

# Ecological site R061XY020SD Overflow

Accessed: 05/05/2024

## 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.

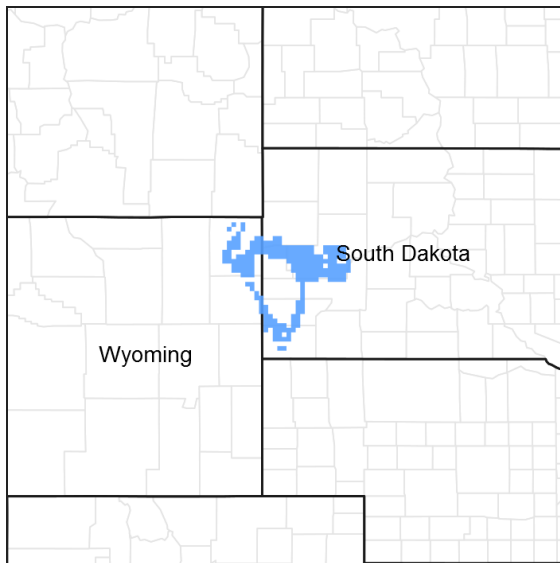


Figure 1. Mapped extent

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>
R061XN011SD	<b>Clayey-North (18-22" PZ)</b>
R061XS010SD	<b>Loamy-South (16-18" PZ)</b>
R061XS011SD	<b>Clayey-South (16-18" PZ)</b>

## Similar sites

R061XS010SD	<b>Loamy-South (16-18" PZ)</b> (R061XS010SD) – Loamy [less big bluestem, lower production]
R061XN010SD	<b>Loamy-North (18-22" PZ)</b> (R061XN010SD) – Loamy [less big bluestem; lower production]

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Andropogon gerardii</i> (2) <i>Pascopyrum smithii</i>

## Physiographic features

This site occurs on nearly level lowlands and drainageways.

**Table 2. Representative physiographic features**

Landforms	(1) Flood plain (2) Stream terrace
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Rare to occasional
Ponding frequency	None
Elevation	884–1,219 m
Slope	0–3%
Water table depth	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

The soils in this site are moderately well to well drained and formed in alluvium. The silt loam to fine sandy loam surface layer is 4 to 10 inches thick. The soils have a moderate to moderately slow infiltration rate. This site should show no evidence of rills, wind scoured areas or pedestalled plants. If present, water flow paths are broken, irregular in appearance or discontinuous with numerous debris dams or vegetative barriers. The soil surface is stable and intact.

These soils are mainly susceptible to water erosion. The hazard of water erosion increases where vegetative cover is not adequate. A drastic loss of the soil surface layer 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) Silt loam (2) Fine sandy loam (3) Loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Moderately slow to moderately rapid
Soil depth	203 cm
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	12.7–20.32 cm
Calcium carbonate equivalent (0-101.6cm)	0–20%
Electrical conductivity (0-101.6cm)	0–8 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–4
Soil reaction (1:1 water) (0-101.6cm)	5.1–9
Subsurface fragment volume <=3" (Depth not specified)	0–15%
Subsurface fragment volume >3" (Depth not specified)	0–2%

### 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.

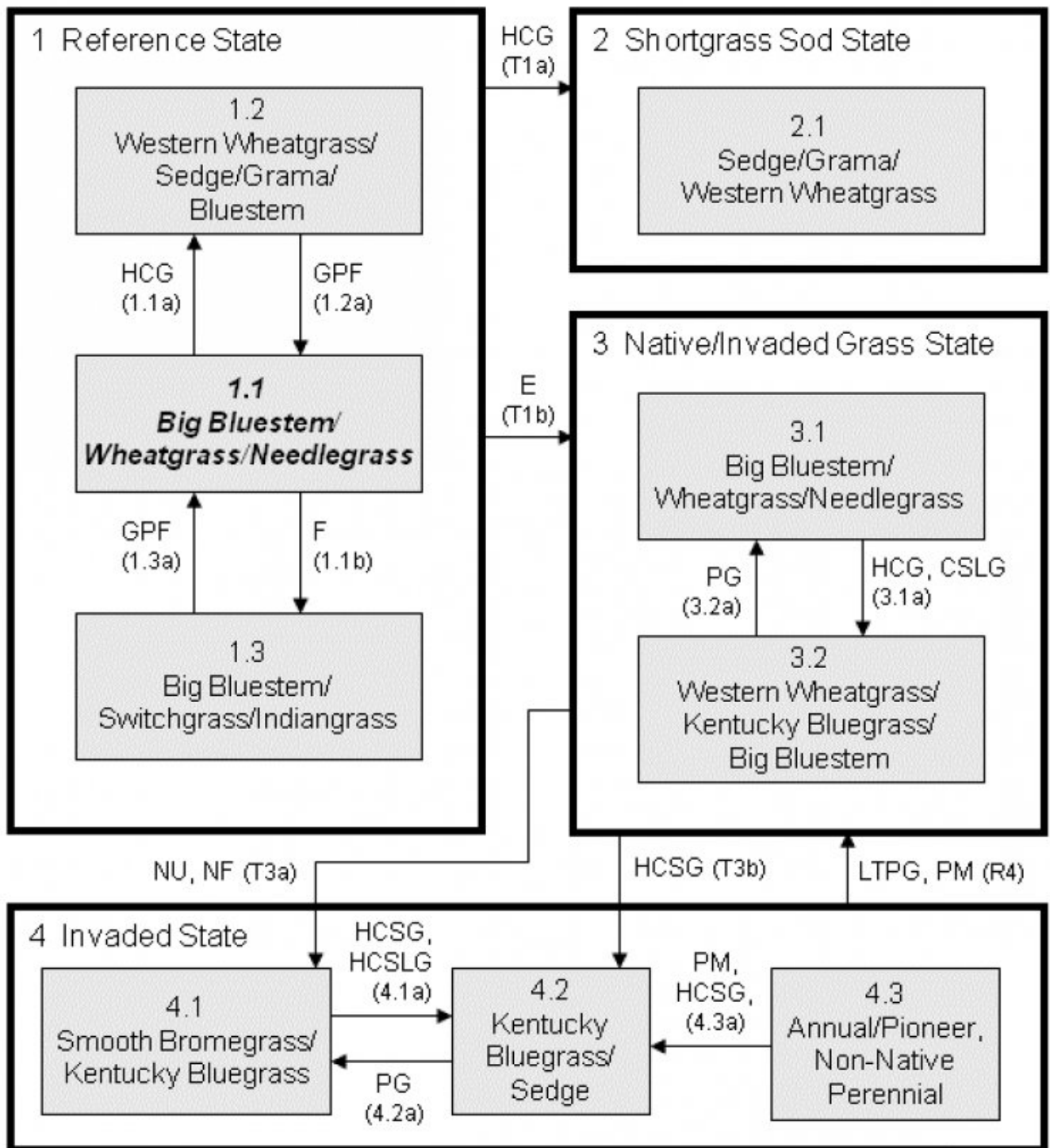
Continuous season-long grazing (during the typical growing season of May through October) and/or heavy continuous grazing (e.g., every spring and/or every summer at moderate to heavy stocking levels) without adequate recovery periods following grazing events causes departure from the Big Bluestem/Wheatgrass/Needlegrass Plant

Community Phase. Short grass and grass-like species such as sedge, blue grama, and bluegrass will increase and eventually develop into a sod. Western wheatgrass will increase initially and then begin to decrease. Green needlegrass, big bluestem, switchgrass, and Indiangrass will decrease in frequency and production. Excessive defoliation can cause bluegrass 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 Big Bluestem/Wheatgrass/Needlegrass 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: C – Cropped, abandoned; CSLG – Continuous season-long grazing; E – Encroachment of introduced species; F – Fire; GPF – Grazing, precipitation, and/or fire returning to more normal disturbance regime levels and frequencies; HCG – Heavy continuous grazing; HCSG – Heavy continuous seasonal grazing; HCSLG – Heavy continuous season-long grazing; LTPG – Long-term prescribed grazing; NU, NF – Non-use, no fire; PG – Prescribed grazing; PM – Pest management (herbicide); S – Seeding.

**Any Plant Community**

### State 1 Reference

This state description represents the natural range of variability that dominated the dynamics of this ecological site.

This state was typically dominated by warm-season grasses, with occasional shifts to a near co-dominance of cool- and warm-season grasses. In pre-European times, the primary disturbance mechanisms for this site in the reference condition included periods of below and/or above average precipitation, periodic fire, and herbivory by insects and large ungulates. Timing of fires and herbivory coupled with weather events dictated the dynamics that occurred within the natural range of variability. A combination of disturbances would likely have caused a shift to more cool-season grasses with a corresponding decrease in tall warm-season grasses. An increase in fire frequency or fire followed by occasional grazing would have caused an increase in warm-season grasses.

### Community 1.1 Big Bluestem/Wheatgrass/Needlegrass



Interpretations are based primarily on the Big Bluestem/Wheatgrass/Needlegrass Plant Community Phase (this is also considered to be climax). The potential vegetation was about 80 percent grasses or grass-like plants, 10 percent forbs, 10 percent shrubs, and a minor amount of trees in some locations. The community was dominated by warm-season grasses. The major grasses included big bluestem, western wheatgrass, and green needlegrass. Other grass or grass-like species included switchgrass, slender wheatgrass, little bluestem, sideoats grama, Indiangrass, porcupine grass, Columbia needlegrass, sedge, Canada wildrye, and blue grama. This plant community was resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allowed for high drought tolerance. This was 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	2365	2992	3531
Shrub/Vine	163	269	415
Forb	163	269	415
Tree	–	57	123
<b>Total</b>	<b>2691</b>	<b>3587</b>	<b>4484</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 Western Wheatgrass/Sedge/Grama/Bluestem

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 80 percent grasses and grass-like species,

10 percent forbs, 10 percent shrubs, and a minor amount of trees in some locations. Dominant grass and grass-like species included western wheatgrass, sedge, blue grama, little bluestem, and big bluestem. Grass and grass-like species of secondary importance included green needlegrass, switchgrass, Indiangrass, porcupine grass, slender wheatgrass, and Canada wildrye. Forbs commonly found in this plant community included cudweed, sagewort, prairie coneflower, scurfpea, and western yarrow. This plant community had similar plant composition to the 3.2 Western Wheatgrass/Kentucky Bluegrass/Big Bluestem 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/Wheatgrass/Needlegrass Plant Community Phase (1.1), western wheatgrass, blue grama and sedges increased. Green needlegrass and big bluestem 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). 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 Big Bluestem/Switchgrass/Indiangrass**

This plant community was a result of fire occurring at relatively frequent intervals. This phase could have also resulted from a combination of grazing events immediately following early season fire (i.e., large ungulates attracted to highly nutritious vegetative growth following a fire). These events would have caused a reduction in cool-season grasses and an increase in warm-season grasses. The warm-season grasses were more tolerant of shorter return intervals of fire, and would have increased in vigor and production leading to a temporary shift to this phase. Needlegrasses would have decreased most significantly amongst the cool-season grasses. The potential vegetation was about 80 percent grasses or grass-like plants, 15 percent forbs, and 5 percent shrubs. The community was dominated by warm-season grasses. The major grasses included big bluestem, Indiangrass, switchgrass, sideoats grama, little bluestem, and western wheatgrass. Other grass or grass-like species included green needlegrass, porcupine grass, needleandthread, slender wheatgrass, Canada wildrye, and sedges. This plant community was not resistant to change, and would have readily shifted back to the 1.1 Big Bluestem/Wheatgrass/Needlegrass Plant Community Phase with a return of more normal fire return intervals.

**Figure 7. Plant community growth curve (percent production by month). SD6105, Black Hills Foot Slopes, warm-season dominant. Warm-season dominant.**

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		2	5	15	25	30	15	7	1		

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

Heavy continuous grazing which included herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, or a combination of disturbances such as extended periods of below average precipitation coupled with periodic or chronic heavy grazing would have shifted this community to the 1.2 Western Wheatgrass/Sedge/Grama/Bluestem Plant Community Phase.

### **Pathway 1.1b Community 1.1 to 1.3**

Fire occurring at relatively frequent intervals, and occasional grazing events immediately following early season fire caused a reduction in cool-season grasses and an increase in warm-season grasses. The warm-season grasses were more tolerant of shorter return intervals of fire, and would increase in vigor and production leading to a temporary shift to the 1.3 Big Bluestem/Switchgrass/Indiangrass 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 would have converted this plant community to the 1.1 Big Bluestem/Wheatgrass/Needlegrass Plant Community Phase.

## **Pathway 1.3a**

### **Community 1.3 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 would have converted this plant community to the 1.1 Big Bluestem/Wheatgrass/Needlegrass Plant Community Phase.

## **State 2**

### **Shortgrass Sod**

#### **Community 2.1**

##### **Sedge/Grama/Western Wheatgrass**

This plant community evolved under heavy continuous season 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 grasses typically included sedge and western wheatgrass. Grasses of secondary importance included sideoats grama, green needlegrass, and big bluestem. Forbs commonly found in this plant community included cudweed sagewort, green sagewort, Missouri goldenrod, and western yarrow. When compared to the Big Bluestem/Needlegrass Plant Community Phase (1.1), sedge and western wheatgrass were dominant on this plant community. This vegetation state was very resistant to change. The herbaceous species present were well adapted to grazing. This plant community was less productive than other phases. The thick sod prevented other species from getting established.

**Figure 8. 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		

## **State 3**

### **Native/Invaded Grass**

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 3.1**

##### **Big Bluestem/Wheatgrass/Needlegrass**

This plant community phase is similar to the 1.1 Big Bluestem/Wheatgrass/Needlegrass 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 80 percent grasses or grass-like plants, 10 percent forbs, 10 percent shrubs, and a minor amount of trees in some locations. The community is dominated by warm-season grasses. The major grasses include big bluestem, western wheatgrass, and green needlegrass. Other grass or grass-like species include switchgrass, slender wheatgrass, little bluestem, sideoats grama, Columbia needlegrass, Indiangrass, porcupine grass, sedge, Canada wildrye, blue grama, Kentucky bluegrass, and smooth brome grass. 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 9. 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 3.2 Western Wheatgrass/Kentucky Bluegrass/Big Bluestem

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 80 percent grasses and grass-like species, 10 percent forbs, and 10 percent shrubs, and a minor amount of trees in some locations. Dominant grasses include western wheatgrass, Kentucky bluegrass, and big bluestem. Grass and grass-like species of secondary importance include sedge, blue grama, green needlegrass, slender wheatgrass, little bluestem, and smooth brome. Forbs commonly found in this plant community include cudweed sagewort, goldenrod, western ragweed, western yarrow, and verbena. When compared to the Big Bluestem/Wheatgrass/Needlegrass Plant Community Phase (1.1), western wheatgrass has increased and big bluestem has decreased. Needlegrasses have decreased, and production of mid and tall warm-season grasses has also been 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.

**Table 6. Annual production by plant type**

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1670	2153	2589
Shrub/Vine	118	194	291
Forb	118	194	291
Tree	–	37	78
<b>Total</b>	<b>1906</b>	<b>2578</b>	<b>3249</b>

**Figure 11. 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 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 often at the same time of year each year), or continuous season-long grazing, or a combination of disturbances such as extended periods of below average precipitation coupled with periodic heavy grazing will shift this community to the 3.2 Western Wheatgrass/Kentucky Bluegrass/Big Bluestem Plant Community Phase.

### Pathway 3.2a Community 3.2 to 3.1

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 3.1 Big Bluestem/Wheatgrass/Needlegrass Plant Community Phase.

## Conservation practices

Prescribed Grazing

### State 4 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 4.1 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 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2174	2633	2976
Shrub/Vine	146	325	583
Forb	146	244	375
Tree	–	48	101
<b>Total</b>	<b>2466</b>	<b>3250</b>	<b>4035</b>

Figure 13. Plant community growth curve (percent production by month).  
SD6101, Black Hills Foot Slopes, cool-season dominant. Cool-season dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		4	12	25	36	10	5	4	4		

#### Community 4.2 Kentucky Bluegrass/Sedge

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 and sedge. The dominance 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 8. Annual production by plant type**

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1065	1363	1575
Forb	84	224	415
Shrub/Vine	84	179	308
Tree	–	27	56
<b>Total</b>	<b>1233</b>	<b>1793</b>	<b>2354</b>

**Figure 15. Plant community growth curve (percent production by month). SD6101, Black Hills Foot Slopes, cool-season dominant. Cool-season dominant.**

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		4	12	25	36	10	5	4	4		

### Community 4.3 Annual/Pioneer, Non-Native Perennial

This plant community developed under continuous heavy grazing or other excessive disturbances (e.g., heavy use areas, defoliation by rodents, etc.). The potential plant community is made up of approximately 40 to 80 percent grasses and grass-like species, 20 to 60 percent forbs, and 0 to 5 percent shrubs. The species present in this phase are highly variable, but often include non-native invasive and/or early seral species. Plant diversity is low (plant richness may be high, but areas are often dominated by a few species). The ecological processes are difficult to restore because of the loss of plant diversity and overall soil disturbance. Soil erosion is potentially very high because of the bare ground and shallow rooted herbaceous plant community. Water runoff will increase and infiltration will decrease due to animal related soil compaction and loss of root mass due to low plant diversity and vigor. This plant community will require significant economic inputs and time to move towards another plant community. This movement is highly variable in its succession. This is due to the loss of diversity (including the loss of the seed bank), within the existing plant community, and the plant communities on adjacent sites.

#### Pathway 4.1a Community 4.1 to 4.2

Heavy continuous seasonal grazing (stocking levels well above carrying capacity for extended portions of the growing season, and at the same time of year each year) or heavy continuous season-long grazing will convert this plant community to the 4.2 Kentucky Bluegrass/Sedge Plant Community Phase.

#### Pathway 4.2a Community 4.2 to 4.1

Prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest may convert this plant community to the 4.1 Smooth Bromegrass/Kentucky Bluegrass Plant Community Phase.

#### Conservation practices

Prescribed Grazing
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## **Pathway 4.3a**

### **Community 4.3 to 4.2**

Pest management (herbicides) and often heavy continuous seasonal grazing will likely result in an eventual dominance by Kentucky bluegrass which will lead to the 4.2 Kentucky Bluegrass/Sedge Plant Community Phase.

#### **Conservation practices**

Integrated Pest Management (IPM)
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### **Transition T1a**

#### **State 1 to 2**

Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season, and often at the same time of year each year, typically beginning early in the season) would have converted this plant community to the 2.1 Sedge/Grama/Western Wheatgrass Plant Community Phase and the Shortgrass Sod State (State 2).

### **Transition T1b**

#### **State 1 to 3**

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 3).

### **Transition T5**

#### **State 1 to 4**

Encroachment of non-native invasive/noxious species, abandonment of cropping, or seeding of introduced and/or native improved varieties of forage species may lead this plant community phase over a threshold to the Invaded State (State 4) and more specifically to the 4.3 Annual/Pioneer, Non-native Perennial Plant Community Phase. In the case of a seeding, refer to the corresponding Forage Suitability Group description for adapted species and expected production (production estimates in the Forage Suitability Group description may be unrealistically high due to the degraded condition of the site at this phase).

### **Transition T5**

#### **State 2 to 4**

Encroachment of non-native invasive/noxious species, abandonment of cropping, or seeding of introduced and/or native improved varieties of forage species may lead this plant community phase over a threshold to the Invaded State (State 4) and more specifically to the 4.3 Annual/Pioneer, Non-native Perennial Plant Community Phase. In the case of a seeding, refer to the corresponding Forage Suitability Group description for adapted species and expected production (production estimates in the Forage Suitability Group description may be unrealistically high due to the degraded condition of the site at this phase).

### **Transition T5**

#### **State 3 to 4**

Encroachment of non-native invasive/noxious species, abandonment of cropping, or seeding of introduced and/or native improved varieties of forage species may lead this plant community phase over a threshold to the Invaded State (State 4) and more specifically to the 4.3 Annual/Pioneer, Non-native Perennial Plant Community Phase. In the case of a seeding, refer to the corresponding Forage Suitability Group description for adapted species and expected production (production estimates in the Forage Suitability Group description may be unrealistically high due to the degraded condition of the site at this phase).

### **Transition T3b**

#### **State 3 to 4**

Heavy continuous seasonal grazing (stocking levels well above carrying capacity for extended portions of the growing season, and at the same time of year each year, typically beginning early in the season) will cause a shift across a threshold leading to the 4.2 Kentucky Bluegrass/Sedge Plant Community Phase within the Invaded State (State 4).

### Transition T3a State 3 to 4

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 4.1 Smooth Bromegrass/Kentucky Bluegrass Plant Community Phase within the Invaded State (State 4).

### Restoration pathway R4 State 4 to 3

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 Native/Invaded Grass State (State 3). Pest management (i.e., herbicide) may also be needed to suppress cool-season invasive grasses. This will likely take a long period of time, possibly up to 10 years or more, and recovery may not be attainable. Success depends on whether native reproductive propagules remain intact on the site.

#### Conservation practices

Prescribed Grazing
Integrated Pest Management (IPM)

### 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>Tall Warm-Season Grasses</b>			717–1435	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	717–1435	–
	switchgrass	PAV12	<i>Panicum virgatum</i>	72–359	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	0–179	–
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	0–108	–
2	<b>Wheatgrasses</b>			359–897	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	359–717	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	36–359	–
3	<b>Cool-Season Bunchgrasses</b>			179–538	
	green needlegrass	NAVI4	<i>Nassella viridula</i>	179–538	–
	Columbia needlegrass	ACNE9	<i>Achnatherum nelsonii</i>	0–179	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	0–179	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0–179	–
4	<b>Mid Warm-Season Grasses</b>			179–538	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	72–359	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	72–359	–
5	<b>Short Warm-Season Grasses</b>			36–179	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	36–179	–

	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–108	–
	mat muhly	MURI	<i>Muhlenbergia richardsonis</i>	0–72	–
6	<b>Other Native Grasses</b>			36–179	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–179	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	36–108	–
	fowl bluegrass	POPA2	<i>Poa palustris</i>	0–108	–
7	<b>Grass-likes</b>			36–179	
	sedge	CAREX	<i>Carex</i>	36–179	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–108	–
<b>Forb</b>					
8	<b>Forbs</b>			179–359	
	Forb, native	2FN	<i>Forb, native</i>	36–179	–
	scurfpea	PSORA2	<i>Psoralegium</i>	36–108	–
	goldenrod	SOLID	<i>Solidago</i>	36–108	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	36–108	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	0–72	–
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	0–72	–
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	36–72	–
	Maximilian sunflower	HEMA2	<i>Helianthus maximiliani</i>	0–72	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0–72	–
	white prairie aster	SYFA	<i>Symphyotrichum falcatum</i>	36–72	–
	vervain	VERBE	<i>Verbena</i>	36–72	–
	American vetch	VIAM	<i>Vicia americana</i>	36–72	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	36–72	–
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	36–72	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	36–72	–
	starry false lily of the valley	MAST4	<i>Maianthemum stellatum</i>	0–36	–
	beardtongue	PENST	<i>Penstemon</i>	0–36	–
	northern bedstraw	GABO2	<i>Galium boreale</i>	0–36	–
	scarlet beeblossom	GACO5	<i>Gaura coccinea</i>	0–36	–
<b>Shrub/Vine</b>					
9	<b>Shrubs</b>			179–359	
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	0–191	–
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	36–179	–
	leadplant	AMCA6	<i>Amorpha canescens</i>	36–108	–
	American plum	PRAM	<i>Prunus americana</i>	36–108	–
	chokecherry	PRVI	<i>Prunus virginiana</i>	0–108	–
	rose	ROSA5	<i>Rosa</i>	36–72	–
	silver buffaloberry	SHAR	<i>Shepherdia argentea</i>	0–72	–
<b>Tree</b>					
10	<b>Trees</b>			0–114	
	Tree	2TREE	<i>Tree</i>	0–114	–

	green ash	FRPE	<i>Fraxinus pennsylvanica</i>	0–108	–
	plains cottonwood	PODEM	<i>Populus deltoides ssp. monilifera</i>	0–108	–
	bur oak	QUMA2	<i>Quercus macrocarpa</i>	0–108	–
	American elm	ULAM	<i>Ulmus americana</i>	0–108	–

Table 10. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Tall Warm-Season Grasses</b>			129–387	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	52–387	–
	switchgrass	PAV12	<i>Panicum virgatum</i>	0–77	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	0–77	–
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	0–52	–
2	<b>Wheatgrass</b>			258–644	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	258–644	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–129	–
3	<b>Cool-Season Bunchgrasses</b>			52–258	
	green needlegrass	NAVI4	<i>Nassella viridula</i>	52–258	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	0–52	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0–52	–
4	<b>Mid Warm-Season Grasses</b>			0–129	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–129	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0–77	–
5	<b>Short Warm-Season Grasses</b>			52–258	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	52–258	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–129	–
	mat muhly	MURI	<i>Muhlenbergia richardsonis</i>	0–77	–
6	<b>Other Native Grasses</b>			26–129	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–129	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	26–77	–
	fowl bluegrass	POPA2	<i>Poa palustris</i>	0–52	–
7	<b>Grass-likes</b>			52–258	
	sedge	CAREX	<i>Carex</i>	52–258	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–129	–
8	<b>Non-Native Grasses</b>			258–644	
	bluegrass	POA	<i>Poa</i>	129–516	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	52–387	–
	brome	BROMU	<i>Bromus</i>	0–129	–
<b>Forb</b>					
9	<b>Forbs</b>			129–258	
	Forb, introduced	2FI	<i>Forb, introduced</i>	26–103	–
	Forb, native	2FN	<i>Forb, native</i>	0–103	–

	western yarrow	ACMIO	<i>Achillea millefolium</i> var. <i>occidentalis</i>	26-77	-
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	26-77	-
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	26-77	-
	goldenrod	SOLID	<i>Solidago</i>	26-77	-
	vervain	VERBE	<i>Verbena</i>	26-77	-
	white prairie aster	SYFA	<i>Symphotrichum falcatum</i>	0-52	-
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	26-52	-
	scurfpea	PSORA2	<i>Psoraleidium</i>	26-52	-
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0-52	-
	Maximilian sunflower	HEMA2	<i>Helianthus maximiliani</i>	0-26	-
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0-26	-
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	0-26	-
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	0-26	-
	American vetch	VIAM	<i>Vicia americana</i>	0-26	-
<b>Shrub/Vine</b>					
10	<b>Shrubs</b>			129-258	
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	26-180	-
	rose	ROSA5	<i>Rosa</i>	26-77	-
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	0-77	-
	American plum	PRAM	<i>Prunus americana</i>	0-52	-
	chokecherry	PRVI	<i>Prunus virginiana</i>	0-26	-
	silver buffaloberry	SHAR	<i>Shepherdia argentea</i>	0-26	-
	leadplant	AMCA6	<i>Amorpha canescens</i>	0-26	-
<b>Tree</b>					
11	<b>Trees</b>			0-77	
	Tree	2TREE	<i>Tree</i>	0-77	-
	green ash	FRPE	<i>Fraxinus pennsylvanica</i>	0-77	-
	plains cottonwood	PODEM	<i>Populus deltoides</i> ssp. <i>monilifera</i>	0-77	-
	bur oak	QUMA2	<i>Quercus macrocarpa</i>	0-77	-
	American elm	ULAM	<i>Ulmus americana</i>	0-77	-

Table 11. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Wheatgrass</b>			0-325	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0-325	-
2	<b>Cool-Season Bunchgrasses</b>			0-163	
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0-163	-
3	<b>Short Warm-Season Grasses</b>			0-163	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0-130	-
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0-33	-
	mat muhly	MURI	<i>Muhlenbergia richardsonis</i>	0-33	-
4	<b>Other Native Grasses</b>			0-163	



4	<b>Other Native Grasses</b>			0-163	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0-163	-
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0-65	-
	fowl bluegrass	POPA2	<i>Poa palustris</i>	0-65	-
5	<b>Grass-likes</b>			33-325	
	sedge	CAREX	<i>Carex</i>	33-260	-
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0-163	-
6	<b>Non-Native Grasses</b>			975-2113	
	smooth brome	BRIN2	<i>Bromus inermis</i>	488-1950	-
	bluegrass	POA	<i>Poa</i>	325-1300	-
	brome	BROMU	<i>Bromus</i>	33-325	-
<b>Forb</b>					
7	<b>Forbs</b>			163-325	
	Forb, introduced	2FI	<i>Forb, introduced</i>	33-260	-
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	33-130	-
	Forb, native	2FN	<i>Forb, native</i>	0-98	-
	vervain	VERBE	<i>Verbena</i>	33-98	-
	goldenrod	SOLID	<i>Solidago</i>	33-98	-
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	33-65	-
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	33-65	-
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	33-65	-
	scurfpea	PSORA2	<i>Psoralegium</i>	33-65	-
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0-33	-
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	0-33	-
	white prairie aster	SYFA	<i>Symphotrichum falcatum</i>	0-33	-
<b>Shrub/Vine</b>					
8	<b>Shrubs</b>			163-488	
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	33-488	-
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	0-98	-
	American plum	PRAM	<i>Prunus americana</i>	0-98	-
	chokecherry	PRVI	<i>Prunus virginiana</i>	0-65	-
	rose	ROSA5	<i>Rosa</i>	0-65	-
	silver buffaloberry	SHAR	<i>Shepherdia argentea</i>	0-33	-
<b>Tree</b>					
9	<b>Trees</b>			0-98	
	Tree	2TREE	<i>Tree</i>	0-98	-
	green ash	FRPE	<i>Fraxinus pennsylvanica</i>	0-98	-
	plains cottonwood	PODEM	<i>Populus deltoides ssp. monilifera</i>	0-98	-
	bur oak	QUMA2	<i>Quercus macrocarpa</i>	0-98	-
	American elm	ULAM	<i>Ulmus americana</i>	0-98	-

Table 12. Community 4.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Wheatgrass</b>			0–90	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–90	–
2	<b>Cool-Season Bunchgrasses</b>			0–36	
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0–36	–
3	<b>Short Warm-Season Grasses</b>			36–269	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	36–215	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–90	–
	mat muhly	MURI	<i>Muhlenbergia richardsonis</i>	0–90	–
4	<b>Other Native Grasses</b>			0–90	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–72	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–36	–
	fowl bluegrass	POPA2	<i>Poa palustris</i>	0–18	–
5	<b>Grass-likes</b>			90–359	
	sedge	CAREX	<i>Carex</i>	90–323	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–90	–
6	<b>Non-Native Grasses</b>			448–807	
	bluegrass	POA	<i>Poa</i>	359–717	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	18–215	–
	brome	BROMU	<i>Bromus</i>	0–90	–
<b>Forb</b>					
7	<b>Forbs</b>			90–359	
	Forb, introduced	2FI	<i>Forb, introduced</i>	18–269	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	18–90	–
	goldenrod	SOLID	<i>Solidago</i>	18–90	–
	vervain	VERBE	<i>Verbena</i>	18–90	–
	scurfpea	PSORA2	<i>Psoraleidium</i>	18–72	–
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	18–72	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	18–72	–
	Forb, native	2FN	<i>Forb, native</i>	0–54	–
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	0–36	–
	white prairie aster	SYFA	<i>Symphotrichum falcatum</i>	0–18	–
<b>Shrub/Vine</b>					
8	<b>Shrubs</b>			90–269	
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	36–269	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	0–54	–
	rose	ROSA5	<i>Rosa</i>	0–36	–
<b>Tree</b>					
9	<b>Trees</b>			0–54	
	Tree	2TREE	<i>Tree</i>	0–54	–
	green ash	FRPE	<i>Fraxinus pennsylvanica</i>	0–54	–

	plains cottonwood	PODEM	<i>Populus deltoides ssp. monilifera</i>	0-54	-
	bur oak	QUMA2	<i>Quercus macrocarpa</i>	0-54	-
	American elm	ULAM	<i>Ulmus americana</i>	0-54	-

## 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/Wheatgrass/Needlegrass (1.1 & 3.1)

Average Annual Production (lbs./acre, air-dry): 3,200

Stocking Rate\* (AUM/acre): 0.88

#### Western Wheatgrass/Kentucky Bluegrass/Big Bluestem (3.2)

Average Annual Production (lbs./acre, air-dry): 2,300

Stocking Rate\* (AUM/acre): 0.63

#### Smooth Bromegrass/Kentucky Bluegrass (4.1)

Average Annual Production (lbs./acre, air-dry): 2,900

Stocking Rate\* (AUM/acre): 0.79

#### Kentucky Bluegrass/Sedge (4.2)

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

Stocking Rate\* (AUM/acre): 0.44

#### Annual/Pioneer, Non-Native Perennial (4.3)

Average Annual Production (lbs./acre, air-dry): 800

Stocking Rate\* (AUM/acre): 0.22

\* 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, 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.

## Other references

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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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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 should not be present.  

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2. **Presence of water flow patterns:** Barely observable or not present.  

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3. **Number and height of erosional pedestals or terracettes:** Essentially non-existent.  

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground less than 5 percent and pathces less than two inches in diameter.  

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5. **Number of gullies and erosion associated with gullies:** Active gullies should not be present.  

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

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7. **Amount of litter movement (describe size and distance expected to travel):** Little to no plant litter movement. Plant litter remains in place and is not moved by erosional forces.  

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil aggregate stability normally a 6 rating. Typically high root content and organic matter in the soil surface. Soil surface is very resistant to erosion.  

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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 or parting to granular, and mollic (higher organic matter) colors of A-horizon down to about 5 to 14 inches deep. If conditions are other than this, refer to map unit component descriptions for component on which the site occurs.  

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Healthy, deep-rooted native grass and grass-like species enhance infiltration and reduce runoff.  

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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 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 >> wheatgrasses (mid, cool-season) >

Sub-dominant: Tall and mid, cool-season bunchgrasses = mid, warm-season grasses > forbs = shrubs >

Other: Short, warm-season grasses = grass-like species > trees

Additional: Other native 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.
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14. **Average percent litter cover (%) and depth ( in):** 80-90 percent plant litter cover, roughly 0.5 to 1 inch in depth. Litter cover is in contact with the soil surface.
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Total annual production ranges from 2,400 to 4,000 pounds/acre, with the reference value being 3,200 pounds/acre (air-dry 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; also Kentucky bluegrass and smooth brome grass.
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17. **Perennial plant reproductive capability:** Perennial grasses have vigorous rhizomes and/or tillers.
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