USDA Natural Resources Conservation Service

Ecological site R102AY010SD
Loamy

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.

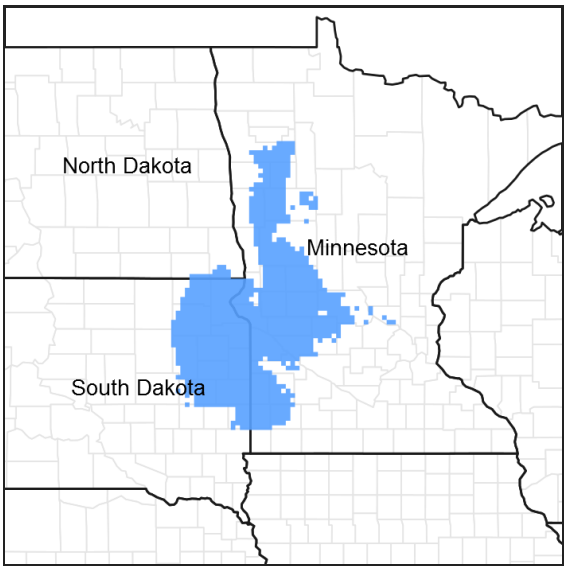


Figure 1. Mapped extent

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.

MLRA notes

Major Land Resource Area (MLRA): 102A–Rolling Till Prairie

For further information on this Ecological Site Description (ESD), view on South Dakota Electronic Field Office Technical Guide (EFOTG), contact the NRCS State Office in Huron, SD, or MLRA Soil Survey Office in Redfield, SD.

Classification relationships

Level IV Ecoregions of the Conterminous United States: 46e – Tewaukon Dead Ice Moraine, 46k – Prairie Coteau, 46l – Prairie Coteau Escarpment, 46m – Big Sioux Basin, 46o – Minnesota River Prairie, 47b – Des Moines Lobe, 48d – Lake Agassiz Plain, 51j – Alexandria Moraines and Detroit Lakes Outwash Plain.

Associated sites

R102AY012SD	**Thin Upland**
R102AY020SD	**Loamy Overflow**

Similar sites

R102AY020SD	**Loamy Overflow** Loamy Overflow [more big bluestem; higher production]
R102AY011SD	**Clayey** Clayey [more green needlegrass; less big bluestem]

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Andropogon gerardii* (2) *Sorghastrum nutans*

Physiographic features

This site occurs on nearly level to steeply sloping uplands.

Table 2. Representative physiographic features

Landforms	(1) Till plain (2) Moraine (3) Outwash plain
Flooding frequency	None
Ponding frequency	None
Elevation	305–610 m
Slope	0–30%
Water table depth	107–203 cm
Aspect	Aspect is not a significant factor

Climatic features

MLRA 102A is considered to have a continental climate – cold winters and relatively hot summers, low to moderate 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 21 to 27 inches per year. The average annual temperature is about 43°F. January is the coldest month with average temperatures ranging from about 5°F (Mahnomen 1 W, Minnesota (MN)), to about 14°F (Tracy, MN). July is the warmest month with temperatures averaging from about 69°F (Mahnomen 1 W, MN), to about 73°F (Tracy, MN). The range of normal average monthly temperatures between the coldest and warmest months is about 62°F. This large annual range attests to the continental nature of this area's climate. Hourly winds are estimated to average about 11 miles per hour (mph) annually, ranging from about 13 mph during the spring to about 10 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 (average)	152 days
Freeze-free period (average)	174 days
Precipitation total (average)	686 mm

Influencing water features

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

Soil features

The common features of soils in this site are loam to clay loam textured subsurface soils (occasionally silty clay), with slopes ranging from 0 to 30 percent. Some soils are underlain with sand and/or gravel at about two to three feet in depth. The soils in this site are well-drained and typically formed in till, drift, and/or loess. The loam to silty clay loam surface layer is typically 5 to 18 inches thick. Surface and subsurface layers are sometimes stony or very stony. The soils have a moderate to moderately slow infiltration rate. This site typically should show slight to no evidence of rills, wind scoured areas, or pedestalled plants. If present, water flow paths are broken, irregular in appearance, or discontinuous. The soil surface is stable and intact. Subsurface soil layers are nonrestrictive to water movement and root penetration. These soils are mainly susceptible to water erosion. The hazard of water erosion increases on slopes greater than about 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/HomePage.htm) 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
Permeability class	Moderately slow to moderate
Soil depth	203 cm
Surface fragment cover <=3"	0–15%
Surface fragment cover >3"	0–35%
Available water capacity (0-101.6cm)	15.24–20.32 cm
Calcium carbonate equivalent (0-101.6cm)	0–30%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–2
Soil reaction (1:1 water) (0-101.6cm)	5.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–50%
Subsurface fragment volume >3" (Depth not specified)	0–20%

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

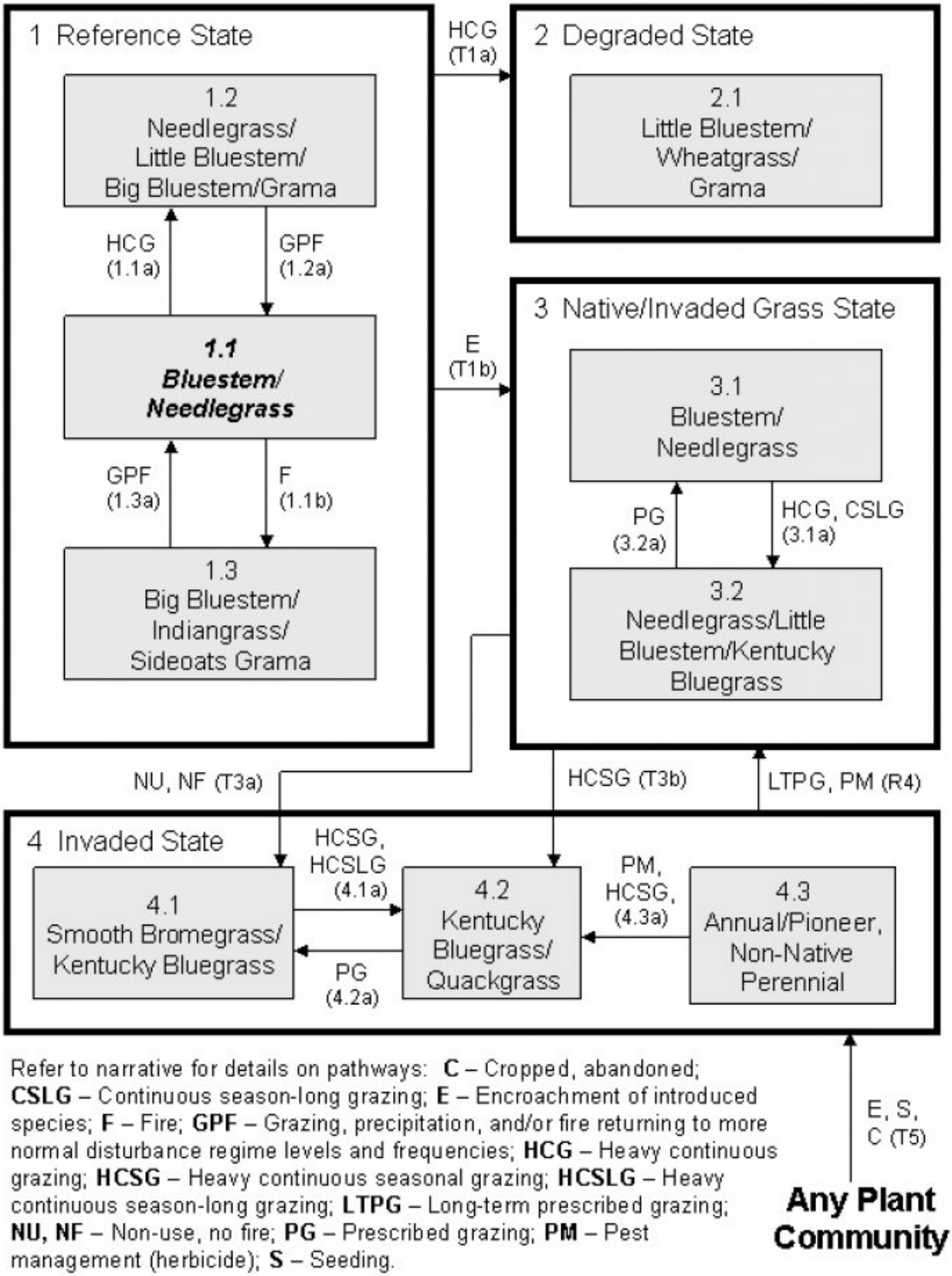
variations, impacts of native and/or exotic plant and animal species, and management actions. While the following plant community descriptions describe more typical transitions that will occur, severe disturbances, such as periods of well below average precipitation, can cause significant shifts in plant communities and/or species composition that may not be described within this document.

Continuous season-long grazing (during the typical growing season of May through October) and/or repeated seasonal grazing (e.g., every spring, every summer) without adequate recovery periods following grazing events causes departure from the 3.1 Bluestem/Needlegrass Plant Community Phase. Little bluestem, wheatgrass, sideoats grama, and blue grama will increase. Eventually, blue grama, quackgrass, and Kentucky bluegrass may develop into a sod. Indiangrass, big bluestem, porcupine grass, green needlegrass, sideoats grama, and little bluestem will decrease in frequency and production. Extended periods of nonuse and/or lack of fire will result in excessive litter and a plant community dominated by cool-season grasses such as Kentucky bluegrass, smooth bromegrass, and green needlegrass.

Interpretations are primarily based on the 1.1 Bluestem/Needlegrass Plant Community Phase. 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



State 1
Reference

This state represents the natural range of variability that dominated the dynamics of this ecological site (ES). This

state was dominated by warm-season grasses, with cool-season grasses being subdominant. In pre-European times, the primary disturbance mechanisms for this site in the reference condition included 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. In some locations, this site likely received relatively heavy grazing pressure. Tall warm-season grasses would have declined and cool-season bunchgrasses and short to mid-statured warm-season grasses would have increased. Today, a similar state (State 3) can be found on areas that are properly managed with grazing and/or prescribed burning and sometimes on areas receiving occasional short periods of rest.

Community 1.1
Bluestem/Needlegrass Plant Community Phase

Interpretations are based primarily on the Bluestem/Needlegrass Plant Community Phase (this is also considered to be climax). The potential vegetation was about 80 percent grasses or grass-like plants, 15 percent forbs, and 5 percent shrubs. The community was dominated by warm-season grasses, with cool-season grasses being subdominant. The major grasses included big bluestem, Indiangrass, porcupine grass, green needlegrass, and little bluestem. Other grass or grass-like species included switchgrass, sideoats grama, slender wheatgrass, prairie dropseed, and sedges. 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	2780	3335	3755
Forb	174	392	706
Shrub/Vine	73	196	359
Total	**3027**	**3923**	**4820**

Figure 5. Plant community growth curve (percent production by month). SD0204, Rolling Till Prairie, 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 1.2
Needlegrass/Little Bluestem/Big Bluestem/Grama Plant Community Phase

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 green needlegrass, little bluestem, big bluestem, and sideoats grama. Grasses of secondary importance included blue grama, western wheatgrass, porcupine grass, Indiangrass, switchgrass, tall dropseed, prairie dropseed, slender wheatgrass, and sedge. Forbs commonly found in this plant community included Canada goldenrod, cudweed sagewort, heath aster, scurfpea, stiff goldenrod, western ragweed, and western yarrow. This plant community had similar plant composition to the 3.2 Needlegrass/Little Bluestem/Kentucky Bluegrass Plant Community Phase (refer to the plant composition tables). The main difference is that this plant community phase did not have the presence of non-native invasive species such as Kentucky bluegrass and smooth bromegrass. When compared to the Bluestem/Needlegrass Plant Community Phase (1.1), green needlegrass and little bluestem increased. Production of tall warm-season grasses was reduced. This plant community was moderately resistant to change. The herbaceous species present were well adapted to grazing; however, species composition could be altered through long-term overgrazing. If the herbaceous component was intact, it tended to be resilient if the disturbance was not long-term. 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 6. Plant community growth curve (percent production by month). SD0203, Rolling Till Prairie, cool-season/warm-season codominant.. Cool-season, warm-season codominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	20	28	21	10	5	3	0	0

Community 1.3
Big Bluestem/Indiangrass/Sideoats Grama Plant Community Phase

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

Figure 7. Plant community growth curve (percent production by month). SD0205, Rolling Till Prairie, warm-season dominant.. Warm-season dominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	2	5	15	25	30	15	7	1	0	0

Pathway 1.1a
Community 1.1 to 1.2

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

Pathway 1.1b
Community 1.1 to 1.3

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

Pathway 1.2a
Community 1.2 to 1.1

Grazing, precipitation, and/or fire returned to normal disturbance regime levels and frequencies or periodic light to moderate grazing possibly including periodic rest would have converted this plant community to the 1.1 Bluestem/Needlegrass Plant Community Phase.

Pathway 1.3a
Community 1.3 to 1.1

Grazing, precipitation, and/or fire returned to normal disturbance regime levels and frequencies or periodic light to moderate grazing possibly including periodic rest will convert this plant community to the 1.1 Bluestem/Needlegrass Plant Community Phase.

State 2
Degraded

Community 2.1
Little Bluestem/Wheatgrass/Grama Plant Community

This plant community evolved under heavy continuous season grazing or from over utilization during extended drought periods. The potential plant community was made up of approximately 85 percent grasses and grass-like species, 10 percent forbs, and 5 percent shrubs. Dominant grasses included little bluestem, western wheatgrass, sideoats grama, and blue grama. Grasses of secondary importance included big bluestem, switchgrass, green needlegrass, slender wheatgrass, tall dropseed, and sedge. Forbs commonly found in this plant community included cudweed sagewort, green sagewort, and western yarrow. When compared to the Bluestem/Needlegrass Plant Community Phase (1.1), tall warm-season grasses were reduced, and the more grazing tolerant species such as blue grama, little bluestem, and sideoats grama were dominant on this plant community. With the exception of western wheatgrass, cool-season grasses decreased significantly. This vegetation state was very resistant to change, especially if the disturbance continued and the short-statured species such as blue grama increased. The herbaceous species present were well adapted to grazing. This plant community was less productive than other phases.

Figure 8. Plant community growth curve (percent production by month). SD0204, Rolling Till Prairie, 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

State 3
Native/Invaded Grass

This state represents the more common range of variability that exists with higher levels of grazing management but in the absence of periodic fire due to fire suppression. This state is dominated by cool- and warm-season grasses. It can be found on areas that are properly managed with grazing and/or prescribed burning, and sometimes on areas receiving occasional short periods of rest. Taller warm-season species can decline and a corresponding increase in short statured grass will occur.

Community 3.1
Bluestem/Needlegrass Plant Community Phase

This plant community phase is similar to the 1.1 Bluestem/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 10 percent by air-dry weight). The potential vegetation is about 80 percent grasses or grass-like plants, 15 percent forbs, and 5 percent shrubs. This community is dominated by warm-season grasses, with cool-season grasses being subdominant. The major grasses include big bluestem, Indiangrass, porcupine grass, green needlegrass, and little bluestem. Other grass or grass-like species include switchgrass, sideoats grama, slender wheatgrass, prairie dropseed, and sedges. This plant community is resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allows for high drought tolerance. This is a sustainable plant community in regards to site/soil stability, watershed function, and biologic integrity.

Figure 9. Plant community growth curve (percent production by month). SD0204, Rolling Till Prairie, 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
Needlegrass/Little Bluestem/Kentucky Bluegrass Plant Community Phase

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 85 percent grasses and grass-like species, 10 percent forbs, and 5 percent shrubs. Dominant grasses include green needlegrass, little bluestem, big bluestem, sideoats grama, and Kentucky bluegrass. Grasses of secondary importance include blue grama, western wheatgrass, porcupine grass, Indiangrass, switchgrass, tall dropseed, prairie dropseed, slender wheatgrass, and sedge. Forbs commonly found in this plant community include Canada goldenrod, cudweed sagewort, heath aster, scurfpea, stiff goldenrod, western ragweed, and western yarrow. When compared to the Bluestem/Needlegrass Plant Community Phase (1.1), green needlegrass and little bluestem have increased. Production of 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 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2074	2809	3503
Forb	140	235	359
Shrub/Vine	28	94	174
Total	**2242**	**3138**	**4036**

Figure 11. Plant community growth curve (percent production by month). SD0203, Rolling Till Prairie, cool-season/warm-season codominant.. Cool-season, warm-season codominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	20	28	21	10	5	3	0	0

Pathway 3.1a
Community 3.1 to 3.2

Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season, and often at the same time of year each year), or continuous season-long grazing, or a combination of disturbances such as extended periods of below average precipitation coupled with periodic heavy grazing will shift this community to the 3.2 Needlegrass/Little Bluestem/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 Bluestem/Needlegrass Plant Community Phase.

Conservation practices

Prescribed Grazing

State 4
Invaded

This state is a result of encroachment mainly by invasive introduced cool-season grasses. 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 Plant Community Phase

This plant community phase is a result of extended periods of nonuse and no fire or occasionally light levels of grazing over several years. It is characterized by dominance of smooth bromegrass and to a lesser extent 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. 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 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2494	3120	3643
Forb	163	359	639
Shrub/Vine	34	108	202
Total	**2691**	**3587**	**4484**

Figure 13. Plant community growth curve (percent production by month). SD0201, Rolling Till Prairie, 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/Quackgrass Plant Community Phase

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 quackgrass. The dominance is at times so complete that other species are difficult to find on the site. A relatively thick duff layer can sometimes accumulate at or above the soil surface. Nutrient cycling is greatly reduced, and native plants have great difficulty becoming established. Infiltration is greatly reduced and runoff is high. Production will be significantly reduced when compared to the interpretive plant community. The period that palatability is high is relatively short as Kentucky bluegrass matures rapidly. Energy capture is also reduced. Biological activity in the soil is likely reduced significantly in this phase.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1681	2158	2572
Forb	112	247	432
Shrub/Vine	–	62	135
Total	**1793**	**2467**	**3139**

Figure 15. Plant community growth curve (percent production by month). SD0201, Rolling Till Prairie, 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 4.3
Annual/Pioneer, Non-Native Perennial Plant Community Phase

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/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. 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 seasonal grazing (stocking levels well above carrying capacity for extended portions of the growing season, and at the same time of year each year) or heavy continuous season-long grazing will convert this plant community to the 4.2 Kentucky Bluegrass/Quackgrass 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 seasonal grazing will likely result in an eventual dominance by Kentucky bluegrass which will lead to the 4.2 Kentucky Bluegrass/Quackgrass Plant Community Phase.

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) would have converted this plant community to the 2.1 Little Bluestem/Wheatgrass/Grama Plant Community Phase and the Degraded State.

Transition T1b
State 1 to 3

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 3).

Transition T5
State 1 to 4

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

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 (FSG) description for adapted species and expected production (production estimates in the FSG description may be unrealistically high due to the degraded condition of the site at this phase).

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 (FSG) description for adapted species and expected production (production estimates in the FSG description may be unrealistically high due to the degraded condition of the site at this phase).

Transition T5
State 2 to 4

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

Transition T5
State 3 to 4

Encroachment of non-native invasive/noxious species, abandonment of cropping, or seeding of introduced and/or native improved varieties of forage species may lead this plant community phase over a threshold to the Invaded

State (State 4) and more specifically to the 4.3 Annual/Pioneer, Non-native Perennial Plant Community Phase. In the case of a seeding, refer to the corresponding Forage Suitability Group (FSG) description for adapted species and expected production (production estimates in the FSG description may be unrealistically high due to the degraded condition of the site at this phase).

Transition T5
State 3 to 4

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

Transition T3b
State 3 to 4

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

Transition T3a
State 3 to 4

Non-use and no fire for extended periods of time (typically for 10 or more years) will likely lead this state over a threshold resulting in the 4.1 Smooth Bromegrass/Kentucky Bluegrass Plant Community Phase within the 4.0 Invaded State

Restoration pathway R4
State 4 to 3

Long-term prescribed grazing (moderate stocking levels coupled with adequate recovery periods, or other grazing systems such as high-density, low-frequency intended to treat specific species dominance, or periodic light to moderate stocking levels possibly including periodic rest) may lead this plant community phase over a threshold to the Native/Invaded Grass State (State 3). Pest management (i.e., herbicide) may also be needed to suppress cool-season invasive grasses. This will likely take a long period of time, possibly up to 10 years or more, and recovery may not be attainable. Success depends on whether native reproductive propagules remain intact on the site.

Conservation practices

Prescribed Grazing

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	**Tall Warm-Season Grasses**			785–1765	
	big bluestem	ANGE	*Andropogon gerardii*	392–1373	–
	Indiangrass	SONU2	*Sorghastrum nutans*	196–981	–
	switchgrass	PAVI2	*Panicum virgatum*	78–392	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–118	–
2	**Cool-Season Bunchgrasses**			392–785	

2	**Cool-Season Bunchgrasses**			392–785	
	porcupinegrass	HESP11	*Hesperostipa spartea*	196–785	–
	green needlegrass	NAVI4	*Nassella viridula*	196–785	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–118	–
3	**Mid Warm-Season Grasses**			392–785	
	little bluestem	SCSC	*Schizachyrium scoparium*	196–588	–
	prairie dropseed	SPHE	*Sporobolus heterolepis*	78–392	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	78–392	–
4	**Wheatgrass**			196–392	
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	78–392	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–196	–
5	**Other Native Grasses**			118–275	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	39–196	–
	blue grama	BOGR2	*Bouteloua gracilis*	39–196	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	39–78	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–39	–
	fall rosette grass	DIWI5	*Dichanthelium wilcoxianum*	0–39	–
6	**Grass-likes**			39–196	
	sedge	CAREX	*Carex*	39–196	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–118	–
Forb					
7	**Forbs**			196–588	
	Forb, native	2FN	*Forb, native*	39–196	–
	blazing star	LIATR	*Liatris*	39–118	–
	scurfpea	PSORA2	*Psoralidium*	39–118	–
	white heath aster	SYER	*Symphyotrichum ericoides*	39–78	–
	aromatic aster	SYOB	*Symphyotrichum oblongifolium*	0–78	–
	stiff goldenrod	OLRI	*Oligoneuron rigidum*	39–78	–
	soft-hair marbleseed	ONBEB	*Onosmodium bejariense var. bejariense*	39–78	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	39–78	–
	compassplant	SILA3	*Silphium laciniatum*	0–78	–
	Canada goldenrod	SOCA6	*Solidago canadensis*	39–78	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	39–78	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	39–78	–
	field sagewort	ARCA12	*Artemisia campestris*	39–78	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	39–78	–
	false boneset	BREU	*Brickellia eupatorioides*	39–78	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–78	–
	purple prairie clover	DAPU5	*Dalea purpurea*	39–78	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	39–78	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	39–78	–
	American vetch	VIAM	*Vicia americana*	39–78	–

	Missouri goldenrod	SOMI2	*Solidago missouriensis*	0–39	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–39	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–39	–
	hoary verbena	VEST	*Verbena stricta*	0–39	–
	cutleaf anemone	PUPAM	*Pulsatilla patens ssp. multifida*	0–39	–
Shrub/Vine					
8	**Shrubs**			78–314	
	leadplant	AMCA6	*Amorpha canescens*	39–157	–
	rose	ROSA5	*Rosa*	39–118	–
	snowberry	SYMPH	*Symphoricarpos*	39–118	–
	smooth sumac	RHGL	*Rhus glabra*	0–78	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–78	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–39	–

Table 10. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm-Season Grasses**			157–471	
	big bluestem	ANGE	*Andropogon gerardii*	63–471	–
	switchgrass	PAVI2	*Panicum virgatum*	0–157	–
	Indiangrass	SONU2	*Sorghastrum nutans*	0–157	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–157	–
2	**Cool-season Bunchgrasses**			314–942	
	green needlegrass	NAVI4	*Nassella viridula*	157–785	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	63–314	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–31	–
3	**Mid Warm-Season Grasses**			471–785	
	little bluestem	SCSC	*Schizachyrium scoparium*	314–785	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	63–471	–
	prairie dropseed	SPHE	*Sporobolus heterolepis*	0–157	–
4	**Wheatgrass**			157–471	
	western wheatgrass	PASM	*Pascopyrum smithii*	63–314	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	31–251	–
5	**Other Native Grasses**			157–314	
	blue grama	BOGR2	*Bouteloua gracilis*	63–251	–
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	31–157	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	31–63	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–31	–
	fall rosette grass	DIWI5	*Dichanthelium wilcoxianum*	0–31	–
6	**Grass-likes**			31–157	
	sedge	CAREX	*Carex*	31–157	–

	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–94	–
7	**Non-Native Grasses**			157–471	
	Kentucky bluegrass	POPR	*Poa pratensis*	157–471	–
	smooth brome	BRIN2	*Bromus inermis*	0–251	–
	quackgrass	ELRE4	*Elymus repens*	0–157	–
Forb					
8	**Forbs**			157–314	
	Canada goldenrod	SOCA6	*Solidago canadensis*	31–94	–
	white heath aster	SYER	*Symphyotrichum ericoides*	31–94	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	31–94	–
	Forb, introduced	2FI	*Forb, introduced*	31–94	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	31–94	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	31–94	–
	stiff goldenrod	OLRI	*Oligoneuron rigidum*	31–94	–
	scurfpea	PSORA2	*Psoralidium*	31–94	–
	field sagewort	ARCA12	*Artemisia campestris*	31–63	–
	Forb, native	2FN	*Forb, native*	0–63	–
	hoary verbena	VEST	*Verbena stricta*	0–63	–
	American vetch	VIAM	*Vicia americana*	0–31	–
	aromatic aster	SYOB	*Symphyotrichum oblongifolium*	0–31	–
	Missouri goldenrod	SOMI2	*Solidago missouriensis*	0–31	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–31	–
	soft-hair marbleseed	ONBEB	*Onosmodium bejariense var. bejariense*	0–31	–
	false boneset	BREU	*Brickellia eupatorioides*	0–31	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–31	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–31	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–31	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–31	–
	blazing star	LIATR	*Liatris*	0–31	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–31	–
Shrub/Vine					
9	**Shrubs**			31–157	
	smooth sumac	RHGL	*Rhus glabra*	0–126	–
	rose	ROSA5	*Rosa*	31–63	–
	snowberry	SYMPH	*Symphoricarpos*	0–63	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–63	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–31	–
	leadplant	AMCA6	*Amorpha canescens*	0–31	–

Table 11. Community 4.1 plant community composition

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

1	**Tall Warm-season Grasses**			0–179	
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–179	–
	big bluestem	ANGE	*Andropogon gerardii*	0–108	–
2	**Cool-Season Bunchgrasses**			0–359	
	green needlegrass	NAVI4	*Nassella viridula*	0–359	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–72	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–72	–
3	**Mid Warm-Season Grasses**			0–179	
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–179	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–179	–
4	**Wheatgrass**			0–179	
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–179	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–179	–
5	**Other Native Grasses**			0–179	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–179	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–143	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–36	–
	fall rosette grass	DIWI5	*Dichanthelium wilcoxianum*	0–36	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–36	–
6	**Grass-likes**			0–179	
	sedge	CAREX	*Carex*	0–179	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–72	–
7	**Non-Native Grasses**			1076–2690	
	smooth brome	BRIN2	*Bromus inermis*	717–2511	–
	Kentucky bluegrass	POPR	*Poa pratensis*	359–1793	–
	quackgrass	ELRE4	*Elymus repens*	0–359	–
Forb					
8	**Forbs**			179–538	
	Forb, introduced	2FI	*Forb, introduced*	36–359	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	36–251	–
	Canada goldenrod	SOCA6	*Solidago canadensis*	36–251	–
	white heath aster	SYER	*Symphyotrichum ericoides*	36–179	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	36–179	–
	field sagewort	ARCA12	*Artemisia campestris*	36–143	–
	stiff goldenrod	OLRI	*Oligoneuron rigidum*	36–143	–
	scurfpea	PSORA2	*Psoralidium*	36–143	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	36–143	–
	hoary verbena	VEST	*Verbena stricta*	0–108	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–36	–
	Forb, native	2FN	*Forb, native*	0–36	–
Shrub/Vine					

9	**Shrubs**			36–179	
	smooth sumac	RHGL	*Rhus glabra*	0–179	–
	snowberry	SYMPH	*Symphoricarpos*	36–108	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–72	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–36	–
	rose	ROSA5	*Rosa*	0–36	–

Table 12. Community 4.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Warm-season Grasses**			0–123	
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–123	–
	big bluestem	ANGE	*Andropogon gerardii*	0–123	–
	switchgrass	PAVI2	*Panicum virgatum*	0–74	–
2	**Cool-season Bunchgrasses**			0–123	
	green needlegrass	NAVI4	*Nassella viridula*	0–123	–
3	**Mid Warm-Season Grasses**			0–123	
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–74	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–74	–
4	**Wheatgrass**			0–123	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–123	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–25	–
5	**Other Native Grasses**			25–247	
	blue grama	BOGR2	*Bouteloua gracilis*	25–247	–
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–74	–
	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	–
6	**Grass-likes**			25–123	
	sedge	CAREX	*Carex*	25–123	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–25	–
7	**Non-Native Grasses**			493–1849	
	Kentucky bluegrass	POPR	*Poa pratensis*	247–1480	–
	quackgrass	ELRE4	*Elymus repens*	123–986	–
	smooth brome	BRIN2	*Bromus inermis*	123–740	–
Forb					
8	**Forbs**			123–370	
	Forb, introduced	2FI	*Forb, introduced*	25–247	–
	Canada goldenrod	SOCA6	*Solidago canadensis*	25–148	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–123	–
	stiff goldenrod	OLRI	*Oligoneuron rigidum*	25–123	–

	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	25–123	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	25–123	–
	field sagewort	ARCA12	*Artemisia campestris*	25–99	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–99	–
	hoary verbena	VEST	*Verbena stricta*	0–74	–
	scurfpea	PSORA2	*Psoralidium*	0–74	–
	Forb, native	2FN	*Forb, native*	0–25	–
Shrub/Vine					
9	**Shrubs**			0–123	
	smooth sumac	RHGL	*Rhus glabra*	0–123	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–74	–
	snowberry	SYMPH	*Symphoricarpos*	0–49	–
	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.

Bluestem/Needlegrass (1.1 & 3.1)
Total annual production (lbs/ac, air-dry): 3500
Stocking rate* (AUM/ac): 0.96

Needlegrass/Little Bluestem/Kentucky Bluegrass (3.2)
Total annual production (lbs/ac, air-dry): 2800
Stocking rate* (AUM/ac): 0.77

Smooth Bromegrass/Kentucky Bluegrass (4.1)
Total annual production (lbs/ac, air-dry): 3200
Stocking rate* (AUM/ac): 0.88

Kentucky Bluegrass/Quackgrass (4.2)
Total annual production (lbs/ac, air-dry): 2200
Stocking rate* (AUM/ac): 0.60

Annual/Pioneer, Non-Native Perennial (4.3)
Total annual production (lbs/ac, air-dry): 1000
Stocking rate* (AUM/ac): 0.27

*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. Infiltration is typically moderate to moderately slow and runoff potential for this site varies from low 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 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; and Bruce Kunze, Soil Scientist, NRCS.

There are 26 SCS-RANGE-417's collected from 1985 to 2006 in Clark, Deuel, Grant, Kingsbury, Marshall, Moody, Roberts Counties, South Dakota.

Other references

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USDA, NRCS. 2001. The PLANTS Database, Version 3.1 (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

Contributors

Megan Baxter
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.

Author(s)/participant(s)	David Schmidt, Tim Nordquist, Stan Boltz
Contact for lead author	
Date	12/07/2004
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.

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% and less than 2 inches in diameter.

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

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

7. **Amount of litter movement (describe size and distance expected to travel):** 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):** Stability class usually 6. Typically high root content, organic matter, and granular structure. Soil surface is very resistant to erosion.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Use soil series description for depth and color of A-horizon.

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

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

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant: Mid warm-season bunch grass = tall warm-season rhizomatous grass>

    Sub-dominant: tall cool-season bunch grass >> forb > mid warm-season rhizomatous grass > short cool-season grass

    Other: = short warm-season grass = shrubs

    Additional:

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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):** 70-80%, roughly 0.5 inch thick or less. Litter cover is in contact with soil surface.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 3000 – 4000 lbs./acre air-dry weight, average 3,500 lbs./acre air-dry weight

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

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17. **Perennial plant reproductive capability:** All species are capable of reproducing.
