

## Ecological site R061XN010SD Loamy-North (18-22" PZ)

Accessed: 05/04/2024

### 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.

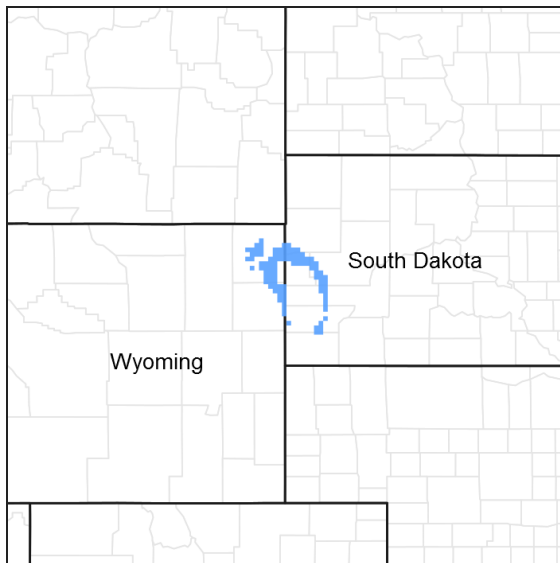


Figure 1. Mapped extent

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

R061XS012SD	<b>Thin Upland-South (16-18" PZ)</b>
R061XS024SD	<b>Shallow Loamy-South (16-18" PZ)</b>
R061XY020SD	<b>Overflow</b>

### Similar sites

R061XY020SD	<b>Overflow</b> (R061XY020SD) – Loamy Overflow [more big bluestem; higher production]
R061XN011SD	<b>Clayey-North (18-22" PZ)</b> (R061XN011SD) – Clayey [more green needlegrass; less needleandthread and big bluestem]

Table 1. Dominant plant species

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

## Physiographic features

This site occurs on nearly level to moderately sloping uplands.

**Table 2. Representative physiographic features**

Landforms	(1) Hill (2) Terrace (3) Fan
Flooding frequency	None
Ponding frequency	None
Elevation	884–1,219 m
Slope	2–15%
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 loam to clay loam textured sub-surface soils, with slopes ranging from about 2 to 15 percent. The soils in this site are well drained and formed in residuum and alluvium. The loam to silt loam surface layer is 4 to 9 inches thick. The soils have a moderate to moderately slow infiltration rate. 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	Moderately slow to moderate
Soil depth	102–203 cm
Surface fragment cover <=3"	0–4%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	15.24–20.32 cm
Calcium carbonate equivalent (0-101.6cm)	0–20%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–2
Soil reaction (1:1 water) (0-101.6cm)	6.1–9
Subsurface fragment volume <=3" (Depth not specified)	0–4%
Subsurface fragment volume >3" (Depth not specified)	0%

## Ecological dynamics

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

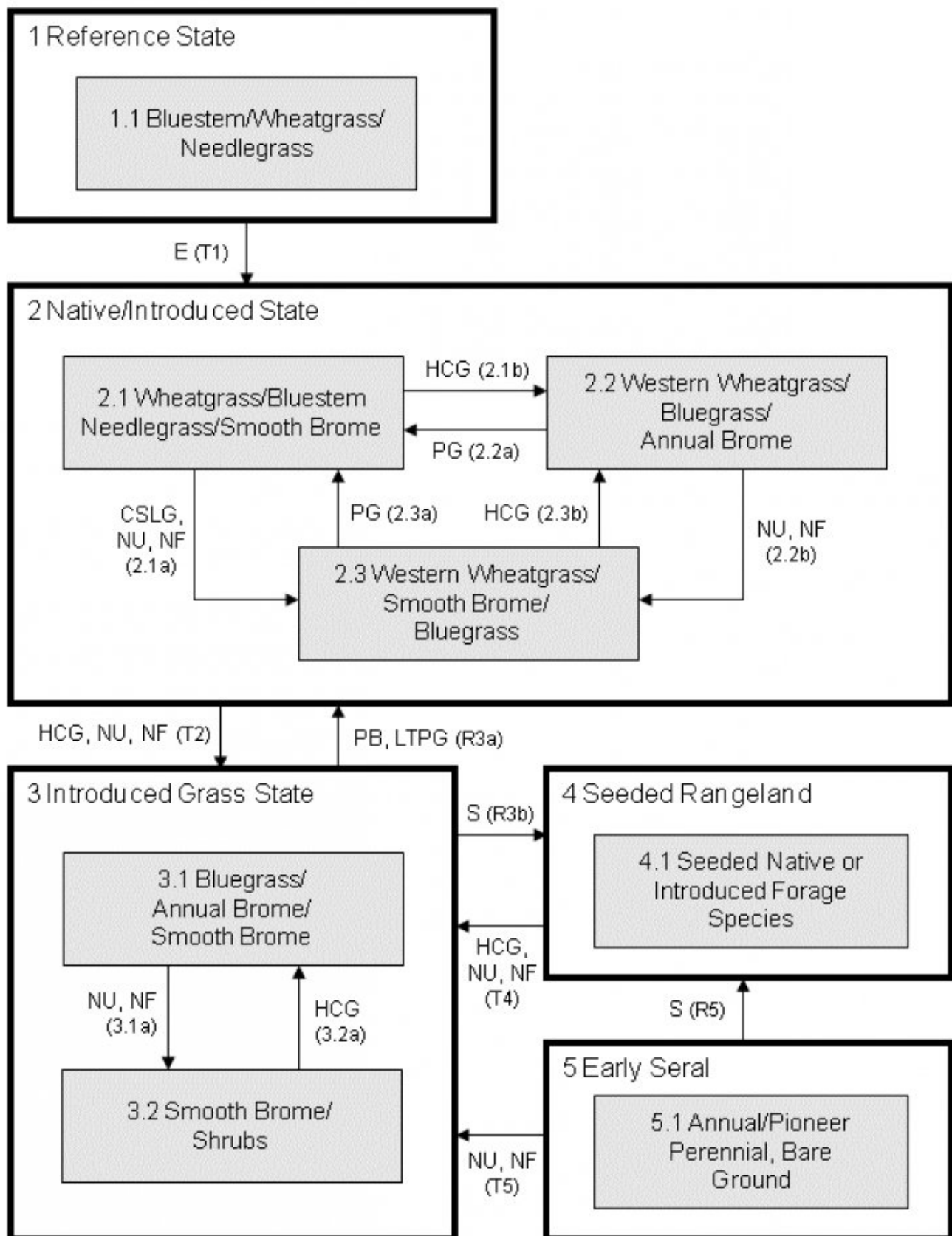
Continuous season-long grazing (during the typical growing season of May through October) and/or heavy continuous grazing (e.g., every spring and/or every summer at moderate to heavy stocking levels) without adequate recovery periods following grazing events causes departure from the Wheatgrass/Bluestem/Needlegrass/Smooth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

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 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; HCG – Heavy continuous grazing; HD – Heavy disturbance; LTPG – Long-term prescribed grazing; NU, NF – Non-use, no fire; PB – Prescribed burning; PG – Prescribed grazing; S – Seeding.

C, HD (T6)  
Any Plant Community

**State 1  
Reference**

This state represents the natural range of variability that dominated the dynamics of this ecological site. This state was co-dominated by cool- and warm-season grasses. In pre-European times, the primary disturbance mechanisms for this site in the reference condition included frequent fire and grazing by large herding ungulates. Timing of fires and grazing coupled with weather events dictated the dynamics that occurred within the natural range of variability. 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  
Bluestem/Wheatgrass/Needlegrass**



Interpretations are based primarily on the Bluestem/Wheatgrass/Needlegrass Plant Community Phase (this is also considered to be climax). The potential vegetation was about 75 percent grasses or grass-like plants, 15 percent forbs, and 10 percent shrubs. The community was co-dominated by cool- and warm-season grasses. The major grasses included big bluestem, western wheatgrass, needleandthread, green needlegrass, and sideoats grama. Other grass or grass-like species included little bluestem, slender wheatgrass, Indiagrass, switchgrass, Idaho fescue, plains muhly, prairie dropseed, and threadleaf sedge. 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	2163	2774	3273
Forb	151	336	600
Shrub/Vine	151	252	387
<b>Total</b>	<b>2465</b>	<b>3362</b>	<b>4260</b>

**Figure 5. 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		

**State 2  
Native/Introduced**

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-season grasses, with warm-season grasses being subdominant. 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. Native cool- and warm-season species can decline and a corresponding increase in non-native species will occur.

## Community 2.1 Wheatgrass/Bluestem/Needlegrass/Smooth Brome

This plant community phase is similar to the 1.1 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 (up to about 15 percent by air-dry weight). The potential vegetation is about 80 percent grasses or grass-like plants, 10 percent forbs, and 10 percent shrubs. The community is co-dominated by cool- and warm-season grasses. The major grasses include western wheatgrass, needleandthread, big bluestem, green needlegrass, sideoats grama, and little bluestem. Other grass or grass-like species include slender wheatgrass, Idaho fescue, plains muhly, prairie dropseed, threadleaf sedge, blue grama, and smooth brome. 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. However, the presence of smooth brome and other invasive species will begin to alter the soil biotic community and potentially lead to further invasion of non-native species.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1771	2382	2948
Shrub/Vine	123	210	319
Forb	123	211	319
<b>Total</b>	<b>2017</b>	<b>2803</b>	<b>3586</b>

Figure 7. 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		

## Community 2.2 Western Wheatgrass/Bluegrass/Annual Brome

This plant community is a result of heavy continuous grazing, continuous season-long grazing at moderate to heavy levels or from over utilization during extended drought periods. The potential plant community is made up of approximately 80 percent grass and grass-like species, 10 percent forbs, and 10 percent shrubs. Dominant grass and grass-like species include western wheatgrass, Kentucky and/or Canada bluegrass, needleandthread, blue grama, threadleaf sedge, and annual brome (cheatgrass and/or Japanese brome). Grasses of secondary importance include green needlegrass, sideoats grama, big bluestem, little bluestem, prairie junegrass, and smooth brome. Forbs commonly found in this plant community include cudweed sagewort, western ragweed, goldenrod, scurfpea, western yarrow, and white prairie aster. When compared to the Bluestem/Wheatgrass/Needlegrass Plant Community Phase (1.1), blue grama and threadleaf sedge has increased, and bluegrass has invaded and increased. Needleandthread and green needlegrass 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 further altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1367	1810	2320
Shrub/Vine	101	159	241
Forb	101	160	241
<b>Total</b>	<b>1569</b>	<b>2129</b>	<b>2802</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		

### Community 2.3 Western Wheatgrass/Smooth Brome/Bluegrass

This plant community is a result of a lack of disturbance over prolonged periods of time, or from light continuous season-long stocking. In the latter case, this plant community may be intermingled with heavily grazed patches. The potential plant community is made up of approximately 70 percent grass and grass-like species, 15 percent forbs, and 15 percent shrubs. Dominant grasses include western wheatgrass, green needlegrass, smooth brome, and Kentucky and/or Canada bluegrass. Grasses and grass-like species of secondary importance included slender wheatgrass, sideoats grama, needleandthread, little bluestem, threadleaf sedge, and blue grama. Forbs commonly found in this plant community include cudweed sagewort, goldenrod, white prairie aster, and western yarrow. When compared to the Bluestem/Wheatgrass/Needlegrass Plant Community Phase (1.1), smooth brome, and bluegrass have invaded and increased to sub-dominance. Green needlegrass and sideoats grama decreased, and production of mid and tall warm-season grasses is also reduced. This plant community is 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.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1670	2062	2343
Shrub/Vine	118	258	454
Forb	118	258	454
<b>Total</b>	<b>1906</b>	<b>2578</b>	<b>3251</b>

Figure 11. 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		

### Pathway 2.1b Community 2.1 to 2.2

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 2.2 Western Wheatgrass/Bluegrass/Annual Brome Plant Community Phase.

### Pathway 2.1a



## **Community 2.1 to 2.3**

Continuous season-long grazing (stocking levels at light to moderate levels for the entire growing season), or non-use and no fire for extended periods will shift this community to the 2.3 Western Wheatgrass/Smooth Brome/Bluegrass Plant Community Phase. With continuous season-long grazing, stocking levels are typically light enough that livestock selectively graze preferred species which results in a patch-grazing effect.

### **Pathway 2.2a**

#### **Community 2.2 to 2.1**

Prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest will convert this plant community to the 2.1 Wheatgrass/Bluestem/Needlegrass/Smooth Brome Plant Community Phase.

#### **Conservation practices**

Prescribed Grazing

### **Pathway 2.2b**

#### **Community 2.2 to 2.3**

Non-use and no fire for extended periods of time will result in an increase of the invasive cool-season grasses and result in the 2.3 Western Wheatgrass/Smooth Brome/Bluegrass Plant Community Phase.

### **Pathway 2.3a**

#### **Community 2.3 to 2.1**

Prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest will convert this plant community to the 2.1 Wheatgrass/Bluestem/Needlegrass/Smooth Brome Plant Community Phase.

#### **Conservation practices**

Prescribed Grazing

### **Pathway 2.3b**

#### **Community 2.3 to 2.2**

Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season) will convert this plant community to the 2.2 Western Wheatgrass/Bluegrass/Annual Brome Plant Community Phase.

## **State 3**

### **Introduced Grass**

This state is the result of invasion and dominance of introduced species. This state is characterized by the dominance of Kentucky bluegrass and smooth brome grass, and an increasing thatch layer that effectively blocks introduction of other plants into the system. Plant litter accumulation tends to favor the more shade tolerant introduced grass species. The nutrient cycle is also impaired, and the result is typically a higher level of nitrogen which also favors the introduced species. Increasing plant litter decreases the amount of sunlight reaching plant crowns thereby shifting competitive advantage to shade tolerant introduced grass species. Studies indicate that soil biological activity is altered, and this shift apparently exploits the soil microclimate and encourages growth of the introduced grass species. Once the threshold is crossed, a change in grazing management alone cannot cause a reduction in the invasive grass dominance. Preliminary studies would tend to indicate this threshold may exist when Kentucky bluegrass exceeds 30% of the plant community and native grasses represent less than 40% of the plant community composition. Once the state is well established, even drastic events such as high intensity fires driven by high fuel loads of litter and thatch will not result in more than a very short term reduction of Kentucky bluegrass. These events may reduce the dominance of Kentucky bluegrass, but due to the large amount of rhizomes in the soil

there is no opportunity for the native species to establish and dominate before Kentucky bluegrass rebounds and again dominates the system.

### Community 3.1 Bluegrass/Annual Brome/Smooth Brome

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/or Canada bluegrass. 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. Along with bluegrass, other species that will be present at varying amounts can include cheatgrass, Japanese brome, smooth brome, and other invasive species that can tolerate repeated heavy grazing. Native species such as western wheatgrass and green needlegrass may be present in minor amounts. Production of this plant community will be approximately 1,600 pounds/acre on an air-dry basis, but can be slightly more or considerably less depending on conditions.

Figure 12. 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 3.2 Smooth Brome/Shrubs

This plant community phase is a result of extended periods of non-use and no fire. It is characterized by a dominance of smooth brome 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 brome, 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. At times, shrubs such as snowberry can also increase significantly in this plant community phase. Other non-native invasive species that can commonly occur include timothy, intermediate wheatgrass, cheatgrass, and Japanese brome. In the early stages of this phase, production can be quite high, sometimes surpassing the production of the 1.1 Bluestem/Wheatgrass/Needlegrass Plant Community Phase. However, over time with the accumulation of plant litter, vegetative reproduction is reduced, and plant vigor suffers as well. This results in a gradual decrease in production. Production of this plant community will be approximately 2,800 pounds/acre on an air-dry basis, but can be more or less depending on conditions.

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		

### Pathway 3.1a Community 3.1 to 3.2

Non-use and no fire for extended periods of time (usually three or more years) or possibly 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 3.2 Smooth Brome/Shrubs Plant Community Phase.

## Conservation practices

Prescribed Grazing

### Pathway 3.2a

#### Community 3.2 to 3.1

Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season, typically at the same time of year each year) or heavy continuous season-long grazing will convert this plant community to the 3.1 Bluegrass/Annual Brome/Smooth Brome Plant Community Phase.

### State 4

#### Seeded Rangeland

This state is the result of seeding of introduced forage-type species, improved/selected varieties of native species, or a combination thereof. The soil and site stability, and the hydrologic function will typically be improved as compared to either the Introduced Grass State (State 3) or Early Seral State (State 5). The biotic integrity will also likely be improved depending on the species established.

### Community 4.1

#### Seeded Native or Introduced Forage Species

This plant community phase is the result of seeding of introduced forage-type species, improved/selected varieties of native species, or a combination thereof. Typical non-native species that are seeded include intermediate and/or pubescent wheatgrass, and alfalfa or other adapted forage legume species. Refer to the related Forage Suitability Group Description for more information about adapted species and management-dependent production levels.

### State 5

#### Early Seral

This state is the result of very heavy, concentrated disturbance such as cropping, concentrated rodent activity, or concentrated livestock areas. This State can also result from invasion by highly competitive weed species such as Canada thistle, hound's tongue, leafy spurge, or knapweeds. In most cases, this phase is dominated by annual and/or pioneer perennial species. Bare ground is also typically much higher than on any other plant community phase.

### Community 5.1

#### Annual/Pioneer Perennial, Bare Ground

This plant community developed under continuous heavy grazing or other excessive disturbances (e.g., heavy use areas, abandoned cropland, defoliation by rodents, etc.). The potential plant community is made up of approximately 60 to 80 percent grasses and grass-like species, 15 to 35 percent forbs, and 2 to 5 percent shrubs. The dominant grass is often threeawn. Other grasses may include cheatgrass, annual brome (Japanese brome and cheatgrass), sedge, blue grama, sand dropseed, bluegrass, and western wheatgrass. The dominant forbs include fetid marigold, sweetclover, western ragweed, cudweed sagewort, and other invader-like species. The dominant shrubs include fringed sagewort, broom snakeweed and cactus. A wide variety of other early seral plant species can occupy this site in varying amounts. This plant community is susceptible to invasion of Canada thistle and other non-native species because of the relatively high percent of bare ground. Compared to the Bluestem/Wheatgrass/Needlegrass Plant Community Phase (1.1), red threeawn, annual brome grasses, and percent of bare ground has increased. Western wheatgrass, needlegrasses and other cool-season grasses have decreased as have the warm-season species including big bluestem, sideoats grama, and little bluestem. 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.

### **Transition T1 State 1 to 2**

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

### **Transition T6 State 1 to 5**

Abandonment of cropping, encroachment of non-native invasive/noxious species, or extremely heavy disturbance (such as areas with concentrated animal/rodent use) may lead this plant community phase over a threshold to the Early Seral State (State 5) and more specifically to the 5.1 Annual/Pioneer Perennial, Bare Ground Plant Community Phase.

### **Transition T2 State 2 to 3**

Heavy continuous grazing or non-use and no fire for prolonged periods of time (several years) will lead this plant community phase over a threshold to the Introduced Grass State (State 3).

### **Transition T6 State 2 to 5**

Abandonment of cropping, encroachment of non-native invasive/noxious species, or extremely heavy disturbance (such as areas with concentrated animal/rodent use) may lead this plant community phase over a threshold to the Early Seral State (State 5) and more specifically to the 5.1 Annual/Pioneer Perennial, Bare Ground Plant Community Phase.

### **Restoration pathway R3a State 3 to 2**

Prescribed burning, followed by 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/Introduced State (State 2). Pest management (i.e., herbicide) may also be needed to suppress cool-season invasive grasses. This will likely take a long period of time, 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 Burning
Prescribed Grazing
Integrated Pest Management (IPM)

### **Restoration pathway R3b State 3 to 4**

Seeding of introduced forage-type species, seeding of improved/selected varieties of native species, or a combination of the two may lead this plant community phase over a threshold to the Seeded Rangeland State (State 4). While the biotic integrity of the plant community may not be improved, the hydrologic function will likely be significantly improved compared to the Introduced Grass State (State 3).

## Transition T6 State 3 to 5

Abandonment of cropping, encroachment of non-native invasive/noxious species, or extremely heavy disturbance (such as areas with concentrated animal/rodent use) may lead this plant community phase over a threshold to the Early Seral State (State 5) and more specifically to the 5.1 Annual/Pioneer Perennial, Bare Ground Plant Community Phase.

## Transition T4 State 4 to 3

Heavy continuous grazing or non-use and no fire for prolonged periods of time (typically five or more years) will lead this plant community phase over a threshold to the Introduced Grass State (State 3). Refer to the associated Forage Suitability Group Description and the Field Office Technical Guide for management guidance related to maintaining stands of introduced forage species.

## Transition T6 State 4 to 5

Abandonment of cropping, encroachment of non-native invasive/noxious species, or extremely heavy disturbance (such as areas with concentrated animal/rodent use) may lead this plant community phase over a threshold to the Early Seral State (State 5) and more specifically to the 5.1 Annual/Pioneer Perennial, Bare Ground Plant Community Phase.

## Transition T5 State 5 to 3

Non-use and no fire for prolonged periods of time (typically five or more years) will lead this plant community phase over a threshold to the Introduced Grass State (State 3).

## Restoration pathway R5 State 5 to 4

Seeding of introduced forage-type species, seeding of improved/selected varieties of native species, or a combination of the two may lead this plant community phase over a threshold to the Seeded Rangeland State (State 4).

## 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>			336–841	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	336–841	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	34–168	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–101	–
2	<b>Wheatgrass</b>			336–841	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	336–673	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	34–336	–
3	<b>Cool-Season Bunchgrasses</b>			336–673	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	168–504	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	168–504	–
	Idaho fescue	FFID	<i>Festuca idahoensis</i>	0–168	–

	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	0–67	–
4	<b>Mid Warm-Season Grasses</b>			336–673	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	168–504	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	67–336	–
	prairie dropseed	SPHE	<i>Sporobolus heterolepis</i>	34–168	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	34–168	–
5	<b>Grass-likes</b>			67–168	
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–168	–
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	34–168	–
	sun sedge	CAINH2	<i>Carex inops ssp. heliophila</i>	34–101	–
6	<b>Other Native Grasses</b>			67–168	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–168	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	34–168	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	34–101	–
	Cusick's bluegrass	POCU3	<i>Poa cusickii</i>	0–101	–
<b>Forb</b>					
7	<b>Forbs</b>			168–504	
	Forb, native	2FN	<i>Forb, native</i>	34–135	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	34–101	–
	prairie clover	DALEA	<i>Dalea</i>	34–101	–
	scurfpea	PSORA2	<i>Psoralegium</i>	34–101	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	34–67	–
	goldenrod	SOLID	<i>Solidago</i>	34–67	–
	white prairie aster	SYFA	<i>Symphyotrichum falcatum</i>	34–67	–
	American vetch	VIAM	<i>Vicia americana</i>	34–67	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	34–67	–
	false boneset	BREU	<i>Brickellia eupatorioides</i>	34–67	–
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	34–67	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	34–67	–
	scarlet beeblossom	GACO5	<i>Gaura coccinea</i>	34–67	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	34–67	–
	western marblesseed	ONBEO	<i>Onosmodium bejariense var. occidentale</i>	34–67	–
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	34–67	–
	beardtongue	PENST	<i>Penstemon</i>	34–67	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0–34	–
	cinquefoil	POTEN	<i>Potentilla</i>	0–34	–
	four o'clock	MIRAB	<i>Mirabilis</i>	0–34	–
	wild bergamot	MOFI	<i>Monarda fistulosa</i>	0–34	–
	sanddune wallflower	ERCAC	<i>Erysimum capitatum var. capitatum</i>	0–34	–
	fleabane	ERIGE2	<i>Erigeron</i>	0–34	–
	deathcamas	ZIGAD	<i>Zigadenus</i>	0–34	–

Shrub/Vine					
8	<b>Shrubs</b>			168–336	
	leadplant	AMCA6	<i>Amorpha canescens</i>	34–135	–
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	34–101	–
	rose	ROSA5	<i>Rosa</i>	34–67	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	34–67	–
	big sagebrush	ARTR2	<i>Artemisia tridentata</i>	0–67	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	0–67	–
	pricklypear	OPUNT	<i>Opuntia</i>	0–34	–
	American plum	PRAM	<i>Prunus americana</i>	0–34	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0–34	–

Table 10. Community 2.1 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>			56–420	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	56–420	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	0–56	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–28	–
2	<b>Wheatgrass</b>			420–841	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	420–841	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–140	–
3	<b>Cool-Season Bunchgrasses</b>			280–701	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	140–560	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	140–420	–
	Idaho fescue	FEID	<i>Festuca idahoensis</i>	0–140	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	0–56	–
4	<b>Mid Warm-Season Grasses</b>			140–420	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	56–280	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	56–280	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	0–84	–
	prairie dropseed	SPHE	<i>Sporobolus heterolepis</i>	0–84	–
5	<b>Grass-likes</b>			56–140	
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–140	–
	threadleaf sedge	CAF1	<i>Carex filifolia</i>	28–140	–
	sun sedge	CAINH2	<i>Carex inops ssp. heliophila</i>	28–84	–
6	<b>Other Native Grasses</b>			56–140	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–140	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	28–140	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	28–84	–
	Cusick's bluegrass	POCU3	<i>Poa cusickii</i>	0–56	–
7	<b>Non-Native Grasses</b>			140–420	

	smooth brome	BRIN2	<i>Bromus inermis</i>	28–280	–
	bluegrass	POA	<i>Poa</i>	28–140	–
	brome	BROMU	<i>Bromus</i>	28–84	–
	timothy	PHPR3	<i>Phleum pratense</i>	0–84	–
<b>Forb</b>					
8	<b>Forbs</b>			140–280	
	Forb, native	2FN	<i>Forb, native</i>	28–84	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	28–84	–
	scurfpea	PSORA2	<i>Psoraleidum</i>	28–84	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	28–56	–
	goldenrod	SOLID	<i>Solidago</i>	28–56	–
	white prairie aster	SYFA	<i>Symphotrichum falcatum</i>	28–56	–
	American vetch	VIAM	<i>Vicia americana</i>	28–56	–
	western marbleseed	ONBEO	<i>Onosmodium bejariense</i> var. <i>occidentale</i>	0–56	–
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	28–56	–
	false boneset	BREU	<i>Brickellia eupatorioides</i>	0–56	–
	prairie clover	DALEA	<i>Dalea</i>	28–56	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	28–56	–
	scarlet beeblossom	GACO5	<i>Gaura coccinea</i>	28–56	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	28–56	–
	western yarrow	ACMIO	<i>Achillea millefolium</i> var. <i>occidentalis</i>	28–56	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	28–56	–
	four o'clock	MIRAB	<i>Mirabilis</i>	0–28	–
	wild bergamot	MOFI	<i>Monarda fistulosa</i>	0–28	–
	sanddune wallflower	ERCAC	<i>Erysimum capitatum</i> var. <i>capitatum</i>	0–28	–
	fleabane	ERIGE2	<i>Erigeron</i>	0–28	–
	beardtongue	PENST	<i>Penstemon</i>	0–28	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0–28	–
	cinquefoil	POTEN	<i>Potentilla</i>	0–28	–
	deathcamas	ZIGAD	<i>Zigadenus</i>	0–28	–
<b>Shrub/Vine</b>					
9	<b>Shrubs</b>			140–280	
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	28–112	–
	leadplant	AMCA6	<i>Amorpha canescens</i>	28–84	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	0–56	–
	rose	ROSA5	<i>Rosa</i>	28–56	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	28–56	–
	big sagebrush	ARTR2	<i>Artemisia tridentata</i>	0–56	–
	pricklypear	OPUNT	<i>Opuntia</i>	0–28	–
	American plum	PRAM	<i>Prunus americana</i>	0–28	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0–28	–



Table 11. Community 2.2 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>			0–106	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–106	–
2	<b>Wheatgrass</b>			106–639	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	106–639	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–64	–
3	<b>Cool-Season Bunchgrasses</b>			64–213	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	43–213	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	21–170	–
4	<b>Mid Warm-Season Grasses</b>			21–106	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	21–106	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–106	–
5	<b>Grass-likes</b>			106–319	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	43–213	–
	sun sedge	CAINH2	<i>Carex inops ssp. heliophila</i>	21–106	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–106	–
6	<b>Other Native Grasses</b>			106–319	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	43–213	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	21–85	–
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–85	–
	Cusick's bluegrass	POCU3	<i>Poa cusickii</i>	0–21	–
7	<b>Non-Native Grasses</b>			106–532	
	bluegrass	POA	<i>Poa</i>	106–319	–
	brome	BROMU	<i>Bromus</i>	43–213	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	0–106	–
<b>Forb</b>					
8	<b>Forbs</b>			106–213	
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	21–85	–
	Forb, introduced	2FI	<i>Forb, introduced</i>	21–64	–
	Forb, native	2FN	<i>Forb, native</i>	0–64	–
	scurfpea	PSORA2	<i>Psoralegium</i>	21–64	–
	goldenrod	SOLID	<i>Solidago</i>	21–64	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	21–64	–
	white prairie aster	SYFA	<i>Symphotrichum falcatum</i>	21–43	–
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	21–43	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–21	–
	American vetch	VIAM	<i>Vicia americana</i>	0–21	–
	deathcamas	ZIGAD	<i>Zigadenus</i>	0–21	–
	false boneset	BREU	<i>Brickellia eupatorioides</i>	0–21	–

	prairie clover	DALEA	<i>Dalea</i>	0–21	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	0–21	–
	scarlet beeblossom	GACO5	<i>Gaura coccinea</i>	0–21	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0–21	–
	wild bergamot	MOFI	<i>Monarda fistulosa</i>	0–21	–
	western marbleseed	ONBEO	<i>Onosmodium bejariense</i> var. <i>occidentale</i>	0–21	–
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	0–21	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0–21	–
	cinquefoil	POTEN	<i>Potentilla</i>	0–21	–
<b>Shrub/Vine</b>					
9	<b>Shrubs</b>			106–213	
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	21–106	–
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	21–85	–
	big sagebrush	ARTR2	<i>Artemisia tridentata</i>	0–43	–
	pricklypear	OPUNT	<i>Opuntia</i>	0–43	–
	rose	ROSA5	<i>Rosa</i>	21–43	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	0–21	–
	leadplant	AMCA6	<i>Amorpha canescens</i>	0–21	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0–21	–

Table 12. Community 2.3 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>			26–258	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	26–258	–
2	<b>Wheatgrass</b>			258–773	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	258–773	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–129	–
3	<b>Cool-Season Bunchgrasses</b>			129–387	
	green needlegrass	NAVI4	<i>Nassella viridula</i>	129–387	–
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	26–206	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	0–77	–
	Idaho fescue	FEID	<i>Festuca idahoensis</i>	0–52	–
4	<b>Mid Warm-Season Grasses</b>			26–129	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–103	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	26–77	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	0–26	–
	prairie dropseed	SPHE	<i>Sporobolus heterolepis</i>	0–26	–
5	<b>Grass-likes</b>			26–129	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	26–103	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–77	–
	sun sedge	CAINH2	<i>Carex inops</i> ssp. <i>heliophila</i>	0–52	–

6	<b>Other Native Grasses</b>			52–129	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–129	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	26–103	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	26–52	–
	Cusick's bluegrass	POCU3	<i>Poa cusickii</i>	0–26	–
7	<b>Non-Native Grasses</b>			258–773	
	smooth brome	BRIN2	<i>Bromus inermis</i>	129–644	–
	bluegrass	POA	<i>Poa</i>	129–516	–
	brome	BROMU	<i>Bromus</i>	26–206	–
	timothy	PHPR3	<i>Phleum pratense</i>	26–206	–
<b>Forb</b>					
8	<b>Forbs</b>			129–387	
	Forb, introduced	2FI	<i>Forb, introduced</i>	26–129	–
	Forb, native	2FN	<i>Forb, native</i>	26–77	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	26–77	–
	goldenrod	SOLID	<i>Solidago</i>	26–77	–
	white prairie aster	SYFA	<i>Symphyotrichum falcatum</i>	26–77	–
	American vetch	VIAM	<i>Vicia americana</i>	26–52	–
	scurfpea	PSORA2	<i>Psoralegium</i>	26–52	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	26–52	–
	wild bergamot	MOFI	<i>Monarda fistulosa</i>	0–52	–
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	26–52	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	26–52	–
	prairie clover	DALEA	<i>Dalea</i>	26–52	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	0–26	–
	sanddune wallflower	ERCAC	<i>Erysimum capitatum var. capitatum</i>	0–26	–
	fleabane	ERIGE2	<i>Erigeron</i>	0–26	–
	scarlet beeblossom	GACO5	<i>Gaura coccinea</i>	0–26	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0–26	–
	four o'clock	MIRAB	<i>Mirabilis</i>	0–26	–
	western marbleseed	ONBEO	<i>Onosmodium bejariense var. occidentale</i>	0–26	–
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	0–26	–
	beardtongue	PENST	<i>Penstemon</i>	0–26	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	0–26	–
	cinquefoil	POTEN	<i>Potentilla</i>	0–26	–
	false boneset	BREU	<i>Brickellia eupatorioides</i>	0–26	–
	deathcamas	ZIGAD	<i>Zigadenus</i>	0–26	–
<b>Shrub/Vine</b>					
9	<b>Shrubs</b>			129–387	
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	26–258	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	26–103	–
	big sagebrush	ARTR2	<i>Artemisia tridentata</i>	0–103	–

	rose	ROSA5	<i>Rosa</i>	26–77	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0–77	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	0–52	–
	leadplant	AMCA6	<i>Amorpha canescens</i>	0–52	–
	American plum	PRAM	<i>Prunus americana</i>	0–52	–
	pricklypear	OPUNT	<i>Opuntia</i>	0–26	–

## Animal community

### Animal Community – Grazing Interpretations

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

#### Bluestem/Wheatgrass/Needlegrass (1.1)

Average Annual Production (lbs./acre, air-dry): 3,000

Stocking Rate\* (AUM/acre): 0.82

#### Wheatgrass/Bluestem/Needlegrass/Smooth Brome (2.1)

Average Annual Production (lbs./acre, air-dry): 2,500

Stocking Rate\* (AUM/acre): 0.69

#### Western Wheatgrass/Bluegrass/Annual Brome (2.2)

Average Annual Production (lbs./acre, air-dry): 1,900

Stocking Rate\* (AUM/acre): 0.52

#### Western Wheatgrass/Smooth Brome/Bluegrass (2.3)

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

Stocking Rate\* (AUM/acre): 0.63

#### Bluegrass/Annual Brome/Smooth Brome (3.1)

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

Stocking Rate\* (AUM/acre): 0.44

#### Smooth Brome/Shrubs (3.2)

Average Annual Production (lbs./acre, air-dry): 2,800

Stocking Rate\* (AUM/acre): 0.77

#### Annual/Pioneer Perennial, Bare Ground (5.1)

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 brome grass 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 should not be present.  

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

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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 patches less than 2 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.  

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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 rating usually 6. Typically high root content, organic matter, and granular structure. 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, and mollic (higher organic matter) colors of A-horizon about 5 to 10 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 grasses 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 evident.
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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 = wheatgrass (mid, cool-season grasses) >

Sub-dominant: Mid and tall, cool-season bunchgrasses = mid, warm-season grasses >

Other: Forbs > shrubs > 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):** 80 to 90 percent plant litter cover, roughly 0.5 to 1 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 2,200 to 3,800 pounds/acre. Reference value is 3,000 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; also Kentucky bluegrass, smooth brome grass.
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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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