USDA Natural Resources Conservation Service

Ecological site R055BY077ND
Linear Meadow

Accessed: 05/09/2024

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.

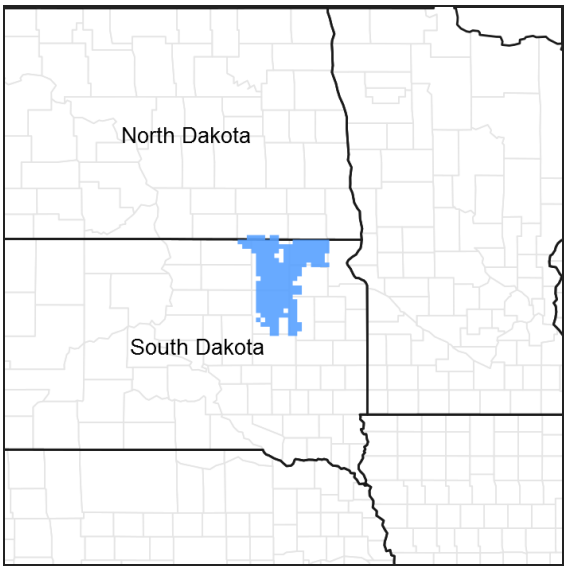


Figure 1. Mapped extent

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

R055BY065ND	**Subirrigated**
R055BY070ND	**Shallow Marsh**
R055BY071ND	**Wet Meadow**

Similar sites

R055BY070ND	**Shallow Marsh** (R055BY070ND) – Shallow Marsh [less prairie cordgrass, whitetop co-dominant; higher production]

Table 1. Dominant plant species

Tree	Not specified

Shrub	Not specified
Herbaceous	(1) *Carex aquatilis* (2) *Spartina pectinata*

Physiographic features

This site occurs on nearly level flood plains or drainageways.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Outwash plain
Flooding duration	Long (7 to 30 days)
Flooding frequency	Frequent
Ponding frequency	None
Elevation	305–640 m
Slope	0–1%
Water table depth	0–51 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

Soil features

These are very deep, poorly and very poorly drained, medium to fine textured soils. Salinity and sodicity are none to slight. Water tables on this site range from the surface to about 20 inches below the surface during most of the growing season. This site occurs on flood plains and along drainageways. Slope ranges from zero to one percent.

This site should show no evidence of rills, wind scoured areas or pedestalled plants. The soil surface is stable and intact. Subsurface soil layers are nonrestrictive to water movement and root penetration. The soils have a slow to moderately slow infiltration rate. These soils are not typically susceptible to water erosion. The high water table, flooding and slow permeability strongly influences the soil-water-plant relationship.

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

Table 4. Representative soil features

Surface texture	(1) Silty clay loam (2) Silty clay
Family particle size	(1) Loamy
Drainage class	Poorly drained
Permeability class	Slow to moderately slow
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	17.78–20.32 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–3
Soil reaction (1:1 water) (0-101.6cm)	6.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

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), fluctuating water tables and flooding events, 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 that may not be described within this document.

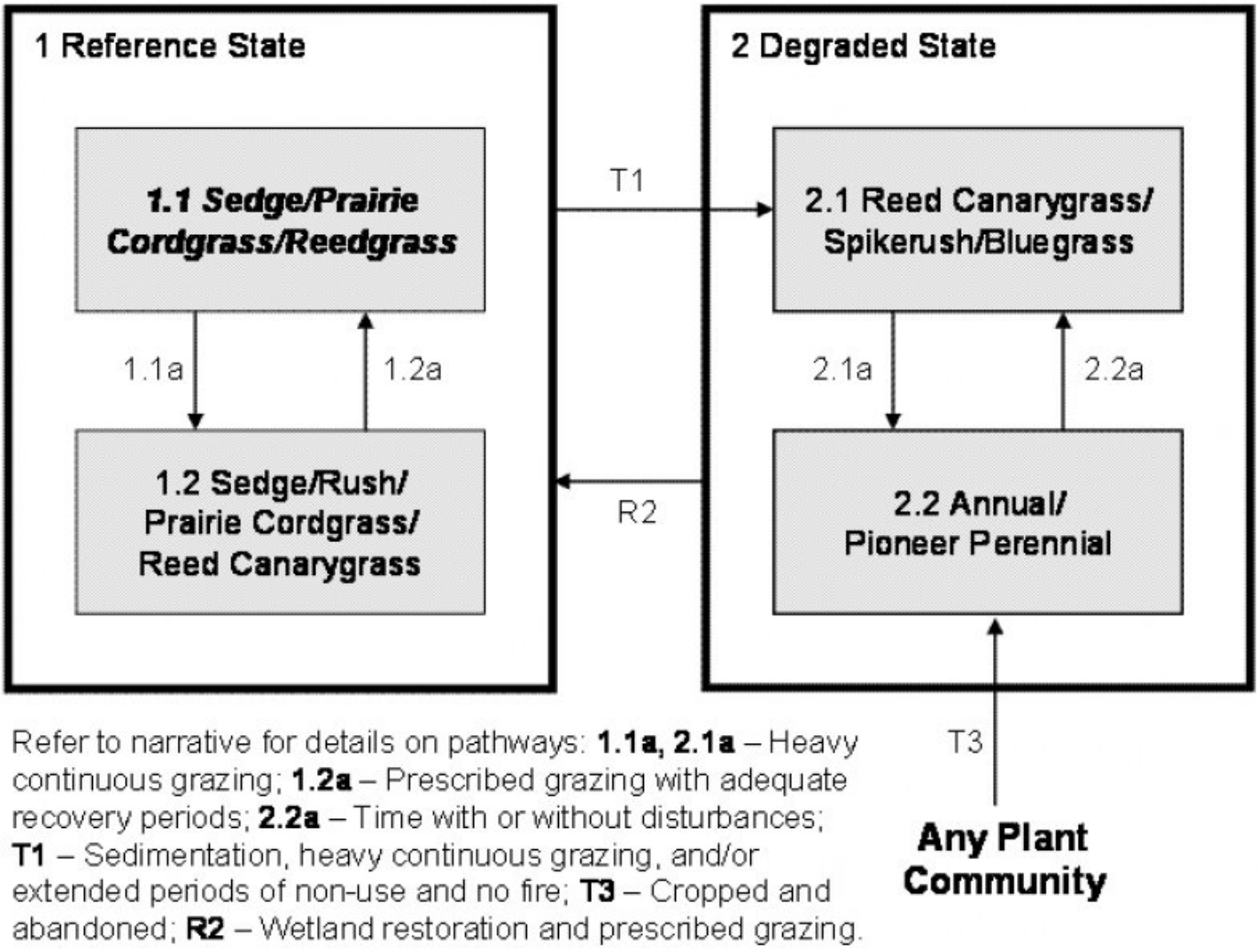
Heavy continuous grazing without adequate recovery periods following each grazing occurrence over several years causes this site to depart from the interpretive plant community. Species such as sedge and rush will initially increase. Prairie cordgrass, northern reedgrass, bluejoint reedgrass, and narrow reedgrass will decrease in frequency and production. Heavy continuous grazing causes reed canarygrass to increase and eventually dominate the site. Extended periods of nonuse and no fire will result in a plant community having high litter levels, which also favors an increase in reed canarygrass, spikerush and bluegrass.

Interpretations are primarily based on the 1.1 Sedge/Prairie Cordgrass/Reedgrass Plant Community Phase. It has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts also have been used. Plant community phases,

states, transitional pathways, and thresholds have been determined through similar studies and experience.

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

State and transition model



State 1
1.1 Sedge/Prairie Cordgrass/Reedgrass

Community 1.1
1.1 Sedge/Prairie Cordgrass/Reedgrass

This community evolved with grazing by large herbivores, occasional prairie fires and relatively frequent flooding and 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. The potential vegetation is about 40 percent grasses, 40 percent grass-like species, 15 percent forbs, and 5 percent shrubs by air-dry weight. Water sedge is typically the dominant grass-like species. Prairie cordgrass is the dominant tall warm-season grass occupying this plant community. Reedgrasses are the dominant tall cool-season species. A variety of sedges and rushes occur throughout this community as well as fowl mannagrass, switchgrass, reed canarygrass, plains bluegrass, and fowl bluegrass. Key forbs include broadfruit burreed, giant goldenrod, New England aster, Maximilian sunflower, white panicle aster, and cinquefoil. This plant community phase is diverse, stable, and productive, and is well adapted to the Northern Great Plains. The high water table supplies much of the moisture for plant growth. Community dynamics, nutrient cycle,

water cycle, and energy flow are functioning properly. Plant litter is properly distributed with very little movement off-site and natural plant mortality is very low. The diversity in plant species allows for the variability of both the fluctuations of water table and reoccurring flooding. This is a sustainable plant community in terms of soil stability, watershed function, and biologic integrity. Community Pathway 1.1a – Heavy continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, or during periods of below normal precipitation when grazing frequency and intensity increases on these sites due to limited forage availability on adjacent upland sites will shift this community to the 1.2 Sedge/Rush/Prairie Cordgrass/Reed Canarygrass Plant Community Phase.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	5257	5851	6383
Forb	286	673	1076
Shrub/Vine	62	202	387
Total	**5605**	**6726**	**7846**

Figure 5. Plant community growth curve (percent production by month). ND5508, Central Black Glaciated Plains, lowland cool-season/warm-season co-dominant.. Cool-season, warm-season co-dominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	3	35	35	15	5	5	2	0	0

State 2
1.2 Sedge/Rush/Prairie Cordgrass/Reed Canarygrass

Community 2.1
1.2 Sedge/Rush/Prairie Cordgrass/Reed Canarygrass

This community develops with periods of heavy continuous grazing with lack of adequate recovery periods during the growing season following periods of below normal precipitation. Lack of litter and reduced plant heights result in higher soil temperatures and reduced water infiltration rates. Recognition of this plant community will enable the land user to implement key management decisions before a significant ecological threshold is crossed. Prairie cordgrass has been reduced in this plant community, but still persists. Sedge, rush, and other grass-like species are dominant. The grass-like species have increased while the reedgrass species have been significantly reduced. Switchgrass may be removed at this stage. Reed canarygrass may begin to increase significantly. Forb species would include asters, goldenrod, and cinquefoil, as well as, a possible invasion of Canada thistle. Plant production and frequency have been reduced. The water cycle, nutrient cycle, and energy flow are slightly reduced but continue to function adequately. Community Pathway 1.2a – Prescribed grazing (alternating season of use and providing adequate recovery periods) or periodic light to moderate grazing possibly including periodic rest will convert this plant community to the 1.1 Sedge/Prairie Cordgrass/Reedgrass Plant Community Phase. This pathway could also occur with a return to more normal precipitation levels and frequencies.

Figure 6. Plant community growth curve (percent production by month). ND5507, Central Black Glaciated Plains, cool-season dominant, warm-season sub-dominant.. Cool-season dominant, warm-season sub-dominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	2	7	36	35	10	3	6	1	0	0

State 3
2.1 Reed Canarygrass/Spikerush/Bluegrass

Community 3.1

2.1 Reed Canarygrass/Spikerush/Bluegrass

This plant community phase develops either with increased sedimentation, heavy continuous grazing, or with a long-term lack of grazing and/or fire. In each case, native plant vigor is reduced allowing the increase of competitive species and eventually the introduction of nonnative species. Spikerush and other grass-like species, as well as, bluegrasses will increase. The more competitive forbs will also increase. Reed canarygrass often will increase to the point of dominance while prairie cordgrass will diminish significantly. Other invasive plants such as creeping meadow foxtail or Canada thistle may become prevalent if a seed source is present or nearby. Nutrient cycling will be greatly diminished and the energy flow will shift significantly and be reduced as well. Infiltration will be reduced somewhat compared to the Reference State. This plant community is somewhat resistant to change. The combination of both grazing and fire is most effective in moving this plant community towards the Reference State. Community Pathway 2.1a – Heavy continuous grazing which includes herbivory at moderate to heavy levels at the same time of year each year without adequate recovery periods, or during periods of below normal precipitation when grazing frequency and intensity increases on these sites due to limited forage availability on adjacent upland sites will shift this community to the 2.2 Annual/Pioneer Perennial Plant Community Phase.

Figure 7. Plant community growth curve (percent production by month). ND5506, Central Black Glaciated Plains, lowland cool-season dominant.. Cool-season dominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	10	37	35	5	2	8	0	0	0

State 4
2.2 Annual/Pioneer Perennial

Community 4.1
2.2 Annual/Pioneer Perennial

This plant community develops under severe disturbance, typically abandonment after cropping. The dominant vegetation includes pioneer annual or perennial grasses, forbs, invaders, and early successional biennial and perennial species. Grasses may include inland saltgrass, foxtail barley, barnyardgrass, quackgrass, fowl bluegrass, Kentucky bluegrass, Baltic rush, and sedges. The dominant forbs may include cocklebur, Canada thistle, and other early successional species. The community is susceptible to invasion of non-native species due to severe soil disturbances and relatively high percent of bare ground. This plant community is resistant to change as long as soil disturbance or severe vegetation defoliation persists, thus holding back secondary plant succession. Significant economic inputs, management, and time would be required to move this plant community toward a higher successional stage. Secondary succession is highly variable, depending upon availability and diversity of a viable reproductive source of higher successional species. This plant community may be renovated to improve the production capability but management changes would be needed to maintain the new plant community. The total annual production ranges from 500 to 1,500 lbs./ac. (air-dry weight) depending upon growing conditions. No growth curve has been assigned to this plant community phase due to the highly variable nature of the plant community. Community Pathway 2.2a – 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 Reed Canarygrass/Spikerush/Bluegrass Plant Community Phase.

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	**Grass-likes**			2018–2690	
	water sedge	CAAQ	*Carex aquatilis*	673–2354	–
	awlfruit sedge	CAST5	*Carex stipata*	67–673	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–538	–
	woolly sedge	CAPE42	*Carex pellita*	67–538	–

	bottlebrush sedge	CAHY4	*Carex hystericina*	0–336	–
	smoothcone sedge	CALA12	*Carex laeviconica*	0–336	–
	green bulrush	SCAT2	*Scirpus atrovirens*	0–336	–
	flatsedge	CYPER	*Cyperus*	67–202	–
	spikerush	ELEOC	*Eleocharis*	67–202	–
	rush	JUNCU	*Juncus*	67–202	–
2	**Tall Warm-season Grasses**			336–1345	
	prairie cordgrass	SPPE	*Spartina pectinata*	336–1345	–
	spiked muhly	MUGL3	*Muhlenbergia glomerata*	0–336	–
	switchgrass	PAVI2	*Panicum virgatum*	0–202	–
3	**Cool-season Grasses**			673–1345	
	northern reedgrass	CASTI3	*Calamagrostis stricta ssp. inexpansa*	135–1009	–
	bluejoint	CACA4	*Calamagrostis canadensis*	67–538	–
	reed canarygrass	PHAR3	*Phalaris arundinacea*	67–336	–
	slimstem reedgrass	CASTS5	*Calamagrostis stricta ssp. stricta*	0–336	–
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–336	–
	Canada wildrye	ELCA4	*Elymus canadensis*	67–202	–
	fowl mannagrass	GLST	*Glyceria striata*	67–202	–
	fowl bluegrass	POPA2	*Poa palustris*	67–202	–
Forb					
4	**Forbs**			336–1009	
	Forb, native	2FN	*Forb, native*	67–336	–
	milkweed	ASCLE	*Asclepias*	67–202	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	67–202	–
	goldenrod	SOLID	*Solidago*	67–202	–
	broadfruit bur-reed	SPEU	*Sparganium eurycarpum*	67–202	–
	New England aster	SYNO2	*Symphyotrichum novae-angliae*	67–202	–
	broadleaf cattail	TYLA	*Typha latifolia*	0–202	–
	prairie ironweed	VEFA2	*Vernonia fasciculata*	0–135	–
	meadow zizia	ZIAP	*Zizia aptera*	67–135	–
	white panicle aster	SYLA6	*Symphyotrichum lanceolatum*	67–135	–
	marsh skullcap	SCGA	*Scutellaria galericulata*	0–135	–
	marsh fleabane	SECO2	*Senecio congestus*	0–135	–
	hemlock waterparsnip	SISU2	*Sium suave*	67–135	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	67–135	–
	common boneset	EUPE3	*Eupatorium perfoliatum*	67–135	–
	wild mint	MEAR4	*Mentha arvensis*	0–135	–
	water knotweed	POAM8	*Polygonum amphibium*	0–135	–
	curlytop knotweed	POLA4	*Polygonum lapathifolium*	67–135	–
	northern water plantain	ALTR7	*Alisma triviale*	0–135	–
	Canadian anemone	ANCA8	*Anemone canadensis*	67–135	–
	Indianhemp	APCA	*Apocynum cannabinum*	67–135	–

	silverweed cinquefoil	ARAN7	*Argentina anserina*	67–135	–
	nodding beggartick	BICE	*Bidens cernua*	0–67	–
	spotted water hemlock	CIMA2	*Cicuta maculata*	0–67	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	0–67	–
	Macoun's buttercup	RAMA2	*Ranunculus macounii*	0–67	–
	western dock	RUAQ	*Rumex aquaticus*	0–67	–
	Virginia strawberry	FRVI	*Fragaria virginiana*	0–67	–
	rough bugleweed	LYAS	*Lycopus asper*	0–67	–
Shrub/Vine					
5	**Shrubs**			67–336	
	false indigo bush	AMFR	*Amorpha fruticosa*	67–336	–
	willow	SALIX	*Salix*	0–202	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–202	–

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 C and D. Infiltration is very slow and runoff is negligible due to the concave nature of the landscape on which this site occurs.

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)
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USDA, NRCS, Various Published Soil Surveys.

Contributors

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Rangeland health reference sheet

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

Author(s)/participant(s)	
Contact for lead author	
Date	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

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2. **Presence of water flow patterns:**

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3. **Number and height of erosional pedestals or terracettes:**

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

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5. **Number of gullies and erosion associated with gullies:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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

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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:

    Sub-dominant:

    Other:

    Additional:

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

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14. **Average percent litter cover (%) and depth (in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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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:**

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17. **Perennial plant reproductive capability:**
