USDA Natural Resources
Conservation Service

Ecological site R102AY014SD
Shallow Gravel

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.

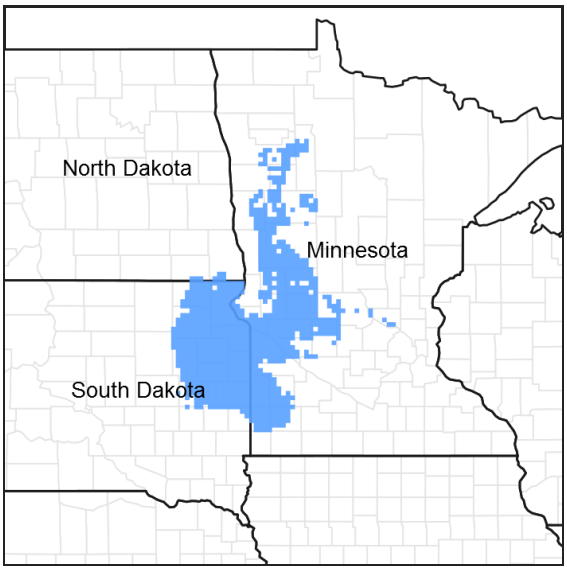


Figure 1. Mapped extent

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.

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

R102AY009SD	**Sandy**
R102AY010SD	**Loamy**
R102AY012SD	**Thin Upland**

Similar sites

R102AY009SD	**Sandy** (R102AY009SD) – Sandy [more big bluestem; higher production]
R102AY010SD	**Loamy** (R102AY010SD) – Loamy [more big bluestem, less needleandthread; higher production]

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Hesperostipa comata ssp. comata* (2) *Hesperostipa spartea*

Physiographic features

This site occurs on gently to somewhat steeply sloping uplands.

Table 2. Representative physiographic features

Landforms	(1) Outwash plain (2) Outwash terrace (3) Moraine
Elevation	305–610 m
Slope	1–20%
Water table depth	203 cm
Aspect	Aspect is not a significant factor

Climatic features

MLRA 102A is considered to have a continental climate – cold winters and relatively hot summers, low to moderate humidity, light rainfall, and much sunshine. Extremes in temperature may also abound. The climate is the result of this MLRA's location near the geographic center of North America. There are few natural barriers on the Northern Great Plains and air masses move freely across the plains and account for rapid changes in temperature.

Annual precipitation typically ranges from 21 to 27 inches per year. The average annual temperature is about 43°F. January is the coldest month with average temperatures ranging from about 5°F (Mahnomen 1 W, Minnesota (MN)), to about 14°F (Tracy, MN). July is the warmest month with temperatures averaging from about 69°F (Mahnomen 1 W, MN), to about 73°F (Tracy, MN). The range of normal average monthly temperatures between the coldest and warmest months is about 62°F. This large annual range attests to the continental nature of this area's climate. Hourly winds are estimated to average about 11 miles per hour (mph) annually, ranging from about 13 mph during the spring to about 10 mph during the summer. Daytime winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 50 mph.

Growth of cool-season plants begins in early to mid-March, slowing or ceasing in late June. Warm-season plants begin growth about mid-May and continue to early or mid-September. Greenup of cool-season plants may occur in September and October when adequate soil moisture is present.

Table 3. Representative climatic features

Frost-free period (average)	152 days
Freeze-free period (average)	174 days
Precipitation total (average)	686 mm

Influencing water features

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

Soil features

Representative Soil Features
These soils are very deep and well to somewhat excessively drained. Soil textures include moderately coarse and medium textured soils over sand or sand and gravel between the depths of 14 to 25 inches. Permeability is

moderate in the upper part and very rapid in the lower part. Available water capacity is moderate in the upper part and low to very low in the lower part. This site occurs on flats, rises, and side slopes on outwash plains and terraces. Slope ranges from 1 to 20 percent. Runoff as evidenced by patterns of rill, gully, or other water flow is negligible to low, in spite of the slopes, due to the very high intake rate of these soils. Some pedestalling of plants occurs but it is not very evident on casual observation and occurs on less than 5 percent of the plants.

These soils are susceptible to wind and water erosion. The hazard of water erosion increases on slopes greater than about 15 percent. Loss of 50 percent or more of the surface layer of the soils on this site can result in a shift in species composition and/or production.

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

Table 4. Representative soil features

Surface texture	(1) Loam (2) Sandy loam
Family particle size	(1) Sandy
Drainage class	Somewhat excessively drained
Permeability class	Moderate
Soil depth	203 cm
Surface fragment cover <=3"	5–10%
Surface fragment cover >3"	0–2%
Available water capacity (0-101.6cm)	7.62–10.16 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	6.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	5–40%
Subsurface fragment volume >3" (Depth not specified)	0–2%

Ecological dynamics

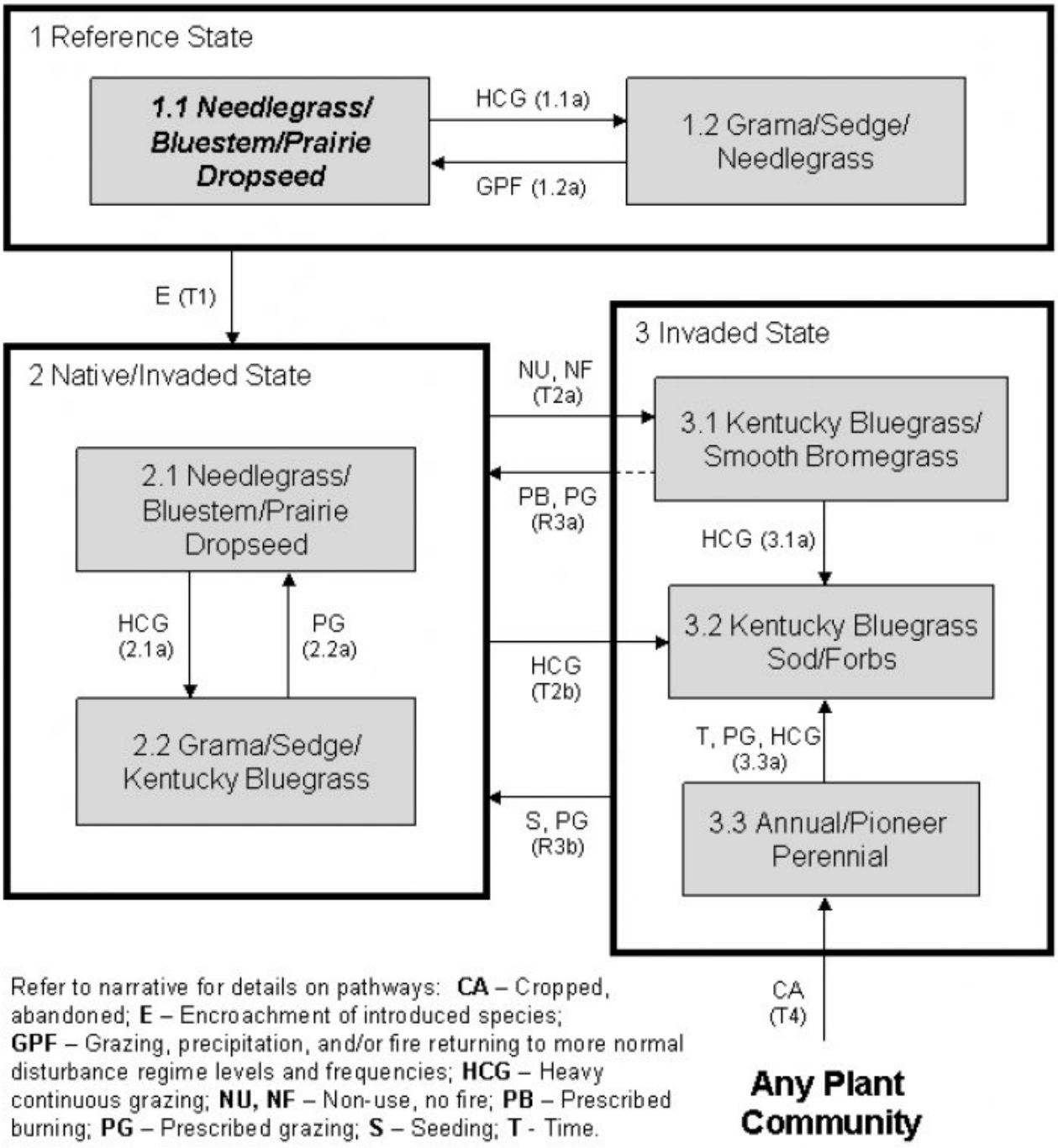
This site developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfire (often of light intensities), and other biotic and abiotic factors that typically influence soil/site development. Changes will occur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

Heavy continuous grazing (season-long grazing during the typical growing season of April through October and/or repeated seasonal grazing during the same time of year each year) without adequate recovery periods following grazing events causes departure from the Needlegrass/Bluestem/Prairie Dropseed Plant Community Phase (2.1). Sedge and blue grama will increase and eventually develop into a sod. Little bluestem will increase initially and then begin to decrease. Needleandthread, porcupine grass, sideoats grama, big bluestem, and little bluestem will decrease in frequency and production. Extended periods of nonuse and/or lack of fire will result in excessive litter and a plant community dominated by cool-season grasses such as Kentucky bluegrass and smooth bromegrass.

Interpretations are primarily based on the 1.1 Needlegrass/Bluestem/Prairie Dropseed Plant Community Phase. It has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts also have been used. Plant community phases, states, transitional pathways, and thresholds have been determined through similar studies and experience.

The following is a diagram that illustrates the common plant community phases that can occur on the site and the transition pathways between communities. These are the most common plant community phases based on current knowledge and experience and changes may be made as more data is collected. Narratives following the diagram contain more detail pertaining to the ecological processes.

State and transition model



State 1
Reference

This state represents the natural range of variability that dominated the dynamics of this ecological site (ES). This state was codominated by warm- and cool-season grasses. The primary disturbance mechanisms for this site in the reference condition included frequent fire and grazing by large herding ungulates. Timing of fires and grazing coupled with weather events dictated the dynamics that occurred within the natural range of variability. Mid- and tall-stature grass species can decline and a corresponding increase in short-stature warm-season grasses and cool-season grass-like species will occur.

Community 1.1

Needlegrass/Bluestem/Prairie Dropseed Plant Community Phase

Interpretations are based primarily on the 1.1 Needlegrass/Bluestem/Prairie Dropseed Plant Community Phase (this is also considered to be climax). This community phase was the most dominant both temporally and spatially. The prevailing climate and weather patterns favored the development of this community phase dominated by mid- and tall cool- and warm-season grasses such as needleandthread, little bluestem, prairie dropseed, and blue grama. Other grass and grass-likes species occurring include big bluestem, threadleaf sedge, porcupine grass, plains muhly, western wheatgrass, prairie Junegrass, and sand dropseed. The vegetation consisted of about 75 percent grass and grass-like species, 15 percent forbs, and 10 percent shrubs. A variety of leguminous and nonleguminous perennial forbs are present in minor amounts. This is a naturally nitrogen deficient plant community. 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	1625	2260	2808
Forb	118	269	471
Shrub/Vine	50	161	308
Total	**1793**	**2690**	**3587**

Figure 5. Plant community growth curve (percent production by month). SD0204, Rolling Till Prairie, warm-season dominant, cool-season subdominant.. Warm-season dominant, cool-season subdominant..

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

Community 1.2
Grama/Sedge/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 grass and grass-like species included blue grama, sideoats grama, sedge, and needleandthread. Grasses of secondary importance included porcupine grass, sand dropseed, little bluestem, western wheatgrass, hairy grama, and threeawn. Forbs commonly found in this plant community included cudweed sagewort, prairie coneflower, and western ragweed. This plant community had similar plant composition to the 2.2 Grama/Sedge/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 bromegrass. When compared to the Needlegrass/Bluestem/Prairie Dropseed Plant Community Phase (1.1), sedge, and blue grama increased. Big bluestem and needlegrasses decreased and production of mid- and tall warm-season grasses was also 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.

Figure 6. Plant community growth curve (percent production by month). SD0203, Rolling Till Prairie, cool-season/warm-season codominant.. Cool-season, warm-season codominant..

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

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 Grama/Sedge/Needlegrass Plant Community Phase.

Pathway 1.2a
Community 1.2 to 1.1

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

State 2
Native/Invaded

This state is very similar to the Reference State. The invasion of introduced cool-season sod grasses has altered the natural range of variability for this ecological site (ES). This state still has strong components of both warm- and cool-season grass species, but invasive introduced cool-season sod grasses are now present in all community phases of this state. The primary disturbance mechanisms for this state include grazing by domestic livestock and a lack of fire. Timing of fires and grazing coupled with weather events dictate the dynamics that occur within this state. The mid- and tall warm- and cool-season native grasses can decline and an increase in introduced sod grasses will occur. Many times, this state appears as a mosaic of community phases caused primarily by continuous season-long grazing.

Community 2.1
Needlegrass/Bluestem/Prairie Dropseed Plant Community Phase

This community phase most closely resembles the Reference State in appearance and ecological functions (e.g., hydrologic, biotic, and soil/site stability). The warm- and cool-season codominated community is maintained with grazing systems that allow for adequate recovery periods following grazing events and potentially the combination of grazing and prescribed burning which closely mimics the natural disturbance regime. This community phase closely resembles the 1.1 Needlegrass/Bluestem/Prairie Dropseed Plant Community Phase (refer to plant composition table and the narrative for the 1.1 plant community phase). The basic difference is the presence of minor amounts of introduced cool-season grasses and forbs. This is likely a naturally nitrogen deficient plant community. A change in the nutrient cycle on this ES possibly due to the introduction of nonnative species may be a causative factor leading to the eventual dominance of cool-season introduced grasses in the Invaded State.

Figure 7. Plant community growth curve (percent production by month). SD0204, Rolling Till Prairie, warm-season dominant, cool-season subdominant.. Warm-season dominant, cool-season subdominant..

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

Community 2.2
Grama/Sedge/Kentucky Bluegrass Plant Community Phase

Grazing pressure reduces the mid/tall, less grazing tolerant species, while the shorter more grazing tolerant species increase. Litter amounts are reduced and energy capture shifts to slightly earlier in the growing season due to a decline in the later maturing native grass component and an increase in the earlier maturing grass-likes and nonnative grasses. Kentucky bluegrass increases and may approach dominance in this community. Vegetation consists of about 75 percent grass and grass-like species, 15 percent forbs, and 10 percent shrubs. Blue grama, sedge, Kentucky bluegrass, and fringed sagewort are the dominant species in the early stages of this community phase. Significant grass species include Kentucky bluegrass, needleandthread, threeawn, and sand dropseed. Other grasses present include western wheatgrass, porcupine grass, and prairie Junegrass. The common forbs include cudweed sagewort, goldenrod, green sagewort, heath aster, and scurfpea. Fringed sagewort, cactus, and rose are the principal shrubs. This community phase is often dispersed throughout the pasture, in an

overgrazed/undergrazed pattern, typically referred to as patch grazing. Some areas (overgrazed) will exhibit the impacts of heavy use, while other areas (undergrazed) will have a build-up of litter and a high amount of plant decadence. This is a typical pattern found in properly stocked pastures grazed season-long. In the undergrazed patches, litter buildup reduces plant vigor and density and native seedling recruitment declines. Due to a lack of tiller stimulation and sunlight, native bunchgrasses typically develop dead centers and native rhizomatous grasses are limited to small colonies. In the overgrazed patches, plant vigor is reduced and the competitive advantage goes towards the grazing tolerant short-statured species such as Kentucky bluegrass and sedge. This community phase is approaching the threshold which would readily lead to the Invaded State. If management is significantly altered, this community phase can still be reverted back to the 2.1 Needlegrass/Bluestem/Prairie Dropseed community. Grazing management that allows for adequate recovery periods will tend to restore the ecological functions of this site. Fire can play a role in reducing the introduced cool-season species. The combination of grazing and fire may be the most effective in moving this community phase towards a community resembling the interpretive plant community. Soil erosion is low. Infiltration is reduced, while runoff is increased compared to the interpretive plant community.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1082	1685	2230
Forb	95	202	347
Shrub/Vine	56	131	224
Total	**1233**	**2018**	**2801**

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

Pathway 2.1a
Community 2.1 to 2.2

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 will shift this community to the 2.2 Grama/Sedge/Kentucky Bluegrass Plant Community Phase.

Pathway 2.2a
Community 2.2 to 2.1

Prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest will convert this plant community to the 2.1 Needlegrass/Bluestem/Prairie Dropseed Plant Community Phase.

Conservation practices

Prescribed Grazing

State 3
Invaded

This state is the result of invasion and dominance of introduced cool-season sod grasses. This state is characterized by the dominance of Kentucky bluegrass and/or smooth bromegrass and an increasing thatch layer that effectively blocks introduction of other plants into the system. Once the state is well established, even drastic events such as high intensity fires driven by high fuel loads of litter and thatch will not result in more than a very

short-term reduction of these two species. These events may reduce the dominance of the sod grasses, but due to the large amount of rhizomes in the soil, there is no opportunity for the native species to establish and dominate before the sod grasses rebound and again dominate the system. Plant litter accumulation tends to favor the more shade tolerant introduced grass species. The nutrient cycle is also impaired and the result is typically a higher level of nitrogen which also favors the introduced species. Increasing plant litter decreases the amount of sunlight reaching plant crowns thereby shifting competitive advantage to shade tolerant introduced grass species. Studies indicate that soil biological activity is altered and this shift apparently exploits the soil microclimate and encourages growth of the introduced grass species. Once the threshold is crossed, a change in grazing management alone cannot cause a reduction in sodgrass dominance. 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.

Community 3.1
Kentucky Bluegrass/Smooth Bromegrass Plant Community Phase

This plant community phase is a result of extended periods of non-use and no fire. It is characterized by a dominance of smooth bromegrass and Kentucky bluegrass. The dominance is at times so complete that other species are difficult to find on the site. A thick duff layer also accumulates at or above the soil surface. Nutrient cycling is greatly reduced and native plants have great difficulty becoming established. When dominated by smooth bromegrass, infiltration is moderately reduced and runoff is moderate. Production can be equal to or higher than the interpretive plant community. However, when dominated by Kentucky bluegrass, infiltration is greatly reduced and runoff is high. Production in this case will likely be significantly less. In either case, the period that palatability is high is relatively short, as these cool-season species mature rapidly. Energy capture is also reduced.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1345	2034	2651
Shrub/Vine	112	247	432
Forb	112	185	280
Total	**1569**	**2466**	**3363**

Figure 11. Plant community growth curve (percent production by month). SD0201, Rolling Till Prairie, cool-season dominant.. Cool-season dominant..

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

Community 3.2
Kentucky Bluegrass Sod/Forbs 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, sedge, and blue grama. The dominance is at times so complete that other species are difficult to find on the site. A relatively thick duff layer can sometimes accumulate at or above the soil surface. 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	796	1216	1709
Forb	140	235	359
Shrub/Vine	73	118	174
Total	**1009**	**1569**	**2242**

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

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

Community 3.3
Annual/Pioneer Perennial Plant Community Phase

This plant community developed under continuous heavy grazing or other excessive disturbances (e.g., heavy use areas, defoliation by rodents, etc.). 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 3.1a
Community 3.1 to 3.2

Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season and at the same time of year each year) will convert this plant community to the 3.2 Kentucky Bluegrass Sod/Forbs Plant Community Phase.

Pathway 3.3a
Community 3.3 to 3.2

This community pathway occurs with the passage of time as successional processes take place and perennial plants gradually begin to establish on the site again. This pathway will likely occur with either prescribed grazing or heavy continuous grazing and lead to the 3.2 Kentucky Bluegrass Sod/Forbs Plant Community Phase.

Transition T1
State 1 to 2

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

Transition T4
State 1 to 3

Cropping followed by abandonment may lead this plant community phase over a threshold to the Invaded State (State 3) and more specifically to the 3.3 Annual/Pioneer Perennial Plant Community Phase.

Transition T4
State 1 to 3

Cropping followed by abandonment may lead this plant community phase over a threshold to the Invaded State (State 3) and more specifically to the 3.3 Annual/Pioneer Perennial Plant Community Phase.

Transition T4
State 2 to 3

Cropping followed by abandonment may lead this plant community phase over a threshold to the Invaded State (State 3) and more specifically to the 3.3 Annual/Pioneer Perennial Plant Community Phase.

Transition T4
State 2 to 3

Cropping followed by abandonment may lead this plant community phase over a threshold to the Invaded State (State 3) and more specifically to the 3.3 Annual/Pioneer Perennial Plant Community Phase.

Transition T2a
State 2 to 3

Non-use and no fire for extended periods of time (typically for 10 or more years) will likely lead this state over a threshold resulting in the 3.1 Kentucky Bluegrass/Smooth Bromegrass Plant Community Phase within the Invaded State (State 3).

Transition T2b
State 2 to 3

Heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season, and at the same time of year each year) will cause a shift across a threshold leading to the 3.2 Kentucky Bluegrass Sod/Forbs Plant Community Phase within the Invaded State (State 3).

Restoration pathway R3a
State 3 to 2

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

Conservation practices

Prescribed Burning
Prescribed Grazing
Integrated Pest Management (IPM)

Restoration pathway R3b
State 3 to 2

Seeding of native species followed by prescribed grazing (moderate stocking levels coupled with adequate recovery periods, or other grazing systems such as high-density, low-frequency intended to treat specific species dominance, or periodic light to moderate stocking levels possibly including periodic rest) may lead this plant community phase over a threshold to the Native/Invaded State (State 2). Pest management (i.e., herbicide) may also be needed to

suppress cool-season invasive grasses. After establishment of the native grasses, management objectives must include the maintenance of those species, the associated reference state functions, and continued treatment of the introduced sod grasses.

Conservation practices

Integrated Pest Management (IPM)
Prescribed Grazing

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Cool-season Bunchgrasses**			269–807	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	135–807	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	135–807	–
	green needlegrass	NAVI4	*Nassella viridula*	0–81	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–81	–
2	**Mid Warm-season Grasses**			269–807	
	little bluestem	SCSC	*Schizachyrium scoparium*	135–538	–
	prairie dropseed	SPHE	*Sporobolus heterolepis*	54–404	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	27–135	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	27–135	–
3	**Tall Warm-season Grasses**			54–404	
	big bluestem	ANGE	*Andropogon gerardii*	54–404	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–135	–
	switchgrass	PAVI2	*Panicum virgatum*	0–135	–
4	**Short Warm-season Grasses**			54–269	
	blue grama	BOGR2	*Bouteloua gracilis*	27–269	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	27–269	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–81	–
	threeawn	ARIST	*Aristida*	0–54	–
5	**Grass-likes**			54–269	
	threadleaf sedge	CAFI	*Carex filifolia*	54–188	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–135	–
6	**Wheatgrass**			0–135	
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–135	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–135	–
7	**Other Native Grasses**			54–135	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–81	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	27–81	–
	fall rosette grass	DIWI5	*Dichanthelium wilcoxianum*	27–54	–
8	**Forbs**			135–404	
	Forb, native	2FN	*Forb, native*	27–135	

	Forb, native	2FN	*Forb, native*	27–135	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	27–81	–
	blazing star	LIATR	*Liatris*	27–81	–
	false boneset	BREU	*Brickellia eupatorioides*	0–54	–
	purple prairie clover	DAPU5	*Dalea purpurea*	27–54	–
	northern bedstraw	GABO2	*Galium boreale*	0–54	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	27–54	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	27–54	–
	anemone	ANEMO	*Anemone*	0–54	–
	field sagewort	ARCA12	*Artemisia campestris*	27–54	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	27–54	–
	wild bergamot	MOFI	*Monarda fistulosa*	0–54	–
	scurfpea	PSORA2	*Psoralidium*	27–54	–
	cutleaf anemone	PUPAM	*Pulsatilla patens ssp. multifida*	0–54	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	27–54	–
	goldenrod	SOLID	*Solidago*	27–54	–
	white heath aster	SYER	*Symphyotrichum ericoides*	27–54	–
	aromatic aster	SYOB	*Symphyotrichum oblongifolium*	0–54	–
	hoary verbena	VEST	*Verbena stricta*	0–54	–
	American vetch	VIAM	*Vicia americana*	27–54	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–27	–
	milkvetch	ASTRA	*Astragalus*	0–27	–
	pussytoes	ANTEN	*Antennaria*	0–27	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	0–27	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–27	–
	lacy tansyaster	MAPI	*Machaeranthera pinnatifida*	0–27	–
9	**Shrubs**			54–269	
	leadplant	AMCA6	*Amorpha canescens*	27–135	–
	snowberry	SYMPH	*Symphoricarpos*	0–81	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–81	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–54	–
	pricklypear	OPUNT	*Opuntia*	0–54	–
	rose	ROSA5	*Rosa*	27–54	–

Table 10. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Cool-season Bunchgrasses**			40–303	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	40–303	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–101	–
2	**Mid Warm-season Grasses**			40–303	
	little bluestem	SCSC	*Schizachyrium scoparium*	20–202	–
	prairie dropseed	SPHE	*Sporobolus heterolepis*	0–101	–

	prairie dropseed	SPHE	*Sporobolus heterolepis*	0–101	
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–101	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–61	–
3	**Tall Warm-season Grasses**			0–61	
	big bluestem	ANGE	*Andropogon gerardii*	0–40	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–40	–
	switchgrass	PAVI2	*Panicum virgatum*	0–20	–
4	**Short Warm-season Grasses**			202–504	
	blue grama	BOGR2	*Bouteloua gracilis*	101–504	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	20–504	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–101	–
	threeawn	ARIST	*Aristida*	0–81	–
5	**Grass-likes**			101–404	
	threadleaf sedge	CAFI	*Carex filifolia*	101–363	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–141	–
6	**Wheatgrass**			0–40	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–40	–
7	**Other Native Grasses**			40–101	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–61	–
	fall rosette grass	DIWI5	*Dichanthelium wilcoxianum*	20–40	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	20–40	–
8	**Non-Native Grasses**			101–404	
	Kentucky bluegrass	POPR	*Poa pratensis*	101–404	–
	smooth brome	BRIN2	*Bromus inermis*	0–101	–
10	**Shrubs**			61–202	
	prairie sagewort	ARFR4	*Artemisia frigida*	20–81	–
	pricklypear	OPUNT	*Opuntia*	20–61	–
	snowberry	SYMPH	*Symphoricarpos*	0–61	–
	rose	ROSA5	*Rosa*	20–40	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–40	–
	leadplant	AMCA6	*Amorpha canescens*	0–40	–
Forb					
9	**Forbs**			101–303	
	Forb, native	2FN	*Forb, native*	0–81	–
	field sagewort	ARCA12	*Artemisia campestris*	20–81	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	20–81	–
	blazing star	LIATR	*Liatris*	20–61	–
	scurfpea	PSORA2	*Psoralidium*	20–61	–
	goldenrod	SOLID	*Solidago*	20–61	–
	white heath aster	SYER	*Symphyotrichum ericoides*	20–61	–
	Forb, introduced	2FI	*Forb, introduced*	20–61	–
	hoary verbena	VEST	*Verbena stricta*	0–40	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	0–40	–

	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–40	–
	pussytoes	ANTEN	*Antennaria*	0–20	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–20	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–20	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–20	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–20	–
	American vetch	VIAM	*Vicia americana*	0–20	–
	aromatic aster	SYOB	*Symphyotrichum oblongifolium*	0–20	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–20	–
	wild bergamot	MOFI	*Monarda fistulosa*	0–20	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–20	–

Table 11. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Cool-season Bunchgrasses**			0–123	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–123	–
2	**Mid Warm-season Grasses**			0–74	
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–74	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–49	–
3	**Short Warm-season Grasses**			25–247	
	blue grama	BOGR2	*Bouteloua gracilis*	25–173	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–99	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–99	–
	threeawn	ARIST	*Aristida*	0–25	–
4	**Grass-likes**			49–247	
	threadleaf sedge	CAFI	*Carex filifolia*	49–247	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–123	–
5	**Wheatgrass**			0–49	
	western wheatgrass	PASM	*Pascopyrum smithii*	0–49	–
6	**Other Native Grasses**			25–123	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–74	–
	fall rosette grass	DIWI5	*Dichanthelium wilcoxianum*	25–49	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–25	–
7	**Non-Native Grasses**			740–1726	
	smooth brome	BRIN2	*Bromus inermis*	370–1356	–
	Kentucky bluegrass	POPR	*Poa pratensis*	370–1356	–
Forb					
8	**Forbs**			123–247	
	Forb, introduced	2FI	*Forb, introduced*	25–74	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	25–74	–
	Forb, native	2FN	*Forb, native*	0–49	–

	Cuman ragweed	AMPS	*Ambrosia psilostachya*	25–49	–
	field sagewort	ARCA12	*Artemisia campestris*	25–49	–
	blazing star	LIATR	*Liatris*	25–49	–
	wild bergamot	MOFI	*Monarda fistulosa*	25–49	–
	scurfpea	PSORA2	*Psoralidium*	25–49	–
	goldenrod	SOLID	*Solidago*	25–49	–
	white heath aster	SYER	*Symphyotrichum ericoides*	25–49	–
	aromatic aster	SYOB	*Symphyotrichum oblongifolium*	0–25	–
	hoary verbena	VEST	*Verbena stricta*	0–25	–
	American vetch	VIAM	*Vicia americana*	0–25	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–25	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–25	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	0–25	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–25	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–25	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–25	–
Shrub/Vine					
9	**Shrubs**			123–370	
	snowberry	SYMPH	*Symphoricarpos*	25–247	–
	rose	ROSA5	*Rosa*	25–99	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–74	–
	leadplant	AMCA6	*Amorpha canescens*	0–74	–
	prairie sagewort	ARFR4	*Artemisia frigida*	25–74	–
	pricklypear	OPUNT	*Opuntia*	0–49	–

Table 12. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Mid Warm-season Grasses**			0–78	
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–78	–
2	**Short Warm-season Grasses**			16–235	
	blue grama	BOGR2	*Bouteloua gracilis*	0–235	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–126	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–94	–
	threeawn	ARIST	*Aristida*	16–78	–
3	**Grass-likes**			78–204	
	threadleaf sedge	CAFI	*Carex filifolia*	78–204	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–78	–
4	**Other Native Grasses**			0–31	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–31	–
	fall rosette grass	DIWI5	*Dichanthelium wilcoxianum*	0–16	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–16	–
5	**Non-Native Grasses**			471–1098	
	Kentucky bluegrass	POPR	*Poa pratensis*	471–1098	–
	smooth brome	BRIN2	*Bromus inermis*	0–157	–
Forb					
6	**Forbs**			157–314	
	Forb, introduced	2FI	*Forb, introduced*	16–110	–
	field sagewort	ARCA12	*Artemisia campestris*	16–78	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	16–78	–
	goldenrod	SOLID	*Solidago*	16–78	–
	white heath aster	SYER	*Symphyotrichum ericoides*	16–78	–
	scurfpea	PSORA2	*Psoralidium*	0–47	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	16–47	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	16–47	–
	blazing star	LIATR	*Liatris*	0–31	–
	hoary verbena	VEST	*Verbena stricta*	0–31	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–16	–
	pussytoes	ANTEN	*Antennaria*	0–16	–
	Forb, native	2FN	*Forb, native*	0–16	–
Shrub/Vine					
7	**Shrubs**			78–157	
	prairie sagewort	ARFR4	*Artemisia frigida*	16–94	–
	pricklypear	OPUNT	*Opuntia*	16–78	–
	snowberry	SYMPH	*Symphoricarpos*	0–47	–
	rose	ROSA5	*Rosa*	16–31	–

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.

Needlegrass/Bluestem/Prairie Dropseed (1.1 & 2.1)
Average Annual Production (lbs./acre, air-dry): 2400
Stocking Rate* (AUM/acre): 0.66

Grama/Sedge/Kentucky Bluegrass (2.2)
Average Annual Production (lbs./acre, air-dry): 1800
Stocking Rate* (AUM/acre): 0.49

Kentucky Bluegrass/Smooth Bromegrass (3.1)
Average Annual Production (lbs./acre, air-dry): 2200
Stocking Rate* (AUM/acre): 0.60

Kentucky Bluegrass Sod/Forbs (3.2)
Average Annual Production (lbs./acre, air-dry): 1400
Stocking Rate* (AUM/acre): 0.38

Annual/Pioneer, Non-Native Perennial (3.3)
Average Annual Production (lbs./acre, air-dry): 900
Stocking Rate* (AUM/acre): 0.25

*Based on 912 lbs./acre (air-dry weight) per Animal Unit Month (AUM), and on 25 percent harvest efficiency (refer to United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), National Range and Pasture Handbook).

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide yearlong forage. During the dormant period, the forage for livestock will likely be lacking protein to meet livestock requirements, and added protein will allow ruminants to better utilize the energy stored in grazed plant materials. A forage quality test (either directly or through fecal sampling) should be used to determine the level of supplementation needed.

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group B. Infiltration is typically moderate and runoff potential for this site varies from negligible 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 blue grama, bluegrass, and/or smooth bromegrass will result in reduced infiltration and increased runoff. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff (refer to Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic curves).

Recreational uses

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

Wood products

No appreciable wood products are typically present on this site.

Other products

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

Inventory data references

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

There are 5 SCS-RANGE-417's collected from 1986-2006 in Day and Roberts Counties, South Dakota.

Other references

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Contributors

Megan Baxter
Stan Boltz

Rangeland health reference sheet

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

Author(s)/participant(s)	David Schmidt, Tim Nordquist, Stan Boltz
Contact for lead author	
Date	12/04/2007
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:** Typically not observable.

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3. **Number and height of erosional pedestals or terracettes:** None.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground 5-15%.

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

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

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7. **Amount of litter movement (describe size and distance expected to travel):** Little to no plant litter movement.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Stability class usually 5-6. Typically high root content, organic matter, and granular structure. Soil surface is resistant to erosion.

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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.

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

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

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

    Dominant: Tall cool-season bunch grass >> mid warm-season bunch grass

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

    Other:

    Additional:

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

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

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14. **Average percent litter cover (%) and depth (in):** 50-60%, less than 0.5 inch thick. Litter cover is in contact with soil surface.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 2100 – 2800 lbs./acre air-dry weight, average 2,400 lbs./acre air-dry weight

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

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