

Ecological site R102AY012SD Thin Upland

Accessed: 05/03/2024

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.

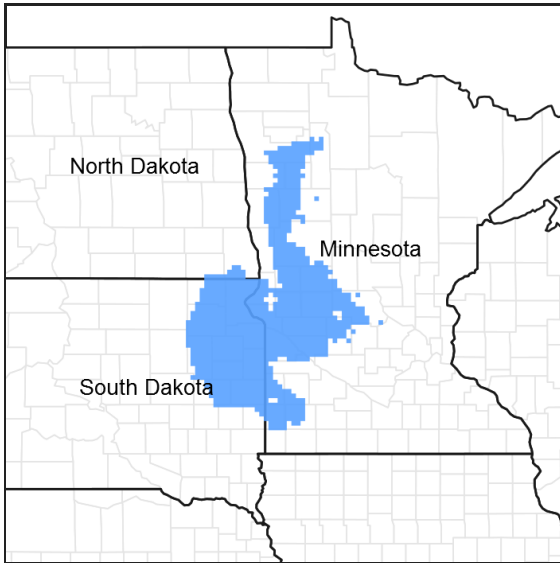


Figure 1. Mapped extent

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

R102AY010SD	Loamy
R102AY020SD	Loamy Overflow

Similar sites

R102AY010SD	Loamy Loamy [more big bluestem, less little bluestem; higher production]
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Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Schizachyrium scoparium</i> (2) <i>Andropogon gerardii</i>

Physiographic features

This site occurs on gently to steeply sloping uplands.

Table 2. Representative physiographic features

Landforms	(1) Plain (2) Moraine (3) Knoll
Elevation	305–610 m
Slope	5–35%
Water table depth	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 features common to soils in this site are the loam, silt loam, or silty clay loam textured surface layers and slopes of 5 to 35 percent. The soils in this site are well-drained and formed in loamy till, drift over till, or glaciolacustrine deposits. The surface layer is 4 to 10 inches thick. The texture of the subsurface layers ranges from loam to clay loam. The soils have a moderate to moderately slow infiltration rate. These soils are typically calcareous at or near the surface. This site should show slight to no evidence of rills, wind scoured areas, or pedestalled plants. Water flow paths are broken, irregular in appearance, or discontinuous with numerous debris dams or vegetative barriers. The soil surface is stable and intact.

These soils are susceptible to wind and water erosion. The hazard of water erosion increases on slopes greater than about 15 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"	3–8%
Surface fragment cover >3"	0–40%
Available water capacity (0-101.6cm)	15.24–20.32 cm
Calcium carbonate equivalent (0-101.6cm)	5–40%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	3–8%
Subsurface fragment volume >3" (Depth not specified)	0–8%

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.

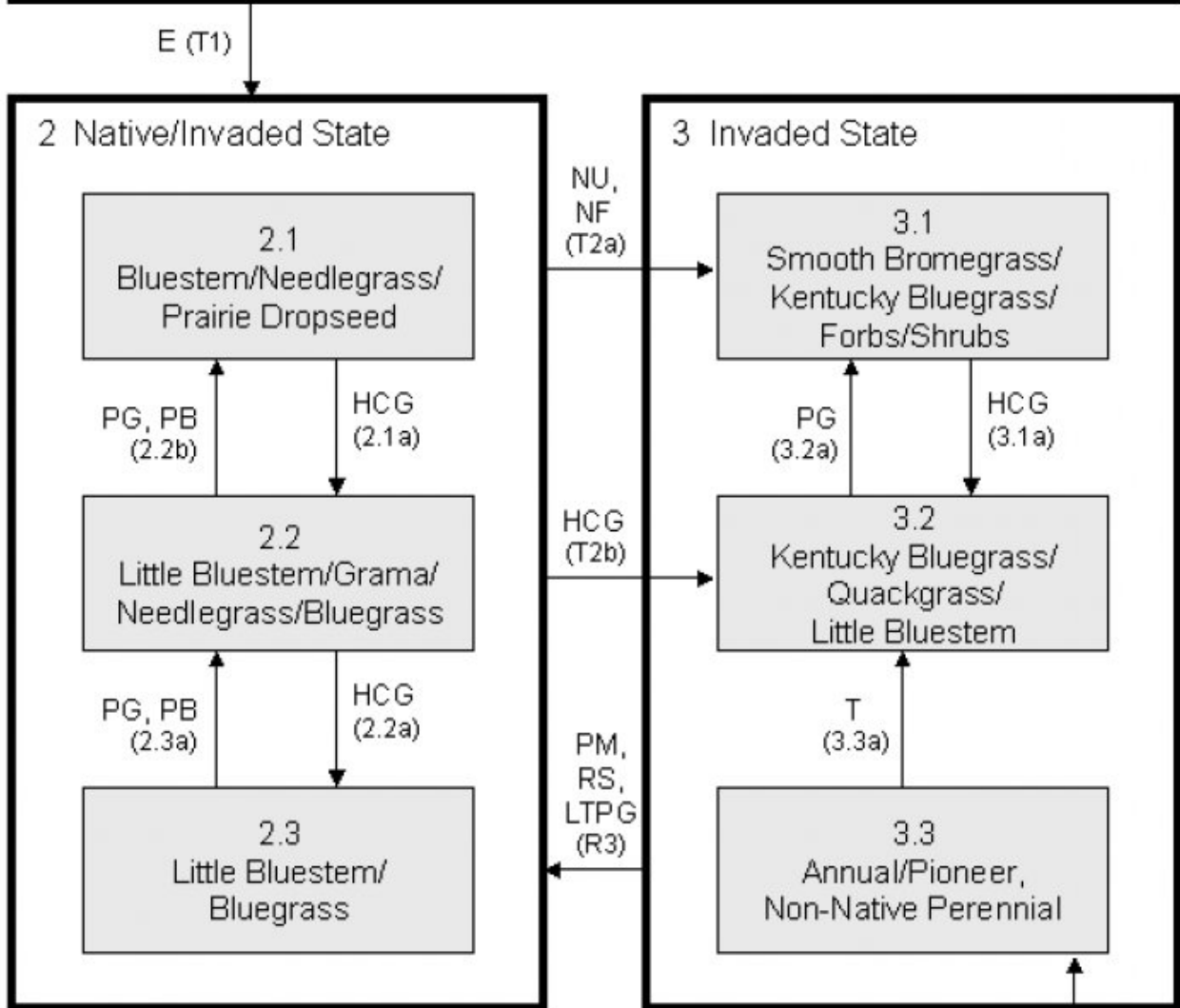
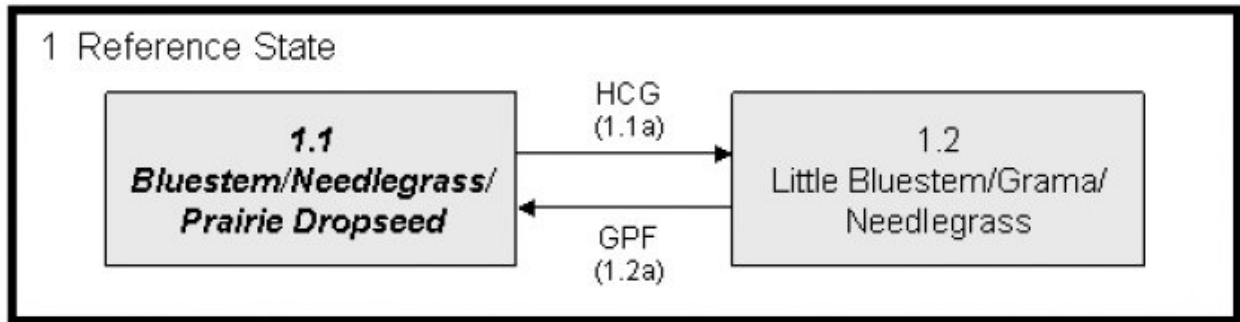
Continuous season-long grazing (during the typical growing season of May through October) and/or repeated

seasonal grazing (e.g., every spring, every summer) without adequate recovery periods following grazing events causes departure from the 2.1 Bluestem/Needlegrass/Prairie Dropseed 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/Prairie Dropseed 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



Refer to narrative for details on pathways: **C** – Cropped, abandoned; **E** – Encroachment of introduced species; **GPF** – Grazing, precipitation, and/or fire returning to more normal disturbance regime levels and frequencies; **HCG** – Heavy continuous grazing; **LTPG** – Long-term prescribed grazing; **NU, NF** – Non-use, no fire; **PB** – Prescribed burning; **PG** – Prescribed grazing; **PM** – Pest management; **RS** – Range seeding; **S** – Seeding; **T** – Time, with or without grazing.

E, S,
C (T4)

**Any Plant
Community**

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 2) 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/Prairie Dropseed Plant Community Phase

Interpretations are based primarily on the Bluestem/Needlegrass/Prairie Dropseed Plant Community Phase (this is also considered to be climax). The potential vegetation was about 80 percent grasses or grass-like plants, 10 percent forbs, and 8 percent shrubs. The community was dominated by warm-season grasses, with cool-season grasses being subdominant. The major grasses included little bluestem, big bluestem, Indiangrass, sideoats grama, prairie dropseed, porcupine grass, and green needlegrass. Other grass or grass-like species included plains muhly, switchgrass, Canada wildrye, needleandthread, slender wheatgrass, western wheatgrass, blue grama, and threadleaf sedge. This plant community was resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allowed for high drought tolerance. This was a sustainable plant community in regards to site/soil stability, watershed function, and biologic integrity.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2219	2925	3564
Forb	151	252	387
Shrub/Vine	95	185	308
Total	2465	3362	4259

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

Little Bluestem/Grama/Needlegrass 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 75 percent grasses and grass-like species, 15 percent forbs, and 10 percent shrubs. Dominant grasses included little bluestem, sideoats grama, and green needlegrass. Grasses of secondary importance included big bluestem, porcupine grass, blue grama, western wheatgrass, prairie dropseed, and threadleaf sedge. Forbs commonly found in this plant community included goldenrod, cudweed sagewort, heath aster, scurfpea, western ragweed, and western yarrow. This plant community had similar plant composition to the 2.2 Little Bluestem/Grama/Needlegrass/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 nonnative invasive species such as Kentucky bluegrass and smooth brome grass. When compared to the Bluestem/Needlegrass/Prairie Dropseed Plant Community Phase (1.1), little bluestem and sideoats grama 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).
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

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 Little Bluestem/Grama/Needlegrass 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/Prairie Dropseed Plant Community Phase.

State 2 **Native/Invaded**

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 2.1 **Bluestem/Needlegrass/Prairie Dropseed Plant Community Phase**

This plant community phase is similar to the 1.1 Bluestem/Needlegrass/Prairie Dropseed Plant Community Phase but it also contains minor amounts of non-native invasive grass species such as Kentucky bluegrass and smooth brome grass (up to about 10 percent by air-dry weight). The potential vegetation is about 80 percent grasses or grass-like plants, 10 percent forbs, and 8 percent shrubs. This community is dominated by warm-season grasses, with cool-season grasses being subdominant. The major grasses include little bluestem, big bluestem, Indiangrass, sideoats grama, prairie dropseed, porcupine grass, and green needlegrass. Other grass or grass-like species include plains muhly, switchgrass, Canada wildrye, needleandthread, slender wheatgrass, western wheatgrass, blue grama, Kentucky bluegrass, and threadleaf sedge. 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 7. 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 2.2 **Little Bluestem/Grama/Needlegrass/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 75 percent grasses and grass-like species, 15 percent forbs, and 10 percent shrubs. Dominant grasses include little bluestem, sideoats grama, and green needlegrass. Grasses of secondary importance include big bluestem, porcupine grass, blue grama, western wheatgrass, prairie dropseed, and threadleaf sedge. Forbs commonly found in this plant community include goldenrod, cudweed sagewort, heath aster, scurfpea, western ragweed, and western yarrow. When compared to the Bluestem/Needlegrass/Prairie Dropseed Plant Community Phase (1.1), little bluestem, sideoats grama, and Kentucky bluegrass 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 non-native invasive species such as Kentucky bluegrass and smooth brome grass 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	1782	2219	2584
Forb	118	269	471
Shrub/Vine	118	202	308
Total	2018	2690	3363

Figure 9. 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 2.3 Little Bluestem/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 75 percent grasses and grass-like species, 15 percent forbs, and 10 percent shrubs. Dominant grasses include little bluestem and Kentucky bluegrass. Grass and grass-like species of secondary importance include sideoats grama, blue grama, western wheatgrass, threadleaf sedge, green needlegrass, big bluestem, and quackgrass. Forbs commonly found in this plant community include goldenrod, cudweed sagewort, heath aster, scurfpea, western ragweed, and western yarrow. When compared to the Bluestem/Needlegrass/Prairie Dropseed Plant Community Phase (1.1), little bluestem and Kentucky bluegrass have increased. Production of mid- and tall warm- and cool-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. A reduction of the dominant functional groups as found in the interpretive plant community phase allows for an increase in shorter-statured (and shallower rooted) species. The introduction of non-native invasive species such as Kentucky bluegrass and smooth brome grass 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 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1569	2034	2427
Forb	112	247	432
Shrub/Vine	112	185	280
Total	1793	2466	3139

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 2.1a Community 2.1 to 2.2

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 a combination of disturbances such as extended periods of below average precipitation coupled with periodic heavy grazing will shift this community to the 2.2 Little Bluestem/Grama/Needlegrass/Bluegrass Plant Community Phase.

Pathway 2.2b Community 2.2 to 2.1

Prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest will convert this plant community to the 2.1 Little Bluestem/Needlegrass/Prairie Dropseed Plant Community Phase. This pathway would be expedited by including prescribed burning along with prescribed grazing.

Conservation practices

Prescribed Burning
Prescribed Grazing

Pathway 2.2a Community 2.2 to 2.3

Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season, and often at the same time of year each year), or a combination of disturbances such as extended periods of below average precipitation coupled with periodic heavy grazing will shift this community to the 2.3 Little Bluestem/Bluegrass Plant Community Phase.

Pathway 2.3a Community 2.3 to 2.2

Prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest will convert this plant community to the 2.2 Little Bluestem/Grama/Needlegrass/Bluegrass Plant Community Phase. This pathway would be expedited by including prescribed burning along with prescribed grazing.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 3 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 3.1 Smooth Bromegrass/Kentucky Bluegrass/Forbs/Shrubs 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 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 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1961	2511	2914
Shrub/Vine	140	314	560
Forb	140	314	560
Total	2241	3139	4034

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 3.2 Kentucky Bluegrass/Quackgrass/Little Bluestem Plant Community Phase

This plant community phase is a result of heavy continuous grazing or a combination of disturbances such as extended periods of below-average precipitation combined with heavy continuous grazing. It is characterized by a dominance of Kentucky bluegrass and quackgrass and occasionally with significant levels of little bluestem. 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 9. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1211	1695	2118
Forb	95	202	347
Shrub/Vine	39	121	224
Total	1345	2018	2689

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 3.3

Annual/Pioneer, Non-Native Perennial Plant Community Phase

This plant community developed under continuous heavy grazing or other excessive disturbances such as abandonment after cropping, seeding of introduced species, or invasion and dominance of noxious weed species. 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 nonnative 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 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 at the same time of year each year) will convert this plant community to the 3.2 Kentucky Bluegrass/Quackgrass Plant Community Phase.

Pathway 3.3a

Community 3.3 to 3.2

With the passage of time, probably regardless of the type of management, this plant community will gradually convert to dominance by Kentucky bluegrass which will lead to the 3.2 Kentucky Bluegrass/Quackgrass/Little Bluestem Plant Community Phase.

Transition T1a

State 1 to 2

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

Transition T4

State 1 to 3

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 3) and more specifically to the 3.3 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 T4 State 1 to 3

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 3) and more specifically to the 3.3 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 T4 State 2 to 3

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 3) and more specifically to the 3.3 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 T4 State 2 to 3

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 3) and more specifically to the 3.3 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 T4 State 2 to 3

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 3) and more specifically to the 3.3 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 T2b State 2 to 3

Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season, and often at the same time of year each year), or a combination of disturbances such as extended periods of below average precipitation coupled with periodic heavy grazing will likely shift this community across a threshold leading to the 3.2 Kentucky Bluegrass/Quackgrass/Little Bluestem Plant Community Phase within the Invaded State (State 3).

Transition T2a

State 2 to 3

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 3.1 Smooth Brome grass/Kentucky Bluegrass/Forbs/Shrubs Plant Community Phase within the Invaded State (State 3).

Restoration pathway R3

State 3 to 2

Long-term prescribed grazing (moderate stocking levels coupled with adequate recovery periods, or other grazing systems such as high-density, low-frequency intended to treat specific species dominance, or periodic light to moderate stocking levels possibly including periodic rest) may lead this plant community phase over a threshold to the Native/Invaded State (State 2). Pest management (i.e., herbicide) may also be needed to suppress cool-season invasive grasses. This will likely take a long period of time possibly up to 10 years or more, and recovery may not be attainable. Success depends on whether native reproductive propagules remain intact on the site. A seeding of native species may be the only avenue to restore this plant community to one resembling a community within the Native/Invaded State (State 2).

Conservation practices

Prescribed Grazing

Additional community tables

Table 10. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Mid Warm-season Grasses			841–1681	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	504–1177	–
	prairie dropseed	SPHE	<i>Sporobolus heterolepis</i>	168–504	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	168–504	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	34–168	–
2	Tall Warm-season Grasses			336–841	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	168–504	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	168–504	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–168	–
3	Cool-season Bunchgrasses			336–673	
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	168–504	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	101–336	–
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	34–168	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	34–101	–
4	Wheatgrass			67–168	
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	67–168	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–101	–
5	Other Native Grasses			67–168	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–168	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	34–101	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	34–101	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes var.</i>	0–67	–

			<i>scribnerianum</i>		
6	Grass-likes			34–101	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	34–101	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–67	–
Forb					
7	Forbs			168–336	
	Forb, native	2FN	<i>Forb, native</i>	34–101	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	34–101	–
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	34–67	–
	blazing star	LIATR	<i>Liatris</i>	34–67	–
	large Indian breadroot	PEES	<i>Pediomelum esculentum</i>	0–67	–
	scurfpea	PSORA2	<i>Psoralegium</i>	34–67	–
	cutleaf anemone	PUPAM	<i>Pulsatilla patens ssp. multifida</i>	34–67	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	34–67	–
	compassplant	SILA3	<i>Silphium laciniatum</i>	34–67	–
	goldenrod	SOLID	<i>Solidago</i>	34–67	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	34–67	–
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	34–67	–
	American vetch	VIAM	<i>Vicia americana</i>	34–67	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	34–67	–
	Nuttall's sensitive-briar	MINU6	<i>Mimosa nuttallii</i>	34–67	–
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	0–34	–
	milkvetch	ASTRA	<i>Astragalus</i>	0–34	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	0–34	–
	aromatic aster	SYOB	<i>Symphyotrichum oblongifolium</i>	0–34	–
	lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	0–34	–
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	0–34	–
	onion	ALLIU	<i>Allium</i>	0–34	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0–34	–
	pussytoes	ANTEN	<i>Antennaria</i>	0–34	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	0–34	–
Shrub/Vine					
8	Shrubs			101–269	
	leadplant	AMCA6	<i>Amorpha canescens</i>	34–135	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–67	–
	Saskatoon serviceberry	AMAL2	<i>Amelanchier alnifolia</i>	0–67	–
	smooth sumac	RHGL	<i>Rhus glabra</i>	0–67	–
	rose	ROSA5	<i>Rosa</i>	34–67	–
	snowberry	SYMPH	<i>Symphoricarpos</i>	34–67	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0–34	–

Table 11. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
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Grass/Grasslike					
1	Mid Warm-season Grasses			673–1211	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	538–1076	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	135–538	–
	prairie dropseed	SPHE	<i>Sporobolus heterolepis</i>	0–135	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	0–54	–
2	Tall Warm-season Grasses			27–269	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	27–215	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	0–81	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–54	–
3	Cool-season Bunchgrasses			135–404	
	green needlegrass	NAVI4	<i>Nassella viridula</i>	54–269	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0–215	–
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	0–108	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	0–54	–
4	Wheatgrass			0–161	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–161	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–54	–
5	Other Native Grasses			27–188	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	27–161	–
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–135	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes</i> var. <i>scribnerianum</i>	0–54	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–54	–
6	Grass-likes			27–135	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	27–135	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–81	–
7	Non-Native Grasses			27–323	
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	27–269	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	0–135	–
	quackgrass	ELRE4	<i>Elymus repens</i>	0–81	–
Forb					
8	Forbs			135–404	
	goldenrod	SOLID	<i>Solidago</i>	27–81	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	27–81	–
	scurfpea	PSORA2	<i>Psoraleidum</i>	27–81	–
	Forb, introduced	2FI	<i>Forb, introduced</i>	27–81	–
	Forb, native	2FN	<i>Forb, native</i>	0–81	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	27–81	–
	western yarrow	ACMIO	<i>Achillea millefolium</i> var. <i>occidentalis</i>	27–54	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	27–54	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	0–54	–
	blazing star	LIATR	<i>Liatris</i>	27–54	–

	field sagewort	ARCA12	<i>Artemisia campestris</i>	0–54	–
	cutleaf anemone	PUPAM	<i>Pulsatilla patens ssp. multifida</i>	0–27	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–27	–
	compassplant	SILA3	<i>Silphium laciniatum</i>	0–27	–
	American vetch	VIAM	<i>Vicia americana</i>	0–27	–
	lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	0–27	–
	Nuttall's sensitive-briar	MINU6	<i>Mimosa nuttallii</i>	0–27	–
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	0–27	–
	large Indian breadroot	PEES	<i>Pedimelum esculentum</i>	0–27	–
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	0–27	–
	pussytoes	ANTEN	<i>Antennaria</i>	0–27	–
	onion	ALLIU	<i>Allium</i>	0–27	–
	milkvetch	ASTRA	<i>Astragalus</i>	0–27	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	0–27	–
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	0–27	–
Shrub/Vine					
9	Shrubs			135–269	
	snowberry	SYMPH	<i>Symphoricarpos</i>	27–135	–
	smooth sumac	RHGL	<i>Rhus glabra</i>	0–81	–
	rose	ROSA5	<i>Rosa</i>	27–54	–
	leadplant	AMCA6	<i>Amorpha canescens</i>	0–54	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0–54	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–54	–
	Saskatoon serviceberry	AMAL2	<i>Amelanchier alnifolia</i>	0–27	–

Table 12. Community 2.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Mid Warm-season Grasses			616–1233	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	616–1233	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	49–370	–
2	Tall Warm-season Grasses			0–123	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–123	–
3	Cool-season Bunchgrasses			0–197	
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0–148	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0–74	–
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	0–49	–
4	Wheatgrass			0–173	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–173	–
5	Other Native Grasses			49–197	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	49–197	–
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–123	–
	Scribner's rosette grass	DIGLS	<i>Dichanthelium oliganthos var.</i>	0–25	–

	SCHDIEP'S rosette grass	DIOLO	<i>Dichanthium oligosanthes</i> var. <i>scribnerianum</i>	0-25	-
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0-25	-
6	Grass-likes			25-173	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	25-173	-
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0-123	-
7	Non-Native Grasses			123-493	
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	49-493	-
	quackgrass	ELRE4	<i>Elymus repens</i>	0-123	-
	smooth brome	BRIN2	<i>Bromus inermis</i>	0-74	-
Forb					
8	Forbs			123-370	
	Forb, introduced	2FI	<i>Forb, introduced</i>	25-148	-
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	25-123	-
	goldenrod	SOLID	<i>Solidago</i>	25-123	-
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	25-99	-
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	25-99	-
	western yarrow	ACMIO	<i>Achillea millefolium</i> var. <i>occidentalis</i>	25-99	-
	Forb, native	2FN	<i>Forb, native</i>	0-74	-
	field sagewort	ARCA12	<i>Artemisia campestris</i>	0-74	-
	scurfpea	PSORA2	<i>Psoralegium</i>	25-74	-
	pussytoes	ANTEN	<i>Antennaria</i>	0-25	-
	onion	ALLIU	<i>Allium</i>	0-25	-
	milkvetch	ASTRA	<i>Astragalus</i>	0-25	-
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	0-25	-
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	0-25	-
	blazing star	LIATR	<i>Liatris</i>	0-25	-
Shrub/Vine					
9	Shrubs			123-247	
	snowberry	SYMPH	<i>Symphoricarpos</i>	25-173	-
	smooth sumac	RHGL	<i>Rhus glabra</i>	0-99	-
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0-74	-
	rose	ROSA5	<i>Rosa</i>	25-49	-
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0-49	-

Table 13. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Mid Warm-season Grasses			0-314	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0-251	-
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0-157	-
2	Tall Warm-season Grasses			0-157	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0-157	-
3	Cool-season Bunchgrasses			0-251	

	Over-season bunchgrasses				
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0–251	–
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	0–94	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	0–63	–
4	Wheatgrass			0–220	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–220	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–94	–
5	Other Native Grasses			0–157	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–157	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0–126	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes var. scribnerianum</i>	0–31	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–31	–
6	Grass-likes			31–157	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	31–157	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–63	–
7	Non-Native Grasses			942–1883	
	smooth brome	BRIN2	<i>Bromus inermis</i>	471–1726	–
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	157–1098	–
	quackgrass	ELRE4	<i>Elymus repens</i>	0–188	–
Forb					
8	Forbs			157–471	
	Forb, introduced	2FI	<i>Forb, introduced</i>	31–314	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	31–188	–
	goldenrod	SOLID	<i>Solidago</i>	31–188	–
	white heath aster	SYER	<i>Symphotrichum ericoides</i>	31–126	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	31–126	–
	scurfpea	PSORA2	<i>Psoralegium</i>	31–126	–
	Forb, native	2FN	<i>Forb, native</i>	0–94	–
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	0–63	–
	pussytoes	ANTEN	<i>Antennaria</i>	0–31	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	0–31	–
	American vetch	VIAM	<i>Vicia americana</i>	0–31	–
	blazing star	LIATR	<i>Liatris</i>	0–31	–
Shrub/Vine					
9	Shrubs			157–471	
	snowberry	SYMPH	<i>Symphoricarpos</i>	157–471	–
	smooth sumac	RHGL	<i>Rhus glabra</i>	0–314	–
	rose	ROSA5	<i>Rosa</i>	0–63	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–63	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0–31	–

Table 14. Community 3.2 plant community composition

				Annual Production	Foliar Cover
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Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Total Cover (%)
Grass/Grasslike					
1	Mid Warm-season Grasses			20–242	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	20–242	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0–61	–
2	Tall Warm-season Grasses			0–61	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–61	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–40	–
3	Cool-season Bunchgrasses			0–61	
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0–61	–
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	0–40	–
4	Wheatgrass			0–40	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–40	–
5	Other Native Grasses			0–101	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0–101	–
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–61	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes var. scribnerianum</i>	0–20	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–20	–
6	Grass-likes			40–202	
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	40–202	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–40	–
7	Non-Native Grasses			706–1412	
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	404–1211	–
	quackgrass	ELRE4	<i>Elymus repens</i>	101–605	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	20–141	–
Forb					
8	Forbs			101–303	
	goldenrod	SOLID	<i>Solidago</i>	20–121	–
	Forb, introduced	2FI	<i>Forb, introduced</i>	20–121	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	20–121	–
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	20–81	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	20–81	–
	white heath aster	SYER	<i>Symphotrichum ericoides</i>	20–81	–
	scurfpea	PSORA2	<i>Psoraleidium</i>	20–61	–
	Forb, native	2FN	<i>Forb, native</i>	0–40	–
	pussytoes	ANTEN	<i>Antennaria</i>	0–40	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	0–40	–
Shrub/Vine					
9	Shrubs			40–202	
	snowberry	SYMPH	<i>Symphoricarpos</i>	20–121	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	20–81	–
	smooth sumac	RHGL	<i>Rhus glabra</i>	0–81	–

	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–40	–
	rose	ROSA5	<i>Rosa</i>	0–20	–

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/Prairie Dropseed (1.1 & 1.2)
Average Annual Production (lbs./acre, air-dry): 3000
Stocking Rate* (AUM/acre): 0.82

Little Bluestem/Grama/Needlegrass/Bluegrass (2.2)
Average Annual Production (lbs./acre, air-dry): 2400
Stocking Rate* (AUM/acre): 0.66

Little Bluestem/Bluegrass (2.3)
Average Annual Production (lbs./acre, air-dry): 2200
Stocking Rate* (AUM/acre): 0.60

Smooth Bromegrass/Kentucky Bluegrass/Forbs/Shrubs (3.1)
Average Annual Production (lbs./acre, air-dry): 2800
Stocking Rate* (AUM/acre): 0.77

Kentucky Bluegrass/Quackgrass/Little Bluestem (3.2)
Average Annual Production (lbs./acre, air-dry): 1800
Stocking Rate* (AUM/acre): 0.49

Annual/Pioneer, Non-Native Perennial (3.3)
Average Annual Production (lbs./acre, air-dry): 1000
Stocking Rate* (AUM/acre): 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 medium 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, 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 7 SCS-RANGE-417's collected from 1985 to 2006 in Clark, Codington, Deuel, and Grant Counties, South Dakota.

Other references

High Plains Regional Climate Center, University of Nebraska, 830728 Chase Hall, Lincoln, NE 68583-0728.
(<http://www.hprcc.unl.edu/>)

USDA, NRCS. National Water and Climate Center, 101 SW Main, Suite 1600, Portland, OR 97204-3224.
(<http://www.wcc.nrcs.usda.gov>)

USDA, NRCS. National Range and Pasture Handbook, September 1997

USDA, NRCS. National Soil Information System, Information Technology Center, 2150 Centre Avenue, Building A, Fort Collins, CO 80526. (<http://soils.usda.gov/technical/nasis/>)

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

Contributors

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

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 10% 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. 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.

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.

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 > mid warm-season rhizomatous grass >> short cool-season grass = short warm-season grass = forb = shrubs

Other:

Additional:

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):** 60-70%, 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):** 2600 – 3300 lbs./acre air-dry weight, average 3,000 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
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17. **Perennial plant reproductive capability:** All species are capable of reproducing.
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