

Ecological site R061XY022SD Loamy Terrace

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.

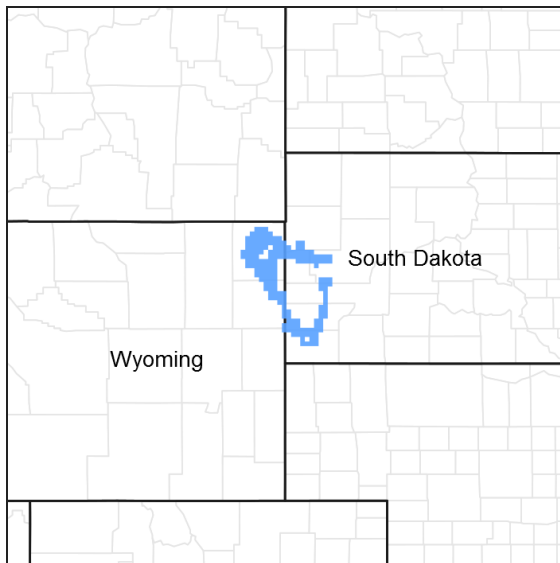


Figure 1. Mapped extent

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

R061XN010SD	Loamy-North (18-22" PZ)
R061XS010SD	Loamy-South (16-18" PZ)
R061XY020SD	Overflow

Similar sites

R061XN010SD	Loamy-North (18-22" PZ) (R061XN010SD) & (R061XS010SD) – Loamy [less shrubs; lower production]
R061XY020SD	Overflow (R061XY020SD) – Loamy Overflow [more big bluestem, higher production]
R061XS010SD	Loamy-South (16-18" PZ) (R061XN010SD) & (R061XS010SD) – Loamy [less shrubs; lower production]

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Pascopyrum smithii</i> (2) <i>Nassella viridula</i>

Physiographic features

This site occurs on nearly level stream terraces.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Terrace
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	None to rare
Ponding frequency	None
Elevation	884–1,219 m
Slope	0–4%
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

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

Soil features

The soils in this site are well drained and formed in alluvium. The silt loam to very fine sandy loam surface layer is 3 to 10 inches thick. The soils have a moderate to moderately slow infiltration rate. At one time, this site was in the active floodplain zone, but downcutting of the channel has left this site out of reach of the water table and flooding. 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) Very fine sandy loam (3) Loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderate
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)	0–15%
Electrical conductivity (0-101.6cm)	0–8 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–5
Soil reaction (1:1 water) (0-101.6cm)	6.6–9
Subsurface fragment volume <=3" (Depth not specified)	0–33%
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.

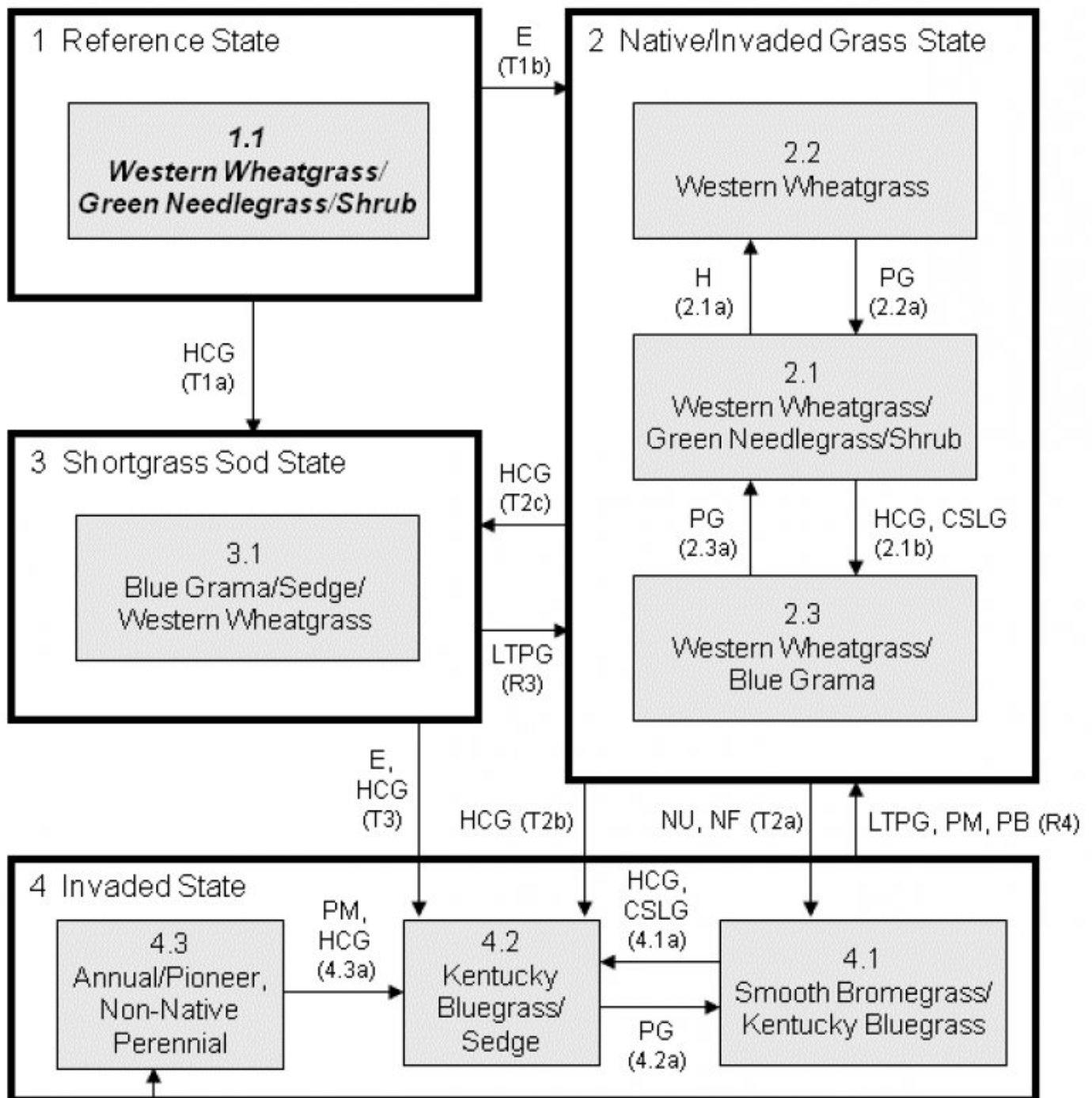
Continuous season-long grazing (during the typical growing season of May through October) and/or heavy

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 Western Wheatgrass/Green Needlegrass/Shrub 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 and big bluestem will decrease in frequency and production. Extended periods of non-use and lack of fire will result in excessive litter and a plant community dominated by cool-season grasses such as green needlegrass, western wheatgrass, bluegrass, and smooth brome grass. Remnant mature trees are randomly present across this site, but recruitment does not typically occur

Interpretations are primarily based on the Western Wheatgrass/Green Needlegrass/Shrub 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



E, S,
C (T5)

**Any Plant
Community**

Refer to narrative for details on pathways: **C** – Cropped, abandoned; **CSLG** – Continuous season-long grazing; **E** – Encroachment of introduced species; **H** – Haying on a regular basis; **HCG** – Heavy continuous grazing; **LTPG** – Long-term prescribed grazing; **NU, NF** – Non-use, no fire; **PB** – Prescribed burning; **PG** – Prescribed grazing; **PM** – Pest management (herbicide); **S** – Seeding.

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 cool-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 shorter statured grasses and grass-likes with a corresponding decrease in taller cool-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 Western Wheatgrass/Green Needlegrass/Shrub



Interpretations are based primarily on the Western Wheatgrass/Green Needlegrass/Shrub Plant Community Phase (this is also considered to be climax). The potential vegetation was about 70 percent grasses or grass-like plants, 10 percent forbs, 20 percent shrubs, and scattered mature trees in some locations. The community was dominated by cool-season grasses. The major grasses included western wheatgrass and green needlegrass. Other grass or grass-like species included big bluestem, prairie sandreed, needleandthread, slender wheatgrass, Canada wildrye, little bluestem, sideoats grama, sedge, 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	1833	2385	2830
Shrub/Vine	269	471	751
Forb	140	235	359
Tree	–	47	95
Total	2242	3138	4035

Figure 5. 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 2 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 typically dominated by cool-season grasses. It can be found on areas that are properly managed with grazing and/or prescribed burning, and sometimes on areas receiving occasional short periods of rest. Taller grass species can decline and a corresponding increase in short statured grass will occur.

Community 2.1 Western Wheatgrass/Green Needlegrass/Shrub

This plant community phase is similar to the 1.1 Western Wheatgrass/Green Needlegrass/Shrub 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 70 percent grasses or grass-like plants, 10 percent forbs, 20 percent shrubs, and scattered mature trees in some locations. The community is dominated by cool-season grasses. The major grasses include western wheatgrass and green needlegrass. Other grass or grass-like species include big bluestem, prairie sandreed, needleandthread, slender wheatgrass, Canada wildrye, little bluestem, sideoats grama, sedge, Kentucky bluegrass, smooth brome grass, and blue grama. 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 6. 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

This plant community occurs when the site is hayed on an annual or regular basis. This type of management tends to simplify the plant community, and species that can survive intermittent, severe defoliation will increase and dominate the site. The potential vegetation is about 90 percent grasses or grass-like plants, 5 percent forbs, 5 percent shrubs, and occasional scattered, mature trees. The community is dominated by western wheatgrass. This plant community is resistant to change as long as haying continues, but will readily shift back to the 1.1 Western Wheatgrass/Green Needlegrass/Shrub Plant Community Phase with a cessation of haying and implementation of prescribed grazing. If the trees and shrubs were largely removed during haying operations (instead of just avoided as is sometimes the case), the resulting plant community will resemble the 1.1 plant community phase, but will lack woody species.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1552	2085	2595
Shrub/Vine	–	56	123
Forb	17	67	123
Tree	–	34	73
Total	1569	2242	2914

Figure 8. 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 2.3 Western Wheatgrass/Blue Grama

This plant community evolves under heavy continuous grazing, continuous season-long grazing, or from over utilization during extended drought periods. The potential plant community is made up of approximately 75 percent grasses and grass-like species, 10 percent forbs, 15 percent shrubs, and a minor amount of trees in some

locations. Dominant grass and grass-like species include western wheatgrass, green needlegrass, blue grama, and sedge. Grasses of secondary importance include needleandthread, prairie sandreed, tall dropseed, buffalograss, and Kentucky bluegrass. Forbs commonly found in this plant community include cudweed sagewort, goldenrod, green sagewort, woolly verbena, and western yarrow. Dominant shrubs are western snowberry and silver sagebrush. When compared to the Western Wheatgrass/Green Needlegrass/Shrub Plant Community Phase (1.1), western wheatgrass, blue grama and sedges increase. Green needlegrass and big bluestem decrease, and production of all tall and mid grasses are 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 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1356	1816	2202
Shrub/Vine	106	224	387
Forb	106	168	252
Tree	–	34	73
Total	1568	2242	2914

Figure 10. 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 2.1b
Community 2.1 to 2.2**

Haying on an annual or regular basis will shift this plant community to the 2.2 Western Wheatgrass Plant Community Phase.

**Pathway 2.1a
Community 2.1 to 2.3**

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 2.3 Western Wheatgrass/Blue Grama Plant Community Phase.

**Pathway 2.2a
Community 2.2 to 2.1**

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

Conservation practices

Prescribed Grazing

**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 1.1 Western Wheatgrass/Green Needlegrass/Shrub Plant Community Phase.

Conservation practices

Prescribed Grazing

State 3 Shortgrass Sod

This state occurs as a result of heavy stocking levels, inadequate recovery periods between grazing events, or a combination of these disturbances. This state is dominated by warm--season grasses, with cool-season grasses being subdominant. The shallow, compact nature of the roots of the dominant species causes increased runoff and reduced infiltration. In addition, reduced shading due to a lesser amount of foliar cover causes increased soil temperatures and increased evaporation of the surface soil moisture. These conditions combine to cause the site to become more droughty, and thus reduce the opportunity for recruitment and/or establishment of the taller statured grasses. This state is relatively stable and resistant to change.

Community 3.1 Blue Grama/Sedge/Western Wheatgrass

This plant community evolved under heavy continuous season grazing or from over utilization during extended drought periods. The potential plant community is made up of approximately 75 percent grasses and grass-like species, 15 percent forbs, 10 percent shrubs, and scattered mature trees. Dominant grass and grass-like species include blue grama, sedge and western wheatgrass. Grasses of secondary importance include needleandthread, sand dropseed, and sometimes Kentucky bluegrass. Forbs commonly found in this plant community included cudweed sagewort, goldenrod, green sagewort, scurfpea, western ragweed, and western yarrow. When compared to the Western Wheatgrass/Green Needlegrass/Shrub Plant Community Phase (1.1), blue grama, sedge and western wheatgrass dominate this plant community. This vegetation state is very resistant to change. The herbaceous species present are well adapted to grazing. This plant community is less productive than most other phases. The thick sod prevents other species from establishing.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	908	1295	1636
Forb	73	157	269
Shrub/Vine	28	94	174
Tree	–	24	50
Total	1009	1570	2129

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

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

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 a single high intensity fire driven by high fuel loads of litter and thatch may 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 may not be an 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.

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 grazing or 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.

Figure 14. 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 grazing (stocking levels well above carrying capacity for extended portions of the growing season, and at the same time of year each year) or 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

Pathway 4.3a **Community 4.3 to 4.2**

Pest management (herbicides) and often heavy continuous 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)

Transition T1b **State 1 to 2**

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

Transition T1a **State 1 to 3**

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 shift this community to the 3.1 Blue Grama/Sedge/Western Wheatgrass Plant Community Phase within the Shortgrass Sod State (State 3). In pre-settlement times, this transition would have happened where concentrated grazing occurred such as near water sources. After the area began to be settled, and with the encroachment of non-native species, the resulting plant community would also have minor amounts of species such as Kentucky bluegrass, cheatgrass, and smooth bromegrass.

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 T2b State 2 to 3

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 shift this community to one of two states/phases. If non-native species such as Kentucky bluegrass are present in only minor amounts when this transition occurs, it will shift across a threshold to the 3.1 Blue Grama/Sedge/Western Wheatgrass Plant Community Phase within the Shortgrass Sod State (State 3). If however the non-native species make up roughly 20 percent or more of the plant community when this transition occurs, it will shift across a threshold to the 4.2 Kentucky Bluegrass/Sedge Plant Community Phase within the Invaded State (State 4).

Transition T2c State 2 to 4

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 shift this community to one of two states/phases. If non-native species such as Kentucky bluegrass are present in only minor amounts when this transition occurs, it will shift across a threshold to the 3.1 Blue Grama/Sedge/Western Wheatgrass Plant Community Phase within the Shortgrass Sod State (State 3). If however the non-native species make up roughly 20 percent or more of the plant community when this transition occurs, it will shift across a threshold to the 4.2 Kentucky Bluegrass/Sedge Plant Community Phase within the Invaded State (State 4).

Transition T2a State 2 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).

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).

Restoration pathway R3 State 3 to 2

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 2). 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

Transition T3 State 3 to 4

Encroachment of non-native grasses such as Kentucky bluegrass, a continuation of heavy continuous grazing (moderate to heavy stocking levels at the same time of year each year without adequate recovery periods), and disruption of natural disturbance regimes (typically as a result of fire suppression following settlement) will lead this state over a threshold to the 4.2 Kentucky Bluegrass/Sedge Plant Community Phase within the Invaded State (State 4).

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).

Restoration pathway R4 State 4 to 2

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 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 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 (%)
Grass/Grasslike					
1	Wheatgrasses			628–1098	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	628–1098	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–157	–
2	Cool-Season Bunchgrasses			471–785	
	green needlegrass	NAVI4	<i>Nassella viridula</i>	314–785	–
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	63–314	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	0–157	–
3	Mid & Tall Warm-Season Grasses			157–628	
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	63–471	–
	big bluestem	ANGE	<i>Andropogon gerardii</i>	31–251	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	31–157	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–157	–

	composite dropseed	SPCOC2	<i>Sporobolus compositus</i> var. <i>compositus</i>	0–94	–
4	Short Warm-Season Grasses			31–157	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	31–157	–
	buffalograss	BODA2	<i>Bouteloua dactyloides</i>	0–94	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–63	–
5	Other Native Grasses			31–157	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–157	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	31–94	–
	Cusick's bluegrass	POCU3	<i>Poa cusickii</i>	0–63	–
6	Grass-likes			31–220	
	sedge	CAREX	<i>Carex</i>	31–220	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–94	–
Forb					
7	Forbs			157–314	
	goldenrod	SOLID	<i>Solidago</i>	31–94	–
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	31–94	–
	Maximilian sunflower	HEMA2	<i>Helianthus maximiliani</i>	31–94	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	31–94	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	0–63	–
	Forb, native	2FN	<i>Forb, native</i>	31–63	–
	western yarrow	ACMIO	<i>Achillea millefolium</i> var. <i>occidentalis</i>	31–63	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	31–63	–
	prairie clover	DALEA	<i>Dalea</i>	31–63	–
	scurfpea	PSORA2	<i>Psoralegium</i>	31–63	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	31–63	–
	white prairie aster	SYFA	<i>Symphyotrichum falcatum</i>	31–63	–
	hoary verbena	VEST	<i>Verbena stricta</i>	31–63	–
	American vetch	VIAM	<i>Vicia americana</i>	31–63	–
	false boneset	BREU	<i>Brickellia eupatorioides</i>	0–31	–
	scarlet beeblossom	GACO5	<i>Gaura coccinea</i>	0–31	–
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	0–31	–
	wood lily	LIPH	<i>Lilium philadelphicum</i>	0–31	–
	dotted blazing star	LIPU	<i>Liatis punctata</i>	0–31	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0–31	–
Shrub/Vine					
8	Shrubs			314–628	
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	63–314	–
	silver buffaloberry	SHAR	<i>Shepherdia argentea</i>	31–251	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–251	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	63–251	–
	leadplant	AMCA6	<i>Amorpha canescens</i>	31–157	–

	big sagebrush	ARTR2	<i>Artemisia tridentata</i>	0–126	–
	American plum	PRAM	<i>Prunus americana</i>	0–126	–
	chokecherry	PRVI	<i>Prunus virginiana</i>	0–94	–
	rose	ROSA5	<i>Rosa</i>	31–94	–
Tree					
9	Trees			0–94	
	Tree	2TREE	<i>Tree</i>	0–94	–
	boxelder	ACNE2	<i>Acer negundo</i>	0–94	–
	green ash	FRPE	<i>Fraxinus pennsylvanica</i>	0–94	–
	plains cottonwood	PODEM	<i>Populus deltoides ssp. monilifera</i>	0–94	–
	American elm	ULAM	<i>Ulmus americana</i>	0–94	–

Table 10. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Wheatgrasses			1121–1569	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	1121–1569	–
2	Cool-Season Bunchgrasses			0–112	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	0–67	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0–67	–
3	Mid & Tall Warm-Season Grasses			0–112	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0–90	–
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–67	–
	composite dropseed	SPCOC2	<i>Sporobolus compositus var. compositus</i>	0–45	–
4	Short Warm-Season Grasses			45–224	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	45–224	–
	buffalograss	BODA2	<i>Bouteloua dactyloides</i>	0–135	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–67	–
5	Other Native Grasses			0–67	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–67	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–22	–
6	Grass-likes			22–224	
	sedge	CAREX	<i>Carex</i>	22–224	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–67	–
7	Non-Native Grasses			22–224	
	bluegrass	POA	<i>Poa</i>	22–224	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	0–45	–
	brome	BROMU	<i>Bromus</i>	0–45	–
Forb					
8	Forbs			22–112	
	Forb, introduced	2FI	<i>Forb, introduced</i>	22–67	–

	western yarrow	ACMIO	<i>Achillea millefolium</i> var. <i>occidentalis</i>	22–67	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0–45	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0–45	–
	Forb, native	2FN	<i>Forb, native</i>	0–45	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	0–22	–
	goldenrod	SOLID	<i>Solidago</i>	0–22	–
Shrub/Vine					
9	Shrubs			0–112	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–112	–
	silver buffaloberry	SHAR	<i>Shepherdia argentea</i>	0–67	–
	rose	ROSA5	<i>Rosa</i>	0–45	–
Tree					
10	Trees			0–67	
	Tree	2TREE	<i>Tree</i>	0–67	–
	boxelder	ACNE2	<i>Acer negundo</i>	0–67	–
	green ash	FRPE	<i>Fraxinus pennsylvanica</i>	0–67	–
	plains cottonwood	PODEM	<i>Populus deltoides</i> ssp. <i>monilifera</i>	0–67	–
	American elm	ULAM	<i>Ulmus americana</i>	0–67	–

Table 11. Community 2.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Wheatgrasses			336–673	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	336–673	–
2	Cool-Season Bunchgrasses			112–336	
	green needlegrass	NAVI4	<i>Nassella viridula</i>	112–336	–
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	22–179	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	0–22	–
3	Mid & Tall Warm-Season Grasses			45–157	
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	22–157	–
	composite dropseed	SPCOC2	<i>Sporobolus compositus</i> var. <i>compositus</i>	22–112	–
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–67	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0–67	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–45	–
4	Short Warm-Season Grasses			112–336	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	112–336	–
	buffalograss	BODA2	<i>Bouteloua dactyloides</i>	22–112	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–67	–
5	Other Native Grasses			22–112	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–112	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	22–67	–
	Cusick's bluegrass	POCU3	<i>Poa cusickii</i>	0–22	–

6	Grass-likes			112–336	
	sedge	CAREX	<i>Carex</i>	112–336	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–67	–
7	Non-Native Grasses			112–336	
	bluegrass	POA	<i>Poa</i>	45–224	–
	brome	BROMU	<i>Bromus</i>	22–157	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	0–90	–
Forb					
8	Forbs			112–224	
	goldenrod	SOLID	<i>Solidago</i>	22–90	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	22–90	–
	Forb, introduced	2FI	<i>Forb, introduced</i>	22–67	–
	Forb, native	2FN	<i>Forb, native</i>	22–67	–
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	22–67	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	22–67	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	0–67	–
	hoary verbena	VEST	<i>Verbena stricta</i>	22–67	–
	scurfpea	PSORA2	<i>Psoralegium</i>	22–45	–
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	0–45	–
	Maximilian sunflower	HEMA2	<i>Helianthus maximiliani</i>	0–22	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	0–22	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–22	–
	white prairie aster	SYFA	<i>Symphotrichum falcatum</i>	0–22	–
	American vetch	VIAM	<i>Vicia americana</i>	0–22	–
Shrub/Vine					
9	Shrubs			112–336	
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	22–157	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	22–112	–
	silver buffaloberry	SHAR	<i>Shepherdia argentea</i>	0–112	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–112	–
	leadplant	AMCA6	<i>Amorpha canescens</i>	0–45	–
	rose	ROSA5	<i>Rosa</i>	22–45	–
	big sagebrush	ARTR2	<i>Artemisia tridentata</i>	0–45	–
	American plum	PRAM	<i>Prunus americana</i>	0–45	–
	chokecherry	PRVI	<i>Prunus virginiana</i>	0–22	–
Tree					
10	Trees			0–67	
	Tree	2TREE	<i>Tree</i>	0–67	–
	boxelder	ACNE2	<i>Acer negundo</i>	0–67	–
	green ash	FRPE	<i>Fraxinus pennsylvanica</i>	0–67	–
	plains cottonwood	PODEM	<i>Populus deltoides ssp. monilifera</i>	0–67	–
	American elm	ULAM	<i>Ulmus americana</i>	0–67	–

Table 12. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Wheatgrasses			78–235	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	78–235	–
2	Cool-Season Bunchgrasses			0–78	
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	0–78	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0–63	–
3	Mid & Tall Warm-Season Grasses			16–78	
	composite dropseed	SPCOC2	<i>Sporobolus compositus var. compositus</i>	16–63	–
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	0–47	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0–31	–
4	Short Warm-Season Grasses			314–628	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	235–549	–
	buffalograss	BODA2	<i>Bouteloua dactyloides</i>	31–126	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–78	–
5	Other Native Grasses			0–78	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–112	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–31	–
	Cusick's bluegrass	POCU3	<i>Poa cusickii</i>	0–22	–
6	Grass-likes			157–314	
	sedge	CAREX	<i>Carex</i>	157–314	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–47	–
7	Non-Native Grasses			0–157	
	bluegrass	POA	<i>Poa</i>	0–157	–
	brome	BROMU	<i>Bromus</i>	0–63	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	0–16	–
Forb					
8	Forbs			78–235	
	Forb, introduced	2FI	<i>Forb, introduced</i>	16–110	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	16–78	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	16–78	–
	hoary verbena	VEST	<i>Verbena stricta</i>	16–78	–
	goldenrod	SOLID	<i>Solidago</i>	16–63	–
	scurfpea	PSORA2	<i>Psoralidium</i>	16–47	–
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	16–47	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	16–47	–
	Forb, native	2FN	<i>Forb, native</i>	0–31	–
Shrub/Vine					
9	Shrubs			31–157	

	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–110	–
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	0–63	–
	silver buffaloberry	SHAR	<i>Shepherdia argentea</i>	0–47	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	16–47	–
	rose	ROSA5	<i>Rosa</i>	0–31	–
Tree					
10	Trees			0–47	
	Tree	2TREE	<i>Tree</i>	0–47	–
	boxelder	ACNE2	<i>Acer negundo</i>	0–47	–
	green ash	FRPE	<i>Fraxinus pennsylvanica</i>	0–47	–
	plains cottonwood	PODEM	<i>Populus deltoides ssp. monilifera</i>	0–47	–
	American elm	ULAM	<i>Ulmus americana</i>	0–47	–

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.

Western Wheatgrass/Green Needlegrass/Shrub (1.1 & 2.1)

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

Stocking Rate* (AUM/acre): 0.77

Western Wheatgrass (2.2)

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

Stocking Rate* (AUM/acre): 0.55

Western Wheatgrass/Blue Grama (2.3)

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

Stocking Rate* (AUM/acre): 0.55

Blue Grama/Sedge/Western Wheatgrass (3.1)

Average Annual Production (lbs./acre, air-dry): 1,400

Stocking Rate* (AUM/acre): 0.38

Smooth Bromegrass/Kentucky Bluegrass (4.1)

Average Annual Production (lbs./acre, air-dry): 2,600

Stocking Rate* (AUM/acre): 0.71

Kentucky Bluegrass/Sedge (4.2)

Average Annual Production (lbs./acre, air-dry): 1,400

Stocking Rate* (AUM/acre): 0.38

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.

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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.

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

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

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

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

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

- 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.

- 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.

- 9. Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface structure is typically granular or subangular blocky parting to granular, and mollic (higher organic matter) colors

of A-horizon down to about 4 to 10 inches deep. If conditions are other than this, refer to map unit component descriptions for component on which the site occurs.

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

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** No compaction layer should be 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: Wheatgrasses (mid, cool-season grasses) > mid and tall, cool-season bunchgrasses >

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

Other: Forbs > grass-like species > short, warm-season grasses > trees

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

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very little to no evidence of decadence or mortality.
-

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.
-

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Total annual production ranges from 2,000 to 3,600 pounds/acre, with the reference value being 2,800 pounds/acre (air-dry basis).
-

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

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