

Ecological site R102AY011SD Clayey

Accessed: 05/06/2024

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

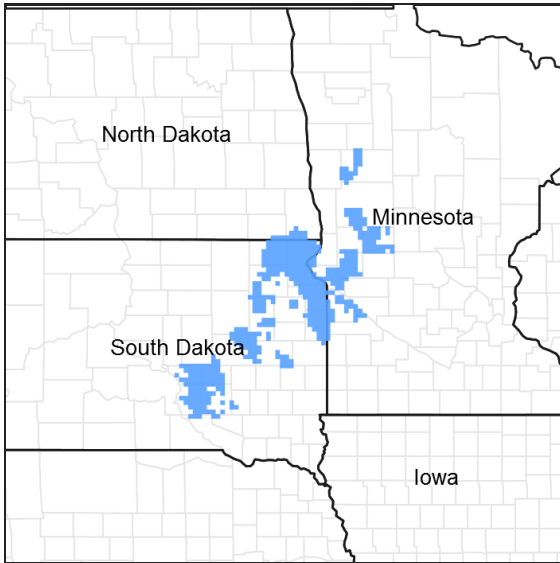


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

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

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

Classification relationships

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

Associated sites

R102AY012SD	Thin Upland
R102AY020SD	Loamy Overflow

Similar sites

R102AY020SD	Loamy Overflow (R102AY010SD) – Loamy [more big bluestem, less green needlegrass; higher production]
R102AY010SD	Loamy (R102AY020SD) – Loamy Overflow [more big bluestem; higher production]

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Nassella viridula</i> (2) <i>Andropogon gerardii</i>

Physiographic features

This site occurs on nearly level to steeply sloping uplands.

Table 2. Representative physiographic features

Landforms	(1) Plain (2) Till plain (3) Collapsed ice-walled lakebed
Ponding duration	Very long (more than 30 days)
Ponding frequency	Occasional
Elevation	305–610 m
Slope	0–30%
Ponding depth	0–15 cm
Water table depth	76–203 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
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Influencing water features

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

Soil features

The common features of soils in this site are the clay loam to clay textured subsurface soils with slopes ranging from 0 to 30 percent. The soils in this site are typically well to moderately well-drained and formed in till or glaciolacustrine deposits. The clay loam to clay surface layer is typically 6 to 12 inches thick. The soils have a slow to very slow infiltration rate. This site typically should show slight to no evidence of rills, wind scoured areas, or pedestalled plants. If present, water flow paths are broken, irregular in appearance, or discontinuous. The soil surface is stable and intact. Subsurface soil layers are nonrestrictive to water movement and root penetration. These soils are mainly susceptible to water erosion. The hazard of water erosion increases on slopes greater than about nine percent. Loss of 50 percent or more of the surface layer of the soils on this site can result in a shift in species composition and/or production.

Access Web Soil Survey (<http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>) for specific local soils information.

Table 4. Representative soil features

Surface texture	(1) Clay loam (2) Silty clay (3) Clay
Drainage class	Somewhat poorly drained to well drained
Permeability class	Very slow to slow
Soil depth	203 cm
Surface fragment cover <=3"	0–5%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	15.24–17.78 cm
Calcium carbonate equivalent (0-101.6cm)	0–30%
Electrical conductivity (0-101.6cm)	0–8 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–10
Soil reaction (1:1 water) (0-101.6cm)	6.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–7%
Subsurface fragment volume >3" (Depth not specified)	0–2%

Ecological dynamics

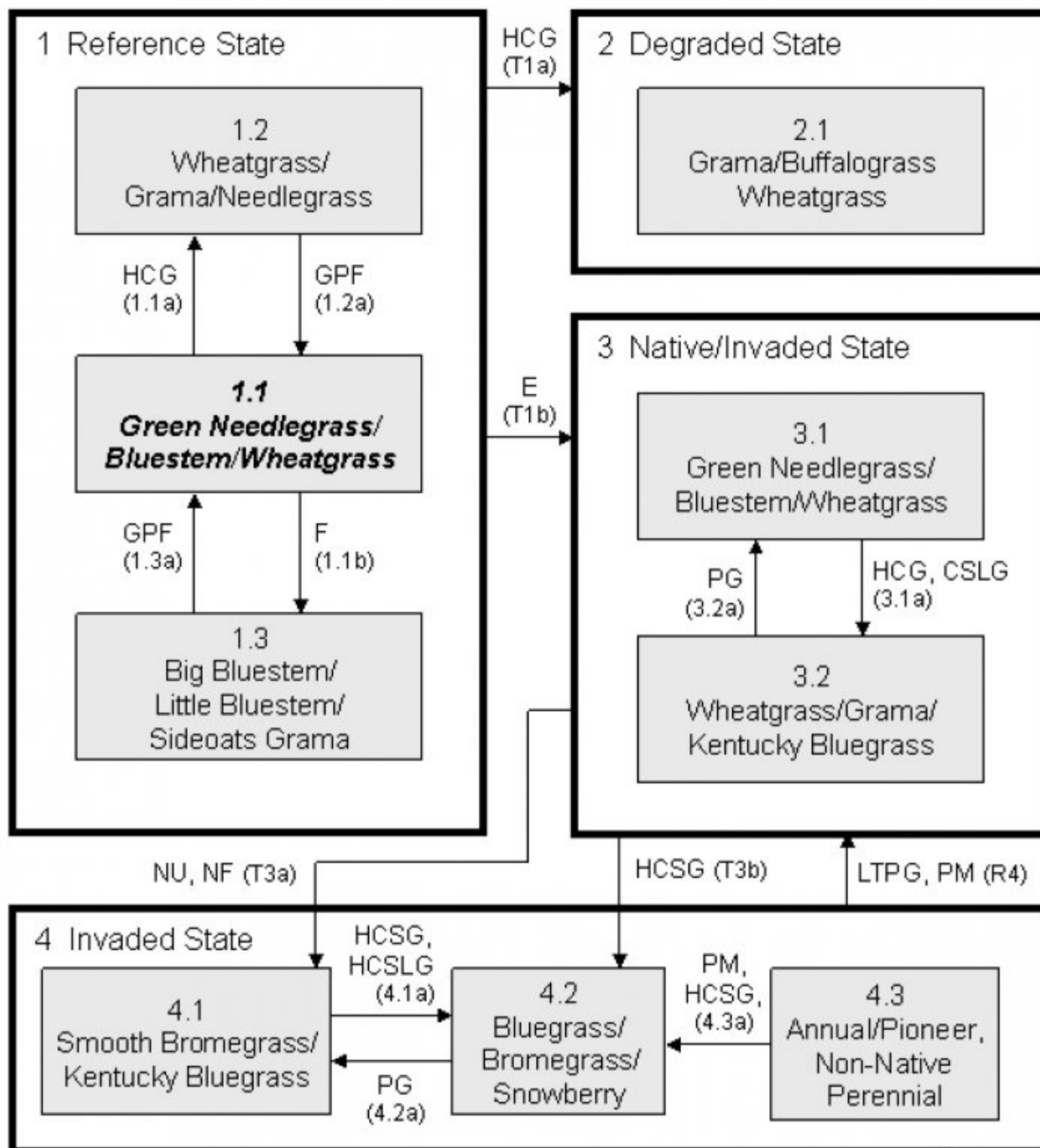
This site developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfire (often of light intensities), and other biotic and abiotic factors that typically influence soil/site development. Changes will occur 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.

Heavy continuous 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 cause departure from the 3.1 Green Needlegrass/Bluestem/Wheatgrass Plant Community Phase. Green needlegrass, little bluestem, and the tall warm-season grasses will decrease, while wheatgrass, sideoats grama, and blue grama will increase. Eventually, blue grama, quackgrass, and Kentucky bluegrass may develop into a sod. 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 and smooth brome grass.

Interpretations are primarily based on the 1.1 Green Needlegrass/Bluestem/Wheatgrass 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; **F** – Fire; **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.

E, S, C (T5)
Any Plant Community

This state represents the natural range of variability that dominated the dynamics of this ecological site (ES). This state was codominated by cool- and warm-season grasses. In pre-European times, the primary disturbance mechanisms for this site in the reference condition included periods of below and/or above average precipitation, periodic fire, and herbivory by insects and large ungulates. Timing of fires and herbivory coupled with weather events dictated the dynamics that occurred within the natural range of variability. In some locations, this site likely received relatively heavy grazing pressure. Tall warm-season grasses would have declined and cool-season bunchgrasses and short to mid-statured warm-season grasses would have increased. Today, a similar state (State 3) can be found on areas that are properly managed with grazing and/or prescribed burning and sometimes on areas receiving occasional short periods of rest.

Community 1.1 Green Needlegrass/Bluestem/Wheatgrass Plant Community Phase

Interpretations are based primarily on the Green Needlegrass/Bluestem/Wheatgrass Plant Community Phase (this is also considered to be climax). The potential vegetation was about 85 percent grasses or grass-like plants, 10 percent forbs, and 5 percent shrubs. The community was codominated by cool- and warm-season grasses. The major grasses included green needlegrass, big bluestem, little bluestem, western wheatgrass, porcupine grass, and sideoats grama. Other grass or grass-like species included slender wheatgrass, Indiangrass, tall dropseed, prairie dropseed, switchgrass, blue grama, buffalograss, and needleleaf 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	2533	3273	3845
Forb	163	278	432
Shrub/Vine	106	148	207
Total	2802	3699	4484

Figure 5. Plant community growth curve (percent production by month). SD0203, Rolling Till Prairie, cool-season/warm-season codominant.. Cool-season, warm-season codominant..

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

Community 1.2 Wheatgrass/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 western wheatgrass, sideoats grama, blue grama, and green needlegrass. Grasses of secondary importance included big bluestem, little bluestem, buffalograss, slender wheatgrass, needleleaf sedge, and porcupine grass. 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 3.2 Wheatgrass/Grama/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 cool-season species. When compared to the Green Needlegrass/Bluestem/Wheatgrass Plant Community Phase (1.1), western wheatgrass, sideoats grama, and blue grama increased. Production of tall warm-season grasses and needlegrasses 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). SD0202, Rolling Till Prairie, cool-season dominant, warm-season subdominant.. Cool-season dominant, warm-season subdominant..

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

Community 1.3

Big Bluestem/Little Bluestem/Sideoats Grama Plant Community Phase

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

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

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

Pathway 1.1a

Community 1.1 to 1.2

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

Pathway 1.1b

Community 1.1 to 1.3

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

Pathway 1.2a

Community 1.2 to 1.1

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

Pathway 1.3a

Community 1.3 to 1.1

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

State 2 Degraded

Community 2.1 Grama/Buffalograss/Wheatgrass Plant Community Phase

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 grasses included blue grama, sideoats grama, buffalograss, western wheatgrass, and needleleaf sedge. Grasses of secondary importance included big bluestem, little bluestem, green needlegrass, slender wheatgrass, tall dropseed, and threeawn. Forbs commonly found in this plant community included cudweed sagewort, goldenrod, scurfpea, and western yarrow. When compared to the Green Needlegrass/Bluestem/Wheatgrass Plant Community Phase (1.1), tall warm-season grasses were reduced, and the more grazing tolerant species such as blue grama, buffalograss, and sideoats grama were dominant on this plant community. With the exception of western wheatgrass, cool-season grasses decreased significantly. This vegetation state was very resistant to change especially if the disturbance continued and the short-statured species such as blue grama increased. The herbaceous species present were well adapted to grazing. This plant community was less productive than other phases.

Figure 8. Plant community growth curve (percent production by month). SD0204, Rolling Till Prairie, warm-season dominant, cool-season subdominant.. Warm-season dominant, cool-season subdominant..

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

State 3 Native/Invaded

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

Community 3.1 Green Needlegrass/Bluestem/Wheatgrass Plant Community Phase

This plant community phase is similar to the 1.1 Green Needlegrass/Bluestem/Wheatgrass Plant Community Phase but it also contains minor amounts of nonnative invasive grass species such as Kentucky bluegrass and smooth bromegrass (up to about 10 percent by air-dry weight). The potential vegetation is about 85 percent grasses or grass-like plants, 10 percent forbs, and 5 percent shrubs. This community is codominated by cool- and warm-season grasses. The major grasses include green needlegrass, big bluestem, little bluestem, western wheatgrass, porcupine grass, and sideoats grama. Other grass or grass-like species include slender wheatgrass, Indiangrass, tall dropseed, prairie dropseed, switchgrass, blue grama, buffalograss, and needleleaf 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 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 3.2

Wheatgrass/Grama/Kentucky Bluegrass Plant Community Phase

This plant community is a result of heavy continuous grazing or from over utilization during extended drought periods. The potential plant community is made up of approximately 75 percent grasses and grass-like species, 15 percent forbs, and 10 percent shrubs. Dominant grasses include western wheatgrass, sideoats grama, blue grama, green needlegrass, and Kentucky bluegrass. Grasses of secondary importance include big bluestem, little bluestem, buffalograss, slender wheatgrass, needleleaf sedge, and porcupine grass. Forbs commonly found in this plant community include goldenrod, cudweed sagewort, heath aster, scurfpea, western ragweed, and western yarrow. When compared to the Green Needlegrass/Bluestem/Wheatgrass Plant Community Phase (1.1), western wheatgrass, sideoats grama and blue grama increased. Production of tall warm-season grasses and needlegrasses was 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 (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2057	2448	2740
Forb	129	291	516
Shrub/Vine	56	175	331
Total	2242	2914	3587

Figure 11. Plant community growth curve (percent production by month). SD0202, Rolling Till Prairie, cool-season dominant, warm-season subdominant.. Cool-season dominant, warm-season subdominant..

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

Pathway 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 Wheatgrass/Grama/Kentucky Bluegrass Plant Community Phase.

Pathway 3.2a

Community 3.2 to 3.1

Prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest will convert this plant community to the 3.1 Green Needlegrass/Bluestem/Wheatgrass 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 (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2365	2909	3486
Shrub/Vine	62	202	387
Forb	151	252	387
Total	2578	3363	4260

Figure 13. Plant community growth curve (percent production by month).
SD0201, Rolling Till Prairie, cool-season dominant.. Cool-season dominant..

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

Community 4.2 Bluegrass/Bromegrass/Snowberry 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, smooth bromegrass, and snowberry. The dominance is at times so complete that other species are difficult to find on the site. A relatively thick duff layer can sometimes accumulate at or above the soil surface. Nutrient cycling is greatly reduced and native plants have great difficulty becoming established. Infiltration is greatly reduced and runoff is high. Production will be significantly

reduced when compared to the interpretive plant community. The period that palatability is high is relatively short as Kentucky bluegrass matures rapidly. Energy capture is also reduced. Biological activity in the soil is likely reduced significantly in this phase.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1636	2071	2427
Forb	112	247	432
Shrub/Vine	45	148	280
Total	1793	2466	3139

**Figure 15. Plant community growth curve (percent production by month).
SD0201, Rolling Till Prairie, cool-season dominant.. Cool-season dominant..**

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

Community 4.3

Bluegrass/Bromegrass/Snowberry 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, smooth bromegrass, and snowberry. 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	1636	2071	2427
Forb	112	247	432
Shrub/Vine	45	148	280
Total	1793	2466	3139

**Figure 17. 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

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 Bluegrass/Bromegrass/Snowberry 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 a plant community resembling the 4.2 Bluegrass/Bromegrass/Snowberry Plant Community Phase.

Conservation practices

Integrated Pest Management (IPM)

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/Buffalograss/Wheatgrass Plant Community Phase and the Degraded State.

Transition T1b State 1 to 3

Encroachment of non-native grasses such as Kentucky bluegrass and smooth bromegrass, and disruption of natural disturbance regimes (typically as a result of fire suppression following settlement led this state over a threshold to the Native/Invaded State (State 3).

Transition T5 State 1 to 4

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

Transition T5 State 1 to 4

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

Transition T5 State 1 to 4

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

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

Transition T5 State 2 to 4

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

Transition T5 State 3 to 4

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

Transition T5 State 3 to 4

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

Transition T3b State 3 to 4

Heavy continuous seasonal grazing (stocking levels well above carrying capacity for extended portions of the growing season and at the same time of year each year) will cause a shift across a threshold leading to the 4.2 Bluegrass/Bromegrass/Snowberry 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 this plant community phase over a threshold to the Native/Invaded 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 10. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Cool-season Bunchgrasses			555–1110	
	green needlegrass	NAVI4	<i>Nassella viridula</i>	370–1110	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	185–555	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	0–111	–
2	Tall Warm-season Grasses			370–1110	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	259–1110	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–185	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	37–185	–
	composite dropseed	SPCOC2	<i>Sporobolus compositus</i> var. <i>compositus</i>	37–185	–
3	Mid Warm-season Grasses			370–925	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	185–740	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	185–555	–
	prairie dropseed	SPHE	<i>Sporobolus heterolepis</i>	37–185	–
4	Wheatgrass			296–555	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	185–555	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	74–370	–
5	Short Warm-season Grasses			74–185	
	buffalograss	BODA2	<i>Bouteloua dactyloides</i>	37–185	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	37–185	–
	threeawn	ARIST	<i>Aristida</i>	0–74	–
6	Other Native Grasses			74–185	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–148	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	37–111	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes</i> var. <i>scribnerianum</i>	37–74	–
7	Grass-likes			37–185	
	needleleaf sedge	CADU6	<i>Carex duriuscula</i>	37–185	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–111	–
Forb					
8	Forbs			185–370	
	Forb, native	2FN	<i>Forb, native</i>	37–111	–
	western yarrow	ACMIO	<i>Achillea millefolium</i> var. <i>occidentalis</i>	37–74	–

	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	37–74	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	37–74	–
	false boneset	BREU	<i>Brickellia eupatorioides</i>	0–74	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	0–74	–
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	0–74	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	37–74	–
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	37–74	–
	blazing star	LIATR	<i>Liatris</i>	37–74	–
	Northern Idaho biscuitroot	LOOR	<i>Lomatium orientale</i>	37–74	–
	American bird's-foot trefoil	LOUNU	<i>Lotus unifoliolatus var. unifoliolatus</i>	37–74	–
	silverleaf Indian breadroot	PEAR6	<i>Pediomelum argophyllum</i>	37–74	–
	beardtongue	PENST	<i>Penstemon</i>	0–74	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	37–74	–
	goldenrod	SOLID	<i>Solidago</i>	37–74	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	37–74	–
	hoary verbena	VEST	<i>Verbena stricta</i>	0–74	–
	American vetch	VIAM	<i>Vicia americana</i>	37–74	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0–37	–
	wild bergamot	MOFI	<i>Monarda fistulosa</i>	0–37	–
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	0–37	–
	sanddune wallflower	ERCAC	<i>Erysimum capitatum var. capitatum</i>	0–37	–
	scarlet beeblossom	GACO5	<i>Gaura coccinea</i>	0–37	–
	candle anemone	ANCY	<i>Anemone cylindrica</i>	0–37	–
	pussytoes	ANTEN	<i>Antennaria</i>	0–37	–
	onion	ALLIU	<i>Allium</i>	0–37	–
Shrub/Vine					
9	Shrubs			111–185	
	leadplant	AMCA6	<i>Amorpha canescens</i>	37–111	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–74	–
	rose	ROSA5	<i>Rosa</i>	37–74	–
	snowberry	SYMPH	<i>Symphoricarpos</i>	37–74	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0–37	–

Table 11. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Cool-season Bunchgrasses			29–291	
	green needlegrass	NAVI4	<i>Nassella viridula</i>	29–291	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0–146	–
3	Mid Warm-season Grasses			29–437	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	29–437	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–233	–
4	Wheatgrasses			146–720	

4	wheatgrasses			146-129	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	146-729	-
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0-204	-
5	Short Warm-season Grasses			146-437	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	58-350	-
	buffalograss	BODA2	<i>Bouteloua dactyloides</i>	29-233	-
	threeawn	ARIST	<i>Aristida</i>	0-87	-
6	Other Native Grasses			58-146	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0-146	-
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes var. scribnerianum</i>	29-58	-
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	29-58	-
7	Grass-likes			29-204	
	needleleaf sedge	CADU6	<i>Carex duriuscula</i>	29-204	-
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0-117	-
8	Non-Native Grasses			146-437	
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	87-437	-
	smooth brome	BRIN2	<i>Bromus inermis</i>	0-233	-
	quackgrass	ELRE4	<i>Elymus repens</i>	0-146	-
Shrub/Vine					
2	Tall Warm-season Grasses			0-233	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0-233	-
	composite dropseed	SPCOC2	<i>Sporobolus compositus var. compositus</i>	0-87	-
10	Shrubs			58-291	
	snowberry	SYMPH	<i>Symphoricarpos</i>	29-233	-
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0-87	-
	rose	ROSA5	<i>Rosa</i>	29-58	-
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0-58	-
	leadplant	AMCA6	<i>Amorpha canescens</i>	0-29	-
Forb					
9	Forbs			146-437	
	goldenrod	SOLID	<i>Solidago</i>	29-117	-
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	29-87	-
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	29-87	-
	Forb, introduced	2FI	<i>Forb, introduced</i>	29-87	-
	Forb, native	2FN	<i>Forb, native</i>	29-87	-
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	29-87	-
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	29-87	-
	silverleaf Indian breadroot	PEAR6	<i>Pediomelum argophyllum</i>	29-87	-
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	0-58	-
	hoary verbena	VEST	<i>Verbena stricta</i>	0-58	-
	American vetch	VIAM	<i>Vicia americana</i>	0-29	-
	purple prairie clover	DAPI15	<i>Dalea purpurea</i>	0-29	-

	purple prairie coneflower	PRCO3	<i>Ratibida columnifera</i>	0–29	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	0–29	–
	blazing star	LIATR	<i>Liatris</i>	0–29	–
	Northern Idaho biscuitroot	LOOR	<i>Lomatium orientale</i>	0–29	–
	American bird's-foot trefoil	LOUNU	<i>Lotus unifoliolatus</i> var. <i>unifoliolatus</i>	0–29	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0–29	–
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	0–29	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–29	–
	pussytoes	ANTEN	<i>Antennaria</i>	0–29	–
	onion	ALLIU	<i>Allium</i>	0–29	–

Table 12. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Cool-season Bunchgrasses			0–235	
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0–235	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	0–67	–
2	Tall Warm-season Grasses			0–101	
	composite dropseed	SPCOC2	<i>Sporobolus compositus</i> var. <i>compositus</i>	0–101	–
3	Mid Warm-season Grasses			0–168	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0–135	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–67	–
4	Wheatgrass			0–168	
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0–168	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–168	–
5	Short Warm-season Grasses			0–101	
	threeawn	ARIST	<i>Aristida</i>	0–101	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0–101	–
	buffalograss	BODA2	<i>Bouteloua dactyloides</i>	0–67	–
6	Other Native Grasses			0–168	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–168	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes</i> var. <i>scribnerianum</i>	0–34	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–34	–
7	Grass-likes			34–235	
	needleleaf sedge	CADU6	<i>Carex duriuscula</i>	34–235	–
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–101	–
8	Non-Native Grasses			1177–2354	
	smooth brome	BRIN2	<i>Bromus inermis</i>	336–2018	–
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	336–2018	–
	quackgrass	ELRE4	<i>Elymus repens</i>	0–168	–
Forb					

9	Forbs			168–336	
	goldenrod	SOLID	<i>Solidago</i>	34–101	–
	white heath aster	SYER	<i>Symphotrichum ericoides</i>	34–101	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	34–101	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	34–101	–
	Forb, introduced	2FI	<i>Forb, introduced</i>	34–101	–
	silverleaf Indian breadroot	PEAR6	<i>Pediomelum argophyllum</i>	34–101	–
	Forb, native	2FN	<i>Forb, native</i>	0–67	–
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	34–67	–
	hoary verbena	VEST	<i>Verbena stricta</i>	0–67	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0–34	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	0–34	–
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	0–34	–
	blazing star	LIATR	<i>Liatris</i>	0–34	–
	Northern Idaho biscuitroot	LOOR	<i>Lomatium orientale</i>	0–34	–
	rush skeletonplant	LYJU	<i>Lygodesmia juncea</i>	0–34	–
Shrub/Vine					
10	Shrubs			67–336	
	snowberry	SYMPH	<i>Symphoricarpos</i>	67–336	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–67	–
	rose	ROSA5	<i>Rosa</i>	0–67	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0–34	–

Table 13. Community 4.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Cool-season Bunchgrasses			0–49	
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0–49	–
2	Mid Warm-season Grasses			0–148	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0–123	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–49	–
3	Wheatgrass			0–99	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–99	–
4	Short Warm-season Grasses			0–197	
	buffalograss	BODA2	<i>Bouteloua dactyloides</i>	0–173	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0–173	–
	threeawn	ARIST	<i>Aristida</i>	0–123	–
5	Other Native Grasses			0–123	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–123	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes var. scribnerianum</i>	0–25	–
6	Grass-likes			49–370	
	needleleaf sedge	CADU6	<i>Carex duriuscula</i>	49–370	–

	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0–123	–
7	Non-Native Grasses			740–1480	
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	247–1480	–
	smooth brome	BRIN2	<i>Bromus inermis</i>	0–247	–
	quackgrass	ELRE4	<i>Elymus repens</i>	0–247	–
Forb					
8	Forbs			123–370	
	Forb, introduced	2FI	<i>Forb, introduced</i>	25–123	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	25–123	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	25–123	–
	goldenrod	SOLID	<i>Solidago</i>	25–123	–
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	25–99	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	25–74	–
	silverleaf Indian breadroot	PEAR6	<i>Pediomelum argophyllum</i>	25–74	–
	hoary verbena	VEST	<i>Verbena stricta</i>	0–49	–
	pussytoes	ANTEN	<i>Antennaria</i>	0–25	–
	Forb, native	2FN	<i>Forb, native</i>	0–25	–
Shrub/Vine					
9	Shrubs			49–247	
	snowberry	SYMPH	<i>Symphoricarpos</i>	49–247	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–49	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0–49	–
	rose	ROSA5	<i>Rosa</i>	0–25	–

Table 14. Community 4.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Cool-season Bunchgrasses			0–49	
	green needlegrass	NAVI4	<i>Nassella viridula</i>	0–49	–
2	Mid Warm-season Grasses			0–148	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0–123	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–49	–
3	Wheatgrass			0–99	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–99	–
4	Short Warm-season Grasses			0–197	
	buffalograss	BODA2	<i>Bouteloua dactyloides</i>	0–173	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0–173	–
	threeawn	ARIST	<i>Aristida</i>	0–123	–
5	Other Native Grasses			0–123	
	Graminoid (grass or grass-like)	2GRAM	<i>Graminoid (grass or grass-like)</i>	0–123	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthes var. scribnerianum</i>	0–25	–

6	Grass-likes			49-370	
	needleleaf sedge	CADU6	<i>Carex duriuscula</i>	49-370	-
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0-123	-
7	Non-Native Grasses			740-1480	
	Kentucky bluegrass	POPR	<i>Poa pratensis</i>	247-1480	-
	smooth brome	BRIN2	<i>Bromus inermis</i>	0-247	-
	quackgrass	ELRE4	<i>Elymus repens</i>	0-247	-
Forb					
8	Forbs			123-370	
	Forb, introduced	2FI	<i>Forb, introduced</i>	25-123	-
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	25-123	-
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	25-123	-
	goldenrod	SOLID	<i>Solidago</i>	25-123	-
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	25-99	-
	white heath aster	SYER	<i>Symphotrichum ericoides</i>	25-74	-
	silverleaf Indian breadroot	PEAR6	<i>Pediomelum argophyllum</i>	25-74	-
	hoary verbena	VEST	<i>Verbena stricta</i>	0-49	-
	pussytoes	ANTEN	<i>Antennaria</i>	0-25	-
	Forb, native	2FN	<i>Forb, native</i>	0-25	-
Shrub/Vine					
9	Shrubs			49-247	
	snowberry	SYMPH	<i>Symphoricarpos</i>	49-247	-
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0-49	-
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	0-49	-
	rose	ROSA5	<i>Rosa</i>	0-25	-

Animal community

Animal Community – Grazing Interpretations

The following table lists annual, suggested initial stocking rates with average growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of conservation planning. Often, the current plant composition does not entirely match any particular plant community (as described in this ES description). Because of this, a resource inventory is necessary to document plant composition and production. More accurate carrying capacity estimates should eventually be calculated using the following stocking rate information along with animal preference data and actual stocking records, particularly when grazers other than cattle are involved. With consultation of the land manager, more intensive grazing management may result in improved harvest efficiencies and increased carrying capacity.

Green Needlegrass/Bluestem/Wheatgrass (1.1 & 3.1)

Average Annual Production (lbs./ac, air-dry): 3300

Stocking Rate* (AUM/acre): 0.90

Wheatgrass/Grama/Kentucky Bluegrass (3.2)

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

Stocking Rate* (AUM/acre): 0.71

Smooth Bromegrass/Kentucky Bluegrass (4.1):

Average Annual Production (lbs./ac, air-dry): 3000

Stocking Rate* (AUM/acre): 0.82

Bluegrass/Bromegrass/Snowberry (4.2):
Average Annual Production (lbs./ac, air-dry): 2200
Stocking Rate* (AUM/acre): 0.60

Annual/Pioneer, Non-native Perennial (4.3):
Average Annual Production (lbs./ac, 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 C. Infiltration is typically slow to very slow and runoff potential for this site varies from low to very high depending on soil hydrologic group, slope, and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where shortgrasses form a strong sod and dominate the site. Dominance by blue grama, buffalograss, bluegrass, and/or smooth bromegrass will result in reduced infiltration and increased runoff. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff (refer to Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic curves).

Recreational uses

This site provides hunting, hiking, photography, bird watching, and other opportunities. The wide varieties of plants that bloom from spring until fall have an esthetic value that appeals to visitors.

Wood products

No appreciable wood products are typically present on this site.

Other products

Seed harvest of native plant species can provide additional income on this site.

Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range-trained personnel were also used. Those involved in developing this site include: Stan Boltz, Range Management Specialist, NRCS; and Bruce Kunze, Soil Scientist, NRCS.

There are 5 SCS-Range-417's collected from 1984-2002 in Grant and Roberts 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/>)
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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 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):**
-
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 = tall & mid cool-season grasses
- Sub-dominant: >> forb > mid warm-season rhizomatous grass > short cool-season grass = short warm-season grass = 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.
-
14. **Average percent litter cover (%) and depth (in):** 70-80%, roughly 0.5 inch thick or less. Litter cover is in contact with soil surface.
-
15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 2800 – 3800 lbs./acre air-dry weight, average 3,300 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.
