USDA Natural Resources Conservation Service

Ecological site R053CY010SD
Loamy

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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.

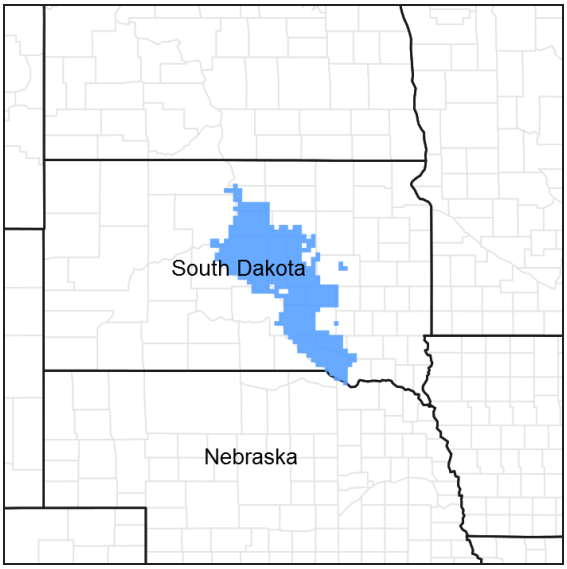

Figure 1. Mapped extent

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.

MLRA notes

Major Land Resource Area (MLRA): 053C–Southern Dark Brown Glaciated Plains

The Southern Dark Brown Glaciated Plains (53C) is located within the Northern Great Plains Region. It is entirely in South Dakota encompassing about 3,990 square miles (Figure 1). The elevation ranges from 1,300 to 2,300 feet. The MLRA is level to gently rolling till plains including many areas of potholes. A terminal moraine occurs in the southern end of the MLRA. Moderately steep and steep slopes are adjacent to the major valleys. The headwaters of many creeks in central South Dakota occur in the high-lying MLRA. (USDA-NRCS 2006).

The dominant soil orders in this MLRA are Mollisols and Inceptisols. The soils in the area dominantly have a mesic soil temperature regime, an ustic soil moisture regime, and mixed or smectitic mineralogy. They generally are very deep, well drained or moderately well drained, and are loamy or clayey. This area supports natural prairie vegetation characterized by western wheatgrass (Pascopyrum smithii), big bluestem (Andropogon gerardii), needleandthread (Hesperostipa comata), and green needlegrass (Nassella viridula). Little bluestem (Schizachyrium scoparium), sideoats grama (Bouteloua curtipendula), and prairie sandreed (Calamovilfa longifolia) are important species on steeper sites. Western snowberry (Symphoricarpos occidentalis) and prairie rose (Rosa arkansana) are commonly dispersed throughout the area. (USDA-NRCS 2006).

Classification relationships

Major Land Resource Area (MLRA): Southern Dark Brown Glaciated Plains (53C) (USDA-NRCS 2006)

USFS Subregions: Northeastern Glaciated Plains Section (331E); Missouri Coteau Subsection (331Ea); Western Great Plains Section (331F); Missouri Breaks Subsection (331Fe); Western Glaciated Plains Section (332B); Southern Missouri Coteau Slope Subsection (332Bd, 332Be); North Central Great Plains Section (332D); Southern Missouri Coteau Slope Subsection (332Dd); Southern Missouri Coteau Subsection (332De) - (Cleland et al. 2007).

US EPA Level IV Ecoregion: Missouri Coteau (42a); Southern Missouri Coteau (42e); Southern Missouri Coteau Slope (42f) - (USEPA 2013)

Ecological site concept

The Loamy ecological site occurs on upland areas. Soils are well drained and have less than 40 percent clay in the surface and/or subsoil. The surface and subsoil textures typically are loam, silt loam, silty clay loam, clay loam, sandy clay loam, and very fine sandy loam. Some soils are underlain with sand and/or gravel at about two to three feet in depth. In some areas the surface layer may consist of stony to extremely stony. Slopes can range from 0 to 25 percent.

Vegetation in the Reference State includes western wheatgrass and needlegrasses. Forbs include goldenrods, cudweed sagewort, and Cuman ragweed. Non-native grasses such as Kentucky bluegrass, smooth brome, quackgrass, and Eastern Red Cedar may invade the site due to changes in disturbance regime.

Associated sites

R053CY011SD	**Clayey** These sites occur on uplands. Soils are well drained and have greater than 40 percent clay in the subsoil. The central concept soil series are Demky, Oko, and Raber, but other series are included.
R053CY012SD	**Thin Upland** These sites occur on uplands. Soils are well drained and will effervesce with acid at or near the surface. The central concept soil series are Ethan, Java, and Betts, but other series are included.
R053CY020SD	**Loamy Overflow** These sites occur in upland swales. Soils are moderately well drained which have water flow into and over or through the site. The central concept soil series are Mobridge, Onita, and Prosper but other series are included.

Similar sites

R053CY011SD	**Clayey** The Clayey site is in a similar landscape position, but the soils have greater than 40 percent clay in the surface and/or subsoil. (more green needlegrass; less needleandthread and big bluestem)
R053CY020SD	**Loamy Overflow** The Loamy Overflow site occurs in upland swales. Soils are moderately well drained which have water flow into and over/through the site. (more big bluestem; higher production)

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Pascopyrum smithii* (2) *Nassella viridula*

Physiographic features

This site occurs on nearly level to steeply sloping uplands.

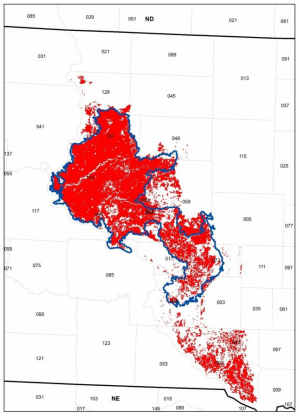

Figure 2. Distribution map

Table 2. Representative physiographic features

Landforms	(1) Plain (2) Till plain (3) Outwash plain
Flooding frequency	None
Ponding frequency	None
Elevation	396–701 m
Slope	1–12%
Water table depth	130–203 cm
Aspect	Aspect is not a significant factor

Climatic features

MLRA 53C is considered to have a continental climate – cold winters and hot summers, low humidity, light rainfall, and much sunshine. Extremes in temperature may also abound. The climate is the result of this MLRA's location near the geographic center of North America. There are few natural barriers on the Northern Great Plains and air masses move freely across the plains and account for rapid changes in temperature.

Annual precipitation typically ranges from 15 to 25 inches per year. The average annual temperature is about 45°F. January is the coldest month with average temperatures ranging from about 15°F (Stephan, South Dakota (SD)), to about 16°F (Onida 4 NW, SD). July is the warmest month with temperatures averaging from about 72°F (Stephan, SD), to about 74°F (Onida 4 NW, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 58°F. This large annual range attests to the continental nature of this area's climate. Hourly winds are estimated to average about 12 miles per hour (mph) annually, ranging from about 13 mph during the spring to about 11 mph during the summer. Daytime winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 50 mph.

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. Greenup of cool-season plants may occur in September and October when adequate soil moisture is present.

Table 3. Representative climatic features

Frost-free period (characteristic range)	107-127 days
Freeze-free period (characteristic range)	128-150 days
Precipitation total (characteristic range)	508-533 mm
Frost-free period (actual range)	104-129 days

Freeze-free period (actual range)	127-159 days
Precipitation total (actual range)	483-610 mm
Frost-free period (average)	117 days
Freeze-free period (average)	139 days
Precipitation total (average)	533 mm

Climate stations used

- (1) GETTYSBURG 13W [USC00393302], Gettysburg, SD
- (2) GETTYSBURG [USC00393294], Gettysburg, SD
- (3) HIGHMORE 23 N [USC00393838], Highmore, SD
- (4) ONIDA 4 NW [USC00396292], Onida, SD
- (5) PIERRE RGNL AP [USW00024025], Pierre, SD
- (6) HARROLD 12 SSW [USC00393608], Pierre, SD
- (7) STEPHAN 2 NW [USC00397992], Highmore, SD
- (8) WESSINGTON SPRINGS [USC00399070], Wessington Springs, SD

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 silty clay loam textured subsurface soils (occasionally clay), with slopes ranging from 1 to 12 percent. The soils in this site are well-drained and formed in till and alluvium. The soil surface texture is generally loam to silty clay loam. The soils have a moderate to slow infiltration rate. Some soils crack when dry. When these soils are wet, surface compaction can occur with heavy traffic. 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. Subsurface soil layers are nonrestrictive to water movement and root penetration.The central concept soil series for this site are Agar, Glenham, and Highmore, but other series are included.

These soils are mainly susceptible to water erosion. The hazard of water erosion increases on slopes greater than about nine 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 (3) Silty clay loam
Family particle size	(1) Loamy
Drainage class	Well drained to moderately well drained
Permeability class	Very slow to moderately slow
Soil depth	203 cm
Surface fragment cover <=3"	0%
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)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–3
Soil reaction (1:1 water) (0-101.6cm)	6.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–42%
Subsurface fragment volume >3" (Depth not specified)	0–8%

Ecological dynamics

State and Community Phases
The information in this Ecological Site Description, including the state-and-transition model (STM), was developed based on historical data, current field data, professional experience, and a review of the scientific literature. As a result, all possible scenarios or plant species may not be included. Key indicator plant species, disturbances, and ecological processes are described to inform land management decisions.

The site which is located in the Southern Dark Brown Glaciated Plains Region developed under Northern Great Plains climatic conditions and included natural influence of large herding herbivores and occasional fire. Changes will occur in the plant communities due to weather fluctuations and/or management actions. Under adverse impacts, a relatively rapid decline in vegetative vigor and composition can occur. Under favorable conditions the site has the potential to resemble the Reference State. Interpretations for this site are based primarily on the 1.1 Western Wheatgrass-Green Needlegrass Plant Community Phase. This community phase and the Reference State have 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 considered. Plant community phases, states, transitional pathways, and thresholds have been determined through similar studies and experience. Due to a general invasion of exotic species (such as Kentucky bluegrass (*Poa pratensis*) and smooth bromegrass (*Bromus inermis*)) across the MLRA within this site, returning to the 1.1 Western Wheatgrass-Needleandthread Plant Community Phase may not be possible.

This ecological site (ES) has been grazed by domestic livestock since they have been introduced into the area. The introduction of domestic livestock and the use of fencing and reliable water sources have changed the ecological dynamics of this site. Heavy continuous grazing without adequate recovery periods following each grazing occurrence causes departure from the 3.1 Western Wheatgrass-Green Needlegrass Plant Community Phase. Blue grama (*Bouteloua gracilis*) will increase and eventually develop into a sod. Western wheatgrass will increase initially and then begin to decrease. Green needlegrass, needleand thread, porcupine grass (*Hesperostipa spartea*), sideoats grama, big bluestem, and little bluestem will decrease in frequency and production. Extended periods of nonuse and lack of fire will result in excessive litter and a plant community dominated by cool-season grasses such as Kentucky bluegrass, smooth bromegrass, green needlegrass, and cheatgrass (*Bromus tectorum*). Extended periods of no surface fire could result in the invasion of conifers in which eastern red cedar (*Juniperus virginiana*) and Rocky Mountain juniper (*Juniperus scopulorum*) will increase and could eventually dominate the site.

Following the state and transition diagram are narratives for each of the described states and community phases. These may not represent every possibility, but they are the most prevalent and repeatable states and community phases. The plant composition tables shown below have been developed from the best available knowledge at the time of this revision. As more data are collected, some of these community phases and/or states may be revised or removed, and new ones may be added. The main purpose for including the descriptions here is to capture the current knowledge and experience at the time of this revision.

The following is a diagram that illustrates the common plant community phases that can occur on the site and the transition and community pathways between them. The ecological processes will be discussed in more detail in the

plant community descriptions following the diagram.

The pie charts may not add up to 100% due to internal rounding error.

State and transition model

Loamy – R053CY010SD

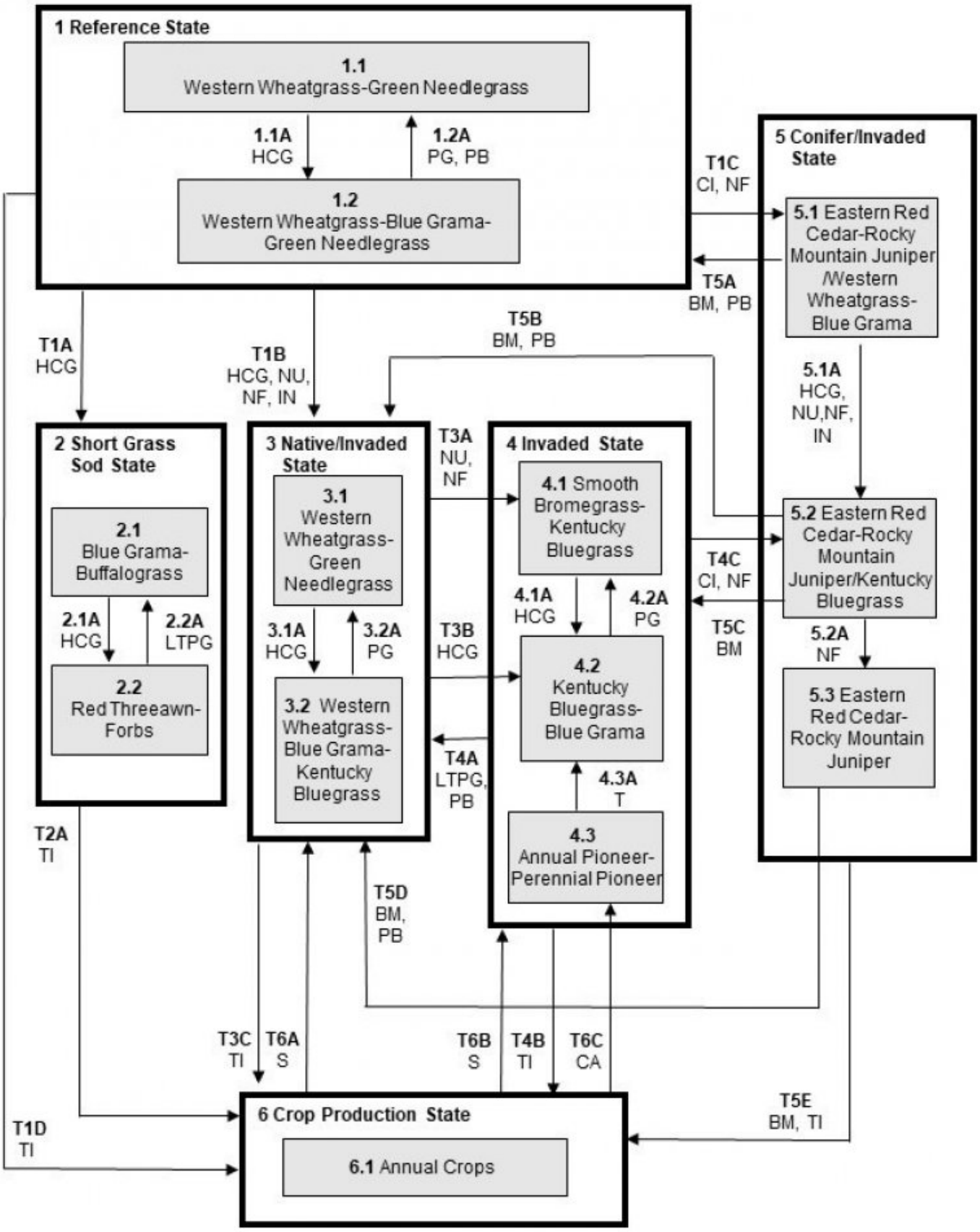

Figure 9. State-And-Transition model

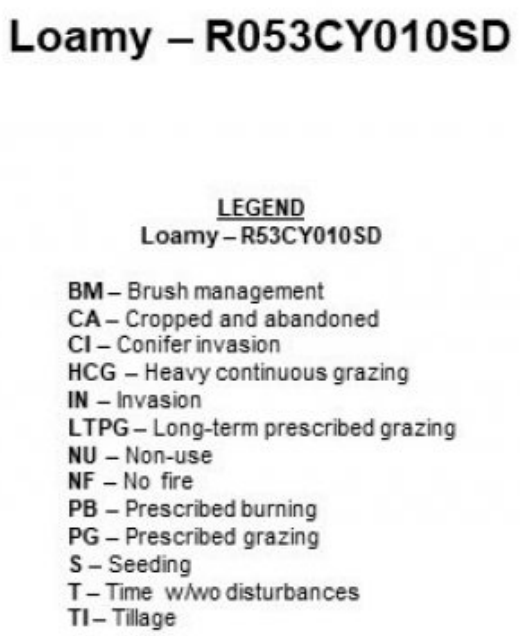

Figure 10. Legend

Code	Process
T1A	Heavy continuous grazing
T1B	Heavy continuous grazing, non-use, no fire, invasion
T1C	Conifer invasion, no fire
T1D	Tillage
T2A	Tillage
T3A	Non-use, no fire
T3B	Heavy continuous grazing
T3C	Tillage
T4A	Long term prescribed grazing, prescribed burning
T4B	Tillage
T4C	Conifer invasion, no fire
T5A	Brush management, prescribed burning
T5B	Brush management, prescribed burning
T5C	Brush management
T5D	Brush management, prescribed burning
T5E	Brush management, tillage
T6A	Seeding
T6B	Seeding
T6C	Cropped and abandoned
1.1A	Heavy continuous grazing
1.2A	Prescribed grazing with recovery periods, prescribed burning
2.1A	Heavy continuous grazing
2.2A	Long-term prescribed grazing
3.1A	Heavy continuous grazing
3.2A	Prescribed grazing with recovery periods
4.1A	Heavy continuous grazing
4.2A	Prescribed grazing with recovery periods
4.3A	Time w/wo disturbances
5.1A	Heavy continuous grazing, non-use, no fire, invasion
5.2A	No fire

Figure 11. Matrix

State 1
Reference State

The Loamy site occurs on upland areas. Soils are well drained and have less than 40 percent clay in the surface and/or subsoil. The surface and subsoil textures typically are loam, silt loam, silty clay loam, clay loam, sandy clay loam, and very fine sandy loam. Some soils are underlain with sand or gravel at about two to three feet in depth. In some areas the surface layer may consist of stony to extremely stony. The central concept soil series are Agar, Glenham, and Highmore, but other series are included. This state represents the natural range of variability that dominated the dynamics of this ecological site (ES). This state was dominated by cool-season grasses, with warm-season grasses being subdominant. In pre-European times, the primary disturbance mechanisms for this site in the reference condition included periods of below and 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. In some locations, this site likely received relatively heavy grazing pressure. Cool-season and taller warm-season grasses would have declined and short warm-season grasses would have increased. Today, a similar state, the Native/Invaded State (State 3) can be found on areas that are properly managed with grazing or prescribed burning and sometimes on areas receiving occasional short periods of rest. These sites are differentiated by the presence of exotic species such as Kentucky bluegrass and smooth bromegrass. On most Loamy ESs within this MLRA, these species have invaded and are now present. It is likely that attaining the reference state as it is described here (without the presence of exotic herbaceous species) is not possible.

Community 1.1
Western Wheatgrass-Green Needlegrass

Interpretations are based primarily on the 1.1 Western Wheatgrass-Green Needlegrass Plant Community Phase (this is also considered to be climax). This plant community evolved with grazing by large herbivores, frequent surface fires, and periodic flooding events and is suited for grazing by domestic livestock. This plant community can be found on areas that are grazed and where the grazed plants receive adequate periods of rest during the growing season in order to recover. The potential vegetation was about 85 percent grasses or grass-like plants, 10 percent forbs, and 5 percent shrubs. The community was dominated by cool-season grasses, with warm-season grasses being subdominant. The major grasses included western wheatgrass and green needlegrass. Other grass or grass-like species included big bluestem, little bluestem, sideoats grama, porcupine grass, 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 and 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	2040	2793	3503
Forb	140	235	359
Shrub/Vine	62	110	174
Total	**2242**	**3138**	**4036**

Figure 13. Plant community growth curve (percent production by month). SD5302, Southern Dark Brown Glaciated Plains, cool-season dominant, warm-season subdominant.. Cool-season dominant, warm-season subdominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	23	34	15	6	5	4	0	0

Community 1.2
Western Wheatgrass-Blue Grama-Green Needlegrass

This plant community evolved under heavy continuous grazing or from over utilization during extended drought periods. The potential plant community was made up of approximately 85 percent grasses and grass-like species, 10 percent forbs, and 5 percent shrubs. Dominant grasses included western wheatgrass, blue grama, and green needlegrass. Grasses of secondary importance included little bluestem, sideoats grama, needleandthread, and big bluestem. Forbs commonly found in this plant community included cudweed sagewort (*Artemisia ludoviciana*) and Cuman ragweed (*Ambrosia psilostachya*). This plant community had similar plant composition to the 3.2 Western Wheatgrass-Blue Grama-Kentucky Bluegrass Plant Community Phase. The main difference is that this plant community phase did not have the presence of non-native invasive species such as Kentucky bluegrass and

smooth bromegrass. When compared to the 1.1 Western Wheatgrass-Green Needlegrass Plant Community Phase, blue grama and buffalograss (*Bouteloua dactyloides*) have increased due to their relatively high tolerance of heavy continuous grazing pressure. Green needlegrass decreased and composition of mid- and tall warm-season grasses was reduced. This plant community was moderately resistant to change. The herbaceous species present were well adapted to grazing; however, species composition could be altered through long-term overgrazing. If the tall and mid-grasses remain intact, it tended to be resilient if the disturbance was not long-term. Most of the components of the ecological processes would have been functioning at optimum levels. However, the vigor and reproductive capability of the tall warm-season grasses would have been reduced due to grazing pressure or a combination of stressors. A reduction of this dominant functional group allowed for an increase in shorter-statured (and shallower rooted) species.

Figure 14. Plant community growth curve (percent production by month). SD5302, Southern Dark Brown Glaciated Plains, cool-season dominant, warm-season subdominant.. Cool-season dominant, warm-season subdominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	23	34	15	6	5	4	0	0

Pathway 1.1A
Community 1.1 to 1.2

Heavy continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, or during periods of below normal precipitation when grazing frequency and intensity increases on these sites due to limited forage availability on adjacent upland sites will shift this community to the 1.2 Western Wheatgrass-Blue Grama-Green Needlegrass Plant Community Phase.

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing, or prescribed burning occurring at relatively frequent intervals (3 to 5 years) and a return to normal disturbance regime levels and frequencies or periodic light to moderate grazing possibly including periodic rest will convert this plant community to the 1.1 Western Wheatgrass-Green Needlegrass Plant Community Phase.

State 2
Short Grass Sod State

This state is the result of heavy continuous grazing, and in the absence of periodic fire due to fire suppression. This state is dominated by blue grama and buffalograss forming a dense sod layer that effectively blocks introduction of other plants into the system. Taller cool-season species will decline and a corresponding increase in short statured grass will occur. Low growth forms and low and late growing points allow blue grama, buffalograss, and upland sedges to tolerate and sometimes avoid heavy continuous grazing. This state has a high level of resiliency and changes occur very slowly with a long-term prescribed grazing. Once the threshold is crossed, a change in grazing management alone cannot cause a reduction in the sod grass dominance.

Community 2.1
Blue Grama-Buffalograss

This plant community evolved under heavy continuous season-long grazing or from over utilization during extended drought periods. The potential plant community was made up of approximately 85 percent grasses and grass-like species, 10 percent forbs, and 5 percent shrubs. Dominant grasses typically included blue grama and buffalograss. Grasses of secondary importance included sedges (Cyperaceae) and western wheatgrass. Forbs commonly found in this plant community included cudweed sagewort and scarlet globemallow (*Sphaeralcea coccinea*). When compared to the 1.1 Western Wheatgrass-Green Needlegrass Plant Community Phase, mid- and tall grasses were reduced significantly. This plant community is very resistant to change, especially if the disturbance continued and the short-statured species such as blue grama increased. The herbaceous species present such as blue grama and buffalograss tolerate heavy grazing use. This plant community was less productive than other phases. A thick “sod” of blue grama and buffalograss reduces the opportunity for other species to establish on this site.

Figure 15. Plant community growth curve (percent production by month). SD5301, Southern Dark Brown Glaciated Plains, cool-season dominant.. Cool-season dominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	4	12	25	36	10	5	4	4	0	0

Community 2.2
Red Threeawn-Forbs

This plant community is a result of heavy continuous grazing, frequent severe defoliation, or from over utilization during extended drought periods. This is a short, warm-season dominated state with cool-season subdominant grasses. The potential plant community is made up of approximately 65 percent grasses and grass-like species, 30 percent forbs, and 5 percent shrubs. Dominant grasses include red threeawn (*Aristida purpurea*) and annual grasses. Grasses of secondary importance include cheatgrass and Kentucky bluegrass. When compared to the 1.1 Western Wheatgrass-Green Needlegrass Plant Community Phase, western wheatgrass and green needlegrass have been greatly reduced. Production of mid- and tall warm-season grasses has also been reduced and invasive and less desirable grasses dominate. Percent bare ground is also increased. This plant community is resistant to change to a different state but is very sensitive to becoming an annual grass and invader state. The herbaceous species present are not well adapted to grazing and composition can be easily altered through long-term overgrazing.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1849	2367	2841
Forb	118	202	308
Shrub/Vine	50	121	213
Total	**2017**	**2690**	**3362**

Figure 17. Plant community growth curve (percent production by month).

SD5302, Southern Dark Brown Glaciated Plains, cool-season dominant, warm-season subdominant.. Cool-season dominant, warm-season subdominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	23	34	15	6	5	4	0	0

Pathway 2.1A
Community 2.1 to 2.2

Heavy continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, or during periods of below normal precipitation when grazing frequency and intensity increases on these sites due to limited forage availability on adjacent upland sites will shift this community to the 2.2 Red Threeawn-Forbs Plant Community Phase.

Pathway 2.2A
Community 2.2 to 2.1

Long-term prescribed grazing (moderate stocking levels coupled with adequate recovery periods, or other grazing systems such as high-density, low-frequency intended to treat specific species dominance, or periodic light to moderate stocking levels possibly including periodic rest) will convert this plant community to the 2.1 Blue Grama-Buffalograss Plant Community Phase.

Conservation practices

Prescribed Grazing

State 3
Native/Invaded State

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 and the presence of exotic species such a Kentucky bluegrass and smooth bromegrass. This state is dominated by cool-season grasses. It can be found on areas that are properly managed with grazing or prescribed burning, and sometimes on areas receiving occasional short periods of rest. Taller warm-season species can decline and a corresponding increase in short statured grass will occur.

Community 3.1
Western Wheatgrass-Green Needlegrass

This plant community phase is similar to the 1.1 Western Wheatgrass-Green Needlegrass Plant Community Phase, but it also contains minor amounts of non-native invasive grass species such as Kentucky bluegrass and smooth bromegrass (up to about 20 percent by air-dry weight). The potential vegetation is about 85 percent grasses or grass-like plants, 10 percent forbs, and 5 percent shrubs. This community is dominated by cool-season grasses with warm-season grasses being subdominant. The major grasses include western wheatgrass and green needlegrass. Other grass species include big bluestem, little bluestem, slender wheatgrass (*Elymus trachycaulus*), sideoats grama, porcupine 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 and soil stability, watershed function, and biologic integrity.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1323	1695	1894
Forb	95	202	347
Shrub/Vine	39	121	224
Total	**1457**	**2018**	**2465**

Figure 19. Plant community growth curve (percent production by month). SD5304, Southern Dark Brown Glaciated Plains, warm-season dominant, cool-season subdominant.. Warm-season dominant, cool-season subdominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	7	17	25	25	15	7	1	0	0

Community 3.2
Western Wheatgrass-Blue Grama-Kentucky Bluegrass

This plant community is a result of heavy continuous grazing or from over utilization during extended drought periods. The potential plant community is made up of approximately 80 percent grasses and grass-like species, 15 percent forbs, and 5 percent shrubs. Dominant grasses include western wheatgrass, blue grama, and Kentucky bluegrass. Grasses of secondary importance include side oats grama, little bluestem, green needlegrass, needleandthread, porcupine grass, big bluestem, buffalograss, smooth bromegrass, and sedges. Forbs commonly found in this plant community include cudweed sagewort and western ragweed. When compared to the 1.1 Western Wheatgrass-Green Needlegrass Plant Community Phase, Blue grama has increased. Green needlegrass and sideoats grama have decreased and production of mid- and tall warm-season grasses is reduced. This plant community is moderately resistant to change. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term. Most of the components of the ecological processes are functioning at optimum levels. However, the vigor and reproductive capability of the tall warm-season grasses are reduced due to grazing pressure or a combination of stressors. A reduction of this dominant functional group allows for an increase in shorter-statured (and shallower rooted) species. The introduction of nonnative invasive species such as Kentucky bluegrass and smooth bromegrass results in alterations to the soil profile. Organic matter levels tend to decrease and begin to be concentrated more in the surface layers and the structure will begin to be modified. These changes favor the shallow-rooted species and hasten their eventual dominance if steps are not taken to reduce these species.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	437	829	1048
Forb	106	252	460
Shrub/Vine	17	39	62
Total	**560**	**1120**	**1570**

Figure 21. Plant community growth curve (percent production by month). SD5304, Southern Dark Brown Glaciated Plains, warm-season dominant, cool-season subdominant.. Warm-season dominant, cool-season subdominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	7	17	25	25	15	7	1	0	0

Pathway 3.1A
Community 3.1 to 3.2

Heavy continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, or during periods of below normal precipitation when grazing frequency and intensity increases on these sites due to limited forage availability on adjacent upland sites will shift this community to the 3.2 Western Wheatgrass-Blue Grama-Kentucky Bluegrass Plant Community Phase.

Pathway 3.2A
Community 3.2 to 3.1

Prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest will convert this plant community to the 3.1 Western Wheatgrass-Green Needlegrass Plant Community Phase.

Conservation practices

Prescribed Grazing

State 4
Invaded State

This state is a result of encroachment mainly by invasion and dominance of introduced cool-season grasses. This state is characterized by the dominance of smooth bromegrass, crested wheatgrass, and Kentucky bluegrass, 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. The ecological processes are not functioning, especially the biotic processes and the hydrologic functions. The introduced cool-season grasses cause reduced infiltration and increased runoff. Preliminary studies would tend to indicate this threshold may exist when Kentucky bluegrass exceeds 30 percent of the plant community and native grasses represent less than 40 percent of the plant community composition. The opportunity for high intensity spring burns is severely reduced by early green up and increased moisture and humidity at the soil surface and grazing pressure cannot cause a reduction in sodgrass dominance. Production is limited to the sod forming species. Infiltration continues to decrease and runoff increases and energy capture into the system is restricted to early season low producing species. Nutrient cycling is limited by root depth of the dominant species.

Community 4.1
Smooth Bromegrass-Kentucky Bluegrass

This plant community phase is a result of extended periods of nonuse and no fire or occasionally light levels of grazing over several years. Due to the relatively high grazing tolerance of smooth bromegrass and Kentucky bluegrass, this plant community phase may also be the result of heavy continuous grazing that eventually eliminates many native grass species. It is characterized by dominance of smooth bromegrass and Kentucky bluegrass. Crested wheatgrass may also be present in varying amounts within this plant community phase, but will

rarely exceed 20 percent of total biomass. 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 and eventually a thatch-mat layer may develop at the 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. The dominance of these introduced species has been shown to alter the biotic component of the soil, as well as, organic matter levels and eventually the soil structure. These alterations perpetuate the dominance of Kentucky bluegrass and smooth bromegrass and tend to make establishment of native species extremely difficult.

Table 9. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2062	2925	3710
Shrub/Vine	28	185	387
Forb	151	252	387
Total	**2241**	**3362**	**4484**

Figure 23. Plant community growth curve (percent production by month). SD5301, Southern Dark Brown Glaciated Plains, cool-season dominant.. Cool-season dominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	4	12	25	36	10	5	4	4	0	0

Community 4.2
Kentucky Bluegrass-Blue Grama

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 blue grama. 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 and a thatch-mat layer often develops at the surface. Nutrient cycling is greatly reduced, and native plants have great difficulty becoming established. Infiltration is greatly reduced and runoff is high. Production will be significantly reduced when compared to the interpretive plant community. The period that palatability is high is relatively short as Kentucky bluegrass matures rapidly. Energy capture is also reduced. Biological activity in the soil is likely reduced significantly in this phase.

Table 10. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1861	2256	2612
Forb	45	148	280
Shrub/Vine	–	62	135
Total	**1906**	**2466**	**3027**

Figure 25. Plant community growth curve (percent production by month). SD5302, Southern Dark Brown Glaciated Plains, cool-season dominant, warm-season subdominant.. Cool-season dominant, warm-season subdominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	23	34	15	6	5	4	0	0

Community 4.3
Annual Pioneer-Perennial Pioneer

This plant community developed under continuous heavy grazing or other excessive disturbances. 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 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. This community can be renovated to improve the production capability; however, if management changes are not made the vegetation could revert back to early seral species.

Pathway 4.1A
Community 4.1 to 4.2

Heavy continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, or during periods of below normal precipitation when grazing frequency and intensity increases on these sites due to limited forage availability on adjacent upland sites will shift this community to the 4.2 Kentucky Bluegrass-Blue Grama 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 will 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

This community pathway occurs with the passage of time as successional processes take place and perennial plants gradually begin to establish on the site again. This pathway will lead to the 4.2 Kentucky Bluegrass-Blue Grama Plant Community Phase.

State 5
Conifer/Invaded State

This state is dominated (canopy exceeds 20 percent of total surface area) by areas where trees have become established or have encroached onto the site due to the absence of periodic fire. This state is dominated by eastern redcedar or Rocky Mountain juniper with cool-season grasses being subdominant. The plant community can develop into a closed canopy that impedes the reproductive capability of the major native perennial grass species. A single eastern red cedar tree with a 7 foot crown diameter eliminates the equivalent of 3 pounds of forage. Further, the forage potential of a pasture with 250 mature eastern red cedar trees per acre (or one tree every thirteen feet) is reduce by 50 percent. It is suggested that reducing stocking rates by 10 percent for every 50 trees per acre. The increase in tree canopy which is a result of a disruption of the natural, and human related fire regimes that occurred prior to European settlement, which kept trees from encroaching much of the grasslands.

Community 5.1
Eastern Redcedar-Rocky Mountain Juniper/Western Wheatgrass-Blue Grama

This plant community evolved due to the invasion of conifers, such as eastern redcedar and Rocky Mountain juniper. This phase was a result of the absence of periodic fire. These events may cause a reduction in warm-season grasses and an increase in cool-season grasses and allow for the encroachment of conifers. The potential plant community is made up of approximately 50 percent grasses and grass-like species, 10 percent forbs, 10 percent shrubs, and 30 percent trees. Dominant grasses and grass-likes include big bluestem, western wheatgrass, blue grama, and sideoats grama. As the canopy increases, warm-season grasses tend to decrease as the cool-season grasses increase. Forbs will be diverse. Trees species will include eastern redcedar and Rocky Mountain juniper. When compared to the 1.1 Western Wheatgrass-Green Needlegrass Plant Community, coniferous trees have increased significantly and herbaceous component has decreased. This plant community is susceptible to the encroachment of eastern redcedar and Rocky Mountain juniper.

Community 5.2
Eastern Redcedar-Rocky Mountain Juniper/Kentucky Bluegrass

This plant community phase is a result of heavy, continuous seasonal grazing or heavy, continuous season-long grazing or non-use or no surface fire for extended periods of time (typically for 10 or more years). When compared to the 5.1 Eastern Redcedar-Rocky Mountain Juniper/Western Wheatgrass-Blue Grama Plant Community, the amount of nonnative invasive cool-season grasses such as Kentucky bluegrass and smooth bromegrass have increased significantly. It is characterized by a dominance of Kentucky bluegrass, smooth bromegrass, and blue grama. The dominance of Kentucky bluegrass is at times so complete that other species are difficult to find on the site. A relatively thick duff layer can sometimes accumulate at or above the soil surface and a thatch-mat layer often develops at the surface. Production is limited to the sod forming species. The period that palatability is high is relatively short, as Kentucky bluegrass matures rapidly. Infiltration continues to decrease and runoff increases, energy capture into the system is restricted to early season low producing species. Nutrient cycling is limited by root depth of the dominate species. Biological activity in the soil is likely reduced significantly in this phase.

Community 5.3
Eastern Redcedar-Rocky Mountain Juniper

This plant community phase is a result of no surface fire for extended periods of time (typically for 10 or more years). Coniferous trees have increased significantly, and the herbaceous component has decreased. With the dominance of the coniferous trees such as eastern redcedar and Rocky Mountain juniper, the canopy covers the area and grass species are unable to survive. Grass production for livestock is severely limited. Prescribed burning before the juniper species reach maturity and are still susceptible to fire (< 5 foot in height), or mechanical brush management can be used to maintain or recover 5.3 Eastern Redcedar-Rocky Mountain Juniper Plant Community Phase.

Pathway 5.1A
Community 5.1 to 5.2

Non-use and/or no surface fire for extended periods of time (typically for 10 or more years) causing litter levels to

become high enough to reduce native grass vigor, diversity, and density, and/or heavy continuous grazing or invasion of non-native plant species will shift this plant community to the 5.2 Eastern Red Cedar-Rocky Mountain Juniper/Kentucky Bluegrass Plant Community Phase.

Pathway 5.2A
Community 5.2 to 5.3

No surface fire for extended periods of time (typically for 10 or more years) causing litter levels to become high enough to reduce native grass vigor, diversity, and density, will shift this plant community to the 5.3 Eastern Red Cedar-Rocky Mountain Juniper Plant Community Phase.

State 6
Crop Production State

This state is characterized by the production of annual crops using a variety of tillage and cropping systems along with management practices. Cropping on this site is enabled during years with drier than normal precipitation or with artificial drainage (surface or subsurface).

Community 6.1
Annual Crops

This plant community developed with the use of a variety of tillage systems and cropping systems for the production of annual crops including corn, soybeans, wheat, and a variety of other crops.

Transition T1A
State 1 to 2

Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season, and often at the same time of year each year, typically beginning early in the season) will likely lead this state over a threshold resulting in the Short Grass Sod State (State 2).

Transition T1B
State 1 to 3

Non-use or no surface fire for extended periods of time (typically for 10 or more years) causing litter levels to become high enough to reduce native grass vigor, diversity, and density, or heavy continuous grazing or invasion of non-native plant species will likely lead this state over a threshold resulting in the Native-Invaded State (State 3).

Transition T1C
State 1 to 5

No surface fire for extended periods of time (typically for 10 or more years) causing litter levels to become high enough to reduce native grass vigor, diversity, and density, and invasion of conifer will likely lead this state over a threshold leading to the 5.1 Eastern Red Cedar-Rocky Mountain Juniper/Western Wheatgrass-Blue Grama Plant Community Phase within the Conifer/Invaded State (State 5).

Transition T1D
State 1 to 6

Tillage will cause a shift over a threshold leading to the 6.1 Annual Crops Plant Community Phase within the Crop Production State (State 6).

Transition T2a
State 2 to 3

Heavy Continuous Seasonal Grazing with stocking levels well above carrying capacity for extended portions of the growing season, and at the same time of year, each year, or Heavy Continuous Season-Long Grazing with stocking

levels well above carrying capacity utilizing available forage through the majority of the growing season in the absence of adequate rest periods, and grazing at the same period each year will shift this plant community to the 3.1 Blue Grama/Buffalograss Sod Plant Community Phase within the 3.0 Degraded State.

Transition T2b
State 2 to 4

Non-Use and No Fire for extended periods of time (typically for 10 or more years) can lead this state over a threshold to the 4.0 Invaded State. Heavy continuous Seasonal Grazing at the same time of year, each year, without adequate recovery periods or chronic heavy grazing will also result in crossing this threshold.

Transition T2A
State 2 to 6

Tillage will cause a shift over a threshold leading to the 6.1 Annual Crops Plant Community Phase within the Crop Production State (State 6).

Transition T3A & T3B
State 3 to 4

T3A - Non-use or no surface fire for extended periods of time (typically for 10 or more years) causing litter levels to become high enough to reduce native grass vigor, diversity, and density, will likely lead this state over a threshold leading to the 4.1 Smooth Bromegrass-Kentucky Bluegrass Community Phase within the Invaded State (State 4). T3B – 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), will likely lead this state over a threshold leading to the 4.2 Kentucky Bluegrass-Blue Grama Community Phase within the Invaded State (State 4). Grazing repeatedly in the early growing season can expedite this shift by causing mechanical disturbance due to trampling.

Transition T3C
State 3 to 6

Tillage will cause a shift over a threshold leading to the 6.1 Annual Crops Plant Community Phase within the Crop Production State (State 6).

Restoration pathway R4
State 4 to 2

Prescribed Fire occurring at relatively frequent intervals and occasional grazing events immediately following early season fire will cause a reduction in cool-season grasses such as Kentucky bluegrass and smooth brome and an increase in warm-season and later growing cool-season grasses. Warm-season grasses are more tolerant of short fire return intervals. Fire will temporarily increase the vigor and production of warm-season grasses and many native cool-season grasses when fire is timed properly. Pest management using chemical or mechanical treatment to suppress invasive cool-season grasses may also be required. This results in a shift to the 2.0 Native/Invaded Grass State. This would also require Long-Term Management with Prescribed Grazing (periodic light to moderate grazing with possible periodic rest). This may take up to 10 years or more, and recovery may not be attainable.

Conservation practices

Prescribed Burning
Prescribed Grazing
Integrated Pest Management (IPM)

Restoration pathway T4A
State 4 to 3

Long-term prescribed grazing (moderate stocking levels coupled with adequate recovery periods, or other grazing

systems such as high-density, low-frequency intended to treat specific species dominance, or periodic light to moderate stocking levels possibly including periodic rest) coupled with prescribed burning occurring at relatively frequent intervals (3 to 5 years) and a return to normal disturbance regime levels may lead this plant community phase over a threshold to the Native/Invaded State (State 3).

Transition T4C
State 4 to 5

No surface fire for extended periods of time (typically for 10 or more years) causing litter levels to become high enough to reduce native grass vigor, diversity, and density, and invasion of conifer will likely lead this state over a threshold leading to the 5.2 Eastern Red Cedar-Rocky Mountain Juniper/Kentucky Bluegrass Plant Community Phase within the Conifer/Invaded State (State 5).

Transition T4B
State 4 to 6

Tillage will cause a shift over a threshold leading to the 6.1 Annual Crops Community Phase within the Crop Production State (State 6).

Restoration pathway T5A
State 5 to 1

Brush management which would include the mechanical removal of the conifers, coupled with prescribed burning occurring at relatively frequent intervals (3 to 5 years) and a return to normal disturbance regime levels may lead this 5.1 Eastern Red Cedar-Rocky Mountain Juniper/Western Wheatgrass-Blue Grama Plant Community Phase within the Conifer/Invaded State (State 5) over a threshold to the Reference State (State 1).

Restoration pathway T5B & T5D
State 5 to 3

T5B – Brush management which would include the mechanical removal of the conifers, coupled with prescribed burning occurring at relatively frequent intervals (3 to 5 years) and a return to normal disturbance regime levels may lead this 5.2 Eastern Red Cedar-Rocky Mountain Juniper/Kentucky Bluegrass Plant Community Phase within the Conifer/Invaded State (State 5) over a threshold to the Native/Invaded State (State 3). T5D – Brush management which would include the mechanical removal of the conifers, coupled with prescribed burning occurring at relatively frequent intervals (3 to 5 years) and a return to normal disturbance regime levels may lead this 5.3 Eastern Red Cedar-Rocky Mountain Juniper Plant Community Phase within the Conifer/Invaded State (State 5) over a threshold to the Native/Invaded State (State 3).

Transition T5E
State 5 to 6

Brush management which would include the mechanical removal of the conifers, coupled with tillage will cause a shift over a threshold leading to the 6.1 Annual Crops Plant Community Phase within the Crop Production State (State 6).

Restoration pathway T6A
State 6 to 3

Seeding may lead this Crop Production State (State 6) over a threshold to the Native/Invaded State (State 3).

Restoration pathway T6B & T6C
State 6 to 4

T6B – Seeding may lead this Crop Production State (State 6) over a threshold to the Invaded State (State 4) T6C – Cropping followed by abandonment may lead this plant community phase over a threshold to the Invaded State (State 4) and more specifically to the 4.3 Annual Pioneer-Perennial Pioneer Plant Community Phase.

Additional community tables

Table 11. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrass**			471–942	
	western wheatgrass	PASM	*Pascopyrum smithii*	314–942	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–157	–
2	**Needlegrass**			471–942	
	green needlegrass	NAVI4	*Nassella viridula*	314–785	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	63–628	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	63–471	–
3	**Tall Warm-Season Grasses**			314–628	
	big bluestem	ANGE	*Andropogon gerardii*	157–628	–
	switchgrass	PAVI2	*Panicum virgatum*	63–471	–
	Indiangrass	SONU2	*Sorghastrum nutans*	63–471	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–157	–
4	**Mid Warm-Season Grasses**			314–628	
	sideoats grama	BOCU	*Bouteloua curtipendula*	157–471	–
	little bluestem	SCSC	*Schizachyrium scoparium*	63–471	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–157	–
	prairie dropseed	SPHE	*Sporobolus heterolepis*	0–126	–
5	**Short Warm-Season Grasses**			31–157	
	blue grama	BOGR2	*Bouteloua gracilis*	31–157	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–126	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–94	–
	threeawn	ARIST	*Aristida*	0–31	–
6	**Other Native GRasses**			31–157	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–126	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	31–126	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–63	–
	fall rosette grass	DIWI5	*Dichanthelium wilcoxianum*	0–63	–
7	**Grass-likes**			31–157	
	sedge	CAREX	*Carex*	31–157	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–126	–
Forb					
8	**Forbs**			157–314	
	Forb, native	2FN	*Forb, native*	31–157	–
	scurfpea	PSORA2	*Psoralidium*	31–126	–
	goldenrod	SOLID	*Solidago*	31–94	–
	white heath aster	SYER	*Symphyotrichum ericoides*	31–94	–

	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–94	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	31–94	–
	purple prairie clover	DAPU5	*Dalea purpurea*	31–94	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	0–63	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	31–63	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–63	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	31–63	–
	dotted blazing star	LIPU	*Liatris punctata*	31–63	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–63	–
	field sagewort	ARCA12	*Artemisia campestris*	0–63	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	31–63	–
	American vetch	VIAM	*Vicia americana*	31–63	–
	false boneset	BREU	*Brickellia eupatorioides*	0–63	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	31–63	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	31–63	–
	beardtongue	PENST	*Penstemon*	0–31	–
	groundplum milkvetch	ASCR2	*Astragalus crassicarpus*	0–31	–
	American bird's-foot trefoil	LOUNU	*Lotus unifoliolatus var. unifoliolatus*	0–31	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–31	–
Shrub/Vine					
9	**Shrubs**			63–157	
	leadplant	AMCA6	*Amorpha canescens*	31–126	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	0–94	–
	rose	ROSA5	*Rosa*	31–63	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–63	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–63	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–31	–

Table 12. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrass**			404–807	
	western wheatgrass	PASM	*Pascopyrum smithii*	404–807	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–135	–
2	**Needlegrass**			54–404	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–269	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–269	–
	green needlegrass	NAVI4	*Nassella viridula*	27–269	–
3	**Tall Warm-Season Grasses**			54–269	
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	27–215	–
	big bluestem	ANGE	*Andropogon gerardii*	27–135	–
	switchgrass	PAVI2	*Panicum virgatum*	0–135	–

	Indiangrass	SONU2	*Sorghastrum nutans*	0–135	–
4	**Mid Warm-Season Grasses**			54–269	
	sideoats grama	BOCU	*Bouteloua curtipendula*	54–269	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–135	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–135	–
	prairie dropseed	SPHE	*Sporobolus heterolepis*	0–135	–
5	**Short Warm-Season Grasses**			269–538	
	blue grama	BOGR2	*Bouteloua gracilis*	269–538	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–135	–
	buffalograss	BODA2	*Bouteloua dactyloides*	27–135	–
	threeawn	ARIST	*Aristida*	0–81	–
6	**Other Native Grasses**			27–135	
	prairie Junegrass	KOMA	*Koeleria macrantha*	27–135	–
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–108	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–81	–
	fall rosette grass	DIWI5	*Dichanthelium wilcoxianum*	0–54	–
7	**Grass-likes**			54–215	
	sedge	CAREX	*Carex*	54–215	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–135	–
8	**Non-Native Grasses**			135–404	
	bluegrass	POA	*Poa*	54–269	–
	crested wheatgrass	AGCR	*Agropyron cristatum*	0–135	–
	smooth brome	BRIN2	*Bromus inermis*	0–135	–
	brome	BROMU	*Bromus*	0–81	–
Forb					
9	**Forbs**			135–269	
	sweetclover	MELIL	*Melilotus*	0–135	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	27–108	–
	white heath aster	SYER	*Symphyotrichum ericoides*	27–108	–
	goldenrod	SOLID	*Solidago*	27–108	–
	scurfpea	PSORA2	*Psoralidium*	27–81	–
	Forb, introduced	2FI	*Forb, introduced*	27–81	–
	Forb, native	2FN	*Forb, native*	27–81	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	27–81	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	27–81	–
	field sagewort	ARCA12	*Artemisia campestris*	27–81	–
	dotted blazing star	LIPU	*Liatris punctata*	27–54	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	27–54	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	27–54	–
	American vetch	VIAM	*Vicia americana*	0–54	–
	American bird's-foot trefoil	LOUNU	*Lotus unifoliolatus var. unifoliolatus*	0–27	–

	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–27	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–27	–
	beardtongue	PENST	*Penstemon*	0–27	–
	groundplum milkvetch	ASCR2	*Astragalus crassicarpus*	0–27	–
	false boneset	BREU	*Brickellia eupatorioides*	0–27	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–27	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	0–27	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–27	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–27	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–27	–
Shrub/Vine					
10	**Shrubs**			54–188	
	western snowberry	SYOC	*Symphoricarpos occidentalis*	27–135	–
	prairie sagewort	ARFR4	*Artemisia frigida*	27–108	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–54	–
	rose	ROSA5	*Rosa*	27–54	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–54	–
	leadplant	AMCA6	*Amorpha canescens*	0–54	–

Table 13. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrass**			0–202	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–202	–
2	**Needlegrass**			0–81	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–81	–
	green needlegrass	NAVI4	*Nassella viridula*	0–61	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–20	–
3	**Tall Warm-Season Grasses**			0–61	
	big bluestem	ANGE	*Andropogon gerardii*	0–61	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–61	–
4	**Mid Warm-Season Grasses**			0–81	
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–81	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–81	–
5	**Short Warm-Season Grasses**			404–908	
	blue grama	BOGR2	*Bouteloua gracilis*	404–807	–
	buffalograss	BODA2	*Bouteloua dactyloides*	40–303	–
	threeawn	ARIST	*Aristida*	0–161	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–101	–
6	**Other Native Grasses**			20–81	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–61	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	20–61	–

	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–40	–
7	**Grass-likes**			101–202	
	sedge	CAREX	*Carex*	61–202	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–101	–
8	**Non-Native Grasses**			0–504	
	bluegrass	POA	*Poa*	0–504	–
	brome	BROMU	*Bromus*	0–101	–
	crested wheatgrass	AGCR	*Agropyron cristatum*	0–101	–
	smooth brome	BRIN2	*Bromus inermis*	0–61	–
Forb					
9	**Forbs**			101–303	
	sweetclover	MELIL	*Melilotus*	0–202	–
	Forb, introduced	2FI	*Forb, introduced*	20–161	–
	white heath aster	SYER	*Symphyotrichum ericoides*	20–81	–
	goldenrod	SOLID	*Solidago*	20–61	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	20–61	–
	field sagewort	ARCA12	*Artemisia campestris*	0–61	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	20–61	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	20–40	–
	Forb, native	2FN	*Forb, native*	0–40	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	20–40	–
	scurfpea	PSORA2	*Psoralidium*	20–40	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–20	–
	American vetch	VIAM	*Vicia americana*	0–20	–
	fetid marigold	DYPA	*Dyssodia papposa*	0–20	–
	dotted blazing star	LIPU	*Liatris punctata*	0–20	–
	American bird's-foot trefoil	LOUNU	*Lotus unifoliolatus var. unifoliolatus*	0–20	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–20	–
Shrub/Vine					
10	**Shrubs**			40–202	
	prairie sagewort	ARFR4	*Artemisia frigida*	40–161	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–61	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	0–61	–
	rose	ROSA5	*Rosa*	0–40	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–20	–

Table 14. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrass**			0–56	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–56	–
2	**Tall Warm-Season Grasses**			0–22	

2	**Tall Warm-Season Grasses**			0–22	
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–22	–
3	**Short Warm-Season Grasses**			224–504	
	threeawn	ARIST	*Aristida*	168–448	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–112	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–112	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–56	–
4	**Other Native Grasses**			0–34	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–22	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–11	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–11	–
5	**Grass-likes**			22–168	
	sedge	CAREX	*Carex*	22–168	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–56	–
6	**Non-Native Grasses**			56–224	
	bluegrass	POA	*Poa*	56–224	–
	crested wheatgrass	AGCR	*Agropyron cristatum*	22–112	–
	brome	BROMU	*Bromus*	0–56	–
	smooth brome	BRIN2	*Bromus inermis*	0–34	–
Forb					
7	**Forbs**			112–392	
	Forb, introduced	2FI	*Forb, introduced*	22–168	–
	fetid marigold	DYPA	*Dyssodia papposa*	22–168	–
	sweetclover	MELIL	*Melilotus*	11–168	–
	Forb, native	2FN	*Forb, native*	0–112	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	11–56	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	11–34	–
	field sagewort	ARCA12	*Artemisia campestris*	0–22	–
	goldenrod	SOLID	*Solidago*	0–22	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–22	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–22	–
	scurfpea	PSORA2	*Psoralidium*	0–11	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–11	–
Shrub/Vine					
8	**Shrubs**			22–56	
	prairie sagewort	ARFR4	*Artemisia frigida*	0–45	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	11–45	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–11	–

Table 15. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					

Grass/Grasslike					
1	**Wheatgrass**			0–336	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–336	–
2	**Needlegrass**			0–336	
	green needlegrass	NAVI4	*Nassella viridula*	0–336	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–101	–
3	**Tall Warm-Season Grasses**			0–101	
	big bluestem	ANGE	*Andropogon gerardii*	0–101	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–101	–
4	**Mid Warm-Season Grasses**			0–67	
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–67	–
5	**Short Warm-Season Grasses**			0–135	
	blue grama	BOGR2	*Bouteloua gracilis*	0–101	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–67	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–67	–
	threeawn	ARIST	*Aristida*	0–34	–
6	**Other Native Grasses**			0–135	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–101	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–101	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–67	–
	fall rosette grass	DIWI5	*Dichanthelium wilcoxianum*	0–34	–
7	**Grass-likes**			0–101	
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–101	–
	sedge	CAREX	*Carex*	0–101	–
8	**Non-native Grasses**			1345–2522	
	smooth brome	BRIN2	*Bromus inermis*	673–2354	–
	bluegrass	POA	*Poa*	168–1009	–
	crested wheatgrass	AGCR	*Agropyron cristatum*	0–504	–
	brome	BROMU	*Bromus*	34–168	–
Forb					
9	**Forbs**			168–336	
	sweetclover	MELIL	*Melilotus*	0–336	–
	Forb, introduced	2FI	*Forb, introduced*	0–202	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–101	–
	scurfpea	PSORA2	*Psoralidium*	0–101	–
	goldenrod	SOLID	*Solidago*	0–101	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–101	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–67	–
	Forb, native	2FN	*Forb, native*	0–67	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	0–67	–
	field sagewort	ARCA12	*Artemisia campestris*	0–34	–
	American vetch	VIAM	*Vicia americana*	0–34	–

	American vetch	VIAM	*Vicia americana*	0–34	
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–34	–
	false boneset	BREU	*Brickellia eupatorioides*	0–34	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–34	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	0–34	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–34	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–34	–
	dotted blazing star	LIPU	*Liatris punctata*	0–34	–
	American bird's-foot trefoil	LOUNU	*Lotus unifoliolatus var. unifoliolatus*	0–34	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–34	–
Shrub/Vine					
10	**Shrubs**			34–336	
	western snowberry	SYOC	*Symphoricarpos occidentalis*	34–336	–
	rose	ROSA5	*Rosa*	0–67	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–34	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–34	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–34	–

Table 16. Community 4.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrass**			0–123	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–123	–
2	**Needlegrass**			0–123	
	green needlegrass	NAVI4	*Nassella viridula*	0–123	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–25	–
3	**Tall Warm-Season Grasses**			0–123	
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–123	–
	big bluestem	ANGE	*Andropogon gerardii*	0–74	–
4	**Mid Warm-Season Grasses**			0–49	
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–49	–
5	**Short Warm-Season Grasses**			25–493	
	threeawn	ARIST	*Aristida*	25–247	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–247	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–74	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–49	–
6	**Other Native Grasses**			0–123	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–123	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–25	–
	fall rosette grass	DIWI5	*Dichanthelium wilcoxianum*	0–25	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–25	–
7	**Sedges**			0–74	

7	**Grass-likes**			0–74	
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–74	–
	sedge	CAREX	*Carex*	0–74	–
8	**Non-Native Grasses**			740–1726	
	bluegrass	POA	*Poa*	740–1603	–
	crested wheatgrass	AGCR	*Agropyron cristatum*	0–247	–
	smooth brome	BRIN2	*Bromus inermis*	0–247	–
	brome	BROMU	*Bromus*	25–247	–
Forb					
9	**Forbs**			49–247	
	sweetclover	MELIL	*Melilotus*	0–247	–
	Forb, introduced	2FI	*Forb, introduced*	0–173	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	0–74	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–74	–
	goldenrod	SOLID	*Solidago*	0–74	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–49	–
	field sagewort	ARCA12	*Artemisia campestris*	0–49	–
	Forb, native	2FN	*Forb, native*	0–49	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–49	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–25	–
	scurfpea	PSORA2	*Psoralidium*	0–25	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–25	–
Shrub/Vine					
10	**Shrubs**			0–123	
	western snowberry	SYOC	*Symphoricarpos occidentalis*	0–123	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–123	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–74	–
	rose	ROSA5	*Rosa*	0–25	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–25	–

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 ES 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/Needlegrass (1.1)
Average Annual Production (lbs./acre, air-dry): 2,800
Stocking Rate* (AUM/acre): 0.77

Western Wheatgrass/Blue Grama/Kentucky Bluegrass (2.2)
Average Annual Production (lbs./acre, air-dry): 2,400

Stocking Rate* (AUM/acre): 0.66

Blue Grama/ Buffalograss Sod (3.1)
Average Annual Production (lbs./acre, air-dry): 1,800
Stocking Rate* (AUM/acre): 0.49

Three Awn/ Forbs (3.2)
Average Annual Production (lbs./acre, air-dry): 1,000
Stocking Rate* (AUM/acre): 0.27

Smooth Brome/Kentucky Bluegrass/Crested Wheatgrass (4.1)
Average Annual Production (lbs./acre, air-dry): 3,000
Stocking Rate* (AUM/acre): 0.82

Kentucky Bluegrass Plant Community Phase (4.2)
Average Annual Production (lbs./acre, air-dry): 2,200
Stocking Rate* (AUM/acre): 0.60

Annual/Pioneer, Non-native Perennial (4.3)
Average Annual Production (lbs./acre, air-dry): 900
Stocking Rate* (AUM/acre): 0.25

*Based on 912 lbs./acre (air-dry weight) per Animal Unit Month (AUM), and on 25 percent harvest efficiency (refer to United States Department of Agriculture (USDA) Natural Resources Conservation Service (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 with localized areas in hydrologic group C. 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 percent 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 percent 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 varieties of plants that bloom from spring until fall have an aesthetic 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.

Other information

Ecological Site Correlation Issues and Questions:

• SD107 Potter County, SD did not use the (JgC) Java-Glenham loams, 3 to 9 percent slopes (national symbol cvf0) as used in the adjoining SD119 Sully County.
• SD069 Hyde County, SD did not use the (WnB) Williams-Bowbells loams, 1 to 6 percent slopes (national symbol cxm4) (R53BY010SD ESD) as used in the adjoining SD049 Faulk County. SD049 Faulk County, SD (WnB) Williams-Bowbells loams, 1 to 6 percent slopes (national symbol cxm4) (R53BY010SD ESD) will need to be split correlated to match SD069 Hyde County, SD ESD.
• SD069 Hyde County, SD did not use the (WoB) Williams-Bowbells-Nishon complex, 1 to 6 percent slopes (national symbol cxm6) (R53BY010SD ESD) as used in the adjoining SD049 Faulk County. SD049 Faulk County, SD (WoB) Williams-Bowbells-Nishon, 1 to 6 percent slopes (national symbol cxm6) (R53BY010SD ESD) will need to be split correlated to match SD069 Hyde County, SD ESD.
• SD069 Hyde County, SD did not use the (WmB) Williams loam, undulating (national symbol cv02) (R55CY010SD ESD) as used in the adjoining SD059 Hand County. SD059 Hand County, SD (WmB) William loam, undulating (national symbol cv02) (R55CY010SD ESD) will need to be split correlated to match SD069 Hyde County, SD ESD.
• SD059 Hand County, SD did not use the (WnB) Williams-Bowbells loams, 1 to 6 percent slopes (national symbol cxm4) (R53BY010SD ESD) as used in the adjoining SD049 Faulk County. SD049 Faulk County, SD (WnB) Williams-Bowbells loams, 1 to 6 percent slopes (national symbol cxm4) (R53BY010SD ESD) will need to be split correlated to match SD059 Hand County, SD ESD.
• SD059 Hand County, SD did not use the (VdC) Vida-Williams-Bowbells loams, 2 to 9 percent slopes (national symbol cxm0) (R53BY010SD ESD) as used in the adjoining SD049 Faulk County. SD049 Faulk County, SD (VdC) Vida-Williams-Bowbells loams, 2 to 9 percent slopes (national symbol cxm0) (R53BY010SD ESD) will need to be split correlated to match SD059 Hand County, SD ESD.

• SD069 Hyde County, SD did not use the (ZyD) Java-Glenham loams, hilly (national symbol cv0w) as used in the adjoining SD059 Hand County. SD059 Hand County, SD.
• SD017 Buffalo County, SD (SD603 Brule and Buffalo Counties Soil survey) did not use the (ZxD) Java-Glenham loams, hilly (national symbol cv0t) as used in the adjoining SD059 Hand County. SD059 Hand County, SD.
• SD017 Buffalo County, SD (SD603 Brule and Buffalo Counties Soil survey) did not use the (WmB) Williams loam, undulating (national symbol cv02) (R55CY010SD ESD) as used in the adjoining SD059 Hand County. SD059 Hand County, SD (WmB) William loam, undulating (national symbol cv02) (R55CY010SD ESD) will need to be split correlated to match SD017 Buffalo County, SD ESD.
• SD017 Buffalo County, SD (SD603 Brule and Buffalo Counties Soil survey) did not use the (HwB) Houdek-Ethan-Prosper loams, 1 to 6 percent slopes (national symbol 2tlb9) (R55CY010SD ESD) as used in the adjoining SD073 Jerauld County. SD073 Jerauld County, SD (HwB) Houdek-Ethan-Prosper loams, 1 to 6 percent slopes (national symbol 2tlb9) (R55CY010SD ESD) will need to be split correlated to match SD017 Buffalo County, SD ESD.
• SD073 Jerauld County, SD did not use the (HgB) Highmore-Java complex, 1 to 5 percent slopes (national symbol cxxx) (R55CY010SD ESD) as used in the adjoining SD017 Buffalo County (SD603 Brule and Buffalo Counties Soil survey. SD017 Buffalo County, SD (HgB) Highmore-Java complex, 1 to 5 percent slopes (national symbol cxxx) (R55CY010SD ESD) will need to be split correlated to match SD073 Jerauld County, SD ESD.
• SD073 Jerauld County, SD did not use the (EeB) Eakin-Ethan complex, 2 to 6 percent slopes (national symbol 2xhbv) (R55CY010SD ESD) as used in the adjoining SD003 Aurora County. SD003 Aurora County, SD (EeB) Eakin-Ethan complex, 2 to 6 percent slopes (national symbol 2xhbv) (R55CY010SD ESD) will need to be split correlated to match SD073 Jerauld County, SD ESD.
• SD015 Brule County, SD (SD603 Brule and Buffalo Counties Soil survey) did not use the (HwB) Houdek-Ethan-Prosper loams, 1 to 6 percent slopes (national symbol 2tlb9) (R55CY010SD ESD) as used in the adjoining SD073 Jerauld County. SD073 Jerauld County, SD (HwB) Houdek-Ethan-Prosper loams, 1 to 6 percent slopes (national symbol 2tlb9) (R55CY010SD ESD) will need to be split correlated to match SD015 Brule County, SD ESD.
• SD003 Aurora County, SD did not use the (HmA) Highmore-Mobridge silt loams, 0 to 4 percent slopes (national symbol cxxz) (R55CY010SD ESD) as used in the adjoining SD015 Brule County (SD603 Brule and Buffalo Counties Soil survey). SD015 Brule County (SD603 Brule and Buffalo Counties Soil survey) (HmA) Highmore-Mobridge silt loams, 0 to 4 percent slopes (national symbol cxxz) (R55CY010SD ESD) will need to be split correlated to match SD003 Aurora County, SD ESD.
• Reference and alternative states within the state and transition model are may not be fully documented and may require additional field sampling for refinement.

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; and Bruce Kunze, Soil Scientist,, NRCS; Shane Deranleau, RMS, NRCS; Mitch Faulkner, RMS, NRCS; and Kelly Stout, RMS, NRCS.

Data Source Sample Period State County
SCS-Range-417 (0027146065) 9/2/1971 SD Hughes
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Approval

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This Provisional Ecological Site concept has passed both Quality Control and Quality Assurance processes. Quality Assurance was approved by David Kraft, NRCS Regional Ecologist as of 11/12/2020.

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	03/15/2011
Approved by	Suzanne Mayne-Kinney
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills should not be present.

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

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

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

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

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

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

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

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface structure is typically granular, and mollic (higher organic matter) colors of A-horizon down to about 4 to 8 inches. If conditions are other than this, refer to map unit component descriptions for component on which the site occurs.

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

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** No compaction layer should be present.

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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: Wheatgrasses (mid, cool-season rhizomatous) = needlegrasses (mid and tall, cool-season bunchgrasses) >

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

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

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

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or**

decadence): Very little to no evidence of decadence or mortality.

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

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 2,800 pounds/acre (air-dry basis)

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

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