

Ecological site R061XY003SD Subirrigated

Accessed: 05/02/2024

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.

Classification relationships

Level IV Ecoregions of the Conterminous United States: 17a – Black Hills Foothills.

Associated sites

R061XY020SD	Overflow
R061XY042SD	Lowland

Similar sites

R061XY020SD	Overflow (R061XY020SD) – Loamy Overflow [more cool-season grasses; scattered trees; lower production]
R061XY042SD	Lowland (R061XY042SD) – Lowland [more cool-season grasses; trees & shrubs common; lower production]

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified

Herbaceous	(1) <i>Andropogon gerardii</i> (2) <i>Sorghastrum nutans</i>
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Physiographic features

This site occurs on nearly level lowlands and drainageways.

Table 2. Representative physiographic features

Landforms	(1) Flood plain
Flooding duration	Brief (2 to 7 days) to long (7 to 30 days)
Flooding frequency	Occasional to frequent
Ponding frequency	None
Elevation	884–1,219 m
Slope	0–4%
Water table depth	61–203 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate in this MLRA is typical of the drier portions of the Northern Great Plains where sagebrush steppes to the west yield to grassland steppes to the east. Annual precipitation ranges from 18 to 21 inches per year, with most occurring during the growing season. Temperatures show a wide range between summer and winter and between daily maximums and minimums, due to the high elevation and dry air, which permits rapid incoming and outgoing radiation. Cold air outbreaks from Canada in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Chinook winds may occur in winter and bring rapid rises in temperature. Extreme storms may occur during the winter, but most severely affect ranch operations during late winter and spring.

The average annual temperature is about 46° F. January is the coldest month with average temperatures ranging from about 20° F (Sundance, Wyoming (WY)) to about 26° F (Fort Meade, South Dakota (SD)). July is the warmest month with temperatures averaging from about 69° F (Sundance, WY) to about 72° F (Fort Meade, SD). The range of average monthly temperatures between the coldest and warmest months is about 48° F. 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 storms may bring brief periods of high winds with gusts to more than 50 miles per hour.

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

Table 3. Representative climatic features

Frost-free period (average)	140 days
Freeze-free period (average)	167 days
Precipitation total (average)	533 mm

Influencing water features

Soil features

These are very deep, poorly to somewhat poorly drained, coarse to moderately fine textured soils. Permeability is moderate to slow and available water capacity is high. Salinity is none to slight and sodicity is typically none to

slight. These soils have a high water table (2 to 3 feet from the surface) which keeps the rooting zone moist for a portion of the growing season. This site occurs on flood plains. Slope ranges from 0 to 4 percent. This site should show slight to no evidence of rills, wind scoured areas or pedestalled plants. No water flow paths are seen on this site. The soil surface is stable and intact. Sub-surface soil layers are non-restrictive to water movement and root penetration.

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

Table 4. Representative soil features

Surface texture	(1) Silt loam (2) Fine sandy loam (3) Loam
Family particle size	(1) Loamy
Drainage class	Poorly drained to somewhat poorly drained
Permeability class	Slow to moderate
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	15.24–17.78 cm
Calcium carbonate equivalent (0-101.6cm)	5–30%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–5
Soil reaction (1:1 water) (0-101.6cm)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–11%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

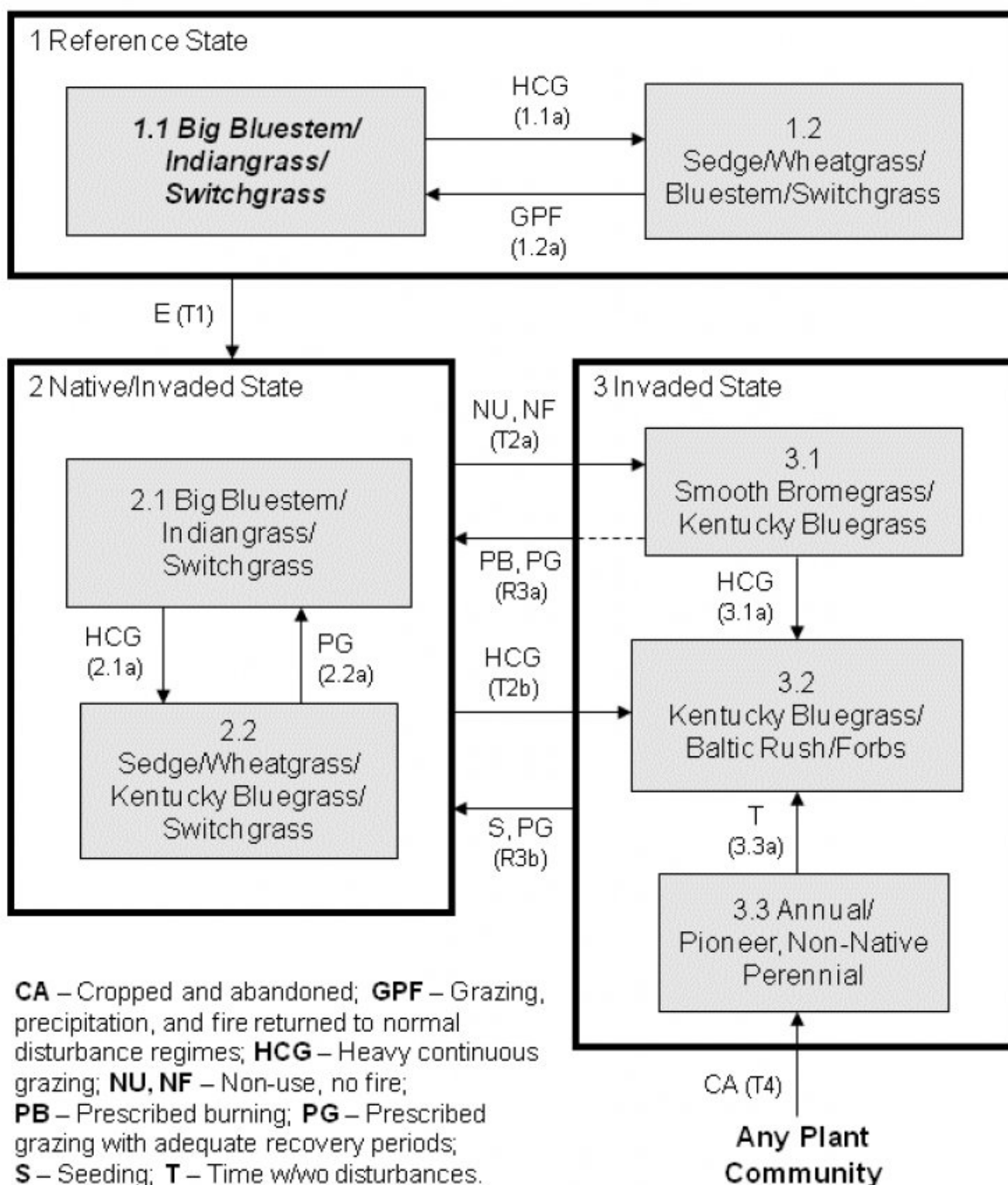
This site developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfire (often of light intensities), and other biotic and abiotic factors that typically influence soil/site development. Changes will occur 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. As this site deteriorates, species such as Kentucky bluegrass and smooth brome grass will increase. Warm-season grasses such as Indiangrass and big bluestem will decrease in frequency and production.

Interpretations are primarily based on the Bluestem/Indiangrass/Switchgrass 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. Subclimax plant communities, states, transitional pathways, and thresholds have been determined through similar studies and experience. 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.

State and transition model



**State 1
Reference**

This state represents the natural range of variability that dominated the dynamics of this ecological site. This state was typically dominated by warm-season grasses. Pre-European settlement, the primary disturbance mechanisms for this site in the reference condition included periodic 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 the primary disturbance is from a lack of fire and concentrated livestock grazing. Grasses that are desirable for livestock and wildlife can decline and a corresponding increase in less desirable grasses will occur.

**Community 1.1
Big Bluestem/Indiangrass/Switchgrass**



This community evolved with grazing by large herbivores, occasional prairie fires and relatively frequent flooding events. The potential vegetation was about 85 percent grass and grass-like species, 10 percent forbs, and 5 percent shrubs by air-dry weight. The dominant grasses included big bluestem, Indiangrass, and switchgrass. Other grass and grass-like species that occurred were sedges, little bluestem, porcupine grass, Canada wildrye, slender wheatgrass, and western wheatgrass. Common forbs were likely Maximilian sunflower, Rocky Mountain iris, Indianhemp, goldenrod, showy milkweed, gayfeather, black-eyed Susan, and American licorice. This site does not typically support a large amount of woody species, but rose, leadplant, and snowberry were the most common shrubs. This plant community phase is diverse, stable, and productive, and is well adapted to the Northern Great Plains. The high water table supplies much of the moisture for plant growth. Community dynamics, nutrient cycle, water cycle and energy flow are functioning properly. Plant litter is properly distributed with very little movement off-site and natural plant mortality is very low. The diversity in plant species allows for the variability of the water table. This is a sustainable plant community in terms of 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	4203	4815	5330
Forb	230	404	639
Shrub/Vine	50	161	308
Total	4483	5380	6277

Figure 5. Plant community growth curve (percent production by month). SD6110, Black Hills Foot Slopes, lowland warm-season dominant. Warm-season dominant, lowland.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		2	8	15	21	26	15	8	5		

Community 1.2

Sedge/Wheatgrass/Bluestem/Switchgrass

This plant community evolved under heavy continuous grazing or from over utilization during extended drought periods. The potential plant community was made up of approximately 85 percent grasses and grass-like species, 10 percent forbs, and 5 percent shrubs. Dominant grass and grass-like species included sedges, slender wheatgrass, western wheatgrass, switchgrass, big bluestem, and little bluestem. Other grass and grass-like species included plains bluegrass, rushes, Indiangrass, Canada wildrye, and foxtail barley. Forbs commonly found in this plant community included cudweed, sagewort, goldenrod, and western yarrow. This plant community had similar plant composition to the 2.2 Sedge/Wheatgrass/Kentucky Bluegrass/Switchgrass Plant Community Phase (refer to the plant composition tables). The main difference is that this plant community phase did not have the presence of non-native invasive species such as Kentucky bluegrass and smooth brome grass. When compared to the Big Bluestem/Indiangrass/Switchgrass Plant Community Phase (1.1), sedges, slender wheatgrass, and western wheatgrass increased. Big bluestem and Indiangrass decreased, and production of all tall warm-season grasses was reduced. This plant community was moderately resistant to change. The herbaceous species present were well adapted to grazing; however, species composition could be altered through long-term overgrazing. If the herbaceous component was intact, it tended to be resilient if the disturbance was not long-term.

Figure 6. Plant community growth curve (percent production by month). SD6107, Black Hills Foot Slopes, cool-season dominant, warm-season sub-dominant. Cool-season dominant, warm-season sub-dominant, lowland.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		5	13	20	25	18	11	5	3		

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 Sedge/Wheatgrass/Bluestem/Switchgrass Plant Community Phase.

Pathway 1.2a Community 1.2 to 1.1

Grazing, precipitation, and/or fire returned to normal disturbance regime levels and frequencies or periodic light to moderate grazing possibly including periodic rest will convert this plant community to the 1.1 Big Bluestem/Indiangrass/Switchgrass Plant Community Phase.

State 2 Native/Invaded

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- and warm-season grasses. It 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. Taller grass species can decline and a corresponding increase in short statured grass will occur.

Community 2.1 Big Bluestem/Indiangrass/Switchgrass

This plant community phase is similar to the 1.1 Big Bluestem/Indiangrass/Switchgrass Plant Community Phase, but it also contains minor amounts of non-native invasive grass species such as Kentucky bluegrass and smooth brome grass (up to about 15 percent by air-dry weight). The potential vegetation is about 85 percent grass and grass-like species, 10 percent forbs, and 5 percent shrubs by air-dry weight. The dominant grasses include big bluestem, Indiangrass, and switchgrass. Other grass and grass-like species that occur are sedges, little bluestem, porcupine grass, Canada wildrye, slender wheatgrass, and western wheatgrass. Common forbs are Maximilian sunflower, Indianhemp, goldenrod, showy milkweed, gayfeather, black-eyed Susan, and American licorice. This site

does not typically support a large amount of woody species, but rose, leadplant, and snowberry are the most common shrubs. 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.

Figure 7. Plant community growth curve (percent production by month). SD6110, Black Hills Foot Slopes, lowland warm-season dominant. Warm-season dominant, lowland.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		2	8	15	21	26	15	8	5		

Community 2.2 Sedge/Wheatgrass/Kentucky Bluegrass/Switchgrass

This plant community is a result of heavy continuous grazing, continuous season-long grazing or from over utilization during extended drought periods. The potential plant community is made up of approximately 87 percent grasses and grass-like species, 10 percent forbs, and 3 percent shrubs. Dominant grass and grass-like species include sedges, slender wheatgrass, western wheatgrass, switchgrass, Kentucky bluegrass, big bluestem, and little bluestem. Other grass and grass-like species include plains bluegrass, rushes, Indiangrass, Canada wildrye, and foxtail barley. Forbs commonly found in this plant community include cudweed sagewort, goldenrod, and western yarrow. When compared to the Big Bluestem/Indiangrass/Switchgrass Plant Community Phase (1.1), sedges, slender wheatgrass, and western wheatgrass increase. Big bluestem and Indiangrass decrease, and production of all tall warm-season grasses is reduced. 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.

Figure 9. Plant community growth curve (percent production by month). SD6107, Black Hills Foot Slopes, cool-season dominant, warm-season sub-dominant. Cool-season dominant, warm-season sub-dominant, lowland.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		5	13	20	25	18	11	5	3		

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 will shift this community to the 2.2 Sedge/Wheatgrass/Kentucky Bluegrass/Switchgrass Plants 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 Big Bluestem/Indiangrass/Switchgrass Plant Community Phase.

Conservation practices

Prescribed Grazing

State 3 Invaded

This state is the result of invasion and dominance of introduced species. This state is characterized by the dominance of Kentucky bluegrass and smooth brome grass, 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, and 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% of the plant community and native grasses represent less than 40% of the plant community composition. Once the state is well established, even drastic events such as high intensity fires driven by high fuel loads of litter and thatch will not result in more than a very short term reduction of Kentucky bluegrass. These events may reduce the dominance of Kentucky bluegrass, but due to the large amount of rhizomes in the soil there is no opportunity for the native species to establish and dominate before Kentucky bluegrass rebounds and again dominates the system.

Community 3.1 Smooth Bromegrass/Kentucky Bluegrass

This plant community phase is a result of extended periods of non-use and no fire. It is characterized by a dominance of smooth bromegrass and Kentucky bluegrass. The dominance is at times so complete that other species are difficult to find on the site. A thick duff layer also accumulates at or above the soil surface. Nutrient cycling is greatly reduced, and native plants have great difficulty becoming established. When dominated by smooth bromegrass, infiltration is moderately reduced and runoff is moderate. Production can be equal to or higher than the interpretive plant community. However, when dominated by Kentucky bluegrass, infiltration is greatly reduced and runoff is high. Production in this case will likely be significantly less. In either case, the period that palatability is high is relatively short, as these cool-season species mature rapidly. Energy capture is also reduced.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	3559	4213	4775
Forb	207	353	560
Shrub/Vine	45	141	269
Total	3811	4707	5604

Figure 11. Plant community growth curve (percent production by month). SD6106, Black Hills Foot Slopes, lowland cool-season dominant. Cool-season dominant, lowland.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		6	15	20	26	17	9	4	3		

Community 3.2 Kentucky Bluegrass/Baltic Rush/Forbs

This plant community phase is a result of heavy, continuous seasonal grazing or heavy, continuous season-long grazing. It is characterized by a dominance of Kentucky bluegrass, Baltic rush and forbs. The dominance of Kentucky bluegrass is at times so complete that other species are difficult to find on the site. A relatively thick duff layer can sometimes accumulate at or above the soil surface. Nutrient cycling is greatly reduced, and native plants have great difficulty becoming established. Infiltration is greatly reduced and runoff is high. Production will be significantly reduced when compared to the interpretive plant community. The period that palatability is high is relatively short, as Kentucky bluegrass matures rapidly. Energy capture is also reduced. Biological activity in the soil is likely reduced significantly in this phase.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2315	2892	3346
Forb	151	420	807
Shrub/Vine	–	50	106
Total	2466	3362	4259

Figure 13. Plant community growth curve (percent production by month). SD6106, Black Hills Foot Slopes, lowland cool-season dominant. Cool-season dominant, lowland.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		6	15	20	26	17	9	4	3		

Community 3.3 Annual/Pioneer, Non-native Perennial

This plant community develops under severe disturbance, typically abandonment after cropping. The dominant vegetation includes pioneer annual or perennial grasses, forbs, invaders, and early successional biennial and perennial species. Grasses may include foxtail barley, barnyardgrass, quackgrass, fowl bluegrass, Kentucky bluegrass, Baltic rush and sedges. The dominant forbs include curlycup gumweed, Canada thistle and other early successional species. The community is susceptible to invasion of non-native species due to severe soil disturbances and relatively high percent of bare ground. This plant community is resistant to change, as long as soil disturbance or severe vegetation defoliation persists, thus holding back secondary plant succession. Significant economic inputs, management and time would be required to move this plant community toward a higher successional stage. Secondary succession is highly variable, depending upon availability and diversity of a viable reproductive source of higher successional species. This plant community may be renovated to improve the production capability, but management changes would be needed to maintain the new plant community. The total annual production ranges from 500 to 1500 lbs./ac. (air-dry weight) depending upon growing conditions. No growth curve has been assigned to this plant community phase due to the highly variable nature of the plant community.

Pathway 3.1a Community 3.1 to 3.2

Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season, and at the same time of year each year) will convert this plant community to the 3.2 Kentucky Bluegrass/Baltic Rush/Forbs Plant Community Phase.

Pathway 3.3a Community 3.3 to 3.2

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 3.2 Kentucky Bluegrass/Baltic Rush/Forbs Plant Community Phase.

Transition T1 State 1 to 2

Encroachment of non-native grasses such as Kentucky bluegrass and smooth brome grass, and disruption of natural disturbance regimes (typically as a result of fire suppression following settlement led this state over a threshold to the Native/Invaded Grass State (State 2).

Transition T4 State 1 to 3

Cropping followed by abandonment may lead this plant community phase over a threshold to the Invaded State

(State 3) and more specifically to the 3.3 Annual/Pioneer, Non-native Perennial Plant Community Phase.

Transition T4 State 2 to 3

Cropping followed by abandonment may lead this plant community phase over a threshold to the Invaded State (State 3) and more specifically to the 3.3 Annual/Pioneer, Non-native Perennial Plant Community Phase.

Transition T2a State 2 to 3

Non-use and no fire for extended periods of time (typically for 10 or more years) will likely lead this state over a threshold resulting in the 3.1 Smooth Bromegrass/Kentucky Bluegrass Plant Community Phase within the Invaded State (State 3).

Transition T2b State 2 to 3

Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season, and at the same time of year each year) will cause a shift across a threshold leading to the 3.2 Kentucky Bluegrass/Baltic Rush/Forbs Plant Community Phase within the Invaded State (State 3).

Restoration pathway R3a State 3 to 2

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 may lead this plant community phase over a threshold to the Native/Invaded State (State 2). Pest management (i.e., herbicide) may also be needed to suppress cool-season invasive grasses. This will likely take a long period of time and recovery may not be attainable. Success depends on whether native reproductive propagules remain intact on the site.

Conservation practices

Prescribed Burning
Prescribed Grazing
Integrated Pest Management (IPM)

Restoration pathway R3b State 3 to 2

Seeding followed by prescribed grazing may lead this plant community phase over a threshold to the Native/Invaded State (State 2).

Additional community tables

Table 8. 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			1614–3228	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	1076–2421	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	161–1076	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	161–1076	–
	prairie cordgrass	SPPE	<i>Spartina pectinata</i>	54–269	–

	spiked muhly	MUGL3	<i>Muhlenbergia glomerata</i>	0–161	–
2	Mid & Tall Cool-Season Grasses			538–1076	
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	108–430	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	108–430	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	54–269	–
	northern reedgrass	CASTI3	<i>Calamagrostis stricta</i> ssp. <i>inexpansa</i>	54–269	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–269	–
	plains bluegrass	POAR3	<i>Poa arida</i>	54–161	–
	foxtail barley	HOJU	<i>Hordeum jubatum</i>	0–108	–
3	Grass-likes			269–807	
	clustered field sedge	CAPR5	<i>Carex praegracilis</i>	269–538	–
	Sartwell's sedge	CASA8	<i>Carex sartwellii</i>	0–377	–
	rush	JUNCU	<i>Juncus</i>	0–269	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–269	–
4	Mid Warm-Season Grasses			161–538	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	108–538	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	54–269	–
5	Other Native Grasses			54–269	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–269	–
	saltgrass	DISP	<i>Distichlis spicata</i>	0–108	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	54–108	–
Forb					
6	Forbs			269–538	
	Forb, native	2FN	<i>Forb, native</i>	54–161	–
	Maximilian sunflower	HEMA2	<i>Helianthus maximiliani</i>	54–161	–
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	54–108	–
	Rocky Mountain iris	IRMI	<i>Iris missouriensis</i>	0–108	–
	blazing star	LIATR	<i>Liatris</i>	54–108	–
	western yarrow	ACMIO	<i>Achillea millefolium</i> var. <i>occidentalis</i>	54–108	–
	Indianhemp	APCA	<i>Apocynum cannabinum</i>	0–108	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	54–108	–
	showy milkweed	ASSP	<i>Asclepias speciosa</i>	54–108	–
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	54–108	–
	goldenrod	SOLID	<i>Solidago</i>	54–108	–
	cinquefoil	POTEN	<i>Potentilla</i>	54–108	–
	scurfpea	PSORA2	<i>Psoralegium</i>	0–108	–
	western dock	RUAQ	<i>Rumex aquaticus</i>	54–108	–
	blackeyed Susan	RUHI2	<i>Rudbeckia hirta</i>	0–108	–
	blue-eyed grass	SISYR	<i>Sisyrinchium</i>	0–54	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–54	–
	white prairie aster	SYFA	<i>Symphotrichum falcatum</i>	0–54	–
	smooth horsetail	EQUA	<i>Equisetum laevigatum</i>	0–54	–

	Virginia strawberry	FRVI	<i>Fragaria virginiana</i>	0-54	-
	northern bedstraw	GABO2	<i>Galium boreale</i>	0-54	-
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0-54	-
	Canadian anemone	ANCA8	<i>Anemone canadensis</i>	0-54	-
	palespike lobelia	LOSP	<i>Lobelia spicata</i>	0-54	-
	mint	MENTH	<i>Mentha</i>	0-54	-
	stickseed	HACKE	<i>Hackelia</i>	0-54	-
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	0-54	-
Shrub/Vine					
7	Shrubs			54-269	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0-161	-
	leadplant	AMCA6	<i>Amorpha canescens</i>	54-161	-
	rose	ROSA5	<i>Rosa</i>	54-108	-
	snowberry	SYMPH	<i>Symphoricarpos</i>	0-108	-

Table 9. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Tall Warm-Season Grasses			448-897	
	switchgrass	PAVI2	<i>Panicum virgatum</i>	135-897	-
	big bluestem	ANGE	<i>Andropogon gerardii</i>	90-673	-
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	0-224	-
	prairie cordgrass	SPPE	<i>Spartina pectinata</i>	0-135	-
2	Mid & Tall Cool-Season			673-1345	
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	135-897	-
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	135-897	-
	plains bluegrass	POAR3	<i>Poa arida</i>	90-448	-
	foxtail barley	HOJU	<i>Hordeum jubatum</i>	45-359	-
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	0-224	-
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0-135	-
	northern reedgrass	CASTI3	<i>Calamagrostis stricta ssp. inexpansa</i>	0-90	-
3	Grass-likes			448-1345	
	clustered field sedge	CAPR5	<i>Carex praegracilis</i>	90-897	-
	Sartwell's sedge	CASA8	<i>Carex sartwellii</i>	90-673	-
	rush	JUNCU	<i>Juncus</i>	90-359	-
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0-224	-
4	Mid Warm-Season Grasses			90-673	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	90-673	-
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0-90	-
5	Other Native Grasses			45-224	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0-224	-
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	45-90	-

	saltgrass	DISP	<i>Distichlis spicata</i>	0–45	–
6	Non-Native Grasses			224–897	
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	224–897	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	45–448	–
	quackgrass	ELRE4	<i>Elymus repens</i>	0–224	–
	creeping bentgrass	AGST2	<i>Agrostis stolonifera</i>	0–224	–
Forb					
7	Forbs			224–448	
	goldenrod	SOLID	<i>Solidago</i>	45–135	–
	Forb, introduced	2FI	<i>Forb, introduced</i>	45–135	–
	Forb, native	2FN	<i>Forb, native</i>	45–135	–
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	45–135	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	45–135	–
	showy milkweed	ASSP	<i>Asclepias speciosa</i>	45–90	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	45–90	–
	Indianhemp	APCA	<i>Apocynum cannabinum</i>	0–90	–
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	0–90	–
	Rocky Mountain iris	IRMI	<i>Iris missouriensis</i>	0–90	–
	cinquefoil	POTEN	<i>Potentilla</i>	45–90	–
	scurfpea	PSORA2	<i>Psoraleidum</i>	0–45	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–45	–
	western dock	RUAQ	<i>Rumex aquaticus</i>	0–45	–
	blazing star	LIATR	<i>Liatris</i>	0–45	–
	Maximilian sunflower	HEMA2	<i>Helianthus maximiliani</i>	0–45	–
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	0–45	–
	smooth horsetail	EQLA	<i>Equisetum laevigatum</i>	0–45	–
	white prairie aster	SYFA	<i>Symphotrichum falcatum</i>	0–45	–
Shrub/Vine					
8	Shrubs			45–135	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–90	–
	rose	ROSA5	<i>Rosa</i>	45–90	–
	snowberry	SYMPH	<i>Symphoricarpos</i>	0–90	–
	leadplant	AMCA6	<i>Amorpha canescens</i>	0–45	–

Table 10. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Tall Warm-Season Grasses			0–235	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–235	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–141	–
2	Mid & Tall Cool-Season			47–706	
	foxtail barley	HOJU	<i>Hordeum jubatum</i>	47–471	–

	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–235	–
	plains bluegrass	POAR3	<i>Poa arida</i>	0–141	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	0–141	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–141	–
3	Grass-likes			235–942	
	rush	JUNCU	<i>Juncus</i>	94–471	–
	clustered field sedge	CAPR5	<i>Carex praeegracilis</i>	94–471	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–235	–
	Sartwell's sedge	CASA8	<i>Carex sartwellii</i>	0–141	–
4	Mid Warm-Season Grasses			0–235	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–235	–
5	Other Native Grasses			0–235	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–235	–
	saltgrass	DISP	<i>Distichlis spicata</i>	0–47	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–47	–
6	Non-Native Grasses			1412–2825	
	smooth brome	BRIN2	<i>Bromus inermis</i>	706–2354	–
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	141–942	–
	quackgrass	ELRE4	<i>Elymus repens</i>	0–377	–
	creeping bentgrass	AGST2	<i>Agrostis stolonifera</i>	0–377	–
Forb					
7	Forbs			235–471	
	Forb, introduced	2FI	<i>Forb, introduced</i>	47–235	–
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	47–188	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	47–188	–
	goldenrod	SOLID	<i>Solidago</i>	47–188	–
	showy milkweed	ASSP	<i>Asclepias speciosa</i>	47–141	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	47–141	–
	Forb, native	2FN	<i>Forb, native</i>	0–141	–
	Indianhemp	APCA	<i>Apocynum cannabinum</i>	0–94	–
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	0–94	–
	cinquefoil	POTEN	<i>Potentilla</i>	47–94	–
	scurfpea	PSORA2	<i>Psoraleidum</i>	0–47	–
	white prairie aster	SYFA	<i>Symphotrichum falcatum</i>	0–47	–
	Rocky Mountain iris	IRMI	<i>Iris missouriensis</i>	0–47	–
	smooth horsetail	EQLA	<i>Equisetum laevigatum</i>	0–47	–
Shrub/Vine					
8	Shrubs			47–235	
	snowberry	SYMPH	<i>Symphoricarpos</i>	0–235	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–94	–
	rose	ROSA5	<i>Rosa</i>	47–94	–

Table 11. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Mid & Tall Cool-Season			34–504	
	foxtail barley	HOJU	<i>Hordeum jubatum</i>	34–504	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–101	–
2	Grass-likes			168–841	
	rush	JUNCU	<i>Juncus</i>	168–673	–
	clustered field sedge	CAPR5	<i>Carex praegracilis</i>	0–269	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–168	–
3	Other Native Grasses			0–168	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–168	–
	saltgrass	DISP	<i>Distichlis spicata</i>	0–101	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–34	–
4	Non-Native Grasses			841–2018	
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	673–1681	–
	creeping bentgrass	AGST2	<i>Agrostis stolonifera</i>	0–504	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	34–504	–
	quackgrass	ELRE4	<i>Elymus repens</i>	0–404	–
Forb					
5	Forbs			168–673	
	Forb, introduced	2FI	<i>Forb, introduced</i>	34–336	–
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	34–168	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	34–168	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	34–168	–
	goldenrod	SOLID	<i>Solidago</i>	34–168	–
	Rocky Mountain iris	IRMI	<i>Iris missouriensis</i>	0–135	–
	cinquefoil	POTEN	<i>Potentilla</i>	34–135	–
	showy milkweed	ASSP	<i>Asclepias speciosa</i>	34–101	–
	Indianhemp	APCA	<i>Apocynum cannabinum</i>	0–67	–
	Forb, native	2FN	<i>Forb, native</i>	0–67	–
	white prairie aster	SYFA	<i>Symphyotrichum falcatum</i>	0–67	–
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	0–67	–
	smooth horsetail	EQLA	<i>Equisetum laevigatum</i>	0–34	–
Shrub/Vine					
6	Shrubs			0–101	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–34	–
	rose	ROSA5	<i>Rosa</i>	0–34	–
	snowberry	SYMPH	<i>Symphoricarpos</i>	0–34	–

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.

Big Bluestem/Indiangrass/Switchgrass (1.1 & 2.1)
Average Annual Production (lbs./acre, air-dry): 4,800
Stocking Rate* (AUM/acre): 1.32

Sedge/Wheatgrass/Kentucky Bluegrass/Switchgrass (2.2)
Average Annual Production (lbs./acre, air-dry): 4,000
Stocking Rate* (AUM/acre): 1.10

Smooth Bromegrass/Kentucky Bluegrass (3.1)
Average Annual Production (lbs./acre, air-dry): 4,200
Stocking Rate* (AUM/acre): 1.15

Kentucky Bluegrass/Baltic Rush/Forbs (3.2)
Average Annual Production (lbs./acre, air-dry): 3,000
Stocking Rate* (AUM/acre): 0.82

Annual/Pioneer, Non-Native Perennial (3.3)
Average Annual Production (lbs./acre, air-dry): 1,200
Stocking Rate* (AUM/acre): 0.33

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

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

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic groups B and D. 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% 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% 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 variety of plants that bloom from spring until fall have an esthetic value that appeals to visitors.

Wood products

No appreciable wood products are typically present on this site.

Other products

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

Inventory data references

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, NRCS; Cynthia Englebert, Range Management Specialist, Forest Service; George Gamblin, Range Management Specialist, NRCS; Tate Lantz, Range Management Specialist, NRCS; Ryan Murray, Range Management Specialist, NRCS; Cheryl Nielsen, Range Management Specialist, NRCS; L. Michael Stirling, Range Management Specialist, NRCS; Jim Westerman, Soil Scientist, NRCS.

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Contributors

Stan Boltz

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.

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Contact for lead author	Stan Boltz, stanley.boltz@sd.usda.gov, 605-352-1236
Date	09/30/2009
Approved by	Stan Boltz
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.

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

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

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

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

7. **Amount of litter movement (describe size and distance expected to travel):** Litter falls in place, and is in contact with the soil surface.

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 typically 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 10 to 30 inches thick with black to very dark gray colors when moist. Structure typically is medium to fine granular in the upper A-horizon.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Deep rooted species (mid and tall rhizomatous cool- and warm-season grasses and grass-like) 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 – when dry, B horizons can be hard and appear to be compacted, but no platy structure will be present.

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

Dominant: Tall, warm-season grasses >>

Sub-dominant: Mid and tall, cool-season grasses > grass-like species >

Other: Mid, warm-season grasses = forbs > shrubs

Additional: Other 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 evidence of decadence or mortality.

14. **Average percent litter cover (%) and depth (in):** Litter cover 80 to 90 percent and 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 4,000 to 5,600 pounds/acre, with the reference value being 4,800 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 weeds, Kentucky bluegrass – Russian olive can dominate this site in localized areas.

17. **Perennial plant reproductive capability:** Perennial grasses and grass-likes should have vigorous rhizomes or tillers.
