days
Precipitation total (average)	19 in

Climate stations used

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

Influencing water features

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

Soil features

The soils in this site are moderately well to somewhat excessively drained and formed in eolian sand or alluvium. The surface layer is 3 to 21 inches thick but, typically 4 to 8 inches thick. The surface texture can range from fine sandy loam to silt loam. The subsurface textures range from loamy sand to clay loam. Slopes range from 0 to 30 percent. This site should show slight to 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 stable and intact.

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 decreased production.

Major soils correlated to the Sandy Ecological Site: Manter, Tally and Tuthill

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

Table 4. Representative soil features

Surface texture	(1) Fine sandy loam
Family particle size	(1) Sandy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderate to rapid
Soil depth	80 in
Surface fragment cover <=3"	0–25%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	5–7 in
Calcium carbonate equivalent (0-40in)	0–30%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	6.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–25%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

This site developed under Northern Great Plains climatic conditions, light to severe

grazing by bison and other large herbivores, sporadic natural or man-caused wildfire (often of light intensities), and other biotic and abiotic factors that typically influence soil/site development. Changes will occur in the plant communities due to short-term weather variations, impacts of native and/or exotic plant, and animal species, and management actions. While the following plant community descriptions describe more typical transitions between communities that will occur, severe disturbances, such as periods of well below average precipitation, can cause significant shifts in plant communities and/or species composition.

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, causes this site to depart from the Bluestem-Prairie Sandreed-Needlegrass Plant Community (1.1). Species such as western wheatgrass, prairie sandreed, needleandthread, prairie Junegrass, blue grama, and sedges will increase. Continued deterioration results in a community dominated by blue grama, sedge, bluegrass, sand dropseed, and western ragweed. Warm-season grasses such as sand bluestem, big bluestem, little bluestem, and eventually prairie sandreed, will decrease in frequency and production.

Interpretations are primarily based on the Bluestem-Prairie Sandreed-Needlegrass Plant Community, which is considered to be the reference plant community. It has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts also have been used. Plant communities, states, transitional pathways, and thresholds have been determined through similar studies and experience.

The following diagram illustrates the common plant communities and vegetation states commonly occurring on the site and the transition pathways between communities and states. The ecological processes will be discussed in more detail in the plant community descriptions following the diagram.

State and transition model

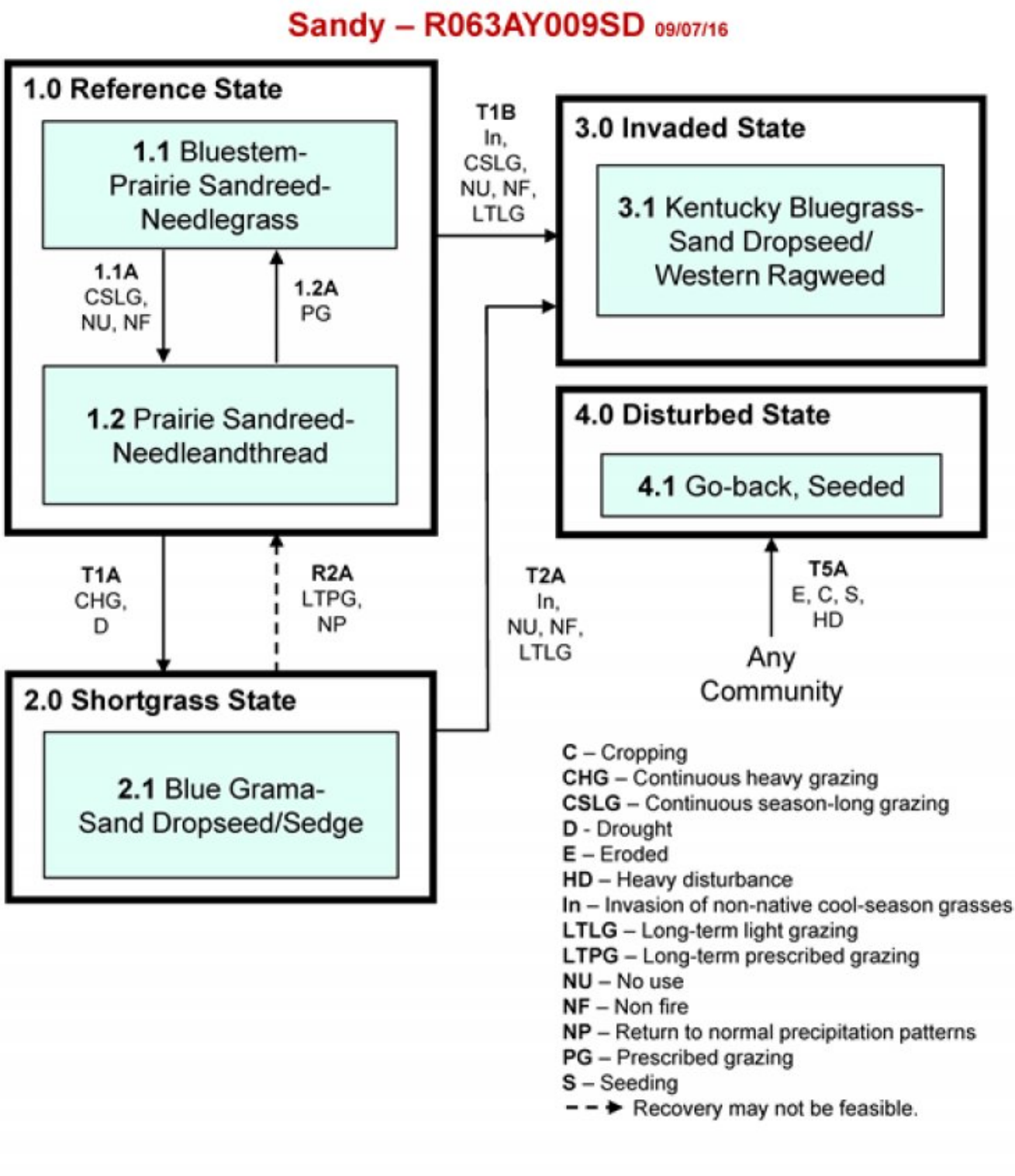

Figure 8. Sandy - R063AY009SD

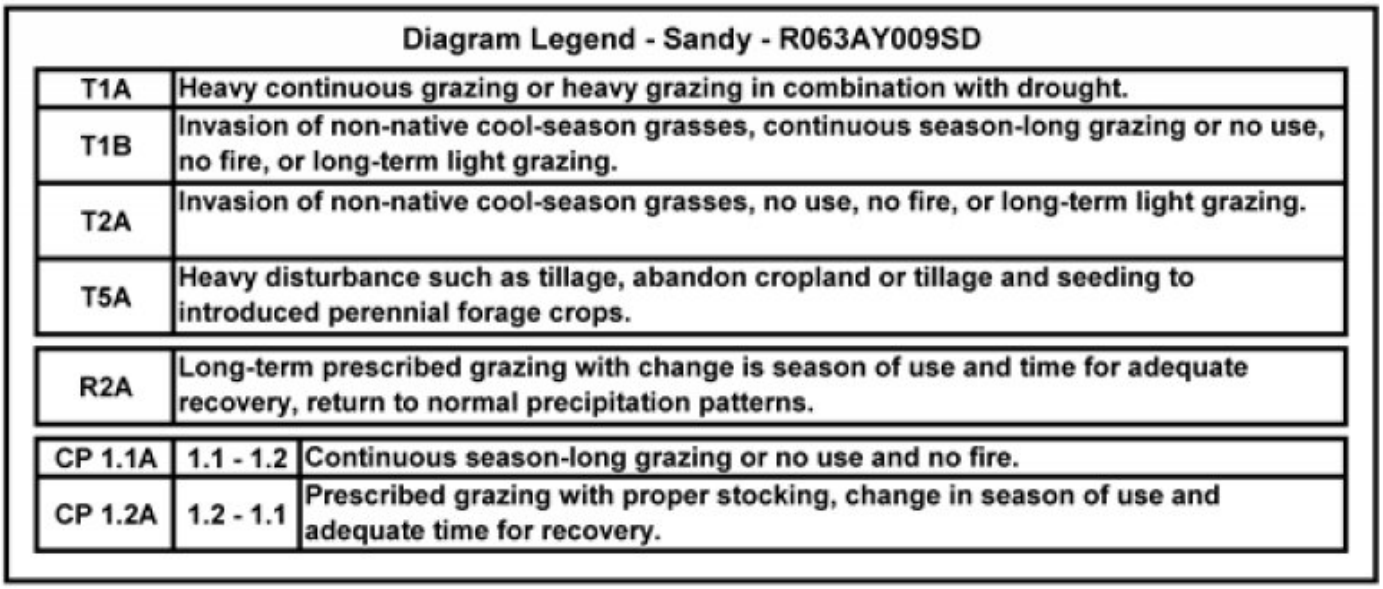

Figure 9. Sandy - R063AY009SD

State 1
Reference State

This State represents what is believed to show the natural range of variability that dominated the dynamics of the ecological site prior to European settlement. This site in Reference, is dominated by warm-season grasses and sub-dominant cool-season grass. Grazing or the lack of grazing and fire are the major drivers between plant communities. Non-use and no fire or long-term, light grazing will result in heavy litter accumulations and the invasion of non-native, cool-season grasses.

Community 1.1
Bluestem-Prairie Sandreed-Needlegrass Plant Community

Interpretations are based primarily on the Bluestem-Prairie Sandreed-Needlegrass Plant Community (this is also considered to be reference plant community). This community evolved with grazing by large herbivores and occasional prairie fire. It is well suited for grazing by domestic livestock and 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 80 to 90 percent grasses or grass-like plants, 5 to 10 percent forbs, and 5 to 10 percent shrubs. The dominant grasses include big or sand bluestem, prairie sandreed, little bluestem, and needleandthread. Other grasses and grass-likes include sideoats grama, western wheatgrass, and switchgrass. Significant forbs include false boneset, gayfeather, and stiff sunflower. Common shrubs include leadplant and rose. This plant community is well adapted to the Northern Great Plains climatic conditions. Individual species can vary greatly in production depending on growing conditions (timing and amount of precipitation and temperature). Community dynamics, nutrient cycle, water cycle, and energy flow are functioning properly. Plant litter is properly distributed with little movement off-site and natural plant mortality is very low. The diversity in species allows for high drought

tolerance. Runoff from adjacent sites and moderate or high available water capacity provides a favorable soil-water-plant relationship.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1690	2040	2450
Forb	105	180	275
Shrub/Vine	105	180	275
Total	**1900**	**2400**	**3000**

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

Community 1.2
Prairie Sandreed-Needleandthread Plant Community

This plant community developed under continuous season-long grazing or nonuse and no fire. The plant community's mid-grass component is reduced and an understory of short, sod-forming grasses are increasing. The potential vegetation is about 80 to 90 percent grasses or grass-like plants, 5 to 10 percent forbs, and 5 to 10 percent shrubs. The dominant grasses include needleandthread and prairie sandreed. Other grasses and grass-likes include blue grama, sideoats grama, western wheatgrass, and sedges. Forbs commonly found in this plant community include cudweed sagewort, goldenrod, green sagewort, scurfpea, and western ragweed. Shrubs in this community include rose, fringed sagewort, and yucca. When compared to the Bluestem-Prairie Sandreed-Needlegrass Plant Community (1.1), sand bluestem and little bluestem have decreased. Prairie sandreed is beginning to decline. Needleandthread, blue grama, and sand dropseed are increasing. Plant diversity is high, but on a downward trend. This plant community is not resistant to change. Management changes can easily shift this plant community. Soil erosion is low. The water cycle is functioning, infiltration is high, and runoff is low.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1310	1700	2050
Forb	95	150	225
Shrub/Vine	95	150	225
Total	**1500**	**2000**	**2500**

Figure 13. Plant community growth curve (percent production by month). SD6303, Pierre Shale Plains, cool/warm-season codominant.. Cool-season, warm-season codominant..

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

Pathway 1.1A
Community 1.1 to 1.2

Continuous season-long grazing or nonuse and no fire will convert the plant community to the Prairie Sandreed-Needleandthread Plant Community.

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing will adequate precipitation and time for recovery from grazing occurrences will move this plant community toward the Bluestem-Prairie Sandreed-Needlegrass Plant Community (1.1).

State 2
Shortgrass State

The Shortgrass State is dominated by grazing tolerant, shortgrass species and upland sedges. This State is the result of grazing patterns that do not provide adequate recovery time for the tall, warm-season and mid stature cool-season grasses. The hydrologic function of this site is dramatically altered. Runoff is high and infiltration is low. This State is very resistant to change through grazing management alone.

Community 2.1
Blue Grama-Dropseed/Sedge Plant Community

This plant community typically develops under continuous heavy grazing over a period of several years, or drought. The dominate grasses are short, grazing tolerant species. The potential vegetation is about 80 to 90 percent grasses or grass-like plants, 5 to 10 percent forbs, and 5 to 10 percent shrubs. The dominant species are blue grama, sand dropseed,

threadleaf sedge and needleandthread. Dominant forbs include, cudweed sagewort, goldenrod, green sagewort, scurfpea and western ragweed. Dominant shrubs are fringed sagewort and yucca. Compared to the reference plant community (1.0), blue grama and sand dropseed have increased creating sod bound conditions. Big bluestem and sand bluestem are absent. Prairie sandreed is limited to a few sparse colonies. This plant community is fairly resistant to change. Soil erosion is low. The water cycle is reduced because of the lack of surface litter. Infiltration is moderate due to soil texture, which can help to reduce runoff, but offsite gully erosion can be a concern. Forage production, species diversity, and ground cover are declining.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	810	1225	1520
Forb	65	105	155
Shrub/Vine	25	70	125
Total	**900**	**1400**	**1800**

Figure 15. Plant community growth curve (percent production by month). SD6303, Pierre Shale Plains, cool/warm-season codominant.. Cool-season, warm-season codominant..

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

State 3
Invaded State

This state is the result of invasion and dominance of introduced species. This state is characterized by the dominance of Kentucky bluegrass and/or smooth brome, and an increasing thatch layer that effectively blocks introduction of other plants into the system. Plant litter accumulation tends to favor the more shade tolerant, introduced grass species. The nutrient cycle is also impaired, the result is typically a higher level of nitrogen which also favors the introduced species. Increasing plant litter decreases the amount of sunlight reaching plant crowns thereby shifting competitive advantage to shade tolerant, introduced grass species. Studies indicate that soil biological activity is altered, and this shift apparently exploits the soil microclimate and encourages growth of the introduced grass species. Once the threshold is crossed, a change in grazing management alone cannot cause a reduction in the invasive grass dominance. Preliminary studies would tend to indicate this threshold may exist when Kentucky bluegrass exceeds 30 percent of the plant community and native grasses represent less than 40 percent of the plant community composition. Plant communities dominated by Kentucky bluegrass have significantly less cover and diversity of native grasses and forb species (Toledo, D. et al., 2014).

Community 3.1
Kentucky Bluegrass-Sand Dropseed/Western Ragweed Plant Community

This plant community is dominated by Kentucky bluegrass or smooth brome and/or other non-native cool season grasses (30 percent or more of the PC). This plant community evolved under no use and no fire or heavy continuous season-long grazing with no change in season of use or long-term light grazing. The dominant grasses include Kentucky bluegrass, and smooth brome. Sand dropseed and some needlegrass may still be found in the plant community. Forbs commonly found in this plant community include western ragweed, cudweed sagewort, goldenrod and scurfpea. Production will be significantly reduced when compared to the interpretive plant community. The period when palatability is high is relatively short, as Kentucky bluegrass and smooth brome matures rapidly. Energy capture is also reduced. Runoff is high and biological activity in the soil is likely reduced significantly in this phase.

State 4
Disturbed State

This State can transition from any Plant Community. The two separate vegetative Plant Communities are highly variable in nature. They are derived through different management scenarios, and are not related successionally. Infiltration, runoff, and soil erosion varies depending on the vegetation present on the site.

Community 4.1
Go-back or Seeded Plant Communities

The Go-back plant community can be reached whenever severe mechanical disturbance occurs (e.g., tilled and abandoned land, either past or present). During the early successional stages, the species that mainly dominate are annual grasses and forbs, later being replaced by both native and introduced perennials. The vegetation on this site varies greatly, sometimes being dominated by threeawn, bluegrass, smooth brome, annual bromegrass, crested wheatgrass, buffalograss, broom snakeweed, sweetclover, and nonnative thistles. Other plants that commonly occur on the site include western wheatgrass, western ragweed, Rocky Mountain beeplant, deathcamas, prickly lettuce, marestail, kochia, foxtail, and sunflowers. Bare ground is prevalent due to the loss of organic matter and lower overall soil health. The Seeded Plant Community is normally those areas planted to pubescent or intermediate wheatgrass, alfalfa, crested wheatgrass, or other introduced species. Refer to the associated Forage Suitability Group description for adapted species.

Transition 1A
State 1 to 2

Continuous heavy grazing or drought will transition this plant community to the Shortgrass State (2.0).

Transition 1B
State 1 to 3

Invasion of non-native cool-season grasses, continuous season-long grazing, no use and no fire or long-term light grazing will cause a transition to the Invaded State (3.0).

Transition 5A
State 1 to 4

Heavy disturbance including eroded, tillage, abandon cropland or seeding to improved pasture species result in a transition to the Disturbed State (4.0).

Restoration pathway 2A
State 2 to 1

Long-term, prescribed grazing and a return of normal precipitation patterns will move this plant community back towards the Reference State (1.0). The rate of this transition can be extremely variable depending on the species present on the site and the availability of a seed source. Typically, this transition will take a long period of time.

Transition 2A
State 2 to 3

Invasion of non-native, cool-season grasses, no use and no fire or long-term, light grazing will transition this state to the Invaded State (3.0).

Transition 5A
State 2 to 4

Heavy disturbance including eroded, tillage, abandon cropland or seeding to improved pasture species result in a transition to the Disturbed State (4.0).

Transition 5A
State 3 to 4

Heavy disturbance including eroded, tillage, abandon cropland or seeding to improved pasture species result in a transition to the Disturbed State (4.0).

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)

Grass/Grasslike					
1	**Bluestem**			240–720	
	big bluestem	ANGE	*Andropogon gerardii*	120–720	–
	sand bluestem	ANHA	*Andropogon hallii*	120–720	–
2	**Tall Warm-Season Grasses**			360–600	
	prairie sandreed	CALO	*Calamovilfa longifolia*	240–600	–
	switchgrass	PAVI2	*Panicum virgatum*	120–240	–
3	**Needlegrass**			240–480	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	240–480	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–120	–
	green needlegrass	NAVI4	*Nassella viridula*	0–120	–
4	**Mid Warm-Season Grasses**			240–360	
	little bluestem	SCSC	*Schizachyrium scoparium*	120–360	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	120–240	–
5	**Short Warm-Season Grasses**			48–192	
	blue grama	BOGR2	*Bouteloua gracilis*	48–192	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–120	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–120	–
6	**Other Native Grasses**			120–240	
	western wheatgrass	PASM	*Pascopyrum smithii*	48–240	–
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–120	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	24–72	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	24–48	–
7	**Grass-likes**			48–168	
	threadleaf sedge	CAFI	*Carex filifolia*	48–168	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–120	–
Forb					
9	**Forbs**			120–240	
	Forb, native	2FN	*Forb, native*	0–120	–
	false boneset	BREU	*Brickellia eupatorioides*	24–72	–
	blazing star	LIATR	*Liatris*	24–72	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	24–72	

	stiff sunflower	HEPA19	*Helianthus pauciflorus*	24–72	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–48	–
	bush morning-glory	IPLE	*Ipomoea leptophylla*	0–48	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	24–48	–
	prairie spiderwort	TROC	*Tradescantia occidentalis*	24–48	–
	scurfpea	PSORA2	*Psoralidium*	24–48	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	24–48	–
	goldenrod	SOLID	*Solidago*	24–48	–
	prairie clover	DALEA	*Dalea*	24–48	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–48	–
	tarragon	ARDR4	*Artemisia dracunculus*	24–48	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	24–48	–
	common sunflower	HEAN3	*Helianthus annuus*	0–48	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–24	–
	pussytoes	ANTEN	*Antennaria*	0–24	–
	annual buckwheat	ERAN4	*Eriogonum annuum*	0–24	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–24	–
	hoary puccoon	LICA12	*Lithospermum canescens*	0–24	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–24	–
	beardtongue	PENST	*Penstemon*	0–24	–
Shrub/Vine					
10	**Shrubs**			120–240	
	leadplant	AMCA6	*Amorpha canescens*	24–96	–
	rose	ROSA5	*Rosa*	24–72	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–48	–
	prairie sagewort	ARFR4	*Artemisia frigida*	24–48	–
	pricklypear	OPUNT	*Opuntia*	0–24	–
	western sandcherry	PRPUB	*Prunus pumila var. besseyi*	0–24	–
	soapweed yucca	YUGL	*Yucca glauca*	0–24	–

Table 9. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)

Grass/Grasslike					
1	**Bluestem**			40–160	
	big bluestem	ANGE	*Andropogon gerardii*	40–160	–
	sand bluestem	ANHA	*Andropogon hallii*	40–160	–
2	**Tall Warm-Season Grasses**			300–600	
	prairie sandreed	CALO	*Calamovilfa longifolia*	300–600	–
	switchgrass	PAVI2	*Panicum virgatum*	0–100	–
3	**Needlegrass**			300–500	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	300–500	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–40	–
	green needlegrass	NAVI4	*Nassella viridula*	0–40	–
4	**Mid Warm-Season Grasses**			100–200	
	sideoats grama	BOCU	*Bouteloua curtipendula*	100–200	–
	little bluestem	SCSC	*Schizachyrium scoparium*	40–160	–
5	**Short Warm-Season Grasses**			100–300	
	blue grama	BOGR2	*Bouteloua gracilis*	100–300	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	40–160	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–100	–
6	**Other Native Grasses**			100–200	
	western wheatgrass	PASM	*Pascopyrum smithii*	40–200	–
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–100	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	20–60	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	20–60	–
7	**Grass-likes**			100–200	
	threadleaf sedge	CAFI	*Carex filifolia*	100–200	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–100	–
8	**Non-Native Grasses**			40–140	
	bluegrass	POA	*Poa*	20–140	–
	cheatgrass	BRTE	*Bromus tectorum*	0–100	–
Forb					
9	**Forbs**			100–200	

	Forb, introduced	2FI	*Forb, introduced*	0–100	–
	Forb, native	2FN	*Forb, native*	0–100	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	20–60	–
	tarragon	ARDR4	*Artemisia dracunculus*	20–60	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	20–60	–
	common sunflower	HEAN3	*Helianthus annuus*	0–60	–
	scurfpea	PSORA2	*Psoralidium*	20–60	–
	goldenrod	SOLID	*Solidago*	20–60	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	20–40	–
	blazing star	LIATR	*Liatris*	20–40	–
	annual buckwheat	ERAN4	*Eriogonum annuum*	0–40	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–20	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–20	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–20	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–20	–
	bush morning-glory	IPLE	*Ipomoea leptophylla*	0–20	–
	false boneset	BREU	*Brickellia eupatorioides*	0–20	–
	prairie clover	DALEA	*Dalea*	0–20	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–20	–
	pussytoes	ANTEN	*Antennaria*	0–20	–
	prairie spiderwort	TROC	*Tradescantia occidentalis*	0–20	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–20	–
Shrub/Vine					
10	**Shrubs**			100–200	
	prairie sagewort	ARFR4	*Artemisia frigida*	20–60	–
	pricklypear	OPUNT	*Opuntia*	0–40	–
	rose	ROSA5	*Rosa*	20–40	–
	soapweed yucca	YUGL	*Yucca glauca*	0–40	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–40	–
	leadplant	AMCA6	*Amorpha canescens*	0–20	–

Table 10. Community 2.1 plant community composition

				Annual	**Foliar**

Group	Common Name	Symbol	Scientific Name	Production (Lb/Acre)	Cover (%)
Grass/Grasslike					
2	**Tall Warm-Season Grasses**			0–70	
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–70	–
3	**Needlegrass**			28–140	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	28–140	–
4	**Mid Warm-Season Grasses**			0–42	
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–42	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–42	–
5	**Short Warm-Season Grasses**			280–560	
	blue grama	BOGR2	*Bouteloua gracilis*	210–490	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	70–210	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–70	–
6	**Other Native Grasses**			28–112	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–70	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–70	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	14–42	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	14–28	–
7	**Grass-likes**			140–280	
	threadleaf sedge	CAFI	*Carex filifolia*	140–280	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–140	–
8	**Non-Native Grasses**			140–350	
	bluegrass	POA	*Poa*	140–350	–
	cheatgrass	BRTE	*Bromus tectorum*	0–140	–
Forb					
9	**Forbs**			70–140	
	Forb, introduced	2FI	*Forb, introduced*	0–98	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	14–70	–
	tarragon	ARDR4	*Artemisia dracunculus*	14–56	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	14–56	–
	goldenrod	SOLID	*Solidago*	14–56	–

	scurfpea	PSORA2	*Psoralidium*	14–42	–
	annual buckwheat	ERAN4	*Eriogonum annuum*	0–42	–
	common sunflower	HEAN3	*Helianthus annuus*	0–42	–
	Forb, native	2FN	*Forb, native*	0–42	–
	pussytoes	ANTEN	*Antennaria*	0–14	–
	blazing star	LIATR	*Liatris*	0–14	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–14	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–14	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–14	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	0–14	–
Shrub/Vine					
10	**Shrubs**			28–112	
	prairie sagewort	ARFR4	*Artemisia frigida*	14–56	–
	pricklypear	OPUNT	*Opuntia*	0–42	–
	soapweed yucca	YUGL	*Yucca glauca*	0–42	–
	rose	ROSA5	*Rosa*	0–14	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–14	–

Animal community

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

Bluestem-Prairie Sandreed-Needlegrass Plant Community (1.1)
Total Annual Production (lbs./acre, air-dry): 2400
Stocking Rate* (AUM/acre): 0.66

Prairie Sandreed-Needleandthread Plant Community (1.2)
Total Annual Production (lbs./acre, air-dry): 2000
Stocking Rate* (AUM/acre): 0.55

Blue Grama-Sand Dropseed/Sedge Plant Community (2.1)
Total Annual Production (lbs./acre, air-dry): 1400
Stocking Rate* (AUM/acre): 0.38

Other Plant Community Phases have highly variable forage production levels. Actual on-site forage inventories will need to be conducted to determine average annual production, stocking rates and timing of grazing.

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

Total annual production on site may contain vegetation which is 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 B. Infiltration varies from moderate to rapid and runoff potential varies from negligible to medium for this site 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 exception would be where shortgrasses form a dense sod and dominate the site. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff (refer to Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic curves).

Recreational uses

This site provides hunting, hiking, photography, bird watching, and other opportunities. The wide varieties of plants that bloom from spring until fall have an aesthetic value that appeals to visitors.

Wood products

No appreciable wood products are typically present on this site.

Other products

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

Other information

Revision Notes: “Previously Approved Provisional
This Provisional ecological site concept has passed Quality Control (QC) and Quality Assurance (QA) to ensure that the site meets the 2014 NESH standards for a Provisional ecological site. This is an updated “Previously Approved” ESD which represents a first generation tier of documentation that prior to the release of the 2014 National Ecological Site Handbook (NESH), met all requirement as an Approved ESD as laid out in the 2003 National Range and Pasture Handbook (NRPH). The document fully describe the reference state and community phase in the state and transition model. All other alternative states are at least described in narrative form. The “Previously Approved” ESD has been field tested for a minimum of five years and is a proven functional document for conservation planning. The “Previously Approved” ESD does not contain all tabular and narrative entries as required in the current Approved level of documentation but it is expected that the “Previously Approved” ESD will continue refinement towards an Approved status.

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

Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range-trained personnel were also used. Those involved in developing this site include: April Boltjes, Range Management Specialist (RMS), NRCS; Stan Boltz, RMS, NRCS; Kent Cooley, Soil Scientist, NRCS; Rick Peterson, RMS, NRCS; and L. Michael Stirling, RMS, NRCS. There are no SCS-RANGE-417 clipping records for this site.

Other references

High Plains Regional Climate Center, University of Nebraska. (http://www.hprcc.unl.edu/)
Teledo, D., Sanderson, M., Spaeth, K., Hendrickson, J., Printz, J. 2014. Extent of Kentucky Bluegrass and Its Effect on Native Plant Species Diversity and Ecosystem

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

Contributors

Stan Boltz

Approval

Suzanne Mayne-Kinney, 6/26/2024

Acknowledgments

Rick L. Peterson Updated ESD 9/7/16

Rangeland health reference sheet

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

Author(s)/participant(s)	Stan Boltz
Contact for lead author	stanley.boltz@sd.usda.gov, 605-352-1236
Date	05/08/2010
Approved by	Suzanne Mayne-Kinney
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None.

---

2. **Presence of water flow patterns:** None, or barely visible and discontinuous.

---

3. **Number and height of erosional pedestals or terracettes:** Typically non-existent, but steeper areas may have limited pedastalling of bunchgrasses. No exposed roots should be present.

---

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 0 to 10 percent is typical.

---

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

---

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

---

7. **Amount of litter movement (describe size and distance expected to travel):** Litter should fall in place. Slight amount of movement of smallest size class litter is possible, but not normal.

---

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil aggregate stability ratings should typically be 5 to 6, normally 6. Surface organic matter adheres to the soil surface. Soil surface fragments will typically retain structure indefinitely when dipped in distilled water.

---

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** A-horizon should be 3 to 10 inches thick with mollic (dark) colors when moist. Structure typically is medium to fine granular at least in the upper A-horizon.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Combination of shallow and deep rooted species (mid & tall rhizomatous and tufted perennial cool- and warm-season grasses) with fine and coarse roots positively influences infiltration.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None.

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: Big and/or sand bluestem > Tall warm-season rhizomatous grasses

    Sub-dominant: Mid/tall cool-season bunchgrasses > Mid warm-season grasses >

    Other: Mid cool-season rhizomatous grass = Forbs = Shrubs > Short warm-season grasses > Short cool-season bunchgrass

    Additional:

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

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Production ranges from 1,900-3,000 lbs./acre (air-dry weight). Reference value production is 2,400 lbs./acre (air-dry weight).

16. **Potential invasive (including noxious) species (native and non-native). List species**

which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site: State and local noxious weeds, Kentucky bluegrass, annual bromes

---

17. **Perennial plant reproductive capability:** All species exhibit high vigor relative to climatic conditions. Do not rate based solely on seed production. Perennial grasses should have vigorous rhizomes or tillers.
