USDA Natural Resources Conservation Service

Ecological site R055BY072ND
Sandy Claypan

Accessed: 02/08/2025

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.

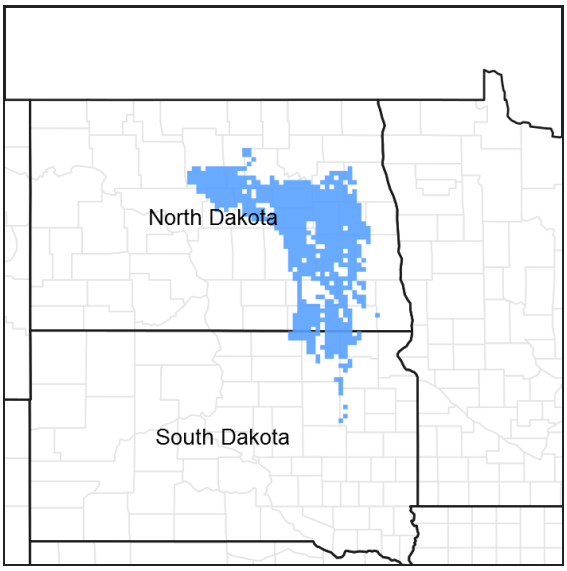


Figure 1. Mapped extent

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.

Associated sites

R055BY056ND	**Clayey**
R055BY059ND	**Loamy Overflow**
R055BY064ND	**Loamy**

Similar sites

R055BY057ND	**Claypan** (R055BY057ND) – Claypan [more green needlegrass; less prairie sandreed; lower production]

Table 1. Dominant plant species

Tree	Not specified

Shrub	Not specified
Herbaceous	(1) *Pascopyrum smithii* (2) *Andropogon gerardii*

Physiographic features

This site typically occurs on nearly level to gently sloping, undulating uplands.

Table 2. Representative physiographic features

Landforms	(1) Outwash plain (2) Till plain (3) Delta plain
Elevation	1,000–2,100 ft
Slope	0–3%
Water table depth	42–80 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 very deep, moderately well to well drained soils. They have moderately coarse to medium textured surface layers underlain by a sodic subsoil. The subsoils are moderately coarse to medium textured and are high in sodium. Saturated hydraulic conductivity is moderate to slow and available water capacity is moderate. Salinity is none to slight and sodicity is high. This site is nearly level to moderately steep till plains and lake plains. Slope

ranges from 0 to 25 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 with numerous debris dams or vegetative barriers. The soil surface is stable and intact. Sub-surface soil layers are restrictive to water movement and root penetration. Access Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app/) for specific local soils information.

Table 4. Representative soil features

Surface texture	(1) Fine sandy loam (2) Sandy loam (3) Loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Slow to moderate
Soil depth	6–19 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	6–9 in
Calcium carbonate equivalent (0-40in)	0–20%
Electrical conductivity (0-40in)	0–8 mmhos/cm
Sodium adsorption ratio (0-40in)	0–20
Soil reaction (1:1 water) (0-40in)	5.1–9
Subsurface fragment volume <=3" (Depth not specified)	0–5%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

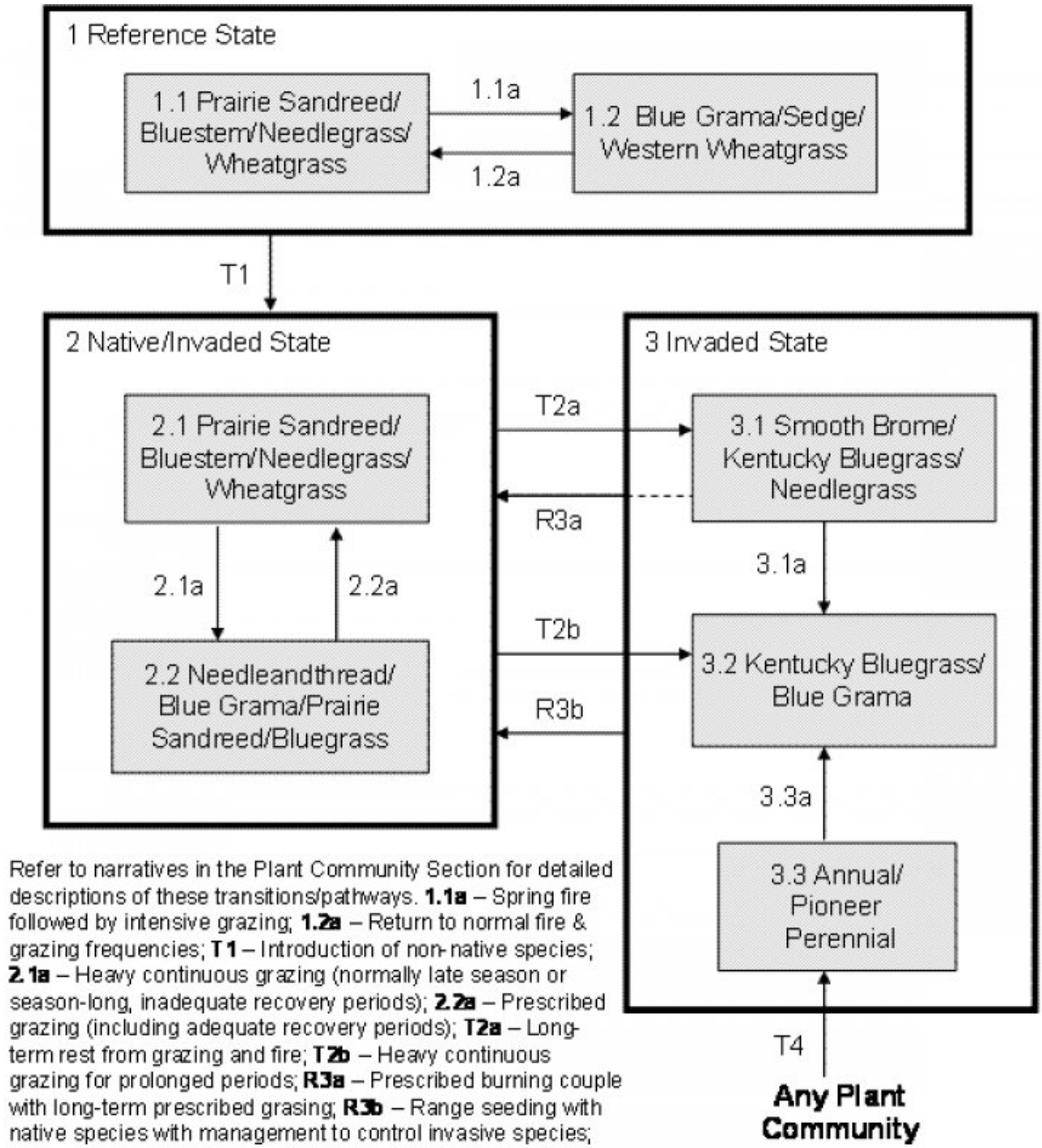
The site developed under Northern Great Plains climatic conditions, and included natural influence of large herding herbivores and occasional fire. Changes will occur in the plant communities due to weather fluctuations and/or management actions. Under adverse impacts, a slow decline in vegetative vigor 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 Prairie Sandreed/Bluestem/Needlegrass/Wheatgrass Plant Community Phase (1.1). The Reference State and the interpretive plant community have 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 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. Blue grama and Kentucky bluegrass if present, will begin to increase. Western wheatgrass will increase initially and then begin to decrease. Tall and mid warm-season grasses will decrease in frequency and production. In time, heavy continuous grazing will likely cause upland sedges and blue grama and/or Kentucky bluegrass if present to

dominate and pioneer perennials and annuals to increase. The resulting plant community is relatively stable and competitive advantage prevents other species from establishing. 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.

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



Refer to narratives in the Plant Community Section for detailed descriptions of these transitions/pathways. **1.1a** – Spring fire followed by intensive grazing; **1.2a** – Return to normal fire & grazing frequencies; **T1** – Introduction of non-native species; **2.1a** – Heavy continuous grazing (normally late season or season-long, inadequate recovery periods); **2.2a** – Prescribed grazing (including adequate recovery periods); **T2a** – Long-term rest from grazing and fire; **T2b** – Heavy continuous grazing for prolonged periods; **R3a** – Prescribed burning couple with long-term prescribed grasing; **R3b** – Range seeding with native species with management to control invasive species; **3.1a** – Heavy continous grazing; **3.3a** – Time with or without disturbances; **T4** – Cropped and abandoned, or other extreme disturbances.

State 1
Reference

This state represents the natural range of variability that dominated the dynamics of this ecological site. This state was co-dominated by cool-season and warm-season grasses. In pre-European times, the primary disturbance mechanisms for this site in the reference condition included periods of below and/or above average precipitation, periodic fire, and herbivory by insects and large ungulates. Timing of fires and herbivory coupled with weather events dictated the dynamics that occurred within the natural range of variability. Cool-season and taller warm-season grasses would have declined and a corresponding increase in short, warm-season grasses would have occurred. Today, a similar state (State 2) can be found on areas that are properly managed with grazing and/or prescribed burning, and sometimes on areas receiving occasional short periods of rest.

Community 1.1
Prairie Sandreed/Bluestem/Needlegrass/Wheatgrass

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 a mix of cool- and warm-season grasses. This is the interpretive plant community and is considered to be climax. This community evolved with grazing by large herbivores and occasional prairie fire. The potential vegetation was about 85 percent grass and grass-like species, 10 percent forbs, and 5 percent shrubs. Cool-season and tall warm-season grasses dominated the plant community. The co-dominant grasses included prairie sandreed, western wheatgrass, big bluestem, porcupine grass and needleandthread. Other grasses and grass-like plants occurring on the site included blue grama, green needlegrass, little bluestem, prairie junegrass and sedges. Significant forbs included stiff sunflower, bracted spiderwort, hairy goldaster, false gromwell, dotted gayfeather, and purple coneflower. The dominant shrubs were leadplant, western snowberry, and fringed sagewort.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1675	2148	2595
Forb	105	180	275
Shrub/Vine	20	72	130
Total	**1800**	**2400**	**3000**

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
Blue Grama/Sedge/Western Wheatgrass

This plant community was a result of concentrated grazing following a spring fire, from heavy continuous grazing or from over utilization during extended drought periods. The potential plant community was made up of approximately 85 percent grasses and grass-like species, 10 percent forbs, and 5 percent shrubs. Dominant grass and grass-like species included western wheatgrass, blue grama, sedge, and needleandthread. Grasses of secondary importance included prairie sandreed, porcupine grass, big bluestem, sand dropseed, and threeawn. Forbs commonly found in this plant community included cudweed sagewort, heath aster, and western yarrow. Short grasses, grass-likes and forbs increased to dominate the site and annual production decreased dramatically. Lack of litter and reduced plant vigor resulted in higher soil temperatures, poor water infiltration rates, and high evapotranspiration, which gave blue grama and sedges a competitive advantage over cool season mid-grasses. When compared to the Prairie Sandreed/Bluestem/Needlegrass/Wheatgrass Plant Community Phase (1.1), blue grama and sedge increased. Porcupine grass, prairie dropseed, and big bluestem decreased, and production 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. The increase of shorter-statured, more compact rooted species would have resulted in somewhat higher runoff and decreased infiltration. This would have caused the site to become drier. These species also would have been more competitive.

Figure 6. 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

Pathway 1.1a
Community 1.1 to 1.2

This pathway occurs as a result of spring fire followed by heavy grazing, or a combination of moderate to heavy grazing coupled with prolonged periods of below-average precipitation. The dominant cool- and warm-season grasses such as prairie sandreed, big bluestem, and porcupine grass will decrease, and shorter statured species such as blue grama and sedge will increase. This pathway would have led to the 1.2 Blue Grama/Sedge/Western Wheatgrass Plant Community Phase.

Pathway 1.2a
Community 1.2 to 1.1

This pathway occurred when grazing, precipitation, and/or fire returned to normal disturbance regime levels and frequencies or periodic light to moderate grazing possibly including periodic rest occurred. This would have led to the 1.1 Prairie Sandreed/Bluestem/Needlegrass/Wheatgrass Plant Community Phase.

State 2
Native/Invaded

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

Community 2.1
Prairie Sandreed/Bluestem/Needlegrass/Wheatgrass

This plant community phase is similar to the 1.1 Prairie Sandreed/Bluestem/Needlegrass/Wheatgrass Plant Community Phase, but it also contains minor amounts of non-native invasive grass species such as Kentucky bluegrass and smooth bromegrass (up to about 10 percent by air-dry weight). The potential vegetation is about 85 percent grass and grass-like species, 10 percent forbs, and 5 percent shrubs. Cool-season and tall warm-season grasses dominate the plant community. The co-dominant grasses include prairie sandreed, western wheatgrass, big bluestem, porcupine grass and needleandthread. Other grasses and grass-like plants occurring on the site include blue grama, green needlegrass, little bluestem, prairie junegrass and sedges. Significant forbs include stiff sunflower, bracted spiderwort, hairy goldaster, false gromwell, dotted gayfeather, and purple coneflower. The dominant shrubs are leadplant, western snowberry, and fringed sagewort. This plant community is resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allows for high drought tolerance. This is a sustainable plant community in regards to site/soil stability, watershed function, and biologic integrity.

Figure 7. Plant community growth curve (percent production by month). 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/Blue Grama/Prairie Sandreed/Bluegrass

This plant community is a result of heavy continuous grazing, continuous season-long grazing or from over utilization during extended drought periods. The potential plant community is made up of approximately 80 percent grasses and grass-like species, 15 percent forbs, and 5 percent shrubs. Dominant grass and grass-like species include needleandthread, blue grama, prairie sandreed, and Kentucky bluegrass. Grasses of secondary importance include porcupine grass, big bluestem, western wheatgrass, slender wheatgrass, green needlegrass, sand dropseed, smooth bromegrass, and sedge. Forbs commonly found in this plant community include cudweed sagewort, heath aster, prairie coneflower, and western yarrow. When compared to the Prairie Sandreed/Bluestem/Needlegrass/Wheatgrass Plant Community Phase (1.1), blue grama and needleandthread have increased, and Kentucky bluegrass has invaded. Porcupine grass and production of mid and tall grasses has also been reduced. This plant community is moderately resistant to change. The herbaceous species present are well adapted to grazing; however, species composition can be altered through long-term overgrazing. If the herbaceous component is intact, it tends to be resilient if the disturbance is not long-term. The increase of shorter-statured, more compact rooted species will result in somewhat higher runoff and decreased infiltration. This will cause the site to become drier. These species will also more competitive.

Figure 8. 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

Figure 9. 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

Pathway 2.1a
Community 2.1 to 2.2

This pathway occurs as a result of heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season, and often at the same time of year each year), or continuous season-long grazing, or a combination of disturbances such as extended periods of below average precipitation coupled with periodic heavy grazing. This pathway will lead to the 2.2 Needleandthread/Blue Grama/Prairie Sandreed/Bluegrass Plant Community Phase.

Pathway 2.2a
Community 2.2 to 2.1

The implementation of prescribed grazing including adequate recovery periods between grazing events and season of use change will initiate this pathway by shifting the competitive advantage away from the short statured grasses to the taller cool-season grasses.

State 3
Invaded

This state is the result of invasion and dominance of introduced species. This state is characterized by the dominance of Kentucky bluegrass and smooth bromegrass, and an increasing thatch layer that effectively blocks introduction of other plants into 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 the invasive grass dominance. 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 Kentucky bluegrass. These events may reduce the dominance of Kentucky bluegrass, but due to the large amount of rhizomes in the soil there is no opportunity for the native species to establish and dominate before Kentucky bluegrass rebounds and again dominates the system.

Community 3.1
Smooth Brome/Kentucky Bluegrass/Needlegrass

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.

Figure 10. 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/Blue Grama

This plant community phase is a result of heavy, continuous seasonal grazing or heavy, continuous season-long grazing. It is characterized by a dominance of Kentucky bluegrass, smooth bromegrass, 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.

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 3.3
Annual/Pioneer Perennial

This plant community developed under continuous heavy grazing or other excessive disturbances. The potential plant community is made up of approximately 40 to 80 percent grasses and grass-like species and 20 to 60 percent forbs. The species present in this phase are highly variable, but often include non-native 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

This pathway occurs as a result of heavy continuous grazing (stocking levels well above carrying capacity for extended portions of the growing season, and often at the same time of year each year), or continuous season-long grazing, or a combination of disturbances such as extended periods of below average precipitation coupled with periodic heavy grazing. This pathway will lead to the 3.2 Kentucky Bluegrass/Blue Grama 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 lead to the 2.1 Foxtail Barley/Inland Saltgrass, Bare Ground Plant Community Phase.

Transition T1
State 1 to 2

This is the transition from the native herbaceous dominated reference state to the herbaceous dominated native/invaded state. This transition occurs when propagules of non-native species such as Kentucky bluegrass and/or smooth bromegrass are present and become established on the site. This occurs as natural and/or management actions (altered grazing and/or fire regime) favor an increase in cool-season sodgrasses. Chronic season-long or heavy late season grazing facilitates this transition. Complete rest from grazing and no fire events can also lead to this transition. The threshold between states is crossed when the non-natives become established on the site.

Transition T4
State 1 to 3

Encroachment of non-native invasive/noxious species, abandonment of cropping, or seeding of introduced and/or native improved varieties of forage species may lead this plant community phase over a threshold to the Invaded State (State 3) and more specifically to the 3.3 Annual/Pioneer Perennial Plant Community Phase. In the case of a seeding, refer to the corresponding Forage Suitability Group description for adapted species and expected production (production estimates in the Forage Suitability Group description may be unrealistically high due to the degraded condition of the site at this phase).

Transition T4
State 1 to 3

Encroachment of non-native invasive/noxious species, abandonment of cropping, or seeding of introduced and/or native improved varieties of forage species may lead this plant community phase over a threshold to the Invaded State (State 3) and more specifically to the 3.3 Annual/Pioneer Perennial Plant Community Phase. In the case of a seeding, refer to the corresponding Forage Suitability Group description for adapted species and expected production (production estimates in the Forage Suitability Group description may be unrealistically high due to the degraded condition of the site at this phase).

Transition T4
State 2 to 3

Encroachment of non-native invasive/noxious species, abandonment of cropping, or seeding of introduced and/or native improved varieties of forage species may lead this plant community phase over a threshold to the Invaded State (State 3) and more specifically to the 3.3 Annual/Pioneer Perennial Plant Community Phase. In the case of a seeding, refer to the corresponding Forage Suitability Group description for adapted species and expected production (production estimates in the Forage Suitability Group description may be unrealistically high due to the degraded condition of the site at this phase).

Transition T4
State 2 to 3

Encroachment of non-native invasive/noxious species, abandonment of cropping, or seeding of introduced and/or native improved varieties of forage species may lead this plant community phase over a threshold to the Invaded State (State 3) and more specifically to the 3.3 Annual/Pioneer Perennial Plant Community Phase. In the case of a seeding, refer to the corresponding Forage Suitability Group description for adapted species and expected production (production estimates in the Forage Suitability Group description may be unrealistically high due to the degraded condition of the site at this phase).

Transition T2a
State 2 to 3

Complete rest from grazing and elimination of fire are the two major contributors to this transition. 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. The opportunity for high intensity spring burns is severely reduced by early green up and increased moisture and humidity at the soil surface and grazing pressure cannot cause a reduction in sodgrass dominance. Production is limited to the sod forming species. Infiltration continues to decrease and runoff increases, energy capture into the system is restricted to early season low producing species. Nutrient cycling is limited by root depth of the dominant species. This transition typically leads to the 3.1 Smooth Brome/Kentucky Bluegrass/Needlegrass Plant Community Phase.

Transition T2b
State 2 to 3

This represents the transition from the more native dominated Native/Invaded State to a plant community phase dominated by a dense Kentucky bluegrass sod and grazing tolerant forbs. Heavy continuous season-long grazing is the major contributor to this transition. 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. This transition typically leads to the 3.2 Kentucky Bluegrass/Blue Grama Plant Community Phase.

Restoration pathway R3a
State 3 to 2

It may be possible using selected plant materials and agronomic practices to approach something very near the functioning of the 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 function and continued treatment of the introduced sodgrasses. This pathway may also be possible with the combination of prescribed burning and long-term prescribed grazing if sufficient native remnants are present on the site.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrass**			240–480	
	western wheatgrass	PASM	*Pascopyrum smithii*	240–480	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	48–240	–
2	**Tall Warm-season Grasses**			240–480	
	big bluestem	ANGE	*Andropogon gerardii*	120–480	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	120–480	–

3	**Needlegrass**			240–480	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	120–360	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	120–360	–
	green needlegrass	NAVI4	*Nassella viridula*	0–120	–
4	**Short Warm-season Grasses**			48–240	
	blue grama	BOGR2	*Bouteloua gracilis*	48–240	–
	threeawn	ARIST	*Aristida*	0–72	–
	saltgrass	DISP	*Distichlis spicata*	0–24	–
5	**Other Native Grasses**			120–240	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	24–120	–
	little bluestem	SCSC	*Schizachyrium scoparium*	24–120	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	24–72	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	24–48	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–24	–
6	**Grass-likes**			24–120	
	threadleaf sedge	CAFI	*Carex filifolia*	24–120	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	0–72	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–48	–
Forb					
7	**Forbs**			120–240	
	Forb, native	2FN	*Forb, native*	24–72	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	24–48	–
	field sagewort	ARCA12	*Artemisia campestris*	0–48	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	24–48	–
	prairie clover	DALEA	*Dalea*	24–48	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	24–48	–
	dotted blazing star	LIPU	*Liatris punctata*	24–48	–
	soft-hair marbleseed	ONBEB	*Onosmodium bejariense var. bejariense*	0–48	–
	scurfpea	PSORA2	*Psoralidium*	24–48	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	24–48	–
	goldenrod	SOLID	*Solidago*	24–48	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	24–48	–
	white heath aster	SYER	*Symphyotrichum ericoides*	24–48	–
	longbract spiderwort	TRBR	*Tradescantia bracteata*	24–48	–
	beardtongue	PENST	*Penstemon*	24–48	–
	spiny phlox	PHHO	*Phlox hoodii*	0–24	–
	American vetch	VIAM	*Vicia americana*	0–24	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	0–24	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–24	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–24	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–24	–

	scarlet beeblossom	GACO5	*Gaura coccinea*	0–24	–
	milkvetch	ASTRA	*Astragalus*	0–24	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–24	–
Shrub/Vine					
8	**Shrubs**			24–120	
	leadplant	AMCA6	*Amorpha canescens*	24–72	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	24–72	–
	prairie sagewort	ARFR4	*Artemisia frigida*	24–48	–
	prairie rose	ROAR3	*Rosa arkansana*	24–48	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–48	–

Animal community

Animal Community – Wildlife Interpretations
Major Land Resource Area (MLRA) 55B lies within the Northern mixed-grass prairie ecosystem. Prior to European settlement, this area consisted of diverse grassland habitats interspersed with varying densities of depressional wetlands and limited woody riparian corridors. These habitats provided critical life cycle components for many of its users. Many species of grassland birds and herds of roaming bison, elk, and pronghorn were among the inhabitants. These species, as well as several small mammal and insect species, were the primary consumers linking the grassland resources to predators such as wolves, mountain lions, and grizzly bears as well as smaller carnivores such as coyotes, bobcats, foxes and raptors. In addition, a wide variety of small mammals, reptiles, amphibians and insects were adapted to this semi-arid climate.

Historically, the Northern mixed-grass prairie was a disturbance-driven ecosystem with fire, herbivory and climate functioning as the primary disturbance factors either singly or in combination. Following European settlement, widespread conversion to cropland, elimination of fire, and habitat fragmentation influenced species composition and abundance. Introduced and invasive species further impacted plant and animal communities. Bison were historically a keystone species but have been extirpated as a free-ranging herbivore. The loss of bison and fire as ecological drivers greatly influenced the character of the remaining native plant community and the habitats that they provide. Fragmentation has reduced habitat quality for area-sensitive species.

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.

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group C. Infiltration varies from very slow to slow, and runoff potential for this site varies from high to very high depending on soil hydrologic group, slope and ground cover. In many cases, areas with greater than 75% ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where shortgrasses form a strong sod and dominate the site. Dominance by blue grama, buffalograss, bluegrass, and/or smooth bromegrass will result in reduced infiltration and increased runoff. Areas where ground cover is less than 50% 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 opportunities for upland game species. The wide variety of plants which bloom from spring until fall have an esthetic value that appeals to visitors.

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; David Dewald, NRCS State Biologist; Jody Forman, 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

Jeff Printz
Megan Baxter

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):** Bare ground is 5 to 20 percent. Patch size is 2 inches or less and not connected.

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):** Average 5 to 6. 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):** No compaction layer evident. Naturally occurring compaction layer (“claypan”) and some platy surface structure is expected for this site.

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

    Dominant: Mid, cool-season bunchgrasses > tall, warm-season grasses = mid, cool-season rhizomatous grasses

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

cool-season bunchgrasses

Other:

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

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** No plant mortality or decadence expected.

---

14. **Average percent litter cover (%) and depth (in):** Plant litter is in contact with soil surface.

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Representative value = 2400 lbs/ac air dry with a range of 1800 to 3000 lbs./acre air dry depending upon growing conditions.

---

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

---

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.
