USDA Natural Resources Conservation Service

Ecological site R055BY057ND
Claypan

Accessed: 05/12/2025

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.

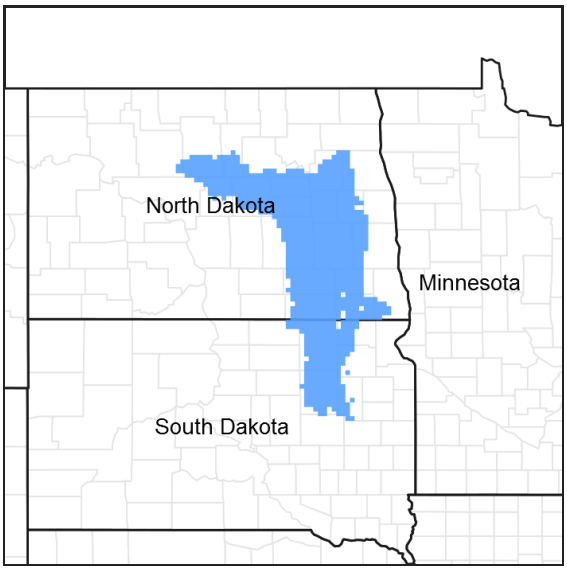


Figure 1. Mapped extent

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

R055BY056ND	**Clayey** (R055BY056ND) – Clayey [more green needlegrass; less blue grama; higher production]

Table 1. Dominant plant species

Tree	Not specified

Shrub	Not specified
Herbaceous	(1) *Pascopyrum smithii* (2) *Nassella viridula*

Physiographic features

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

Table 2. Representative physiographic features

Landforms	(1) Lake plain (2) Till plain
Elevation	1,600–2,000 ft
Slope	1–6%
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)	146 days
Freeze-free period (average)	129 days
Precipitation total (average)	19 in

Influencing water features

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

Soil features

These are very deep, moderately well to well drained soils. Texture in the surface layers ranges from silt loam to silty clay. Permeability ranges from moderately slow to very slow and available water capacity is moderately high. Salinity is moderate to strong and sodicity is high at depths greater than 16 inches. Slope ranges from 0 to 25 percent. Subsurface layer texture is loam to silty clay. When dry these soils may crack. When the soils are wet, surface compaction can occur with heavy traffic. 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. Sub-surface soil layers are restrictive to water movement and root penetration.

These soils are mainly susceptible to water erosion. The hazard of water erosion increases on slopes greater than about 5 percent. 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 site:
http://www.nrcs.usda.gov/technical/efotg/

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

Table 4. Representative soil features

Surface texture	(1) Loam (2) Silt loam (3) Silty clay loam
Family particle size	(1) Clayey
Drainage class	Moderately well drained
Permeability class	Very slow to moderately slow
Soil depth	6–19 in
Surface fragment cover <=3"	0–15%
Surface fragment cover >3"	0–30%
Available water capacity (0-40in)	6–9 in
Calcium carbonate equivalent (0-40in)	0–25%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	5–25
Soil reaction (1:1 water) (0-40in)	6.1–9
Subsurface fragment volume <=3" (Depth not specified)	0–15%
Subsurface fragment volume >3" (Depth not specified)	0–30%

Ecological dynamics

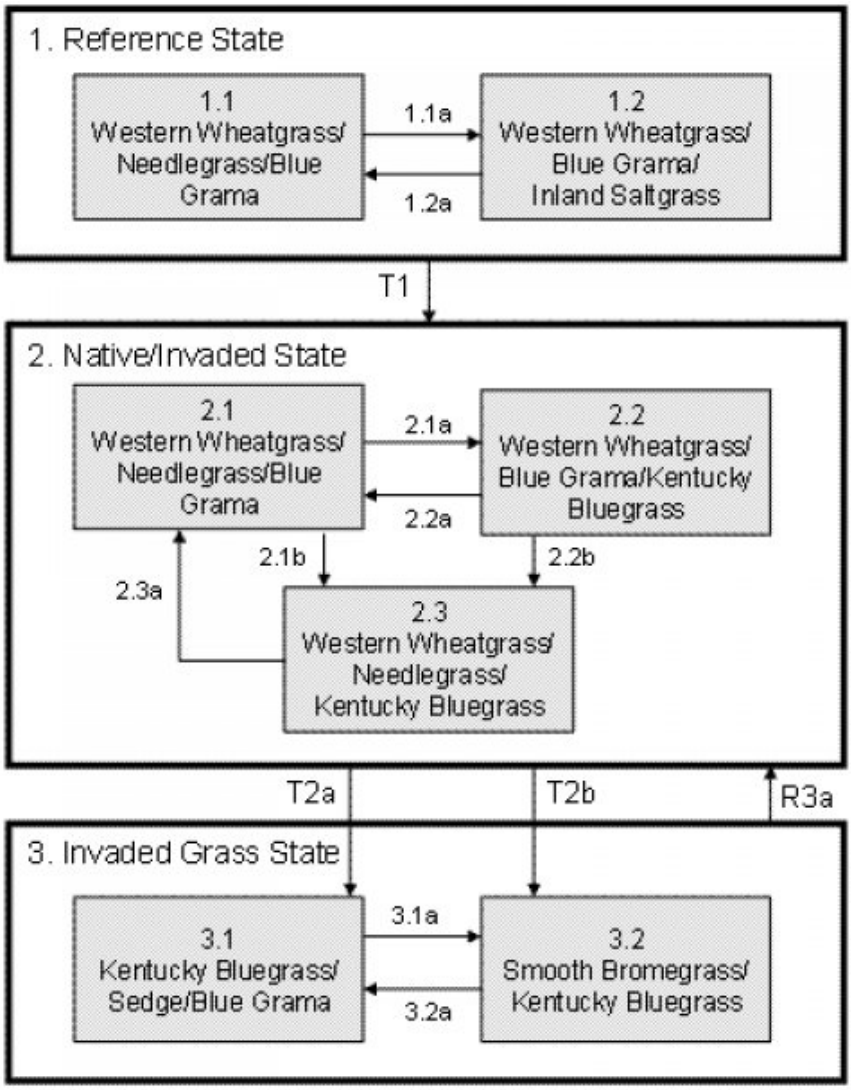
This site developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, sporadic natural or man-caused wildfire (often of light intensities), and other biotic and abiotic factors that typically influence soil/site development. Changes will occur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

Continuous season-long grazing (during the typical growing season of May through October) and/or repeated seasonal grazing (e.g., every spring, every summer) without adequate recovery periods following grazing events causes departure from the 3.1 Western Wheatgrass/Needlegrass/Blue Grama Plant Community Phase. Blue grama will increase and eventually develop into a sod. Western wheatgrass will increase initially and then begin to decrease. Green needlegrass, needleandthread, porcupine grass, sideoats grama, big bluestem and little bluestem will decrease in frequency and production. Extended periods of non-use and/or lack of fire will result in excessive litter and a plant community dominated by cool-season grasses such as Kentucky bluegrass, smooth bromegrass, green needlegrass, and cheatgrass.

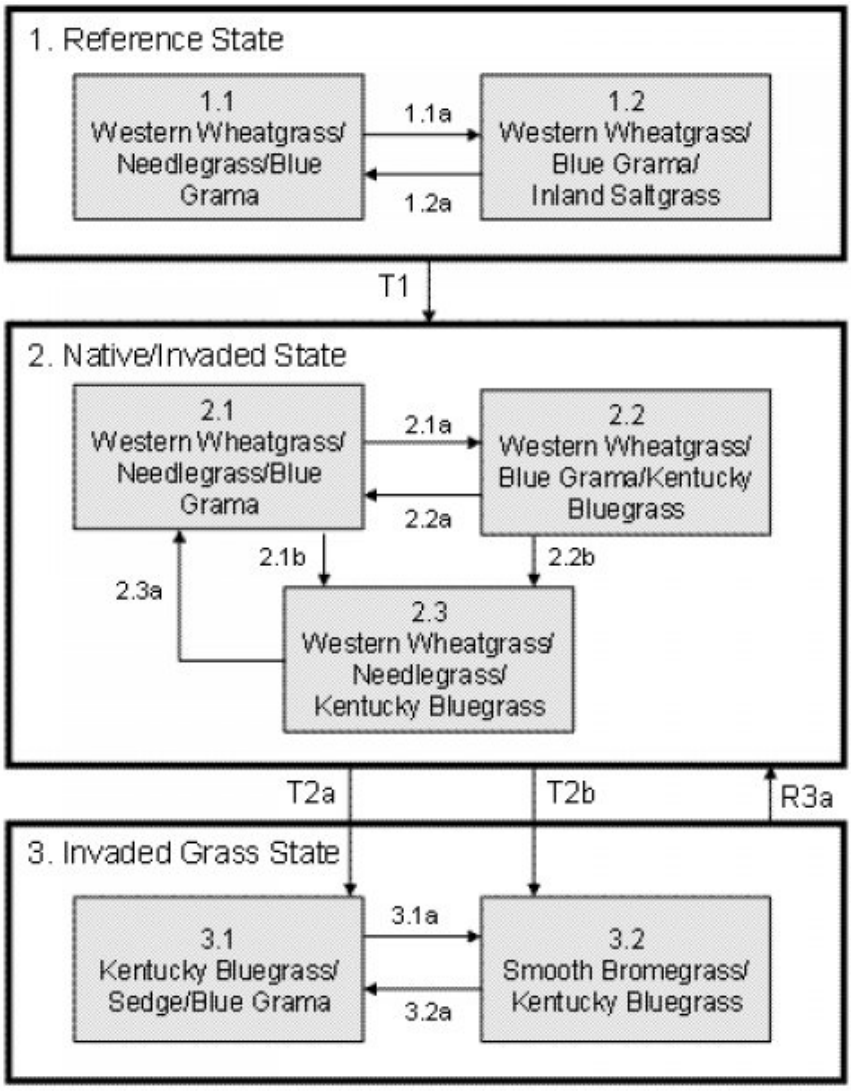
Interpretations are primarily based on the 1.1 Western Wheatgrass/Needlegrass/Blue Grama Plant Community Phase. It has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics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

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

State and transition model



Refer to narratives in the Plant Community Section for detailed descriptions of these transitions/pathways. 1.1a – Heavy continuous grazing or a combination of disturbances (i.e., grazing & fire, grazing & drought, proximity to water); 1.2a – Return to more normal disturbance levels and frequencies; T1 – Introduction of non-native species; 2.1a – Heavy continuous grazing (normally late season or season-long, inadequate recovery periods); 2.1b – Continuous season-long grazing or lack of grazing and fire; 2.2a – Prescribed grazing (including adequate recovery periods); 2.2b – No fire, non-use; 2.3a – Combination of fire and grazing; T2a – Heavy continuous grazing; T2b – Non-use and no fire for extended periods; R3a – Range seeding with native species with management to control invasive species; 3.1a – No fire, non use; 3.2a – Heavy continuous grazing.



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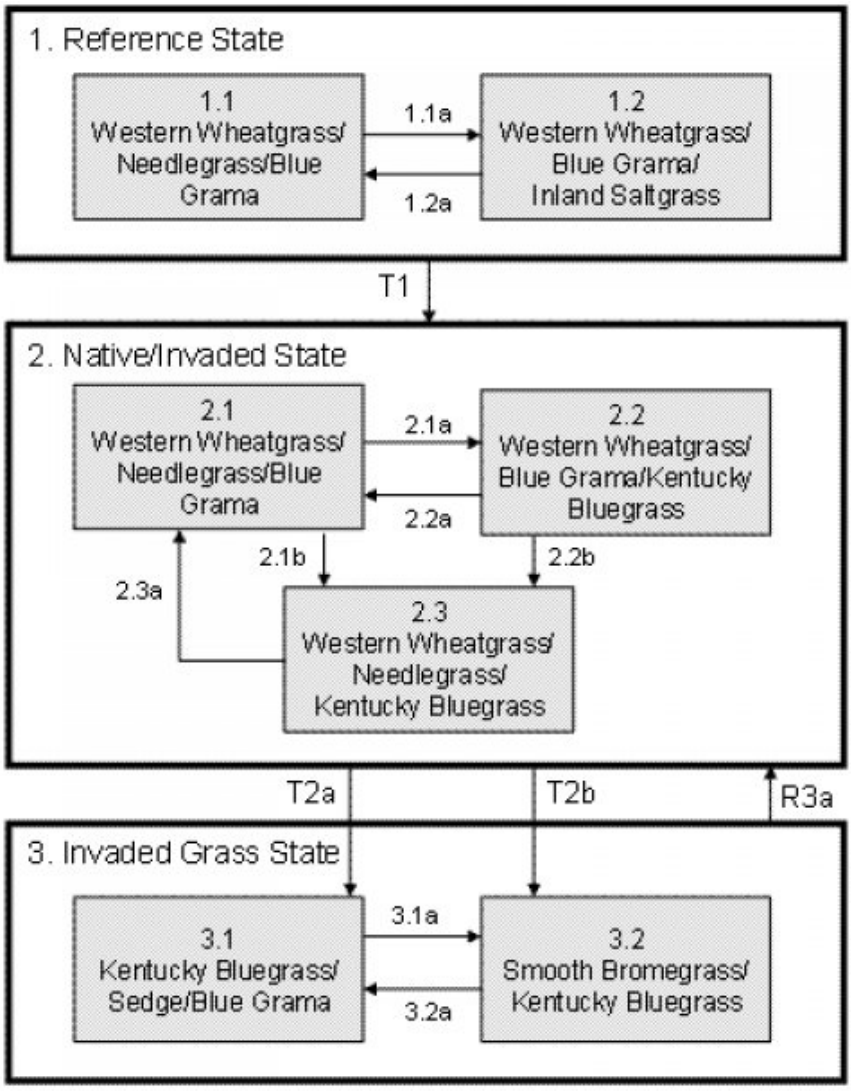

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State 1
Reference

This state represents the natural range of variability that dominated the dynamics of this ecological site. This state was dominated by cool-season grasses, with warm-season grasses being subdominant. 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 3) can be found on areas that are properly managed with grazing and/or prescribed burning, and sometimes on areas receiving occasional short periods of rest.

Community 1.1
Western Wheatgrass/Needlegrass/Blue Grama

Interpretations are based primarily on the Western Wheatgrass/Needlegrass/Blue Grama Plant Community Phase (this is also considered to be climax). The potential vegetation was about 85 percent grasses or grass-like plants, 10

percent forbs, and 5 percent shrubs. The community was dominated by cool-season grasses. The major grasses included western wheatgrass, green needlegrass, and blue grama. Other grass or grass-like species included needleandthread, slender wheatgrass, and porcupine grass. This plant community was resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allowed for high drought tolerance. This was a sustainable plant community in regards to site/soil stability, watershed function, and biologic integrity.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1290	1790	2265
Forb	95	150	225
Shrub/Vine	15	60	110
Total	**1400**	**2000**	**2600**

Figure 7. 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

Community 1.2
Western Wheatgrass/Blue Grama/Inland Saltgrass

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 85 percent grasses and grass-like species, 10 percent forbs, and 5 percent shrubs. Dominant grasses included western wheatgrass, blue grama, inland saltgrass, buffalograss, green needlegrass, sideoats grama, and needleandthread. Grasses of secondary importance included porcupine grass and sedge. Forbs commonly found in this plant community included cudweed sagewort, prairie coneflower, and western yarrow. This plant community had similar plant composition to the 2.2 Western Wheatgrass/Blue Grama/Kentucky Bluegrass Plant Community Phase. The main difference is that this plant community phase did not have the presence of non-native invasive species such as Kentucky bluegrass and smooth bromegrass. When compared to the Western Wheatgrass/Needlegrass/Blue Grama Plant Community Phase (1.1), blue grama and inland saltgrass increased. Green needlegrass and porcupine grass 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.

Pathway 1.1a
Community 1.1 to 1.2

This pathway occurred as a result of relatively heavy, continuous grazing typically 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. This pathway would have led to the 1.2 Western Wheatgrass/Blue Grama/Inland Saltgrass 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 Western Wheatgrass/Needlegrass/Blue Grama Plant Community Phase.

State 2
Native/Invaded Grass

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

Community 2.1
Western Wheatgrass/Needlegrass/Blue Grama

This plant community phase is similar to the 1.1 Western Wheatgrass/Needlegrass/Blue Grama 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 grasses or grass-like plants, 10 percent forbs, and 5 percent shrubs. The community is dominated by cool-season grasses, with warm-season grasses being subdominant. The major grasses include western wheatgrass, green needlegrass, and blue grama. Other grass or grass-like species include needleandthread, slender wheatgrass, and porcupine grass. This plant community is resilient and well adapted to the Northern Great Plains climatic conditions. The diversity in plant species allows for high drought tolerance. This is a sustainable plant community in regards to site/soil stability, watershed function, and biologic integrity.

Figure 8. Plant community growth curve (percent production by month). 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

Community 2.2
Western Wheatgrass/Blue Grama/Kentucky 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 grasses include western wheatgrass, blue grama, and Kentucky bluegrass. Grasses of secondary importance include green needlegrass, needleandthread, porcupine grass, buffalograss, smooth bromegrass, and sedge. Forbs commonly found in this plant community include cudweed sagewort, prairie coneflower, and western yarrow. When compared to the Western Wheatgrass/Needlegrass/Blue Grama Plant Community Phase (1.1), blue grama has increased and Kentucky bluegrass has invaded. Green needlegrass 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 9. 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

Community 2.3
Western Wheatgrass/Needlegrass/Kentucky Bluegrass

This plant community is a result of continuous season-long grazing, typically at light levels, or prolonged periods (multiple years) of complete rest from grazing and elimination of fire. This community phase is characterized by an

increase in the introduced cool-season sodgrass, Kentucky bluegrass. This community phase is the most dominant both temporally and spatially. Kentucky bluegrass has become nearly co-dominant with western wheatgrass and green needlegrass. Warm season grasses are present but minor and tap rooted perennial forbs have decreased. Production and infiltration both decrease and this community phase is at risk of transitioning across a state threshold. With natural or management actions that decrease the composition of the cool-season bunchgrasses and increase the composition of Kentucky bluegrass, transition T2b will be initiated.

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 Western Wheatgrass/Blue Grama/Kentucky Bluegrass Plant Community Phase.

Pathway 2.1b
Community 2.1 to 2.3

Prolonged periods (multiple years) of continuous season-long grazing, or complete rest from grazing or grazing at very light levels coupled with elimination of fire results in increased litter levels and decreased vigor of less shade tolerant species. These factors favor cool-season species, and lead to the 2.3 Western Wheatgrass/Needlegrass/Kentucky Bluegrass Plant Community Phase. When continuous or light grazing is involved, this community will often occur in a patchy mosaic pattern, often referred to as patch grazing.

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.

Pathway 2.2b
Community 2.2 to 2.3

Prolonged periods (multiple years) of complete rest from grazing or grazing at very light levels coupled with elimination of fire results in increase litter levels and decreased vigor of less shade tolerant species. These factors favor cool-season species, and lead to the 2.3 Western Wheatgrass/Needlegrass/Kentucky Bluegrass Plant Community Phase.

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
Kentucky Bluegrass/Sedge/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, 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 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
Smooth Bromegrass/Kentucky Bluegrass

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.

Pathway 3.1a
Community 3.1 to 3.2

Prolonged periods (multiple years) of complete rest from grazing or grazing at very light levels coupled with elimination of fire results in increased litter levels and decreased vigor of less shade tolerant species. These factors favor cool-season species, and lead to the 3.2 Smooth Bromegrass/Kentucky Bluegrass Plant Community Phase.

Pathway 3.2a
Community 3.2 to 3.1

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 3.1 Kentucky Bluegrass/Sedge/Blue Grama 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 T2a
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 3.1 Kentucky Bluegrass/Sedge/Blue Grama Plant Community Phase.

Transition T2b
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 dominate species. This transition typically leads to the 3.2 Smooth Bromegrass/Kentucky Bluegrass 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 bunchgrasses are possible and can be successful. After establishment of the native bunchgrasses, management objectives must include the maintenance of those species, the associated reference function and continued treatment of the introduced sodgrasses.

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**			400–600	
	western wheatgrass	PASM	*Pascopyrum smithii*	400–600	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–100	–
2	**Needlegrass**			300–600	
	green needlegrass	NAVI4	*Nassella viridula*	200–400	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	40–200	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–100	–
3	**Short Warm-season Grasses**			100–300	
	blue grama	BOGR2	*Bouteloua gracilis*	100–300	–
	saltgrass	DISP	*Distichlis spicata*	20–100	–
	buffalograss	BODA2	*Bouteloua dactyloides*	20–100	–
4	**Other Native Grasses**			20–100	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–100	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	20–100	–

	tumblegrass	SCPA	*Schedonnardus paniculatus*	0–40	–
5	**Grass-likes**			20–100	
	needleleaf sedge	CADU6	*Carex duriuscula*	20–100	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–60	–
Forb					
6	**Forbs**			100–200	
	Forb, native	2FN	*Forb, native*	20–60	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	20–40	–
	field sagewort	ARCA12	*Artemisia campestris*	0–40	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	20–40	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	20–40	–
	white heath aster	SYER	*Symphyotrichum ericoides*	20–40	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–40	–
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	20–40	–
	goldenrod	SOLID	*Solidago*	0–20	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–20	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–20	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0–20	–
	Nuttall's violet	VINU2	*Viola nuttallii*	0–20	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–20	–
	mouse-ear chickweed	CERAS	*Cerastium*	0–20	–
	textile onion	ALTE	*Allium textile*	0–20	–
	pussytoes	ANTEN	*Antennaria*	0–20	–
Shrub/Vine					
7	**Shrubs**			20–100	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–40	–
	prairie sagewort	ARFR4	*Artemisia frigida*	20–40	–
	prairie rose	ROAR3	*Rosa arkansana*	20–40	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	20–40	–

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.

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group D. 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, hiking, photography, bird watching and other opportunities. The wide variety 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 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://www.hprcc.unl.edu/)
USDA, NRCS. National Water and Climate Center, 101 SW Main, Suite 1600, Portland, OR 97204-3224. (http://wcc.nrcs.usda.gov)
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USDA, NRCS. 2001. The PLANTS Database, Version 3.1 (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

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.

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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 < 10%.

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 would be expected except for the naturally occurring pan

within 6 to 14 inches of the soil surface which restricts root penetration.

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

    Sub-dominant: Short, warm-season grasses >

    Other: Forbs > grass-likes = shrubs > short, cool-season bunchgrasses > annual grasses

    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):** No plant mortality or decadence.

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14. **Average percent litter cover (%) and depth (in):** Plant litter 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):** Representative value = 2000 lbs/ac air dry with a range of 1400 to 2600 lbs/ac 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, Russian olive

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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.
