

# Ecological site R061XN012SD Thin Upland-North (18-22" PZ)

Accessed: 05/03/2024

## 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

R061XN010SD	<b>Loamy-North (18-22" PZ)</b>
R061XN024SD	<b>Shallow Loamy-North (18-22" PZ)</b>
R061XY029SD	<b>Stony Hills</b>

## Similar sites

R061XY029SD	<b>Stony Hills</b> (R061XN029SD) – Stony Hills [more big bluestem and ponderosa pine; higher production]
R061XN024SD	<b>Shallow Loamy-North (18-22" PZ)</b> (R061XN024SD) – Shallow Loamy [less little bluestem; lower production]

Table 1. Dominant plant species

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

## Physiographic features

This site occurs on moderately to steeply sloping uplands.

**Table 2. Representative physiographic features**

Landforms	(1) Hogback (2) Hill (3) Plain
Flooding frequency	None
Ponding frequency	None
Elevation	884–1,219 m
Slope	5–30%
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

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

## Soil features

The common features of soils in this site are very fine sandy loam to silt loam textured sub-surface soils, with slopes ranging from about 5 to 30 percent. The soils in this site are well drained and formed in residuum or colluvium. The loam or silt loam surface layer is 4 to 8 inches thick. The soils have a moderately slow to slow infiltration rate. These soils are calcareous at or near the surface. This site typically 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. Sub-surface soil layers are non-restrictive to water movement and root penetration.

These soils are mainly susceptible to water erosion. The hazard of water erosion increases on slopes greater than about 10 percent. Loss of 50 percent or more of the surface layer of the soils on this site can result in a shift in species composition and/or production.

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

**Table 4. Representative soil features**

Surface texture	(1) Loam (2) Silt loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow to very slow
Soil depth	102–203 cm
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–15%
Available water capacity (0-101.6cm)	15.24–20.32 cm
Calcium carbonate equivalent (0-101.6cm)	5–40%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–1
Soil reaction (1:1 water) (0-101.6cm)	6.6–9
Subsurface fragment volume <=3" (Depth not specified)	0–30%
Subsurface fragment volume >3" (Depth not specified)	0–12%

## 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 that will occur, severe disturbances, such as periods of well-below average precipitation, can cause significant shifts in plant communities and/or species composition.

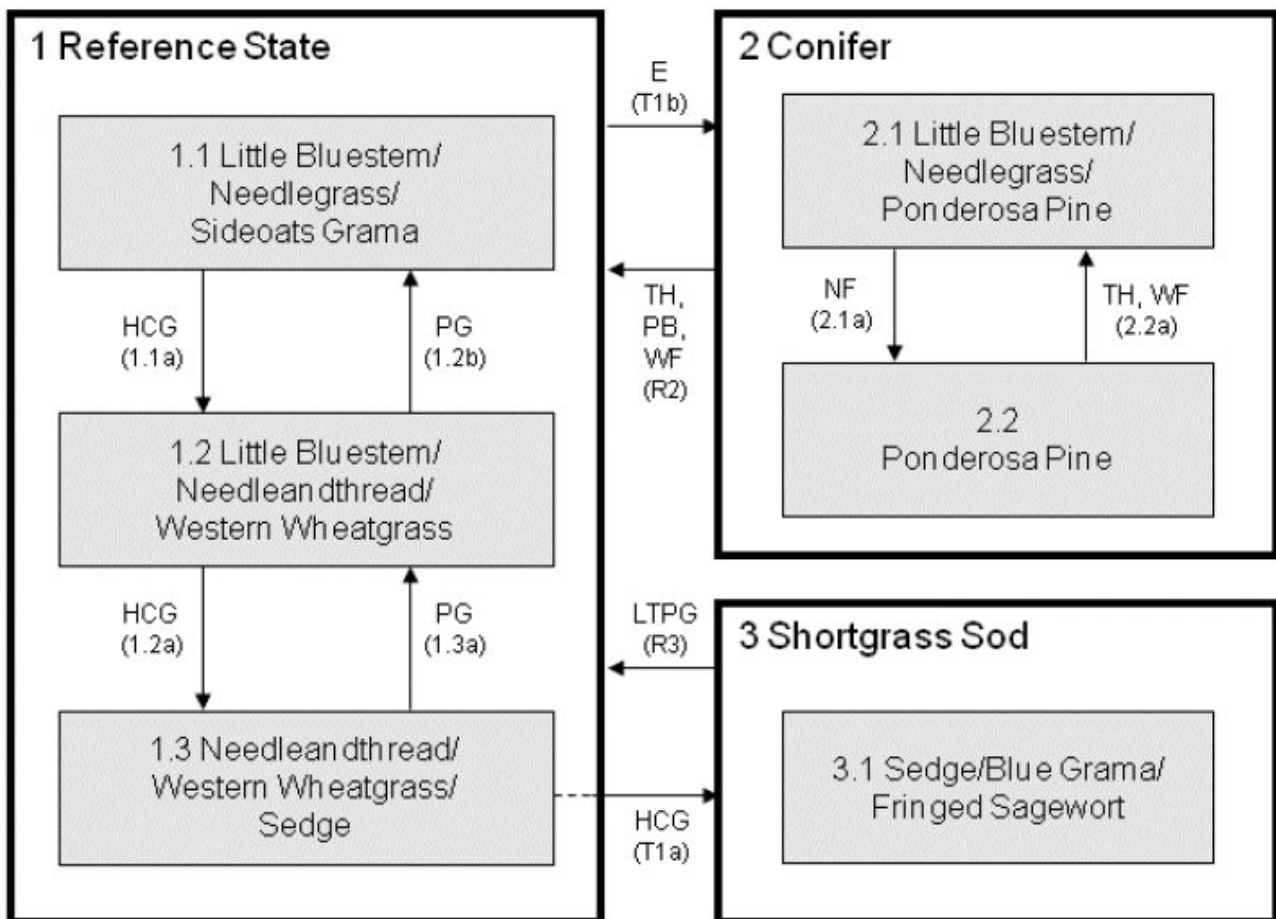
Heavy continuous grazing (e.g., every spring and/or every summer at moderate to heavy stocking levels) without adequate recovery periods following grazing events causes departure from the Little Bluestem/Needlegrass/Sideoats Grama Plant Community Phase (1.1). Blue grama and sedge will increase and eventually develop into a sod. Western wheatgrass will increase initially and then begin to decrease. Needleandthread, green needlegrass, big bluestem, sideoats grama, Indiangrass and little bluestem will decrease

in frequency and production. Excessive defoliation can cause threeawn and annuals to increase and dominate the site. Extended periods of non-use and/or lack of fire will result in excessive litter and a plant community dominated by cool-season grasses such as green needlegrass, western wheatgrass, bluegrass, smooth brome grass and cheatgrass.

Interpretations are primarily based on the Little Bluestem/Needlegrass/Sideoats Grama Plant Community Phase (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



Refer to narrative for details on pathways: **E** – Encroachment; **HCG** – Heavy continuous grazing; **LTPG** – Long-term prescribed grazing; **NF** – No fire; **PB** – Prescribed burning; **PG** – Prescribed grazing; **TH** – Timber harvest; **WF** – Wildfire.

### State 1 Reference

This state represents the natural range of variability that dominates the dynamics of this ecological site. This state is

dominated by warm-season grasses, with cool-season grasses being subdominant. In pre-European times, the primary disturbance mechanisms for this site in the reference condition included occasional fire and grazing by large ungulates. Timing of fires and grazing coupled with weather events dictated the dynamics that occurred within the natural range of variability. Taller cool- and warm-season grasses would have declined and a corresponding increase in short statured grass and grass-like species would have occurred. Today, a similar 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.

## Community 1.1 Little Bluestem/Needlegrass/Sideoats



Interpretations are based primarily on the Little Bluestem/Needlegrass/Sideoats Grama Plant Community Phase (this is also considered to be climax). The potential vegetation is about 80 percent grasses or grass-like plants, 10 percent forbs, and 10 percent shrubs. The community is dominated by warm-season grasses, with cool-season grasses being subdominant. The major grasses include little bluestem, needleandthread, sideoats grama, porcupine grass, and big bluestem. Other grasses include western wheatgrass, plains muhly, slender wheatgrass, green needlegrass, prairie dropseed, Indiangrass, prairie sandreed, blue grama, and a variety of other grass and grass-like species. 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	1558	2287	2970
Shrub/Vine	118	202	308
Forb	118	202	308
<b>Total</b>	<b>1794</b>	<b>2691</b>	<b>3586</b>

Figure 5. Plant community growth curve (percent production by month). SD6104, Black Hills Foot Slopes, warm-season dominant, cool-season sub-dominant. Warm-season dominant, cool-season sub-dominant.

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

## Community 1.2 Little Bluestem/Needleandthread/Western Wheatgrass

This plant community developed under heavy continuous grazing or from over utilization during extended drought periods. This community can also develop where this site occurs near water sources. The potential plant community is made up of approximately 80 percent grasses and grass-like species, 10 percent forbs, and 10

percent shrubs. Dominant grasses include little bluestem, needleandthread, and western wheatgrass. Grasses and grass-like species of secondary importance include sideoats grama, porcupine grass, big bluestem, threadleaf sedge, blue grama, and a variety of other grasses. Forbs commonly found in this plant community include cudweed sagewort, goldenrod, white prairie aster, and scurfpea. When compared to the Little Bluestem/Needlegrass/Sideoats Grama Plant Community Phase (1.1), blue grama, sedge, and western wheatgrass have increased. Tall warm-season grasses have decreased, and production has also been reduced. Needleandthread 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	1356	1905	2410
Shrub/Vine	106	168	252
Forb	106	168	252
<b>Total</b>	<b>1568</b>	<b>2241</b>	<b>2914</b>

**Figure 7. Plant community growth curve (percent production by month).  
SD6103, Black Hills Foot Slopes, cool-season/warm-season co-dominant.  
Cool-season, warm-season co-dominant.**

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

### **Community 1.3 Needleandthread/Western Wheatgrass/Sedge**

This plant community developed under heavy continuous grazing or from over utilization during extended drought periods. This community can also develop where this site occurs near water sources. The potential plant community is made up of approximately 80 percent grasses and grass-like species, 10 percent forbs, and 10 percent shrubs. Dominant grass and grass-like species include needleandthread, western wheatgrass, threadleaf sedge, and blue grama. Grasses of secondary importance include little bluestem, hairy grama, sideoats grama, big bluestem, green needlegrass, Kentucky and/or Canada bluegrass, and a variety of other grasses. Forbs commonly found in this plant community include cudweed sagewort, goldenrod, white prairie aster, scurfpea, and green sagewort. When compared to the Little Bluestem/Needlegrass/Sideoats Grama Plant Community Phase (1.1), blue grama, sedge, and western wheatgrass have increased. Tall and mid warm-season grasses have decreased, and production has also been reduced. 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. This plant community phase is reaching a critical point where continued overgrazing will likely shift this community over a threshold leading to a short grass and grass-like dominated state. The shorter, more grazing tolerant species tend to self-perpetuate as the shallow, dense rooting structure takes advantage of rainfall and reduces deeper infiltration to the taller species.

**Table 7. Annual production by plant type**

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1177	1524	1838
Shrub/Vine	84	135	202
Forb	84	135	202
<b>Total</b>	<b>1345</b>	<b>1794</b>	<b>2242</b>

Figure 9. Plant community growth curve (percent production by month). SD6102, Black Hills Foot Slopes, cool-season dominant, warm-season sub-dominant. Cool-season dominant, warm-season sub-dominant.

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

**Pathway 1.1a**  
**Community 1.1 to 1.2**

Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season) or a combination of disturbances for extended periods of time will lead to the 1.2 Little Bluestem/Needleandthread/Western Wheatgrass Plant Community Phase.

**Pathway 1.2b**  
**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 1.1 Little Bluestem/Needlegrass/Sideoats Grama Plant Community Phase

**Conservation practices**

Prescribed Grazing

**Pathway 1.2a**  
**Community 1.2 to 1.3**

Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season) or a combination of disturbances for extended periods of time will lead to the 1.3 Needleandthread/Western Wheatgrass/Sedge Plant Community Phase.

**Pathway 1.3a**  
**Community 1.3 to 1.2**

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 1.2 Little Bluestem/Needleandthread/Western Wheatgrass Plant Community Phase.

**Conservation practices**

Prescribed Grazing

**State 2**  
**Conifer**

This state consists of areas where tree canopy increases to a level that impedes the reproductive capability of the major native perennial grass species. The increase in tree canopy is a result of a disruption of the natural historic fire regime that kept the trees at an immature stage. This State is reached when mature tree canopy reaches about 25% or more. Tree canopy typically is dominated by ponderosa pine, but bur oak, eastern redcedar, and Rocky Mountain juniper may also be present in varying amounts.

**Community 2.1**  
**Little Bluestem/Needlegrass/Ponderosa Pine**

This plant community develops where trees from adjacent sites encroach and begin to shade out the herbaceous component. Ponderosa pine is the most common species to occupy the site, but encroachment also occurs by

eastern redcedar, Rocky Mountain juniper, and/or occasionally deciduous trees such as bur oak. These species expand on this site due to suppression of fire. The tree canopy is 25 percent or greater. The potential plant community is made up of approximately 45 percent grasses and grass-like species, 10 percent forbs, 10 percent shrubs, and 35 percent trees. Dominant grass and grass-like species include little bluestem, needleandthread, green needlegrass, sideoats grama, western wheatgrass, and threadleaf sedge. As the canopy increases, warm-season grasses tend to decrease as the cool-season grasses initially increase. Forbs commonly found in this community include cudweed sagewort, goldenrod, and green sagewort. Non-native species such as cheatgrass and bluegrass will tend to invade. Compared to the Little Bluestem/Needlegrass/Sideoats Grama Plant Community Phase (1.1), trees encroach and increase significantly. The grass component decreases dramatically with increased shading and the buildup of duff. 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 and livestock due to decreased production. A significant reduction of tree canopy can be accomplished through timber harvest or crown fire. The vegetation in the understory is capable of enduring fire; however, very hot crown fires will have a detrimental effect to the plant community. The total annual production of the understory can range from nearly non-existent under a closed canopy to about 500 pounds per acre (air-dry weight) under a medium canopy.

**Figure 10. Plant community growth curve (percent production by month). SD6111, Black Hills Foot Slopes, heavy conifer canopy. Mature ponderosa pine/juniper 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

## **Community 2.2 Ponderosa Pine**

This plant community is a result of continued suppression of fire, and a lack of tree harvest. The tree canopy eventually becomes closed, and most of the herbaceous understory is lost. Tree canopy approaches 45 percent or higher and competition slows the growth rate of the trees. A few cool-season species may survive, as well as shrubs and possibly vines. This plant community may only be altered through harvest, or possibly a wildfire that has enough energy to cause crowning of the trees. This plant community phase will also be accompanied by a relatively thick layer of acidic duff from the needles of the trees which will further reduce the establishment of herbaceous species.

### **Pathway 2.1a Community 2.1 to 2.2**

No fire or harvest for extended periods of time will cause tree canopy to continue to increase and shift this plant community to the 2.2 Ponderosa Pine Plant Community Phase.

### **Pathway 2.2a Community 2.2 to 2.1**

Timber harvest or wildfire (i.e., crown fire) will be required to shift this plant community away from this phase. Reproductive propagules of the herbaceous species will need to be present to result in a shift to the 2.1 Little Bluestem/Needlegrass/Ponderosa Pine Plant Community Phase.

## **State 3 Shortgrass Sod**

This state is a result of overgrazing (individual plants of selected species being repeatedly grazed due to continuous grazing systems which allow for long paddock occupation periods). This type of grazing causes reduced vigor of the selected species (i.e., typically the most desired by grazing ungulates). As the photosynthetic area of these species is repeatedly removed, carbohydrate production needed for root respiration is inadequate, and the root systems of these species begin to falter. The shorter, more grazing tolerant species are given the advantage, and will dominate the site. In the early stages of this State, mid and tall grass remnants may be present in sufficient quantities to allow for recovery to the Reference State. Over time, this recovery will become less likely due to higher runoff and



reduced infiltration.

### Community 3.1 Sedge/Blue Grama/Fringed Sagewort

This plant community evolved under heavy continuous grazing, heavy continuous season-long grazing or from over utilization during extended drought periods. The potential plant community is made up of approximately 70 percent grasses and grass-like species, 15 percent forbs, and 15 percent shrubs. Dominant grass and grass-like species include threadleaf sedge, blue grama, and threeawn. Grasses of secondary importance include western wheatgrass, needleandthread, little bluestem, sideoats grama, hairy grama, and prairie junegrass. Cheatgrass may also invade and become quite prevalent. Forbs commonly found in this plant community include cudweed sagewort, goldenrod, spiny phlox, and green sagewort. When compared to the Little Bluestem/Needlegrass/Sideoats Grama Plant Community Phase (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. 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 give 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 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	773	1076	1345
Shrub/Vine	62	135	224
Forb	62	135	224
<b>Total</b>	<b>897</b>	<b>1346</b>	<b>1793</b>

Figure 12. Plant community growth curve (percent production by month). SD6103, Black Hills Foot Slopes, cool-season/warm-season co-dominant. Cool-season, warm-season co-dominant.

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

#### Transition T1a State 1 to 3

Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season) or a combination of disturbances for extended periods of time will lead this plant community over a threshold and result in the 3.1 Sedge/Blue Grama/Fringed Sagewort Plant Community Phase within the Shortgrass Sod State (State 3).

#### Transition T1b State 1 to 3

Encroachment and/or an increase in canopy cover of native coniferous tree species will lead this plant community phase over a threshold to the Conifer State (State 3). This threshold will be crossed when tree canopy reaches about 25% or more of mature trees.

#### Restoration pathway R2 State 2 to 1

Prescribed burning in conjunction with long-term prescribed grazing may lead this plant community across a threshold back to the Reference State (State 1). This would have to take place before the trees reach maturity and

are still susceptible to fire, and reproductive propagules of the perennial grasses are still present. After trees reach maturity, a crown fire or timber harvest would be needed to move this plant community over the threshold back to the Reference State (State 1).

### Conservation practices

Prescribed Burning
Prescribed Grazing

### Restoration pathway R3 State 3 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) may lead this plant community phase over a threshold to the Reference State (State 1). This will likely take a long period of time, possibly up to 10 years or more, and recovery may not be attainable. Under certain circumstances, the harsh conditions created by the shortgrass sod can lead to the elimination of invasive grass species such as Kentucky bluegrass.

### Conservation practices

Prescribed Grazing
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### Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Mid Warm-Season Grasses</b>			673–1076	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	404–1076	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	135–404	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	27–215	–
	prairie dropseed	SPHE	<i>Sporobolus heterolepis</i>	0–135	–
2	<b>Cool-Season Bunchgrasses</b>			269–673	
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	135–538	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	54–404	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	27–135	–
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	0–135	–
3	<b>Tall Warm-Season Grasses</b>			135–404	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	135–404	–
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	0–135	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	0–135	–
4	<b>Wheatgrass</b>			135–269	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	135–269	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–135	–
5	<b>Short Warm-Season Grasses</b>			27–135	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	27–135	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–81	–
	threeawn	ARIST	<i>Aristida</i>	0–27	–

6	<b>Other Native Grasses</b>			27-135	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0-108	-
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	27-81	-
	Cusick's bluegrass	POCU3	<i>Poa cusickii</i>	0-54	-
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0-27	-
7	<b>Grass-likes</b>			27-135	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	27-135	-
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0-81	-
<b>Forb</b>					
8	<b>Forbs</b>			135-269	
	Forb, native	2FN	<i>Forb, native</i>	27-81	-
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	27-81	-
	scarlet beeblossom	GACO5	<i>Gaura coccinea</i>	27-54	-
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	27-54	-
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	27-54	-
	nineanther prairie clover	DAEN	<i>Dalea enneandra</i>	0-54	-
	dotted blazing star	LIPU	<i>Liatis punctata</i>	27-54	-
	beardtongue	PENST	<i>Penstemon</i>	27-54	-
	scurfpea	PSORA2	<i>Psoralegium</i>	27-54	-
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	27-54	-
	goldenrod	SOLID	<i>Solidago</i>	27-54	-
	white prairie aster	SYFA	<i>Symphotrichum falcatum</i>	27-54	-
	American vetch	VIAM	<i>Vicia americana</i>	27-54	-
	prairie spiderwort	TROC	<i>Tradescantia occidentalis</i>	0-27	-
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0-27	-
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0-27	-
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	0-27	-
	groundplum milkvetch	ASCR2	<i>Astragalus crassicaarpus</i>	0-27	-
	downy Indian paintbrush	CAPU11	<i>Castilleja purpurea</i>	0-27	-
	pussytoes	ANTEN	<i>Antennaria</i>	0-27	-
	field sagewort	ARCA12	<i>Artemisia campestris</i>	0-27	-
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0-27	-
<b>Shrub/Vine</b>					
9	<b>Shrubs</b>			135-269	
	leadplant	AMCA6	<i>Amorpha canescens</i>	27-108	-
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	0-81	-
	snowberry	SYMPH	<i>Symphoricarpos</i>	27-81	-
	rose	ROSA5	<i>Rosa</i>	27-54	-
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	27-54	-
	pricklypear	OPUNT	<i>Opuntia</i>	0-27	-
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0-27	-
	Saskatoon serviceberry	AMAL2	<i>Amelanchier alnifolia</i>	0-27	-
	elderberry	SAMBRI	<i>Sambucus</i>	0-27	-

Table 10. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Mid Warm-Season Grasses</b>			336–673	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	224–673	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	45–224	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	0–67	–
2	<b>Cool-Season Bunchgrasses</b>			224–560	
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	224–560	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0–179	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0–90	–
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	0–22	–
3	<b>Tall Warm-Season Grasses</b>			22–224	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	22–179	–
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	0–90	–
4	<b>Wheatgrass</b>			112–336	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	112–336	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–67	–
5	<b>Short Warm-Season Grasses</b>			22–224	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	22–179	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–112	–
	threeawn	ARIST	<i>Aristida</i>	0–45	–
6	<b>Other Native Grasses</b>			22–112	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–67	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	22–67	–
	Cusick's bluegrass	POCU3	<i>Poa cusickii</i>	0–22	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0–22	–
7	<b>Grass-likes</b>			22–179	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	22–179	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–67	–
8	<b>Non-Native Grasses</b>			22–157	
	brome	BROMU	<i>Bromus</i>	22–112	–
	bluegrass	POA	<i>Poa</i>	0–112	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	0–67	–
<b>Forb</b>					
9	<b>Forbs</b>			112–224	
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	22–67	–
	Forb, introduced	2FI	<i>Forb, introduced</i>	22–67	–
	Forb, native	2FN	<i>Forb, native</i>	22–67	–
	scurfpea	PSORA2	<i>Psoraleidium</i>	22–67	–
	goldenrod	SOLID	<i>Solidago</i>	22–67	–

	white prairie aster	SYFA	<i>Symphotrichum falcatum</i>	22–45	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–45	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	0–45	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	0–45	–
	scarlet beeblossom	GACO5	<i>Gaura coccinea</i>	0–22	–
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	0–22	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0–22	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0–22	–
	beardtongue	PENST	<i>Penstemon</i>	0–22	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0–22	–
	groundplum milkvetch	ASCR2	<i>Astragalus crassicaarpus</i>	0–22	–
	nineanther prairie clover	DAEN	<i>Dalea enneandra</i>	0–22	–
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	0–22	–
	pussytoes	ANTEN	<i>Antennaria</i>	0–22	–
	American vetch	VIAM	<i>Vicia americana</i>	0–22	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0–22	–
<b>Shrub/Vine</b>					
10	<b>Shrubs</b>			112–224	
	snowberry	SYMPH	<i>Symphoricarpos</i>	22–90	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	22–67	–
	rose	ROSA5	<i>Rosa</i>	22–45	–
	leadplant	AMCA6	<i>Amorpha canescens</i>	0–45	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	0–45	–
	Saskatoon serviceberry	AMAL2	<i>Amelanchier alnifolia</i>	0–22	–
	pricklypear	OPUNT	<i>Opuntia</i>	0–22	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0–22	–

Table 11. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Mid Warm-Season Grasses</b>			36–179	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	18–179	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	18–126	–
2	<b>Cool-Season Bunchgrasses</b>			269–538	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	269–538	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0–72	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0–54	–
3	<b>Tall Warm-Season Grasses</b>			0–90	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–90	–
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	0–54	–
4	<b>Wheatgrass</b>			179–359	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	179–359	–

5	<b>Short Warm-Season Grasses</b>			90-269	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	36-215	-
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0-126	-
	threeawn	ARIST	<i>Aristida</i>	0-54	-
6	<b>Other Native Grasses</b>			18-90	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0-72	-
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	18-72	-
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0-36	-
7	<b>Grass-likes</b>			90-269	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	90-269	-
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0-90	-
8	<b>Non-Native Grasses</b>			36-179	
	bluegrass	POA	<i>Poa</i>	0-179	-
	brome	BROMU	<i>Bromus</i>	18-143	-
	smooth brome	BRIN2	<i>Bromus inermis</i>	0-90	-
<b>Forb</b>					
9	<b>Forbs</b>			90-179	
	goldenrod	SOLID	<i>Solidago</i>	18-72	-
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	18-72	-
	Forb, introduced	2FI	<i>Forb, introduced</i>	18-72	-
	scurfpea	PSORA2	<i>Psoralegium</i>	18-54	-
	white prairie aster	SYFA	<i>Symphotrichum falcatum</i>	18-36	-
	Forb, native	2FN	<i>Forb, native</i>	0-36	-
	field sagewort	ARCA12	<i>Artemisia campestris</i>	18-36	-
	spiny phlox	PHHO	<i>Phlox hoodii</i>	18-36	-
	pussytoes	ANTEN	<i>Antennaria</i>	0-18	-
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	0-18	-
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	0-18	-
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0-18	-
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0-18	-
	American vetch	VIAM	<i>Vicia americana</i>	0-18	-
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0-18	-
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0-18	-
<b>Shrub/Vine</b>					
10	<b>Shrubs</b>			90-179	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	18-90	-
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	0-54	-
	rose	ROSA5	<i>Rosa</i>	0-54	-
	snowberry	SYMPH	<i>Symphoricarpos</i>	18-54	-
	pricklypear	OPUNT	<i>Opuntia</i>	0-36	-
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0-18	-

Table 12. Community 3.1 plant community composition

				Annual Production	Foliar Cover
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Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Perennial Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Mid Warm-Season Grasses</b>			0-67	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0-54	-
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0-40	-
2	<b>Cool-Season Bunchgrasses</b>			0-135	
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	0-135	-
3	<b>Wheatgrass</b>			0-135	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0-135	-
4	<b>Short Warm-Season Grasses</b>			135-404	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	135-404	-
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0-135	-
	threeawn	ARIST	<i>Aristida</i>	0-67	-
5	<b>Other Native Grasses</b>			13-67	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0-40	-
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	13-40	-
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0-40	-
6	<b>Grass-likes</b>			135-404	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	135-404	-
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0-108	-
7	<b>Non-Native Grasses</b>			0-135	
	brome	BROMU	<i>Bromus</i>	0-94	-
	bluegrass	POA	<i>Poa</i>	0-67	-
<b>Forb</b>					
8	<b>Forbs</b>			67-202	
	Forb, introduced	2FI	<i>Forb, introduced</i>	13-94	-
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	13-67	-
	goldenrod	SOLID	<i>Solidago</i>	13-67	-
	field sagewort	ARCA12	<i>Artemisia campestris</i>	13-54	-
	scurfpea	PSORA2	<i>Psoralegium</i>	13-40	-
	spiny phlox	PHHO	<i>Phlox hoodii</i>	13-27	-
	Forb, native	2FN	<i>Forb, native</i>	0-27	-
	pussytoes	ANTEN	<i>Antennaria</i>	0-27	-
	white prairie aster	SYFA	<i>Symphotrichum falcatum</i>	0-27	-
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0-13	-
<b>Shrub/Vine</b>					
9	<b>Shrubs</b>			67-202	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	27-135	-
	pricklypear	OPUNT	<i>Opuntia</i>	0-54	-
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	0-54	-
	rose	ROSA5	<i>Rosa</i>	0-40	-
	snowberry	SYMPH	<i>Symphoricarpos</i>	0-27	-

## **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.

Little Bluestem/Needlegrass/Sideoats Grama (1.1)

Average Annual Production (lbs./acre, air-dry): 2,400

Stocking Rate\* (AUM/acre): 0.66

Little Bluestem/Needleandthread/Western Wheatgrass (1.2)

Average Annual Production (lbs./acre, air-dry): 2,000

Stocking Rate\* (AUM/acre): 0.55

Needleandthread/Western Wheatgrass/Sedge (1.3)

Average Annual Production (lbs./acre, air-dry): 1,600

Stocking Rate\* (AUM/acre): 0.44

Sedge/Blue Grama/Fringed Sagewort (3.1)

Average Annual Production (lbs./acre, air-dry): 1,200

Stocking Rate\* (AUM/acre): 0.33

Little Bluestem/Needlegrass/Ponderosa Pine (2.1)

Average Annual Production (lbs./acre, air-dry): 500

Stocking Rate\* (AUM/acre): 0.14

\* Based on 912 lbs./acre (air-dry weight) per Animal Unit Month (AUM), and on 25% 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 group B. 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 and/or sedge 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.

## Other references

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## Contributors

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## Rangeland health reference sheet

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

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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:** Rills not typically present. If present, very short (usually less than 6 inches long), sporadic, and discontinuous.
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2. **Presence of water flow patterns:** None, or barely visible and discontinuous with numerous debris dams when present.
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3. **Number and height of erosional pedestals or terracettes:** Few pedestalled plants typically on steeper slopes, roots not exposed. Terracettes typically non-existent.
- 
4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground less than 10 percent and patches less than 2 inches in diameter.
- 
5. **Number of gullies and erosion associated with gullies:** Active gullies should not be present.
- 
6. **Extent of wind scoured, blowouts and/or depositional areas:** None.
- 
7. **Amount of litter movement (describe size and distance expected to travel):** Small size litter classes will generally move short distances, some medium size class litter will move very short distances. Litter debris dams are occasionally present.
- 
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.
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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface structure is typically granular, sometimes platy parting to granular, and mollic (higher organic matter) colors of A-horizon about 4 to 5 inches deep. If conditions are other than this, refer to map unit component descriptions for component on which the site occurs.
- 
10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Healthy, deep rooted native grasses enhance infiltration and reduce runoff.
- 
11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** No compaction layer should be evident.
- 
12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**
- Dominant: Mid, warm-season grasses >
- Sub-dominant: Mid and tall, cool-season bunchgrasses > tall, warm-season grasses >
- Other: Wheatgrasses (mid, cool-season) = forbs = shrubs > short, warm-season grasses = grass-like species

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

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very little to no evidence of decadence or mortality. Bunch grasses have strong, healthy centers and shrubs are vigorous.

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14. **Average percent litter cover (%) and depth ( in):** 75 to 85 percent plant litter cover, roughly 0.25 to 0.5 inch depth. Litter cover is in contact with soil surface.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Ranges from 1,600 to 3,200 pounds/acre. Reference value is 2,400 pounds/acre (air-dry weight basis).

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

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

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