USDA Natural Resources Conservation Service

Ecological site R055BY058ND
Limy Subirrigated

Accessed: 05/18/2024

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.

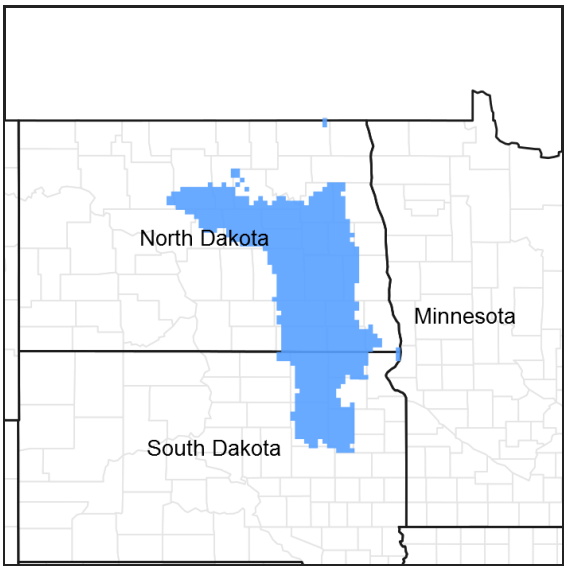


Figure 1. Mapped extent

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.

Associated sites

R055BY059ND	**Loamy Overflow**
R055BY064ND	**Loamy**
R055BY065ND	**Subirrigated**
R055BY070ND	**Shallow Marsh**
R055BY071ND	**Wet Meadow**

Similar sites

R055BY065ND	**Subirrigated** (R055BY065ND) – Subirrigated [Less little bluestem; more big bluestem; more production.]

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Schizachyrium scoparium* (2) *Andropogon gerardii*

Physiographic features

This site occurs on level, nearly level and slight rises on till plains and lake plains, and on slightly convex slopes adjacent to shallow depressions.

Table 2. Representative physiographic features

Landforms	(1) Till plain (2) Lake plain (3) Outwash plain
Flooding frequency	None
Ponding frequency	None
Elevation	305–640 m
Slope	0–6%
Water table depth	46–107 cm
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)	533 mm

Influencing water features

This site has a persistent water table which strongly influences the production of the site, but does not influence the

species present greatly. Most of the dominant species are typical upland plants.

Soil features

These are very deep, somewhat poorly drained, moderately coarse to moderately fine textured soils. These soils have a calcareous subsoil. Saturated hydraulic conductivity is moderately rapid to moderately slow and available water capacity is low to high. Salinity is none to very slight. Soils on this site are moderately to highly susceptible to wind erosion. This site is on flats and swales on lake plains, outwash plains, and till plains. Slope ranges from 0 to 6 percent. This site should show slight to no evidence of rills, wind scoured areas or pedestalled plants. No water flow paths are seen on this site. The soil surface is stable and intact. Sub-surface soil layers are non-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) Loam (2) Silt loam (3) Silty clay loam
Family particle size	(1) Loamy
Drainage class	Somewhat poorly drained
Permeability class	Moderately slow to moderately rapid
Soil depth	203 cm
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–5%
Available water capacity (0-101.6cm)	7.62–30.48 cm
Calcium carbonate equivalent (0-101.6cm)	0–45%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–25%
Subsurface fragment volume >3" (Depth not specified)	0–5%

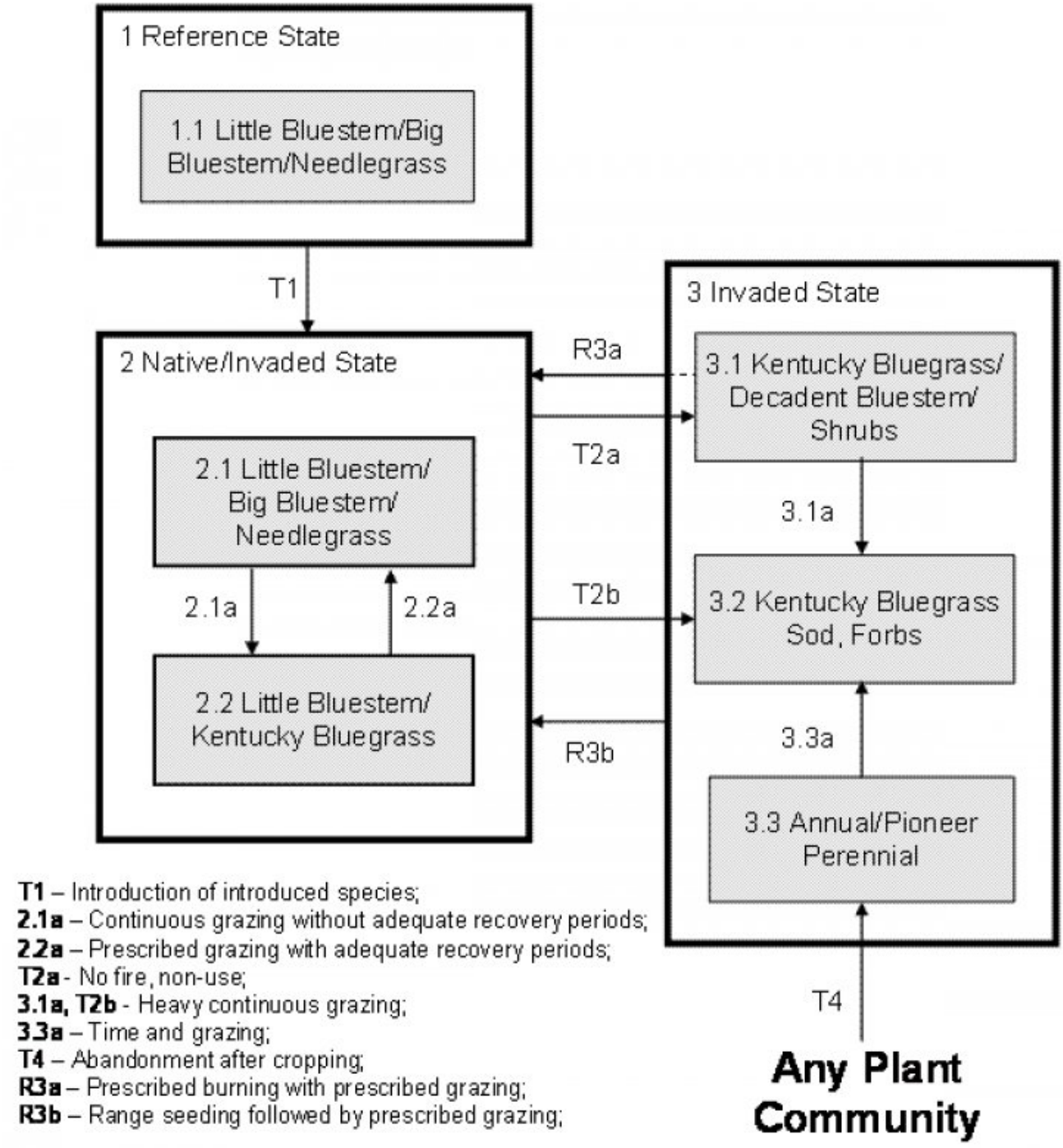
Ecological dynamics

The site developed under Northern Great Plains climatic conditions, and included natural influence of large herding herbivores and sporadic 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 this site has the potential to resemble the Reference State. Interpretations for this site are based on the Little Bluestem/Big Bluestem/Needlegrass Plant Community Phase (1.1). The natural disturbance regime consisted of sporadic 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. Continuous grazing without adequate recovery periods causes this site to depart from the Little Bluestem/Big Bluestem/Needlegrass Plant Community Phase (2.1). Initially little bluestem will increase. Kentucky bluegrass will increase in frequency and density. Kentucky bluegrass may eventually form into a dense sod under heavy continuous grazing. Grasses such as little bluestem, big bluestem, switchgrass and Indiangrass will decrease in frequency and production and can eventually be removed from the site. A lack of disturbance (i.e, non-use and fire suppression) will cause litter levels and plant decadence/mortality to increase resulting in an increase of Kentucky bluegrass and smooth bromegrass.

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

State and transition model



State 1
Reference

This state represents the natural range of variability that dominated the dynamics of this ecological site. This state was diverse, stable, productive and well adapted to the Northern Great Plains. The high water table supplied much of the moisture for plant growth. Plant litter was properly distributed with little movement and natural plant mortality was very low. This was a sustainable state in terms of soil stability, watershed function and biologic integrity. This state was dominated by warm-season grasses, with lesser amounts of cool-season grasses. The primary disturbance mechanisms for this site in the reference condition included sporadic fire and grazing by large herding ungulates. Timing of fires and grazing coupled with weather events dictated the dynamics that occurred within the natural range of variability. Mid and tall statured grass species could have declined with a corresponding increase in short statured warm-season grasses and cool-season grass-like species occurring.

Community 1.1
Little Bluestem/Big Bluestem/Needlegrass

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 tall and mid warm-season and mid cool-season grasses such as little bluestem, big bluestem, and porcupine grass and/or green needlegrass. Other grass and grass-like species included switchgrass, Indiangrass, sideoats grama, western wheatgrass, slender wheatgrass and sedge. A variety of native perennial forbs were present but only in slight amounts. Interpretations are based primarily on this plant community phase. It is further described in the “Plant Community Composition and Group Annual Production” portion of this ecological site description. This was a naturally nitrogen deficient plant community.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	3144	4035	5459
Forb	219	336	476
Shrub/Vine	–	112	230
Total	**3363**	**4483**	**6165**

Figure 5. Plant community growth curve (percent production by month). ND5504, Central Black Glaciated Plains, warm-season dominant, cool-season sub-dominant.. Warm-season dominant, cool-season sub-dominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	1	5	20	38	25	8	3	0	0	0

State 2
Native/Invaded Grass

This state is very similar to the reference state. The invasion of introduced species has altered the natural range of variability for this ecological site. This state still has a strong component of warm-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. Grazing coupled with weather events dictate the dynamics that occur within this state. Fire could still play an important role, but is typically not utilized or is suppressed. The warm-season native grasses can decline and an increase in introduced sod grasses will occur. Many times, this state appears as a mosaic of community phases caused primarily by continuous season-long grazing.

Community 2.1
Little Bluestem/Big Bluestem/Needlegrass

This community phase most closely resembles the Reference State in appearance and ecological functions (e.g., hydrologic, biotic and soil/site stability). The warm-season grass dominated community is maintained with grazing systems that allow for adequate recovery periods following grazing events, and potentially the combination of grazing and prescribed burning which closely mimics the natural disturbance regime. This community phase is dominated by tall and mid warm-season grasses, and mid cool-season grasses such as little bluestem, big bluestem, and porcupine grass and/or green needlegrass. Other grass and grass-like species include switchgrass, Indiangrass, sideoats grama, western wheatgrass, slender wheatgrass and sedge. A variety of native perennial forbs are present but only in slight amounts. 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 and biological activity on this ecological site possibly due to the introduction of non-native species may be a causative factor leading to the eventual dominance of cool-season introduced grasses in the Invaded State (State 3).

Figure 6. Plant community growth curve (percent production by month). ND5504, Central Black Glaciated Plains, warm-season dominant, cool-season sub-dominant.. Warm-season dominant, cool-season sub-dominant..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	1	5	20	38	25	8	3	0	0	0

Community 2.2
Little Bluestem/Kentucky Bluegrass

Grazing pressure reduces the tall, less grazing tolerant species, while the shorter more grazing tolerant species increase. Litter amounts are reduced, and energy capture shifts to slightly earlier in the growing season due to a decline in the warm-season grass component. Non-native grasses, such as Kentucky bluegrass and smooth bromegrass tend to increase and may begin to dominate this community phase. In the early stages of this community phase, little bluestem will initially increase along with the increase of introduced cool-season grasses. In many situations with inadequate recovery periods, the little bluestem will also begin to decline over time, facilitating the change to the Invaded State. Significant grass and grass-like species include little bluestem, green needlegrass, western wheatgrass, slender wheatgrass, Kentucky bluegrass and sedge. Other grasses present include big bluestem, switchgrass, porcupine grass, and sideoats grama. Indiangrass and northern reedgrass are largely absent. The common forbs include American licorice, cudweed sagewort, goldenrod, silverleaf scurfpea, and western yarrow. Western snowberry and prairie rose are the principal shrubs. This community phase is often dispersed throughout the pasture, in an overgrazed/undergrazed pattern, typically referred to as patch grazing. Some areas (overgrazed) will exhibit the impacts of heavy use, while other areas (undergrazed) will have a build-up of litter and a high amount of plant decadence. This is a typical pattern found in properly stocked pastures grazed season-long. In the undergrazed patches, litter buildup reduces plant vigor and density, and native seedling recruitment declines. Due to a lack of tiller stimulation and sunlight, native bunchgrasses typically develop dead centers and native rhizomatous grasses are limited to small colonies. In the overgrazed patches, plant vigor is reduced and the competitive advantage goes towards the grazing tolerant short statured species such as Kentucky bluegrass. This community phase is approaching the threshold which would readily lead to the Invaded State. If management is significantly altered, this community phase can still be reverted back to the Little Bluestem/Big Bluestem/Needlegrass community. Grazing management that allows for adequate recovery periods will tend to restore the ecological functions of this site. Fire can play a role in reducing the introduced cool-season species. The combination of grazing and fire may be the most effective method to move this community phase towards a community resembling the interpretive plant community. Soil erosion is low. Infiltration is reduced, while runoff is increased compared to the interpretive plant community.

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

Pathway 2.1a
Community 2.1 to 2.2

This community pathway is triggered by a change in the natural disturbance regime, most often caused by continuous grazing without adequate recovery periods. Chronic heavy grazing for extended periods during the growing season will also favor this shift. Included with areas affected by a lack of adequate recovery periods may be areas that receive little or no grazing, which may also lead to the increase of introduced cool-season species. Along this pathway, the timing of energy capture shifts from early to mid summer to spring and early summer. The change in plant functional and structural groups and the composition and distribution of the vegetation causes a decrease in production and an increase in runoff with a corresponding decrease in infiltration. Nutrient cycling is restricted as the rooting depth of the vegetation decreases with the change in functional and structural groups. Plant community diversity is reduced with a loss of native forb diversity and minor grass components.

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 from the introduced cool-season species to the tall and mid warm-season grass species. The addition of prescribed burning may expedite this shift.

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 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 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. 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 Sod, Forbs Plant Community Phase (3.2).

Community 3.1
Kentucky Bluegrass/Decadent Bluestem/Shrubs

This community phase is dominated by Kentucky bluegrass. Big bluestem and other native warm- and cool-season native grass species are still present, but much reduced in vigor and production. Western snowberry can increase and become a major component in this community phase. Common forbs include American licorice, cudweed sagewort, western yarrow, and silverleaf scurfpea. Infiltration is reduced and runoff is increased when compared to the Reference State. Soil erosion is low. Much of the plant nutrients are tied up in the excessive litter. Organic matter oxidizes in the air rather than being incorporated into the soil due to the absence of animal impact and reduced soil biological activity. Typically, bunchgrasses (little bluestem) develop dead centers and rhizomatous grasses form small colonies because of a lack of tiller stimulation. Nutrient cycling is limited by the rooting depth of the Kentucky bluegrass 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 the high amount of dead, standing plant material. This plant community is somewhat resistant to change without a combination of prescribed grazing and prescribed burning. The combination of both grazing and fire is most effective in moving this plant community towards the Native/Invaded State. Once this plant community is reached, time and external resources will be needed to see any immediate recovery in diversity.

Figure 8. 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 Sod, Forbs

This community phase is dominated by Kentucky bluegrass with lesser amounts of sedge. Some native and non-native forbs can increase in production and cover as well. The dominant grass is Kentucky bluegrass, with common forbs including cudweed sagewort, goldenrod, aster, western ragweed, western yarrow, and a variety of introduced forbs. The longer this community phase exists the more resistant 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. 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 to the rooting depth of the Kentucky bluegrass and production is limited.

Community 3.3
Annual/Pioneer/Non-Native Perennial

This 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 plant 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). Western snowberry will experience mechanical damage and will decrease in production and cover. Grazing pressure reduces litter cover resulting in elevated soil surface temperatures increasing evaporation rates and further reduction of 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 was the transition from the native warm-season grass dominated reference state to a state that has been invaded by introduced species. When propagules of Kentucky bluegrass are present, this transition occurs as natural and/or management actions favored a decline in the composition of warm-season rhizomatous grasses and an increase in cool-season sodgrasses. This transition was 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 hasten this transition. The threshold between states was crossed when Kentucky bluegrass, smooth bromegrass, and other introduced species became established on the site. These species occupy 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 being applied to any plant community phase on this ecological site.

Transition T4
State 2 to 3

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

Transition T4
State 2 to 3

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

Transition T2a
State 2 to 3

Complete rest from grazing or extended periods of very light grazing and elimination of fire are the two major contributors to this transition. 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 the lack of available carbon for soil biota due to accumulation in the surface layer root mat. This results 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. However, the initial application of prescribed fire can have detrimental effects on remnant native bunchgrass crowns. Damage may be reduced by adjusting prescription parameters. 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. If successful, the resultant plant community may have a relatively higher amount of warm-season grasses than the interpretive plant community.

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 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Mid Warm-season Grasses**			897–1569	
	little bluestem	SCSC	*Schizachyrium scoparium*	673–1569	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–224	–
2	**Tall Warm-season Grasses**			448–897	
	big bluestem	ANGE	*Andropogon gerardii*	224–897	–

	switchgrass	PAVI2	*Panicum virgatum*	90–448	–
	Indiangrass	SONU2	*Sorghastrum nutans*	90–448	–
3	**Needlegrass**			224–538	
	porcupinegrass	HESP11	*Hesperostipa spartea*	224–538	–
	green needlegrass	NAVI4	*Nassella viridula*	224–538	–
4	**Wheatgrass**			90–359	
	slender wheatgrass	ELTRS	*Elymus trachycaulus ssp. subsecundus*	45–359	–
	slender wheatgrass	ELTRT	*Elymus trachycaulus ssp. trachycaulus*	45–359	–
	western wheatgrass	PASM	*Pascopyrum smithii*	45–359	–
5	**Other Native Grasses**			45–224	
	Grass, perennial	2GP	*Grass, perennial*	0–224	–
	northern reedgrass	CASTI3	*Calamagrostis stricta ssp. inexpansa*	0–224	–
	mat muhly	MURI	*Muhlenbergia richardsonis*	0–135	–
	saltgrass	DISP	*Distichlis spicata*	0–90	–
6	**Grass-likes**			45–224	
	sedge	CAREX	*Carex*	45–224	–
	rush	JUNCU	*Juncus*	0–135	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–135	–
Forb					
7	**Forbs**			224–448	
	sunflower	HELIA3	*Helianthus*	45–224	–
	Forb, native	2FN	*Forb, native*	45–224	–
	goldenrod	SOLID	*Solidago*	45–179	–
	white heath aster	SYER	*Symphyotrichum ericoides*	45–135	–
	ragwort	SENEC	*Senecio*	45–90	–
	blue lettuce	LATA	*Lactuca tatarica*	45–90	–
	tall blazing star	LIAS	*Liatris aspera*	45–90	–
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	45–90	–
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	45–90	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	45–90	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	45–90	–
	aster	ASTER	*Aster*	45–90	–
	Flodman's thistle	CIFL	*Cirsium flodmanii*	45–90	–
	horsetail	EQUIS	*Equisetum*	45–90	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	45–90	–
	Canadian anemone	ANCA8	*Anemone canadensis*	0–45	–
	cinquefoil	POTEN	*Potentilla*	0–45	–
	Nuttall's violet	VINU2	*Viola nuttallii*	0–45	–
Shrub/Vine					
8	**Shrubs**			0–224	

	Shrubs				
	prairie rose	ROAR3	*Rosa arkansana*	45–135	–
	willow	SALIX	*Salix*	0–135	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–135	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	45–90	–
	redosier dogwood	COSE16	*Cornus sericea*	0–45	–
	chokecherry	PRVI	*Prunus virginiana*	0–45	–

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 herbage production on this site. The site is dominated by soils in hydrologic groups B and C. Infiltration varies from moderately slow to moderately rapid and runoff potential varies from negligible to high for this site 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 exception would be where shortgrasses form a dense sod and dominate the site. 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	02/10/2012
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):** 5% or less.

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 averages 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):** 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, warm-season grasses >

    Sub-dominant: Tall, warm-season grasses > mid, cool-season bunchgrasses > forbs >

    Other: Mid, cool-season grasses > grass-likes = shrubs > short, warm-season grasses

    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):** None.

---

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

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Representative value = 4000 lbs/ac air dry with a range of 3000 to 5500 lbs/acre air dry depending on 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/local noxious, Kentucky bluegrass, smooth bromegrass, Russian olive, Siberian elm.

---

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.
