

Ecological site R102AY020SD Loamy Overflow

Accessed: 04/19/2024

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.

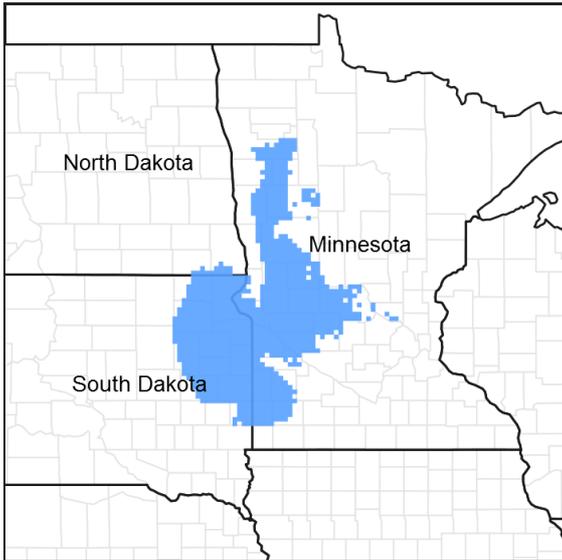


Figure 1. Mapped extent

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
R102AY012SD	Thin Upland

Similar sites

R102AY010SD	Loamy (R102AY010SD) – Loamy [less big bluestem, more needlegrass; lower production]
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Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Andropogon gerardii</i> (2) <i>Sorghastrum nutans</i>

Physiographic features

This site occurs on nearly level drainageways, flood plains, or swales.

Table 2. Representative physiographic features

Landforms	(1) Swale (2) Flood plain (3) Outwash plain
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Rare to occasional
Elevation	1,000–2,000 ft
Slope	1–2%
Water table depth	36–80 in
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)	27 in

Influencing water features

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

Soil features

The soils in this site are moderately well drained and formed in alluvium, loamy till, loess over loamy till, or silty drift. The loam to silty clay loam surface layer is 9 to 21 inches thick and typically has a granular structure. Dark colors are very deep in these soils. The soils have a moderately slow to moderate infiltration rate. This site should show no evidence of rills, wind scoured areas, or pedestalled plants. If present, water flow paths are broken, irregular in appearance, or discontinuous. The soil surface is stable and intact. These soils are mainly susceptible to water erosion. The hazard of water erosion increases where vegetative cover is not adequate. A drastic loss of the soil surface layer on this site can result in a shift in species composition and/or production.

Access Web Soil Survey (<http://websoilsurvey.nrcs.usda.gov/app/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	Moderate to moderately rapid
Soil depth	80 in
Surface fragment cover <=3"	0–7%
Surface fragment cover >3"	0–2%
Available water capacity (0-40in)	7–8 in
Calcium carbonate equivalent (0-40in)	0–20%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	5.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–7%
Subsurface fragment volume >3" (Depth not specified)	0–2%

Ecological dynamics

This site developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfire (often of light intensities), and other biotic and abiotic factors that typically influence soil/site development. Changes will occur in the plant communities due to short-term weather variations, impacts of native and/or exotic plant and animal species, and management actions. While the following plant community descriptions describe more typical transitions that will occur, severe disturbances, such as periods of well below average precipitation, can cause significant shifts in plant communities and/or species composition that may not be described within this document.

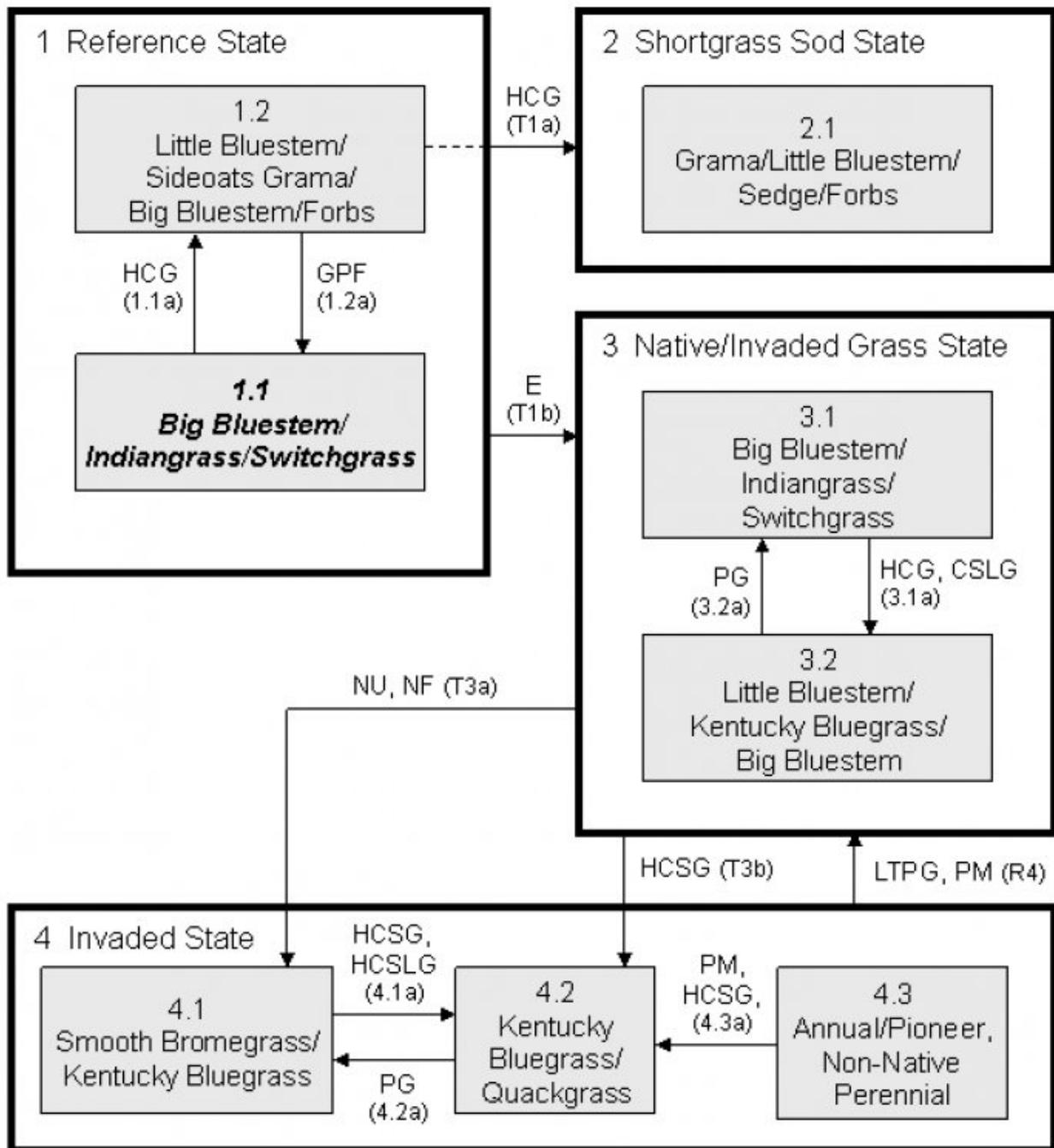
Continuous grazing without adequate recovery periods following each grazing occurrence over several years

causes this site to depart from the interpretive plant community. Species such as little bluestem, sideoats grama, and sedge will initially increase. Big bluestem, Indiangrass, and switchgrass will decrease in frequency and production. Heavy continuous grazing causes Kentucky bluegrass to increase and eventually develop into a sod condition. Extended periods of nonuse and no fire will result in a plant community having high litter levels which favors an increase in Kentucky bluegrass and smooth brome grass. In time, shrubs such as western snowberry and chokecherry will also increase.

Interpretations are primarily based on the 1.1 Big Bluestem/Indiangrass/Switchgrass 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; **CSLG** – Continuous season-long grazing; **E** – Encroachment of introduced species; **GPF** – Grazing, precipitation, and/or fire returning to more normal disturbance regime levels and frequencies; **HCG** – Heavy continuous grazing; **HCSG** – Heavy continuous seasonal grazing; **HCSLG** – Heavy continuous season-long grazing; **LTPG** – Long-term prescribed grazing; **NU, NF** – Non-use, no fire; **PG** – Prescribed grazing; **PM** – Pest management (herbicide); **S** – Seeding.

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. 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 shorter 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 Big Bluestem/Indiangrass/Switchgrass Plant Community Phase

Interpretations are based primarily on the Big Bluestem/Indiangrass/Switchgrass 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 10 percent shrubs. The community was dominated by warm-season grasses. The major grasses included big bluestem, Indiangrass, and switchgrass. Other grass or grass-like species included porcupine grass, green needlegrass, slender wheatgrass, and little bluestem. 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 (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	3400	3910	4300
Shrub/Vine	200	345	550
Forb	200	345	550
Total	3800	4600	5400

Figure 5. 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

Community 1.2 Little Bluestem/Sideoats Grama/Big Bluestem/Forbs 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 big bluestem. Grasses of secondary importance included Indiangrass, switchgrass, green needlegrass, tall dropseed, and slender wheatgrass. Forbs commonly found in this plant community included Canada goldenrod, cudweed sagewort, heath aster, scurfpea, stiff goldenrod, 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 nonnative invasive species such as Kentucky bluegrass and smooth brome grass. When compared to the Bluestem/Indiangrass/Switchgrass Plant Community Phase (1.1), sideoats grama 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).

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 Little Bluestem/Sideoats Grama/Big Bluestem/Forbs 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 Big Bluestem/Indiangrass/Switchgrass Plant Community Phase.

State 2

Shortgrass Sod

Community 2.1

Gramma/Little Bluestem/Sedge/Forbs 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 80 percent grasses and grass-like species, 15 percent forbs, and 5 percent shrubs. Dominant grass and grass-like species included sideoats grama, little bluestem, and sedge. Grasses of secondary importance included big bluestem, switchgrass, green needlegrass, slender wheatgrass, and tall dropseed. Forbs commonly found in this plant community included cudweed sagewort, goldenrod, and western yarrow. When compared to the Big Bluestem/Indiangrass/Switchgrass Plant Community Phase (1.1), tall warm-season grasses were reduced, and the more grazing tolerant species such as sideoats grama, little bluestem and sedge were dominant on this plant community. With the exception of green needlegrass, 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 sedge increased. The herbaceous species present were well adapted to grazing. This plant community was less productive than other phases.

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

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

Community 3.1

Big Bluestem/Indiangrass/Switchgrass Plant Community Phase

This plant community phase is similar to the 1.1 Big Bluestem/Indiangrass/Switchgrass 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 10 percent shrubs. This community is dominated by warm-season grasses. The major grasses include big bluestem, Indiangrass, and switchgrass. Other grass or grass-like species include porcupine grass, green needlegrass, slender wheatgrass, and little bluestem. 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 8. 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

Community 3.2

Little Bluestem/Kentucky Bluegrass/Big Bluestem 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, big bluestem, and Kentucky bluegrass. Grasses of secondary importance include Indiangrass, switchgrass, smooth brome grass, sideoats grama, green needlegrass, tall dropseed, slender wheatgrass, and sedge. Forbs commonly found in this plant community include cudweed sagewort, heath aster, Canada goldenrod, stiff goldenrod, scurfpea, Indian hemp, and western yarrow. When compared to the Big Bluestem/Indiangrass/Switchgrass Plant Community Phase (1.1), little bluestem has increased and Kentucky bluegrass has invaded and become a codominant. 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 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 (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	2285	2856	3290
Forb	150	340	610
Shrub/Vine	65	204	400
Total	2500	3400	4300

Figure 10. 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 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 Little Bluestem/Kentucky Bluegrass/Big Bluestem 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 Big Bluestem/Indiangrass/Switchgrass 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 greenup 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 (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	2750	3460	4050
Shrub/Vine	75	240	475
Forb	175	300	475
Total	3000	4000	5000

Figure 12. 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 (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1660	2249	2765
Forb	115	260	460
Shrub/Vine	25	91	175
Total	1800	2600	3400

Figure 14. 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 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.

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 Grama/Little Bluestem/Sedge/Forbs Plant Community Phase and the Shortgrass Sod State (State 2).

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 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 Invaded State (State 4).

**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 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
Integrated Pest Management (IPM)

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Tall Warm-season Grasses			690–2300	

	big bluestem	ANGE	<i>Andropogon gerardii</i>	690–2300	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	460–1380	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	230–690	–
	spiked muhly	MUGL3	<i>Muhlenbergia glomerata</i>	0–230	–
	composite dropseed	SPCOC2	<i>Sporobolus compositus</i> var. <i>compositus</i>	0–138	–
2	Mid Warm-season Grasses			230–460	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	92–460	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	46–230	–
	prairie dropseed	SPHE	<i>Sporobolus heterolepis</i>	0–138	–
3	Cool-season Bunchgrasses			230–460	
	green needlegrass	NAVI4	<i>Nassella viridula</i>	92–460	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	46–230	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	46–230	–
4	Wheatgrass			92–460	
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	92–460	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–230	–
5	Other Native Grasses			92–230	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	46–230	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	46–92	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes</i> var. <i>scribnerianum</i>	0–46	–
6	Grass-likes			46–230	
	sedge	CAREX	<i>Carex</i>	46–230	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–92	–
Forb					
7	Forbs			230–460	
	Forb, native	2FN	<i>Forb, native</i>	46–138	–
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	0–138	–
	Maximilian sunflower	HEMA2	<i>Helianthus maximiliani</i>	46–138	–
	blazing star	LIATR	<i>Liatris</i>	46–92	–
	western yarrow	ACMIO	<i>Achillea millefolium</i> var. <i>occidentalis</i>	46–92	–
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	46–92	–
	Indianhemp	APCA	<i>Apocynum cannabinum</i>	0–92	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	46–92	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	46–92	–
	goldenrod	SOLID	<i>Solidago</i>	46–92	–
	white heath aster	SYER	<i>Symphotrichum ericoides</i>	46–92	–
	American vetch	VIAM	<i>Vicia americana</i>	46–92	–
	cinquefoil	POTEN	<i>Potentilla</i>	46–92	–
	scurfpea	PSORA2	<i>Psoraleidium</i>	46–92	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	46–92	–
	ragwort	SENEC	<i>Senecio</i>	0–46	–

	golden tickseed	COTI3	<i>Coreopsis tinctoria</i>	0–46	–
	Illinois bundleflower	DEIL	<i>Desmanthus illinoensis</i>	0–46	–
	northern bedstraw	GABO2	<i>Galium boreale</i>	0–46	–
	Canadian anemone	ANCA8	<i>Anemone canadensis</i>	0–46	–
	wood lily	LIPH	<i>Lilium philadelphicum</i>	0–46	–
Shrub/Vine					
8	Shrubs			230–460	
	snowberry	SYMPH	<i>Symphoricarpos</i>	46–184	–
	leadplant	AMCA6	<i>Amorpha canescens</i>	46–184	–
	false indigo bush	AMFR	<i>Amorpha fruticosa</i>	0–92	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–92	–
	American plum	PRAM	<i>Prunus americana</i>	0–92	–
	chokecherry	PRVI	<i>Prunus virginiana</i>	0–92	–
	currant	RIBES	<i>Ribes</i>	0–92	–
	rose	ROSA5	<i>Rosa</i>	46–92	–

Table 10. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Tall Warm-season Grasses			170–850	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	170–680	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–340	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	0–340	–
	composite dropseed	SPCOC2	<i>Sporobolus compositus var. compositus</i>	0–170	–
2	Mid Warm-season Grasses			340–850	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	340–850	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	68–272	–
3	Cool-season Bunchgrasses			34–340	
	green needlegrass	NAVI4	<i>Nassella viridula</i>	34–272	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	0–68	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0–68	–
4	Wheatgrass			0–170	
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–170	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–102	–
5	Other Native Grasses			34–170	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–170	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–68	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes var. scribnerianum</i>	0–34	–
6	Grass-likes			34–170	
	sedge	CAREX	<i>Carex</i>	34–170	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–68	–

7	Non-Native Grasses			340–850	
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	170–680	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	68–340	–
	quackgrass	ELRE4	<i>Elymus repens</i>	0–170	–
Forb					
8	Forbs			170–510	
	goldenrod	SOLID	<i>Solidago</i>	34–170	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	34–136	–
	Forb, introduced	2FI	<i>Forb, introduced</i>	34–136	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	34–136	–
	Forb, native	2FN	<i>Forb, native</i>	0–102	–
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	34–102	–
	Indianhemp	APCA	<i>Apocynum cannabinum</i>	0–102	–
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	0–102	–
	scurfpea	PSORA2	<i>Psoraleidium</i>	34–102	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–68	–
	blazing star	LIATR	<i>Liatris</i>	0–68	–
	cinquefoil	POTEN	<i>Potentilla</i>	0–68	–
	common dandelion	TAOF	<i>Taraxacum officinale</i>	0–68	–
	white clover	TRRE3	<i>Trifolium repens</i>	0–68	–
	Canada thistle	CIAR4	<i>Cirsium arvense</i>	0–68	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	0–34	–
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	0–34	–
	American vetch	VIAM	<i>Vicia americana</i>	0–34	–
	Maximilian sunflower	HEMA2	<i>Helianthus maximiliani</i>	0–34	–
	ragwort	SENEC	<i>Senecio</i>	0–34	–
Shrub/Vine					
9	Shrubs			68–340	
	snowberry	SYMPH	<i>Symphoricarpos</i>	34–272	–
	rose	ROSA5	<i>Rosa</i>	34–102	–
	false indigo bush	AMFR	<i>Amorpha fruticosa</i>	0–102	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–68	–
	leadplant	AMCA6	<i>Amorpha canescens</i>	0–34	–
	American plum	PRAM	<i>Prunus americana</i>	0–34	–
	chokecherry	PRVI	<i>Prunus virginiana</i>	0–34	–

Table 11. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Tall Warm-season Grasses			0–400	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0–320	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–320	–
	composite dropseed	SPCOC2	<i>Sporobolus compositus var. compositus</i>	0–170	–

	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	0–80	–
2	Mid Warm-season Grasses			0–200	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0–200	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–200	–
3	Cool-season Bunchgrasses			0–320	
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0–320	–
4	Wheatgrass			0–200	
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–200	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–80	–
5	Other Native Grasses			0–200	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–160	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes</i> var. <i>scribnerianum</i>	0–40	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–40	–
6	Grass-likes			0–200	
	sedge	CAREX	<i>Carex</i>	0–200	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–40	–
7	Non-Native Grasses			1200–2800	
	smooth brome	BRIN2	<i>Bromus inermis</i>	800–2400	–
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	400–1400	–
	quackgrass	ELRE4	<i>Elymus repens</i>	0–320	–
Forb					
8	Forbs			200–400	
	goldenrod	SOLID	<i>Solidago</i>	40–120	–
	white heath aster	SYER	<i>Symphotrichum ericoides</i>	40–120	–
	white clover	TRRE3	<i>Trifolium repens</i>	0–120	–
	Forb, introduced	2FI	<i>Forb, introduced</i>	40–120	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	40–120	–
	Canada thistle	CIAR4	<i>Cirsium arvense</i>	0–120	–
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	0–80	–
	Forb, native	2FN	<i>Forb, native</i>	0–80	–
	western yarrow	ACMIO	<i>Achillea millefolium</i> var. <i>occidentalis</i>	40–80	–
	Indianhemp	APCA	<i>Apocynum cannabinum</i>	0–80	–
	scurfpea	PSORA2	<i>Psoraleidium</i>	40–80	–
	common dandelion	TAOF	<i>Taraxacum officinale</i>	0–80	–
	cinquefoil	POTEN	<i>Potentilla</i>	0–40	–
Shrub/Vine					
9	Shrubs			80–400	
	snowberry	SYMPH	<i>Symphoricarpos</i>	40–320	–
	rose	ROSA5	<i>Rosa</i>	40–120	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–80	–
	false indigo bush	AMFR	<i>Amorpha fruticosa</i>	0–80	–

American plum	PRAM	<i>Prunus americana</i>	0-80	-
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Table 12. Community 4.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Tall Warm-season Grasses			0-130	
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0-78	-
	composite dropseed	SPCOC2	<i>Sporobolus compositus</i> var. <i>compositus</i>	0-78	-
2	Mid Warm-season Grasses			0-78	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0-78	-
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0-78	-
3	Cool-season Bunchgrasses			0-130	
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0-130	-
4	Wheatgrass			0-130	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0-104	-
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0-52	-
5	Other Native Grasses			0-78	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0-78	-
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes</i> var. <i>scribnerianum</i>	0-26	-
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0-26	-
6	Grass-likes			26-208	
	sedge	CAREX	<i>Carex</i>	26-208	-
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0-52	-
7	Non-Native Grasses			910-1950	
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	650-1690	-
	quackgrass	ELRE4	<i>Elymus repens</i>	130-520	-
	smooth brome	BRIN2	<i>Bromus inermis</i>	0-390	-
Forb					
8	Forbs			130-390	
	Canada thistle	CIAR4	<i>Cirsium arvense</i>	26-208	-
	Forb, introduced	2FI	<i>Forb, introduced</i>	26-182	-
	white clover	TRRE3	<i>Trifolium repens</i>	0-156	-
	common dandelion	TAOF	<i>Taraxacum officinale</i>	0-130	-
	goldenrod	SOLID	<i>Solidago</i>	26-104	-
	western yarrow	ACMIO	<i>Achillea millefolium</i> var. <i>occidentalis</i>	26-104	-
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	26-78	-
	scurfpea	PSORA2	<i>Psoralegium</i>	26-78	-
	white heath aster	SYER	<i>Symphotrichum ericoides</i>	26-78	-
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	0-52	-
	cinquefoil	POTEN	<i>Potentilla</i>	0-26	-
	Indianhemp	APCA	<i>Apocynum cannabinum</i>	0-26	-

	Forb, native	2FN	<i>Forb, native</i>	0–26	–
Shrub/Vine					
9	Shrubs			26–156	
	snowberry	SYMPH	<i>Symphoricarpos</i>	26–130	–
	rose	ROSA5	<i>Rosa</i>	0–52	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–26	–
	American plum	PRAM	<i>Prunus americana</i>	0–26	–

Animal community

Animal Community – Grazing Interpretations The following table lists annual, suggested initial stocking rates with average growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of conservation planning. Often, the current plant composition does not entirely match any particular plant community (as described in this 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.

Big Bluestem/Indiangrass/Switchgrass (1.1 & 3.1)

Average Annual Production (lbs./acre, air-dry): 4600

Stocking Rate* (AUM/acre): 1.26

Little Bluestem/Kentucky Bluegrass/Big Bluestem (3.2)

Average Annual Production (lbs./acre, air-dry): 3400

Stocking Rate* (AUM/acre): 0.93

Smooth Bromegrass/Kentucky Bluegrass (4.1)

Average Annual Production (lbs./acre, air-dry): 4000

Stocking Rate* (AUM/acre): 1.10

Kentucky Bluegrass/Quackgrass (4.2)

Average Annual Production (lbs./acre, air-dry): 2600

Stocking Rate* (AUM/acre): 0.71

Annual/Pioneer, Non-Native Perennial (4.3)

Average Annual Production (lbs./acre, air-dry): 1200

Stocking Rate* (AUM/acre): 0.33

*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 high and runoff potential for this site varies from low to medium 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 Kentucky 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 2 SCS-RANGE-417's collected in 2006 from Clark and Grant Counties, South Dakota.

Other references

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Contributors

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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	12/04/2007

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.

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: Tall warm-season rhizomatous grass >> tall cool-season bunch grass

Sub-dominant: > mid warm-season bunch grass > short cool-season grass = forb > shrub > tree

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.
-

14. **Average percent litter cover (%) and depth (in):** 85-90%, roughly 0.5 inch thick or less. Litter cover is in contact with soil surface.
-

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 4000 – 5200 lbs./acre air-dry weight, average 4,600 lbs./acre air-dry weight
-

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

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