Ecological site R055BY061ND
Sands

Accessed: 04/24/2024

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.

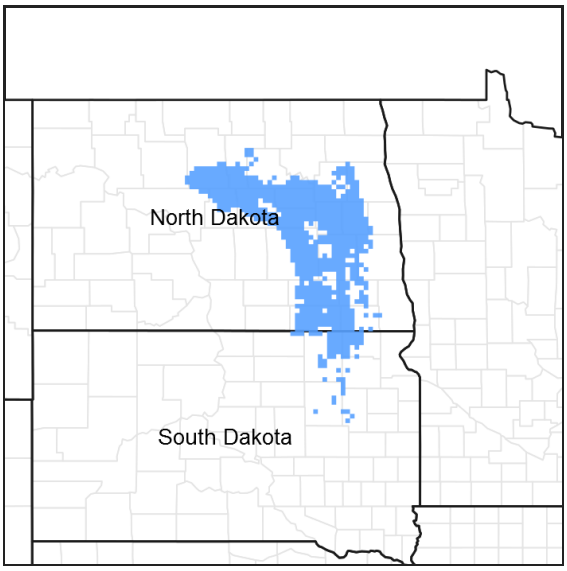


Figure 1. Mapped extent

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: 42a – Missouri Coteau; 42b – Collapsed Glacial Outwash; 42c – Missouri Coteau Slope; 42d – Northern Missouri Coteau; 42f – Southern Missouri Coteau Slope; 42g – Ponca Plains; and 42h – Southern River Breaks.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Hesperostipa spartea* (2) *Calamovilfa longifolia*

Physiographic features

This site typically occurs on nearly level to moderately steep uplands.

Table 2. Representative physiographic features

Landforms	(1) Dune (2) Till plain (3) Stream terrace
Elevation	1,600–2,000 ft
Slope	0–25%
Water table depth	80 in
Aspect	Aspect is not a significant factor

Climatic features

MLRA 55B is considered to have a continental climate – cold winters and hot summers, low humidity, light rainfall, and much sunshine. Extremes in temperature are characteristic. The climate is the result of this MLRA's location in the geographic center of North America. There are few natural barriers on the northern Great Plains. The air masses move unobstructed across the plains and account for rapid changes in temperature.

Annual precipitation ranges from 16 to 21 inches per year. The normal average annual temperature is about 41.5° F. January is the coldest month with average temperatures ranging from about 2° F (Maddock, ND) to about 11° F (Mellette, SD). July is the warmest month with temperatures averaging from about 67° F (Maddock, ND) to about 73° F (Redfield 2 NE, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 64° F. This large annual range attests to the continental nature of this MLRA's climate. Winds average about 11 miles per hour annually, ranging from about 13 miles per hour during the spring to about 10 miles per hour 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 miles per hour.

Growth of native cool-season plants begins in late March and continues to early to mid July. Native warm-season plants begin growth in mid May and continue to the end of August. Green up of cool-season plants can occur in September and October when adequate soil moisture is present.

Table 3. Representative climatic features

Frost-free period (average)	140 days
Freeze-free period (average)	161 days
Precipitation total (average)	21 in

Influencing water features

No significant water features influence this site.

Soil features

These are deep to very deep, well to excessively drained, coarse textured soils. Saturated hydraulic conductivity is rapid to very rapid and available water capacity is moderate to very low. Salinity and sodicity are none. Soils on this site are highly susceptible to wind erosion. This site is on nearly level to steep outwash plains, terraces, flood plains, lake plains and till plains. Slope ranges from 0 to 45 percent. This site should show slight to no evidence of rills, wind scoured areas or pedestalled plants. Water flow paths are broken, irregular in appearance or discontinuous. The soil surface is stable and intact.
These soils are susceptible to water and wind erosion. Loss of the soil surface layer can result in a shift in species composition and/or production.

Major soil series correlated to this ecological site can be found in Section II of the Natural Resources Conservation Service Field Office Technical Guide or the following web sites:
Access Web Soil Survey (http://websoilsurvey.nrcs.gov/app/) for specific local soils information.

Table 4. Representative soil features

Surface texture	(1) Loamy fine sand (2) Loamy sand (3) Fine sandy loam
Drainage class	Well drained to excessively drained
Permeability class	Rapid to very rapid
Soil depth	20–40 in
Surface fragment cover <=3"	0–15%
Surface fragment cover >3"	0–1%
Available water capacity (0-40in)	4–5 in
Calcium carbonate equivalent (0-40in)	0–15%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	6.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–15%
Subsurface fragment volume >3" (Depth not specified)	0–1%

Ecological dynamics

The site developed under Northern Great Plains climatic conditions, and included natural influence of large herding herbivores and frequent fire. Changes will occur in the plant communities due to weather fluctuations and/or management actions. Under adverse impacts, a slow decline in vegetative vigor and composition will occur. Under favorable conditions the site has the potential to resemble the reference state. Interpretations for this site are based on the Reference State. The Reference State 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 considered. Community phases, community pathways, states, transitions, thresholds and restoration pathways have been determined through similar studies and experience.

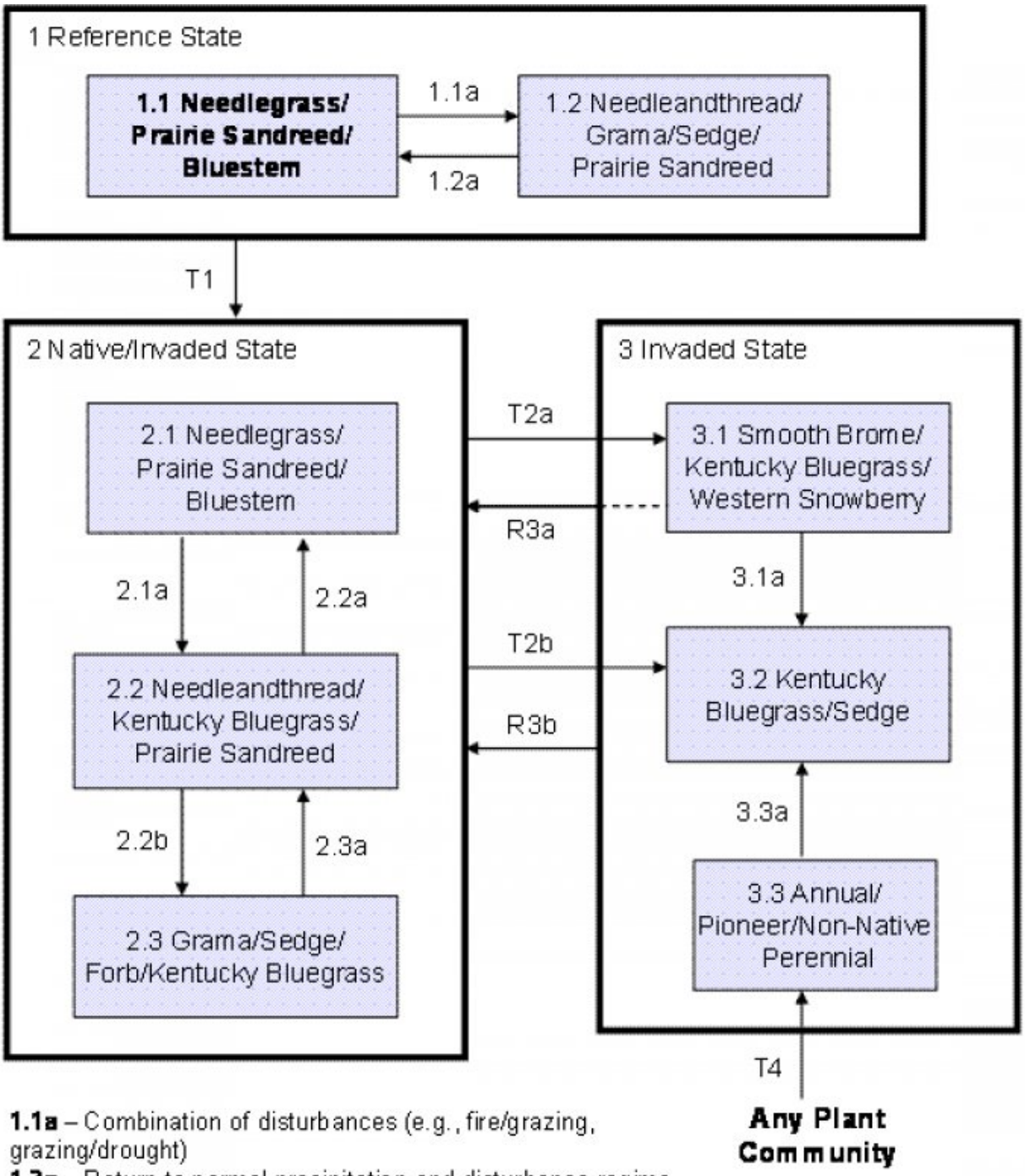
The natural disturbance regime consisted of frequent fires caused both by natural and Native American ignition sources. These fires occurred during any season of the year, but were concentrated in the spring and late summer or early fall. Lightening fires occurred most frequently in July and August while fires started by Native Americans occurred in April, September and October. Large ungulate grazing was heavy and occurred often, but usually for short durations. Grazing may have been severe when occurring after a fire event. The grazing and fire interaction especially when coupled with drought events, set up the dynamics discussed and displayed in the following state and transition diagram and descriptions.

This ecological site has been grazed by domestic livestock since introduced into the area. The introduction of domestic livestock and the use of fencing and reliable water sources have radically changed the disturbance regime of this site. Heavy continuous grazing and/or continuous seasonal (spring) grazing, without adequate recovery periods following each grazing occurrence causes this site to depart from the reference plant community. Species such as needleandthread, blue grama and threadleaf sedge will initially increase. Species such as sand bluestem and prairie sandreed decrease in frequency and production. In time, heavy continuous grazing will likely cause blue grama and threadleaf sedge to dominate and other pioneer perennials and annuals to increase. In this case, runoff will increase and infiltration will decrease. Heavy disturbance through improper grazing, wildfire, excessive defoliation or any type of physical disturbance can lead to serious erosion problems (blowout) on these fragile soils. Extended periods of non-use and/or lack of fire will result in a plant community having high litter levels, which favors an increase in Kentucky bluegrass and/or smooth bromegrass as well as shrubs species such as western

snowberry. Remnant native plants may be present but are reduced in vigor.

Following the state and transition diagram are narratives for each of the described states and community phases. These may not represent every possibility, but they are the most prevalent and repeatable states/community phases. The plant composition tables shown below have been developed from the best available knowledge at the time of this revision. As more data are collected, some of these community phases and/or states may be revised or removed, and new ones may be added. The main purpose for including the descriptions here is to capture the current knowledge and experience at the time of this revision.

State and transition model



1.1a – Combination of disturbances (e.g., fire/grazing, grazing/drought)
1.2a – Return to normal precipitation and disturbance regime
2.1a, 2.2b, T2b, 3.1a – Heavy continuous grazing;
T2a – Extended period of non-use & no fire;
R3a – Prescribed burning, followed by prescribed grazing;
2.2a, 2.3a – Prescribed grazing
3.3a Prescribed grazing and time
R3b – Range seeding with prescribed grazing.
T4 – Cropped go-back with continuous grazing

State 1
Reference

This state represents the natural range of variability that dominates the dynamics of this ecological site. This state is dominated by warm- and cool-season grasses. The primary disturbance mechanisms for this site in the reference condition include frequent fire and grazing by large herding ungulates. Timing of fires and grazing coupled with weather events dictate the dynamics that occur 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. Slight shifts would have occurred in the timing of energy capture, hydrologic function and nutrient cycling between plant community phases within State 1. High basal density, minimal bare ground, and deep root systems resulted in low runoff rates and high infiltration. Overall, the ecological processes were functioning near optimum levels.

Community 1.1
Needlegrass/Prairie Sandreed/Bluestem

This community phase was the most dominant both temporally and spatially. The prevailing climate and weather patterns favored the development of this community phase. Mid statured cool-season bunchgrass such as needleandthread and porcupine grass would have been co-dominates with tall warm-season grasses such as prairie sandreed, needleandthread, big bluestem, and sand bluestem. Other grass and grass-likes species included sand dropseed, sideoats grama, prairie Junegrass, western wheatgrass, Canada wildrye, blue grama, and sedge. A variety of leguminous and non-leguminous perennial forbs including American vetch, dotted gayfeather, goldenrod, purple prairie clover and scurfpea were present. Shrubs included fringed sagewort, leadplant and western snowberry. In this community phase, grasses and grass-likes would have constituted about 85 to 95 percent, forbs 5 to 10 percent and shrub 1 to 5 percent of the annual production. This is the reference plant community phase and is described in the This represents the plant community phase upon which interpretations are primarily based and is described in the “Plant Community Composition and Group Annual Production” portion of this ecological site description. Community dynamics, nutrient cycling, water cycle and energy flow were functioning at near optimum levels. A good component of bunchgrasses, minimal bare ground, litter in contact with the soil surface and deep rooted plants would have resulted in high infiltration rates and minimal runoff. Due to the balance between warm and cool season grasses, energy capture would have been spread across the entire growing season. Natural plan mortality was low. The diversity in plant species allowed for high drought tolerance.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1650	2327	2790
Forb	125	195	275
Shrub/Vine	25	78	135
Total	**1800**	**2600**	**3200**

Figure 5. Plant community growth curve (percent production by month). ND5503, Central Black Glaciated Plains, cool-season/warm-season co-dominant.. Cool-season, warm-season co-dominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	2	6	21	40	20	6	4	1	0	0

Community 1.2
Needleandthread/Grama/Sedge/Prairie Sandreed

This plant community shift results from heavy, frequent grazing over a period of several years and/or several consecutive years of below normal precipitation. This increase in grazing pressure may have resulted from proximity to a water source, changes in fire frequency and/or prolonged drought. Grasses and grass-like species would have still dominated this phase but the overall productivity of these species would have been reduced and the

number and amount of forbs would have increased. Needleandthread would have displaced porcupine grass to become the dominate needlegrass while blue grama, sand dropseed and sedges would have also increased. Prairie sandreed and the bluestems would have decreased but still be present. Forb species such as green sagewort, goldenrod, western ragweed, western yarrow and prairie coneflower would have increased. The shift to the shallower rooted, short statured blue grama and sedges coupled with an increase in bare ground results in lower infiltration rates and higher soil surface temperatures as compared to plant community phase 1.1. This reduction in infiltration would have resulted in a short term increase in the number and size of water flow patterns on steeper slopes. While the timing of energy capture would have remained similar to that of plant community phase 1.1, total energy capture may have been slightly reduced due to a decrease in overall leaf area.

Figure 6. Plant community growth curve (percent production by month). ND5502, Central Black Glaciated Plains, cool-season dominant, warm-season sub-dominant.. Cool-season dominant, warm-season sub-dominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	7	23	42	15	5	4	1	0	0

Pathway 1.1a
Community 1.1 to 1.2

Repeated heavy grazing either due to proximity to water or following short term fire intervals followed by intense grazing will convert the dominance to short stature grasses such as blue grama and upland sedges. This shift may have been facilitated by periods of below normal precipitation.

Pathway 1.2a
Community 1.2 to 1.1

A return to normal precipitation patterns, grazing and fire regime allows for recovery of mid statured cool porcupine grass as well as the prairie sandreed and bluestem species.

State 2
Native/Invaded

This state is similar to the reference state. The invasion of introduced cool-season sodgrasses has altered the natural range of variability for this ecological site. This state still has a strong component of warm and cool season grass species, but invasive introduced cool-season sodgrasses are now present in all community phases of this state. The primary disturbance mechanisms for this state include grazing by domestic livestock and infrequent fires.

Community 2.1
Needlegrass/Prairie Sandreed/Bluestem

This community phase most closely resembles plant phase 1.1in appearance and ecological function (e.g., hydrologic, biotic and soil/site stability). This 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 plant community phase is characterized by co-dominance of mid statured cool-season bunchgrass such as needleandthread and porcupine grass and tall warm-season grasses such as prairie sandreed, needleandthread, big bluestem, and sand bluestem. Other grass and grass-likes species would include sand dropseed, sideoats grama, prairie Junegrass, western wheatgrass, Canada wildrye, blue grama, and sedge. Non-native cool- season grasses such as Kentucky bluegrass and smooth bromegrass would be present in very small amounts. Grasses and grass-likes would constitute about 85 to 95 percent of this phase. A variety of leguminous and non-leguminous perennial forbs would constitute from 5 to 10 percent and included American vetch, dotted gayfeather, goldenrod, purple prairie clover and scurfpea were present. Shrubs comprise about 1 to 5 percent of the plant community by weight and would include fringed sagewort, leadplant and western snowberry. The ecological processes are functioning at levels very close to those of plant community phase 1.1. Slight departure may be noted within the functional/structural indicator due to the presence of a functional/structural group(s) not expected for the site. The basic difference between this community phase and 1.1 of the Reference State is the presence of minor amounts of introduced cool-season grasses and forbs. This is likely a naturally nitrogen deficient plant community, but perhaps less so than the Reference State. A change in the nutrient cycle on

this ecological site possibly due to the introduction of non-native leguminous species such as sweet clover may be a causative factor leading to the eventual dominance of cool-season introduced grasses in the Invaded State.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1650	2327	2790
Forb	125	195	275
Shrub/Vine	25	78	135
Total	**1800**	**2600**	**3200**

Figure 8. Plant community growth curve (percent production by month). ND5503, Central Black Glaciated Plains, cool-season/warm-season co-dominant.. Cool-season, warm-season co-dominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	2	6	21	40	20	6	4	1	0	0

Community 2.2
Needleandthread/Kentucky Bluegrass/Prairie Sandreed

This plant community phase is characterized by a decline in porcupine grass, sand bluestem, and big bluestem and a corresponding increase in the more grazing tolerant needleandthread, sand dropseed, sedges and Kentucky bluegrass. Forbs such as western yarrow, goldenrod, green sagewort, and cudweed sagewort will increase while the leguminous forbs may decrease. The shrub component remains fairly constant however fringed sagewort may increase. Although grasses and grass-likes still comprise 60 to 80 percent of the production, the forb component would increase to 15 to 30 percent of the production with shrubs contributing from 5 to 10 percent. The ecological processes are functioning at levels very close to those of plant community phase 2.1 but some departures begin to occur. Energy capture is shifted to earlier in the growing season due to the decline in the warm-season component of the plant community. Nutrient cycling may be reduced due to the decline in the number and amount of native legumes in the community. Infiltration rates may be slightly reduced due to the reduction in the bunchgrass component as well as the reduction in deep rooted, tall statured warm-season grasses. Departure will be noted within the functional/structural indicator due to the presence of a functional/structural group(s) not expected for the site.

Figure 9. Plant community growth curve (percent production by month). ND5501, Central Black Glaciated Plains, cool-season dominant. Cool-season dominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	8	24	45	10	3	5	2	0	0

Community 2.3
Grama/Sedge/Forb/Kentucky Bluegrass

This plant community shift results from heavy continuous or heavy continuous season-long grazing over a period of several years. Blue grama becomes the dominant grass with lesser amounts of upland sedges and Kentucky bluegrass. Grazing tolerant forbs also increase. These grazing tolerant short grasses such as blue grama and Kentucky bluegrass along with the grass-likes out compete the taller statured grass species. Common forbs would include goldenrod, green sagewort, western salsify, heath aster, western yarrow, scurfpea and western ragweed. Fringed sagewort, and prairie rose are the principal shrubs. Grasses and grass-likes would be co-dominants in this phase with shrubs still comprising 5 to 10 percent of the community. Although greatly reduced in amount and extent, the needlegrasses and tall statured warm season grasses would still be present in limited amounts but may not be readily observable. The shift in the plant community composition results in changes to how the ecological processes function on this site. Due to the increase in short statured grasses and grass-likes, Infiltration for this phase is reduced when compared to plant community phases 1.1 and 2.1. Since the ratio of warm-season to cool-season plants within this community phase is similar to 2.1, the timing of energy capture is not altered but overall

energy capture would be less due to the reduction in total leaf surface area available to capture solar energy. This plant community phase represents an “at risk” plant community. Due to the amount of Kentucky bluegrass present and the reduced competitive abilities of the associated native species, the possibility exists for this community to cross a threshold and transition to State 3, Invaded State. Therefore, caution needs to be exercised when developing and implementing restoration strategies for this plant community phase. Community Pathway 2.3a to Needleandthread/Kentucky Bluegrass/Prairie Sandreed This community pathway is initiated by implementation of prescribed grazing management which includes adequate recovery periods following each grazing event, and stocking levels which match the available resources. If properly implemented, this will shift the competitive advantage from the introduced cool-season species to the remnant native cool-season bunchgrass species and tall statured warm season grasses. Kentucky bluegrass will remain in this community at varying amounts dependant on the level of management. Caution should be exercised when initiating this restoration pathway to ensure that management actions don’t favor Kentucky bluegrass resulting in unexpectedly crossing the threshold to State 3, Invaded State.

Figure 10. Plant community growth curve (percent production by month). ND5502, Central Black Glaciated Plains, cool-season dominant, warm-season sub-dominant.. Cool-season dominant, warm-season sub-dominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	7	23	42	15	5	4	1	0	0

Pathway 2.1a
Community 2.1 to 2.2

Heavy continuous grazing or heavy late seasonal grazing will shift this plant community from a dominance of needlegrasses and prairie sandreed to a dominance of grazing tolerant needleandthread and Kentucky bluegrass.

Pathway 2.2a
Community 2.2 to 2.1

This community pathway is initiated by implementation of prescribed grazing management which includes adequate recovery periods following each grazing event, and stocking levels which match the available resources. If properly implemented, this will shift the competitive advantage away from the introduced cool-season species and back to the mid statured bunchgrasses and tall statured rhizomatous grasses. The addition of properly timed prescribed burning may expedite this shift.

Pathway 2.2b
Community 2.2 to 2.3

Heavy continuous grazing or heavy continuous season-long grazing allows the grazing tolerant short stature grasses and sedges to become more competitive and dominant.

Pathway 2.3a
Community 2.3 to 2.2

This community pathway is initiated by implementation of prescribed grazing management which includes adequate recovery periods following each grazing event, and stocking levels which match the available resources. If properly implemented, this will shift the competitive advantage from the introduced cool-season species to the remnant native cool-season bunchgrass species and tall statured warm season grasses. Kentucky bluegrass will remain in this community at varying amounts dependant on the level of management. Caution should be exercised when initiating this restoration pathway to ensure that management actions don’t favor Kentucky bluegrass resulting in unexpectedly crossing the threshold to State 3, Invaded State.

State 3
Invaded

This state is the result of invasion and dominance of Kentucky bluegrass and/or smooth bromegrass. This state is characterized by these two species 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 sodgrasses, 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 sodgrasses rebound and again dominate the system. This state also includes the Annual, Pioneer Perennial community phase which is highly variable depending on the disturbance which causes this transition (T4). Over time, the Annual, Pioneer Perennial community phase will likely become dominated by introduced cool-season grasses, and shift to the Kentucky bluegrass community phase (3.2).

Community 3.1
Smooth Bromegrass/Kentucky Bluegrass/Western Snowberry

This community phase is dominated by the cool-season sodgrasses including smooth brome and Kentucky bluegrass. Western snowberry can increase and become a major component in this community phase. Remnants of native warm- and cool-season grasses are still present, but greatly reduced. Infiltration may be reduced and runoff is increased when compared to the Reference State. Nutrient cycling is limited by the rooting depth of these species, the lack of leguminous forbs, and the alteration of the soil biotic community. Energy capture into the system is restricted to a short window provided by the early season species and heavy litter layer which reduces the amount of sunlight reaching the grass plant crowns. This further favors the shade tolerant introduced species and shrubs.

Figure 11. Plant community growth curve (percent production by month). ND5501, Central Black Glaciated Plains, cool-season dominant. Cool-season dominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	8	24	45	10	3	5	2	0	0

Community 3.2
Kentucky Bluegrass/Sedge

This community phase is dominated by Kentucky bluegrass with lesser amounts of sedge. Grazing tolerant forbs such as cudweed sagewort, western ragweed and western yarrow are also present. The longer this community phase exists the more resilient it becomes. Natural or management disturbances that reduce the cover of Kentucky bluegrass are very short lived due to the abundance of rhizomes of Kentucky bluegrass in the soil and the lack of propagules of other species present. Production is limited to the sod forming species. Energy capture into this system is limited to one early growing species. Runoff increases and is the highest of any plant community phase on this ecological site. Nutrient cycling is severely limited due to the shallow rooting depth of the Kentucky bluegrass and lack of leguminous forbs.

Figure 12. Plant community growth curve (percent production by month). ND5501, Central Black Glaciated Plains, cool-season dominant. Cool-season dominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	8	24	45	10	3	5	2	0	0

Community 3.3
Annual/Pioneer/Non-Native Perennial

The Annual, Pioneer Perennial community phase is highly variable depending on the level and duration of disturbance related to the T4 transitional pathway. In this MLRA, the most probable origin of this phase is secondary succession following cropland abandonment. This plant community will initially include a variety of annual forbs and grasses. Over time, the introduced cool-season perennial grasses will begin to establish on this site.

Pathway 3.1a
Community 3.1 to 3.2

This pathway is initiated by heavy continuous season-long grazing. The heavy continuous grazing favors those plants which can tolerate repeated defoliation (Kentucky bluegrass and sedges). Smooth brome will decrease with heavy use due to its elevated growth point. Western snowberry will experience mechanical damage and will decrease in production and cover. Grazing pressure will reduce litter cover resulting in elevated soil surface temperatures increasing evaporation rates and reducing biological activity.

Pathway 3.3a
Community 3.3 to 3.2

With grazing and time, the grazing tolerant Kentucky bluegrass will continue to increase leading to community phase 3.2. In the absence of grazing, this pathway will lead to a community phase resembling 3.1 with the primary difference being the lack of western snowberry and remnant native grass species.

Transition T1
State 1 to 2

This is the transition from the native grass dominated reference state to a state that has been invaded by introduced cool-season grass species. When propagules of Kentucky bluegrass are present, this transition occurs as natural and/or management actions favor a decline in the composition of warm and cool season bunch grasses and an increase in cool-season sodgrasses. This transition is compounded by a change in the historic grazing and fire regime where native herbivores would follow periodic fires with grazing. This historic grazing/fire sequence has largely been replaced by chronic season-long or heavy late season grazing. Complete rest from grazing and suppression of fire can also lead to this transition. The threshold between states is crossed when Kentucky bluegrass, smooth brome, and other introduced species become established on the site. These species typically are part of functional/structural groups that were not present in the Reference State.

Transition T4
State 1 to 3

This transition occurs with cessation of cropping practices from any plant community, being applied on this ecological site.

Transition T4
State 1 to 3

This transition occurs with cessation of cropping practices from any plant community, being applied on this ecological site.

Transition T4
State 2 to 3

This transition occurs with cessation of cropping practices from any plant community, being applied on this ecological site.

Transition T4
State 2 to 3

This transition occurs with cessation of cropping practices from any plant community, being applied on this ecological site.

Transition T4
State 2 to 3

This transition occurs with cessation of cropping practices from any plant community, being applied on this ecological site.

Transition T2a
State 2 to 3

Complete rest from grazing and elimination of fire are the two major contributors to this transition, especially when smooth brome is present. The opportunity for high intensity spring burns is severely reduced by early green up, and increased moisture and humidity at the soil surface. 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% of the plant community and native grasses represent less than 40% of the plant community composition.

Transition T2b
State 2 to 3

Heavy continuous season-long grazing is the primary driver of this transition. The very grazing tolerant species have the competitive advantage during this transition. The opportunity for high intensity spring burns (which can serve to reduce the introduced cool-season species) is severely reduced by early green up and the lack of fuel. The nutrient cycle is impaired due to a shift from perennial native legumes to introduced biennial legumes and the lack of available carbon for soil biota due to accumulation in the surface layer root mat. These two factors result in reduced soil biological activity. 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% of the plant community and native grasses represent less than 40% of the plant community composition.

Restoration pathway R3a
State 3 to 2

This restoration pathway may be initiated with the combination of prescribed burning followed by high levels of prescribed grazing management. The success of this restoration pathway depends on the presence of a remnant population of native grasses in community phase 3.1. This remnant population may not be readily apparent without close inspection. The application of prescribed burning may be needed at relatively short intervals in the early phases of this restoration process. Some previous efforts have shown promise with early season prescribed burning; however, fall burning may also be effective under certain circumstances. Both prescribed grazing and prescribed burning are necessary to successfully initiate this restoration pathway.

Restoration pathway R3b
State 3 to 2

It may be possible using selected plant materials and agronomic practices to approach something very near the functioning of the Native/Invaded State (State 2). Application of chemical herbicides and the use of mechanical seeding methods using adapted varieties of the dominant native grasses are possible and can be successful. 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 sodgrasses.

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Needlegrass**			390–780	
	porcupinegrass	HESP11	*Hesperostipa spartea*	390–650	–

	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	130–260	–
2	**Tall Warm-season Grasses**			390–650	
	prairie sandreed	CALO	*Calamovilfa longifolia*	260–650	–
	big bluestem	ANGE	*Andropogon gerardii*	52–390	–
	sand bluestem	ANHA	*Andropogon hallii*	52–390	–
3	**Short Warm-season Grasses**			130–260	
	sand dropseed	SPCR	*Sporobolus cryptandrus*	52–208	–
	blue grama	BOGR2	*Bouteloua gracilis*	26–130	–
4	**Mid Warm-season Grasses**			26–182	
	little bluestem	SCSC	*Schizachyrium scoparium*	26–130	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–78	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–78	–
5	**Other Native Grasses**			26–130	
	Grass, perennial	2GP	*Grass, perennial*	0–130	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	26–130	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–78	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–78	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–78	–
6	**Grass-likes**			52–208	
	sedge	CAREX	*Carex*	52–208	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–130	–
Forb					
7	**Forbs**			130–260	
	Forb, native	2FN	*Forb, native*	26–130	–
	field sagewort	ARCA12	*Artemisia campestris*	26–78	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	26–78	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	26–78	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	26–52	–
	dotted blazing star	LIPU	*Liatris punctata*	26–52	–
	stoneseed	LITHO3	*Lithospermum*	26–52	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	26–52	–
	purple prairie clover	DAPU5	*Dalea purpurea*	26–52	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	26–52	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	26–52	–
	soft-hair marbleseed	ONBEB	*Onosmodium bejariense var. bejariense*	26–52	–
	scurfpea	PSORA2	*Psoralidium*	26–52	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	26–52	–
	goldenrod	SOLID	*Solidago*	26–52	–
	white heath aster	SYER	*Symphyotrichum ericoides*	26–52	–
	longbract spiderwort	TRBR	*Tradescantia bracteata*	26–52	–
	American vetch	VIAM	*Vicia americana*	26–52	–

	scarlet beeblossom	GACO5	*Gaura coccinea*	26–52	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–26	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–26	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–26	–
Shrub/Vine					
8	**Shrubs**			26–130	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–78	–
	leadplant	AMCA6	*Amorpha canescens*	26–78	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	26–78	–
	prairie sagewort	ARFR4	*Artemisia frigida*	26–52	–
	rose	ROSA5	*Rosa*	26–52	–
	prairie willow	SAHU2	*Salix humilis*	0–52	–
	white meadowsweet	SPAL2	*Spiraea alba*	26–52	–

Table 8. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Needlegrass**			390–780	
	porcupinegrass	HESP11	*Hesperostipa spartea*	390–650	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	130–260	–
2	**Tall Warm-season Grasses**			390–650	
	prairie sandreed	CALO	*Calamovilfa longifolia*	260–650	–
	big bluestem	ANGE	*Andropogon gerardii*	52–390	–
	sand bluestem	ANHA	*Andropogon hallii*	52–390	–
3	**Short Warm-season Grasses**			130–260	
	sand dropseed	SPCR	*Sporobolus cryptandrus*	52–208	–
	blue grama	BOGR2	*Bouteloua gracilis*	26–130	–
4	**Mid Warm-season Grasses**			26–182	
	little bluestem	SCSC	*Schizachyrium scoparium*	26–130	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–78	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–78	–
5	**Other Native Grasses**			26–130	
	Grass, perennial	2GP	*Grass, perennial*	0–130	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	26–130	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–78	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–78	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–78	–
6	**Grass-likes**			52–208	
	sedge	CAREX	*Carex*	52–208	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–130	–
7	**Non-Native Grasses**			26–52	
	Kentucky bluegrass	POPR	*Poa pratensis*	26–52	–
	Grass, perennial	2GP	*Grass, perennial*	0–26	

	Grass, perennial	2GP	*Grass, perennial*	0–26	–
	smooth brome	BRIN2	*Bromus inermis*	0–26	–
Forb					
8	**Forbs**			130–260	
	Forb, native	2FN	*Forb, native*	26–130	–
	field sagewort	ARCA12	*Artemisia campestris*	26–78	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	26–78	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	26–78	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	26–52	–
	dotted blazing star	LIPU	*Liatris punctata*	26–52	–
	stoneseed	LITHO3	*Lithospermum*	26–52	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	26–52	–
	purple prairie clover	DAPU5	*Dalea purpurea*	26–52	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	26–52	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	26–52	–
	soft-hair marbleseed	ONBEB	*Onosmodium bejariense var. bejariense*	26–52	–
	scurfpea	PSORA2	*Psoralidium*	26–52	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	26–52	–
	goldenrod	SOLID	*Solidago*	26–52	–
	white heath aster	SYER	*Symphyotrichum ericoides*	26–52	–
	longbract spiderwort	TRBR	*Tradescantia bracteata*	26–52	–
	American vetch	VIAM	*Vicia americana*	26–52	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	26–52	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–26	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–26	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–26	–
Shrub/Vine					
9	**Shrubs**			26–130	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–78	–
	leadplant	AMCA6	*Amorpha canescens*	26–78	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	26–78	–
	prairie sagewort	ARFR4	*Artemisia frigida*	26–52	–
	rose	ROSA5	*Rosa*	26–52	–
	prairie willow	SAHU2	*Salix humilis*	0–52	–
	white meadowsweet	SPAL2	*Spiraea alba*	26–52	–

Animal community

Animal Community – Grazing Interpretations

This site is well adapted to managed grazing by domestic livestock. The predominance of herbaceous plants across all plant community phases best lends these sites to grazing by cattle but other domestic grazers with differing diet preferences may also be a consideration depending upon management objectives. Often, the current plant community does not entirely match any particular plant community (as described in the ecological site description). Because of this, a resource inventory is necessary to document plant composition and production. Proper interpretation of this inventory data will permit the establishment of a safe, initial stocking rate for the type and class of animals and level of grazing management. More accurate stocking rate estimates should eventually be

calculated using actual stocking rate information and monitoring data.

Wood products

No appreciable wood products are present on the 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 and other federal/state agency clipping and inventory data. Also, field knowledge of range-trained personnel was used. All descriptions were peer reviewed and/or field-tested by various private, state and federal agency specialists. Those involved in developing this site description include: Stan Boltz, NRCS Range Management Specialist; Michael D. Brand, State Land Dept., Director Surface Management; David Dewald, NRCS State Biologist; Paul Drayton, NRCS District Conservationist; Jody Forman, NRCS Range Management Specialist; Dennis Froemke, NRCS Range Management Specialist; Jeff Printz, NRCS State Range Management Specialist; Kevin Sedivec, Extension Rangeland Management Specialist; Shawn Dekeyser, North Dakota State University; Rob Self, The Nature Conservancy and Lee Voigt, NRCS Range Management Specialist.

Other references

High Plains Regional Climate Center, University of Nebraska, 830728 Chase Hall, Lincoln, NE 68583-0728. (http://hpccsun.unl.edu)
USDA, NRCS. National Water and Climate Center, 101 SW Main, Suite 1600, Portland, OR 97204-3224. (http://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://nasis.nrcs.usda.gov)
USDA, NRCS. 2001. The PLANTS Database, Version 3.1 (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.
USDA, NRCS, Various Published Soil Surveys.

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)	Jeff Printz, Stan Boltz, Lee Voigt, Jody Forman
Contact for lead author	Jeff.printz@nd.usda.gov 701-530-2080
Date	04/19/2012
Approved by	Jeff Printz
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None.

2. **Presence of water flow patterns:** None.

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

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 10 to 15%.

5. **Number of gullies and erosion associated with gullies:** None.

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

7. **Amount of litter movement (describe size and distance expected to travel):** None.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil aggregate stability ratings should typically be greater than 5. Soil surface fragments will typically retain structure indefinitely when dipped in distilled water.

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

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Combination of shallow and deep rooted species (mid & tall rhizomatous and tufted perennial cool- and warm-season grasses) with fine and coarse roots positively influences infiltration.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None.

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, cool-season bunchgrasses > tall, warm-season grasses >

    Sub-dominant: Short, warm-season bunchgrasses = forbs > grass-likes > mid, warm-season grasses > shrubs = short,

cool-season grasses > mid, cool-season rhizomatous

Other:

Additional: Due to differing root structure and distribution, Kentucky bluegrass and smooth bromegrass do not fit into reference plant community F/S groups.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** None.

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14. **Average percent litter cover (%) and depth (in):** 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):** Representative value = 2600 lbs/ac with a range of 1800 to 3200 lbs./acre air dry depending upon growing conditions.

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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:** State and local noxious weeds, Kentucky bluegrass, smooth bromegrass.

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17. **Perennial plant reproductive capability:** All species exhibit high vigor relative to climatic conditions. Do not rate based solely on seed production. Perennial grasses should have vigorous rhizomes or tillers.
