USDA Natural Resources
Conservation Service

Ecological site R055BY071ND
Wet Meadow

Accessed: 05/11/2025

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: 46c – Glacial Lake Basins; 46d – Glacial Lake Deltas; 46e – Tewaukon Dead Ice Moraine; 46f – End Moraine Complex; 46i – Drift Plains; 46j – Glacial Outwash; 46n – James River Lowland.

Associated sites

R055BY059ND	**Loamy Overflow**
R055BY065ND	**Subirrigated**
R055BY070ND	**Shallow Marsh**

Similar sites

R055BY070ND	**Shallow Marsh** (R055BY070ND) – Shallow Marsh [less prairie cordgrass; higher production]

Table 1. Dominant plant species

Tree	Not specified

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

Physiographic features

This site occurs on concave shallow swales or depressions.

Table 2. Representative physiographic features

Landforms	(1) Pothole (2) Swale
Flooding frequency	None
Ponding duration	Brief (2 to 7 days) to long (7 to 30 days)
Ponding frequency	Occasional to frequent
Elevation	1,000–2,100 ft
Slope	0–1%
Ponding depth	0–18 in
Water table depth	10–36 in
Aspect	Aspect is not a significant factor

Climatic features

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

Annual precipitation ranges from 16 to 21 inches per year. The normal average annual temperature is about 41.5° F. January is the coldest month with average temperatures ranging from about 2° F (Maddock, ND) to about 11° F (Mellette, SD). July is the warmest month with temperatures averaging from about 67° F (Maddock, ND) to about 73° F (Redfield 2 NE, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 64° F. This large annual range attests to the continental nature of this MLRA's climate. Winds average about 11 miles per hour annually, ranging from about 13 miles per hour during the spring to about 10 miles per hour during the summer. Daytime winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 50 miles per hour.

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

Table 3. Representative climatic features

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

Influencing water features

Soil features

These are very deep, poorly drained, moderately coarse to fine textured soils. Saturated hydraulic conductivity is

moderate to very slow and available water capacity is low to high. Salinity and sodicity are typically none to slight. Water tables on this site range from 0 to 1 1/2 foot above the surface for several months during the growing season. The site normally receives additional water from surface runoff and/or subsurface flow. This site occurs in flats and slight depressions on floodplains, lake plains and till plains. Slope ranges from 0 to 3 percent. This site should show no evidence of rills, wind scoured areas or pedestalled plants. The soil surface is stable and intact. In some soils sub-surface soil layers are non-restrictive to water movement. Ponded water conditions and saturated soils strongly influences the soil-water-plant relationship.

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

Table 4. Representative soil features

Surface texture	(1) Silt loam (2) Silty clay loam (3) Fine sandy loam
Family particle size	(1) Loamy
Drainage class	Poorly drained
Permeability class	Moderately rapid to slow
Soil depth	80 in
Surface fragment cover <=3"	0–5%
Surface fragment cover >3"	0–2%
Available water capacity (0-40in)	3–12 in
Calcium carbonate equivalent (0-40in)	0–30%
Electrical conductivity (0-40in)	0–4 mmhos/cm
Sodium adsorption ratio (0-40in)	0–2
Soil reaction (1:1 water) (0-40in)	5.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–15%
Subsurface fragment volume >3" (Depth not specified)	0–3%

Ecological dynamics

The site developed under Northern Great Plains climatic conditions, and included natural influence of large herding herbivores and occasional fire. Changes will occur in the plant communities due to weather fluctuations and/or management actions. Under adverse impacts, a relatively rapid decline in vegetative vigor and composition can occur. Under favorable conditions the site has the potential to resemble the Reference State. Interpretations for this site are based primarily on the Woolly Sedge/Prairie Cordgrass Plant Community Phase. This community phase and the Reference State has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts also have been considered. Community phases, community pathways, states, transitions, thresholds and restoration pathways have been determined through similar studies and experience.

The natural disturbance regime consisted of frequent fires caused both by natural and Native American ignition sources. These fires occurred during any season of the year, but were concentrated in the spring and late summer or early fall. Lightning 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

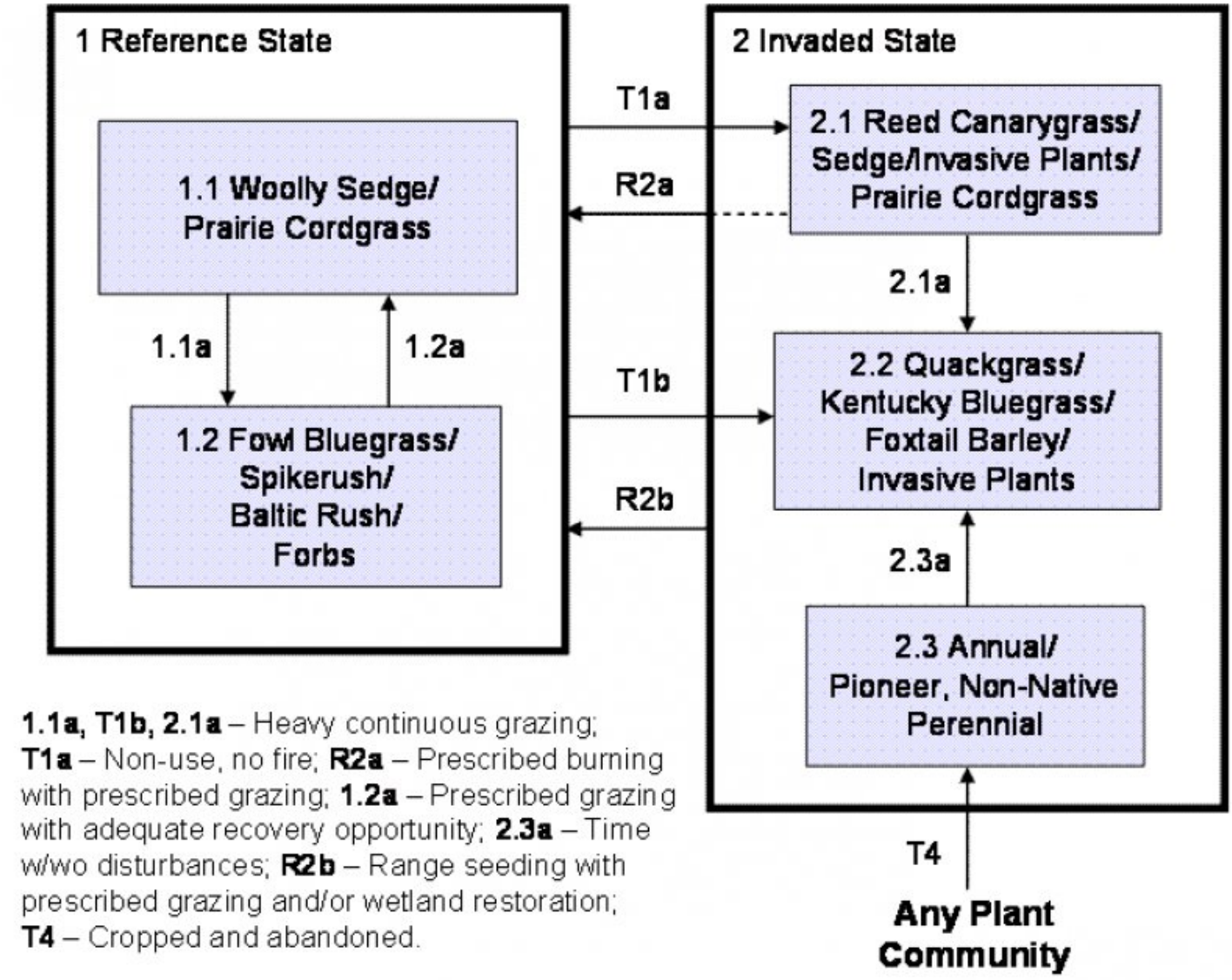
especially when coupled with drought events, set up the dynamics discussed and displayed in the following state and transition diagram and descriptions.

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 changed the disturbance regime of this site.

Heavy continuous grazing without adequate recovery periods following each grazing occurrence causes this site to depart from the Reference State. Species such as fowl bluegrass, spikerush, and Baltic rush will initially increase. Prairie cordgrass and northern reedgrass will decrease in frequency and production. Continued heavy grazing eventually causes quackgrass, foxtail barley, Kentucky bluegrass, spikerush and unpalatable forbs such as curly dock to increase and dominate.

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

State and transition model



State 1

Reference

This state represents the natural range of variability that dominates the dynamics of this ecological site. This state is typically co-dominated by cool-season and warm-season grasses. Pre-European settlement, the primary disturbance mechanisms for this site in the reference condition included periodic 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. Today the primary disturbance is from a lack of fire and concentrated livestock grazing. Grasses that are desirable for livestock and wildlife can decline and a corresponding increase in less desirable grasses will occur.

Community 1.1
Woolly Sedge/Prairie Cordgrass

This community evolved with grazing by large herbivores, occasional prairie fires and relatively frequent ponding events 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 47 percent grasses, 40 percent grass-like species, 10 percent forbs, and 3 percent shrubs by air-dry weight. Woolly sedge is typically the dominant grass-like species, while prairie cordgrass is the dominant tall warm-season grass occupying this plant community. Northern reedgrass is the dominant tall cool-season species. A variety of sedges and rushes occur throughout this community as well as switchgrass and fowl bluegrass. Key forbs include Rydberg's sunflower, Canada goldenrod, Indian hemp and New England aster. 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 ponding. This is a sustainable plant community in terms of 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	3305	4094	4815
Forb	195	338	535
Shrub/Vine	0	68	150
Total	**3500**	**4500**	**5500**

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

Community 1.2
Fowl Bluegrass/Spikerush/Baltic Rush/Forbs

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. Fowl bluegrass, spikerush, other grass-likes and forbs are the dominant species. Spikerush and Baltic rush as well as other grass-likes have increased. Northern reedgrass has 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.

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

Pathway 1.1a
Community 1.1 to 1.2

This community pathway occurs during periods of below normal precipitation when grazing frequency and intensity increases on these sites due to limited forage availability on adjacent upland sites. These sites will produce greener, more palatable forage during periods of below normal precipitation which attracts grazing animals.

Pathway 2.1a
Community 1.2 to 1.1

This community pathway is a result of a return to normal precipitation and reduced or altered grazing pressures. Prescribed grazing with adequate recovery between grazing events will allow prairie cordgrass and northern reedgrass to increase in vigor and production. In pre-European times, this would have occurred where light to moderate disturbances from large ungulates occurred sporadically.

State 2
Invaded

This State is characterized by the dominance of invasive and/or non-native species as a result of disturbance regimes outside the normal variability. Loss or reduction of native cool- and warm-season grasses, and the forb component have negatively impacted energy flow and nutrient cycling. Infiltration is reduced, and native plant mortality is increased. As the disturbance level increases, native plant density decreases even more, giving way to annual species and invasive perennial species, as well as an increase in bare ground.

Community 2.1
Reed Canarygrass/Sedge/Invasive Plants/Prairie Cordgrass

This plant community phase develops with a long-term lack of grazing and/or fire. Eventually litter levels become high enough to reduce native grass vigor, diversity and density. Years of accumulated litter will tend to make this community wetter. Sedge, Baltic rush, spikerush and bulrush will increase. Hydrophytic 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 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 due to the increase in plant litter. 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.

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

Community 2.2
Quackgrass/Kentucky Bluegrass/Foxtail Barley/Invasive Plants

This plant community phase occurs after prolonged heavy disturbance such as described above in the community pathway (i.e., heavy grazing pressure without adequate recovery). The prolonged nature of this disturbance will tend to increase soil temperatures and evaporation, causing this site to become drier than normal. This allows the increase/invasion of typically less hydrophytic vegetation such as quackgrass and Kentucky bluegrass. Occasionally

the soils on this site exhibit higher salinity/sodicity, and these characteristics may become amplified with this shift in vegetation. A significant amount of production and diversity has been lost when compared to the Reference State. Loss or reduction of native cool- and warm-season grasses, and the native forb component have negatively impacted energy flow and nutrient cycling. It will take an extended period of time to restore this plant community back to the Reference State with improved management. Renovation is typically not practical, but may be the only means to significantly restore the ecological processes on this site.

Figure 8. 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

Community 2.3
Annual/Pioneer, Non-native 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 include curlycup gumweed, 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 1500 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.

Pathway 2.1a
Community 2.1 to 2.2

Heavy continuous grazing (stocking rates well above capacity for extended portions of the growing season without adequate recovery) or heavy seasonal grazing (stocking rates well above capacity for a portion of the growing season, but at the same time of year every year and without adequate recovery) will shift the plant community phase to more grazing tolerant species.

Pathway 2.3a
Community 2.3 to 2.2

This community pathway occurs with the passage of time as successional processes take place and perennial plants gradually begin to establish on the site again.

Transition T1a
State 1 to 2

This transition is a result of non-use or very light grazing pressure and no fire for extended periods of time (over several to many years). Eventually litter levels become high enough to reduce native grass vigor, diversity and density.

Transition T1b
State 1 to 2

Heavy continuous grazing (stocking rates well above capacity for extended portions of the growing season without adequate recovery) or heavy seasonal grazing (stocking rates well above capacity for a portion of the growing season, but at the same time of year every year and without adequate recovery) will shift the plant community

phase to more grazing tolerant species. This transition will likely occur after prolonged heavy grazing pressure and mechanical disturbance due to trampling.

Transition T4
State 1 to 2

This transition is a result of abandonment following cropping.

Transition T4
State 1 to 2

This transition is a result of abandonment following cropping.

Restoration pathway R2a
State 2 to 1

This pathway may be achieved with long-term prescribed grazing including adequate recovery periods. However, this pathway may be more effective with the combination of prescribed burning and long-term prescribed grazing. The effectiveness of this pathway will depend on the presence and amount of native reproductive propagules. If plant community phase 2.1 has been in place for a long period of time, these actions may not result in a shift back to the Reference State.

Restoration pathway R2b
State 2 to 1

This pathway may be affected through wetland restoration efforts, including the establishment of native perennial species. Control of non-native invasive species may be necessary to give the competitive advantage to the established native species. Wetland restoration will likely be costly, and the results may not be satisfactory.

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	**Grass-likes**			900–1800	
	woolly sedge	CAPE42	*Carex pellita*	225–1800	–
	Sartwell's sedge	CASA8	*Carex sartwellii*	90–675	–
	wheat sedge	CAAT2	*Carex atherodes*	90–675	–
	Bicknell's sedge	CABI3	*Carex bicknellii*	45–225	–
	shortbeak sedge	CABR10	*Carex brevior*	0–225	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	45–225	–
	water sedge	CAAQ	*Carex aquatilis*	0–225	–
	fox sedge	CAVU2	*Carex vulpinoidea*	45–225	–
	spikerush	ELEOC	*Eleocharis*	45–135	–
	rush	JUNCU	*Juncus*	45–135	–
	green bulrush	SCAT2	*Scirpus atrovirens*	0–45	–
	bulrush	SCHOE6	*Schoenoplectus*	0–45	–
2	**Warm-season Grasses**			450–1125	
	prairie cordgrass	SPPE	*Spartina pectinata*	225–1125	–
	switchgrass	PAVI2	*Panicum virgatum*	0–135	–
	spiked muhly	MUGL3	*Muhlenbergia glomerata*	45–135	–

	Mexican muhly	MUME2	*Muhlenbergia mexicana*	0–90	–
	mat muhly	MURI	*Muhlenbergia richardsonis*	0–45	–
3	**Cool-season Grasses**			450–990	
	northern reedgrass	CASTI3	*Calamagrostis stricta ssp. inexpansa*	225–900	–
	reed canarygrass	PHAR3	*Phalaris arundinacea*	45–225	–
	fowl bluegrass	POPA2	*Poa palustris*	45–225	–
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	45–225	–
	American sloughgrass	BESY	*Beckmannia syzigachne*	45–225	–
	prairie wedgescale	SPOB	*Sphenopholis obtusata*	0–135	–
Forb					
4	**Forbs**			225–450	
	Forb (herbaceous, not grass nor grass-like)	2FORB	*Forb (herbaceous, not grass nor grass-like)*	45–180	–
	Indianhemp	APCA	*Apocynum cannabinum*	45–135	–
	Flodman's thistle	CIFL	*Cirsium flodmanii*	0–135	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	45–90	–
	swamp milkweed	ASIN	*Asclepias incarnata*	45–90	–
	Canadian anemone	ANCA8	*Anemone canadensis*	45–90	–
	mint	MENTH	*Mentha*	45–90	–
	swamp smartweed	POHY2	*Polygonum hydropiperoides*	45–90	–
	Pennsylvania smartweed	POPE2	*Polygonum pensylvanicum*	45–90	–
	cinquefoil	POTEN	*Potentilla*	45–90	–
	Macoun's buttercup	RAMA2	*Ranunculus macounii*	45–90	–
	western dock	RUAQ	*Rumex aquaticus*	0–90	–
	blackeyed Susan	RUHI2	*Rudbeckia hirta*	45–90	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	45–90	–
	Rydberg's sunflower	HENUR	*Helianthus nuttallii ssp. rydbergii*	45–90	–
	blazing star	LIATR	*Liatris*	0–90	–
	giant goldenrod	SOGI	*Solidago gigantea*	45–90	–
	goldenrod	SOLID	*Solidago*	45–90	–
	white panicle aster	SYLA6	*Symphyotrichum lanceolatum*	45–90	–
	New England aster	SYNO2	*Symphyotrichum novae-angliae*	45–90	–
	Canada germander	TECA3	*Teucrium canadense*	0–45	–
	broadleaf cattail	TYLA	*Typha latifolia*	0–45	–
	northern bog violet	VINE	*Viola nephrophylla*	0–45	–
	wood lily	LIPH	*Lilium philadelphicum*	0–45	–
	American water horehound	LYAM	*Lycopus americanus*	0–45	–
	golden dock	RUMA4	*Rumex maritimus*	0–45	–
	blue-eyed grass	SISYR	*Sisyrinchium*	0–45	–
	white doll's daisy	BOAS	*Boltonia asteroides*	0–45	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–45	–
	Virginia strawberry	FRVI	*Fragaria virginiana*	0–45	–
Shrub/Vine					

5	**Shrubs**			0–135	
	willow	SALIX	*Salix*	0–135	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–90	–

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 ponding is the principal factor limiting herbage production on this site. The site is dominated by soils in hydrologic groups C and D. Infiltration is slow and runoff potential for this site is negligible. 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 short grasses 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 offers open space and opportunity for intermittent viewing and/or hunting of a few wildlife species.

Wood products

No appreciable wood products are present on the site.

Other products

Seed harvest of native plant species can provide additional income on this site.

Inventory data references

Information presented here has been derived from NRCS and other federal/state agency clipping and inventory data. Also, field knowledge of range-trained personnel was used. All descriptions were peer reviewed and/or field-tested by various private, state and federal agency specialists. Those involved in developing this site description include: Stan Boltz, NRCS Range Management Specialist; Michael D. Brand, State Land Dept., Director Surface Management; David Dewald, NRCS State Biologist; Paul Drayton, NRCS District Conservationist; Jody Forman, NRCS Range Management Specialist; Dennis Froemke, NRCS Range Management Specialist; Jeff Printz, NRCS State Range Management Specialist; Kevin Sedivec, Extension Rangeland Management Specialist; Shawn Dekeyser, North Dakota State University; Rob Self, The Nature Conservancy and Lee Voigt, NRCS Range Management Specialist.

Other references

High Plains Regional Climate Center, University of Nebraska, 830728 Chase Hall, Lincoln, NE 68583-0728. (http://hpccsun.unl.edu)
USDA, NRCS. National Water and Climate Center, 101 SW Main, Suite 1600, Portland, OR 97204-3224. (http://wcc.nrcs.usda.gov)
USDA, NRCS. National Range and Pasture Handbook, September 1997
USDA, NRCS. National Soil Information System, Information Technology Center, 2150 Centre Avenue, Building A,

Fort Collins, CO 80526. (http://nasis.nrcs.usda.gov)
USDA, NRCS. 2001. The PLANTS Database, Version 3.1 (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.
USDA, NRCS, Various Published Soil Surveys.

Contributors

Jeff Printz
Megan Baxter

Rangeland health reference sheet

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

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

Indicators

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

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

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

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is 0 to 5% but may be higher immediately following periods of inundation.

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 surface fragments will typically retain structure indefinitely when dipped in distilled water. Stability averages 6.

---

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: Grass-likes > tall, warm-season rhizomatous grasses >

    Sub-dominant: Mid and tall, cool-season rhizomatous grasses >

    Other: Forbs > mid, cool-season annual grass > shrubs

    Additional: Other F/S groups may occur in minor amounts. 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):** Plant litter is in contact with soil surface.

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Representative value = 4500 lbs/ac air dry with a range of 3500 to 5500 lbs./acre air dry depending upon growing conditions.

---

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** State and local noxious, Kentucky bluegrass, smooth bromegrass, Russian olive, reed canarygrass

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.