USDA Natural Resources Conservation Service

Ecological site R071XY027NE
Closed Upland Depression

Last updated: 1/08/2025
Accessed: 05/13/2025

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.

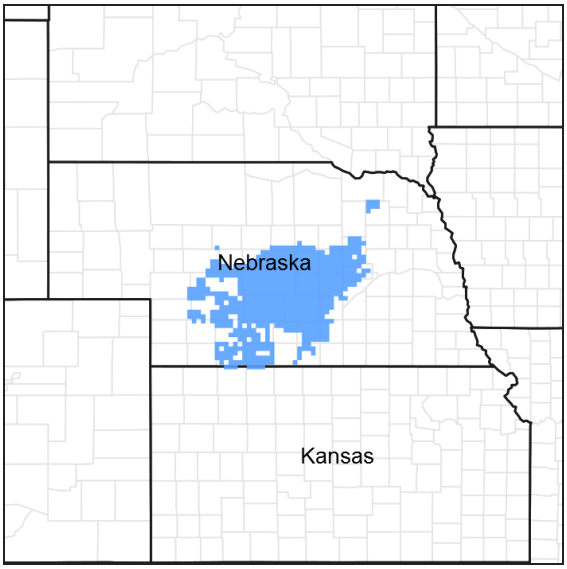


Figure 1. Mapped extent

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.

MLRA notes

Major Land Resource Area (MLRA): 071X–Central Nebraska Loess Hills

MLRA 71 is named “The Central Nebraska Loess Hills” and is located exclusively in Nebraska. The approximately 5.3 million acre landscape covers all or parts of 21 counties, primarily Custer, Dawson, Buffalo, Sherman, Howard, Valley, Greeley, and Hall. The physical appearance of the landscape is dominated by loess hills dissected by the North, Middle, and South Loup Rivers and their tributaries. The Platte River defines the southern border. The elevation in MLRA 71 ranges from over 3,000 to less than 1,700 feet above sea level, with average local relief stretching from 20 to 200 feet. Average annual precipitation ranges from 21 to 26 inches, with the number of freeze-free days averaging around 200.

Loess overlays the surface of almost all of the uplands in this MLRA. Alluvial clay, silt, sand, and gravel are deposited in the stream and river valleys and can be extensive in the major drainages. Terraces are common in the valleys along the river systems. The predominate soil orders are mesic, udic Mollisols and Entisols, commonly represented by the Coly, Uly, Cozad, Hord, Hall, and Holdrege soil series.

The matrix vegetation type is mixed-grass prairie, with big and little bluestem, switchgrass, Indiangrass, and sideoats and blue grama making up the bulk of the warm-season species, while western wheatgrass is the dominant cool-season species. The primary large-patch vegetative component of the landscape is dominated by needle and thread, prairie sandreed, sand and little bluestem, and blue grama. The majority of the small-patch

communities are associated with upland playas and the wetter sites found along the floodplains.

Forty four percent of the land in this MLRA has been broken out of native prairie and farmed; mostly corn, alfalfa, and some soybeans, while 48 percent of the grasslands remain intact. Livestock grazing, primarily cattle, is a major industry here. Wildlife flourishes in this combination of crop and grassland environment, with both mule and white-tailed deer being the most abundant wild ungulate. A variety of smaller species, including coyote, raccoon, opossum, porcupines, muskrat, beaver, squirrel, and mink thrive in the region, as well as a suite of grassland and upland birds. The rivers, streams, and lakes harbor excellent fisheries.

This landscape developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, and repeated natural or man-caused wildfire. Other biotic and abiotic factors also typically influence soil and site development. This is a disturbance driven ecosystem, evolving under the influences of herbivory, fire, and variable climate. Historically, these processes created a heterogenous mosaic of plant communities and structure heights across the region. Any given site in this landscape experienced fire every 7 to 9 years. The fires were caused both by lightning strikes, and were set by native Americans, who used fire for warfare, signaling, and to refresh the native grasses. These people understood the value of fire as a tool, and that the highly palatable growth following a fire provided both excellent forage for their horses and attracted grazing game animals such as bison and elk.

Fragmentation of the native grasslands by conversion to cropland, transportation corridors, and other development by European man has effectively disrupted the natural fire regime of this ecosystem. This has allowed encroachment by native and introduced shrubs and trees into the remnants of the native prairie throughout the MLRA. Aggressive fire suppression policies have exacerbated this process to the point that shrub and tree encroachment is a major ecological issue in the majority of both native and re-seeded grasslands.

Even as post European settlement's alteration of the fire regime allows the expansion of the woody component of the native prairie, introduction of eastern redcedar as a windbreak component further facilitates invasion by this species. While eastern redcedar is native to Nebraska, the historic population in MLRA 71 was limited to isolated pockets in rugged river drainages that were subsequently insulated from fire, or non-existent. Widespread plantings of windbreaks with eastern redcedar as a primary component has established a seed source for the aggressive woody plant. The ensuing encroachment into the native grasslands degrades the native wildlife habit and causes significant forage loss for domestic livestock. However, since it is not a root-sprouter, eastern redcedar is very susceptible to fire when under six feet tall. Management with prescribed fire is exceedingly effective if applied before this stage. Larger eastern redcedars can also be controlled with fire but requires the use of specially designed ignition and suppression techniques.

Classification relationships

Major Land Resource Area (MLRA) 71. (USDA-Natural Resources Conservation Service, 2006)

Revision Notes:
A PROVISIONAL ECOLOGICAL SITE is a conceptual grouping of soil map unit components within a Major Land Resource Area (MLRA) based on the similarities in response to management. Although there may be wide variability in the productivity of the soils grouped into a Provisional Site, the soil vegetation interactions as expressed in the State and Transition Model are similar and the management actions required to achieve objectives, whether maintaining the existing ecological state or managing for an alternative state, are similar. Provisional Sites are likely to be refined into more precise group during the process of meeting the APPROVED ECOLOGICAL SITE DESCRIPTION criteria.

Ecological site concept

The Closed Upland Depression is an upland run-on basin on the landscape, with no outlet. This site harbors two zones with distinctly different vegetation communities. These zones are based on depth, and length of inundation.

The Wheatgrass Prairie Zone occupies the intermittently flooded outer rim of the site, usually on topsoil one to three inches deep. The Sedge Meadow Zone lies inside the Wheatgrass Prairie Zone on three to six inches of topsoil and is temporarily flooded.

Associated sites

R071XY037NE	**Limy Upland** The Limy Upland ecological site may be adjacent to the Closed Upland Depression site but occupies a run-off position on the landscape.
R071XY036NE	**Loamy Upland** The Loamy Upland ecological site may be adjacent to the Closed Upland Depression site but occupies a run-off position on the landscape.

Similar sites

R071XY024NE	**Subirrigated** The Subirrigated ecological site is similar to the Closed Upland Depression site but is connected to the water table and is not a closed system.
R071XY044NE	**Wet Land** The Wet Land ecological site is similar to the Closed Upland Depression site but is found primarily in river and stream valleys.

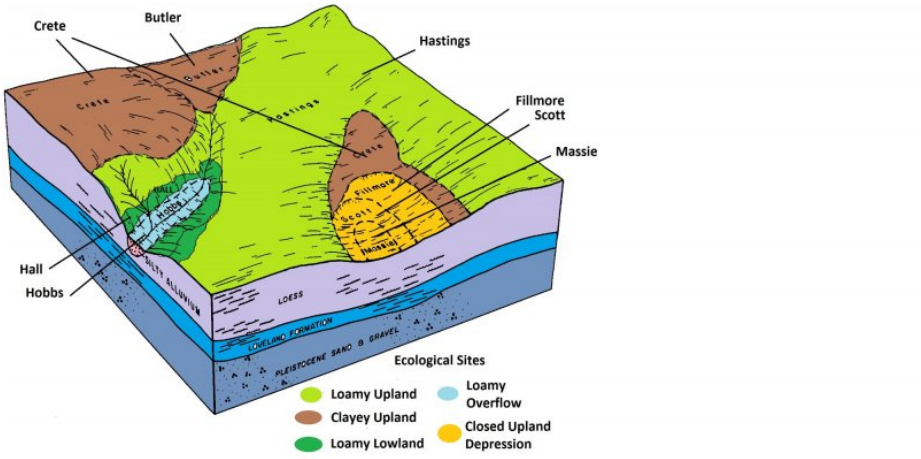


Figure 2. Block diagram

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Pascopyrum smithii* (2) *Buchloe dactyloides*

Physiographic features

The Closed Upland Depression occurs in playas and depressions of the uplands, and occasionally on a depression on a fan. As a run-on site, it is ponded for brief to long periods but is not subject to flooding.

Table 2. Representative physiographic features

Landforms	(1) Playa (2) Depression
Runoff class	Negligible
Flooding frequency	None
Ponding duration	Brief (2 to 7 days) to long (7 to 30 days)
Ponding frequency	Occasional to frequent
Elevation	497–937 m

Slope	0–1%
Ponding depth	8–30 cm
Water table depth	152–203 cm
Aspect	Aspect is not a significant factor

Climatic features

Annual precipitation averages 26 inches per year. Hourly winds are estimated to average about 14 miles per hour annually. Occasional strong storms may bring brief periods of high winds with gusts to more than 60 miles per hour. Growth of native cool season plants begins in early April and continues to about mid-June. Native warm-season plants begin growth in early June and continue to early August. Green up of cool-season plants may occur in September and October.

Table 3. Representative climatic features

Frost-free period (characteristic range)	120-131 days
Freeze-free period (characteristic range)	135-154 days
Precipitation total (characteristic range)	584-660 mm
Frost-free period (actual range)	115-140 days
Freeze-free period (actual range)	134-165 days
Precipitation total (actual range)	584-686 mm
Frost-free period (average)	127 days
Freeze-free period (average)	147 days
Precipitation total (average)	635 mm

Climate stations used

- (1) ANSELMO 2 SE [USC00250245], Anselmo, NE
- (2) BROKEN BOW 2 W [USC00251200], Broken Bow, NE
- (3) MASON CITY [USC00255250], Mason City, NE
- (4) BURWELL [USC00251345], Burwell, NE
- (5) CANADAY STEAM PLT [USC00251450], Lexington, NE
- (6) COMSTOCK [USC00251835], Comstock, NE
- (7) OVERTON 3 W [USC00256439], Overton, NE
- (8) STAPLETON 5W [USC00258133], Stapleton, NE
- (9) TAYLOR [USC00258455], Taylor, NE
- (10) CENTRAL CITY [USC00251560], Central City, NE
- (11) GOTHENBURG [USC00253365], Gothenburg, NE
- (12) NORTH LOUP [USC00256040], North Loup, NE
- (13) RAVENNA [USC00257040], Ravenna, NE
- (14) ARNOLD [USC00250355], Arnold, NE
- (15) KEARNEY 4 NE [USC00254335], Kearney, NE
- (16) LOUP CITY [USC00254985], Loup City, NE
- (17) OCONTO [USC00256167], Oconto, NE
- (18) SAINT PAUL [USC00257515], Saint Paul, NE
- (19) GRAND ISLAND AP [USW00014935], Grand Island, NE

Influencing water features

This site is a temporarily flooded run-on wetland site but is independent of ground water influence.

Soil features

The features common to all soils in this site include a closed upland depression landform, frequent ponding, low saturated hydraulic conductivity, and slopes of 0 to 1 percent. The soils in this site are all formed in loess and either poorly to very poorly drained (Scott), and somewhat poorly drained (Fillmore, Fillmore Variant). The surface layer is typically silt loam or silty clay loam but ranges to include loam and very fine sandy loam; and ranges from 2 to 17 inches thick. The texture of the subsurface ranges from silt loam to very fine sandy loam. Depth to the argillic subsoil horizon ranges from 3 to 24 inches, except in the Fillmore Variant soil where this depth can approach or exceed 60 inches due to excessive accumulation of erosional sediments washed in from higher in the landscape. Runoff as evidenced by patterns of rill, gully, or other water flow is negligible due to the low slope gradient.

Major soils series correlated to this ecological site include Scott, Fillmore, and Fillmore Variant. More information can be found in the various soil survey reports. Contact the local USDA Service Center for internet links to soil survey data that includes more details specific to your location.

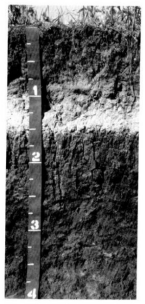


Figure 9. Fillmore series profile

Table 4. Representative soil features

Parent material	(1) Loess
Surface texture	(1) Silt loam (2) Silty clay loam
Family particle size	(1) Loamy
Drainage class	Poorly drained to somewhat poorly drained
Permeability class	Very slow to moderately slow
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	14.73–21.59 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0%

Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

These sites occur on depressional playas or swales on an upland position subject to ponding and evolved under a disturbance regime that included periods of sporadic but often intensive grazing by large transient herbivores, and occasional wildfires. They are often referred to as buffalo wallows. At one time, the larger playas on this site may have been a significant source of water for the transient herbivores and early Americans who followed these herds, as evidenced by the flint tools found on higher landscapes that are in association with these playas.

Inundation is the driving force that controls vegetative dynamics of the site. Vegetation shifts as a result of climatic cycles. The length of time these areas hold water depends on the size of the drainage area, infiltration rate, type and amount of vegetative cover of surrounding soils, the frequency, intensity and total accumulation of rainfall, and the depth of the depression. Wind erosion can be a hazard if water drowns out the vegetation and then dries up leaving the soil surface bare.

This site is rarely managed as a separate unit for livestock grazing. However, it is recognized as an important site for migratory waterfowl. In addition, many species of upland wildlife use this site as a seasonal water source.

This site harbors two zones with distinctly different vegetation communities. These zones are based on depth and the resulting length of the inundation period. The Wheatgrass Prairie Zone occurs around the intermittently flooded outer rim of the site, usually on topsoil one to three inches deep. The Sedge Meadow Zone lies inside the Wheatgrass Prairie Zone on three to six inches of topsoil and is temporarily flooded. Dominant species here include shortbeak sedge, ticklegrass, and bald spikerush. Plains coreopsis, western water clover, docks, and smartweeds make up the bulk of the herbaceous plants.

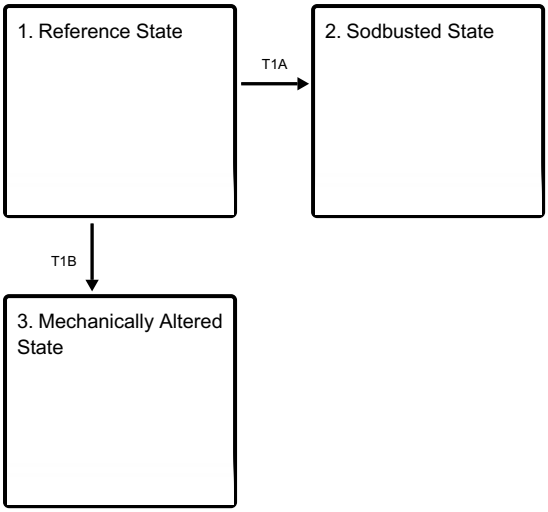
Growth of native cool-season plants begins about April 15 and continues to about June 15. Native warm-season plants begin growth about May 15 and continue to about August 15. Green up of cool-season plants may occur in September and October if adequate moisture is available.

Due to the small patch distribution of this site, and the degree of disturbance in the landscape, it has been difficult to locate examples and reliable descriptions of examples of the pre-European reference plant community. The reference community description has been determined by study of the best remaining examples of relic areas, areas protected from excessive disturbance, expert opinions, and historical accounts.

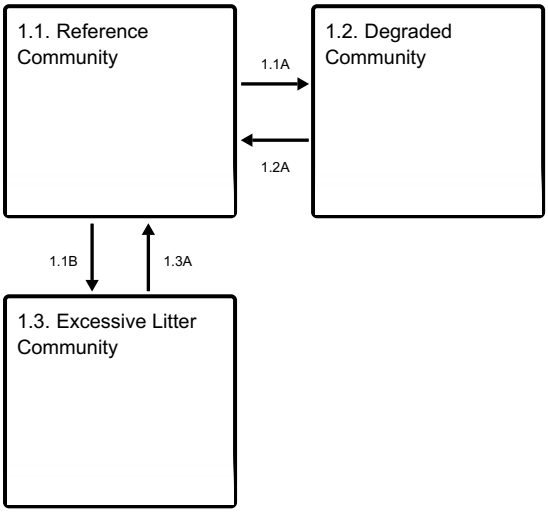
The State and Transition Model (STM) is depicted below and includes a Reference State, a Sodbusted State, and a Mechanically Altered State. Each state represents the crossing of a major ecological threshold due to the alteration of the functional dynamic properties of the ecosystem. The primary properties observed to determine this change are soil stability, vegetative communities, and the hydrologic cycle. Each state may have one or more plant communities that fluctuate in species composition and abundance within the normal parameters of the state. Within each state, communities may degrade or recover in response to natural and man caused disturbances such as variation in the degree and timing of herbivory, presence or absence of fire, and climatic and local fluctuations in the precipitation regime. The processes that cause the movement between the states and communities are discussed in more detail in the state and community descriptions following the diagram.

State and transition model

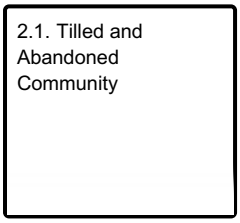
Ecosystem states



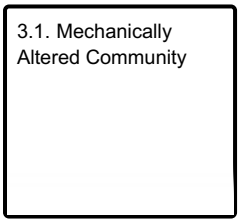
State 1 submodel, plant communities



State 2 submodel, plant communities



State 3 submodel, plant communities



State 1
Reference State

The Reference State is a dynamic state that encompasses the reference community, and the phases it may undergo in response to alterations in the environment. It serves as the base state for the subsequent States depicted in the model. The spatial fluctuation of the borders between the two described vegetative zones of the reference community is directly linked to the duration and depth of ponding. This is driven seasonally, and by local rainfall events. On the outer rim of the depression, where ponding is infrequent, mid- and shortgrasses dominate the site. Western wheatgrass and buffalograss are the major grass species, and forb diversity is low. Deeper into the

playa, as ponding increases, the amount of perennial grasses decreases and water-tolerant forbs, sedges, and annuals increase. Some of these areas may pond water long enough to drown out vegetation leaving bare soil during dry cycles or sparse annual vegetation. Human induced activities such unregulated grazing by domestic livestock, or interruption of the natural disturbance processes can result in community phase changes within the reference state. More severe disturbances, such as plowing, ditching, or excavating can negatively impact the hydrological, soil and vegetative components of the system to the degree that they cross a threshold to a more degraded state.

Dominant plant species

- buffalograss (*Bouteloua dactyloides*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- shortbeak sedge (*Carex brevior*), other herbaceous
- golden tickseed (*Coreopsis tinctoria*), other herbaceous
- bald spikerush (*Eleocharis erythropoda*), other herbaceous
- spotted evening primrose (*Oenothera canescens*), other herbaceous
- wedgeleaf (*Phyla cuneifolia*), other herbaceous

Community 1.1
Reference Community

The Reference Community serves as a description of the native plant community that naturally occurs on the site when the natural disturbance regimes are intact, or closely mimicked by management practices. This community serves as the baseline for the reference state. This community consists of two zones which are determined by the depth and duration of ponding. The borders between the zones fluctuate with the level of ponding spatially, seasonally, and from local rainfall events. The Western Wheatgrass Prairie Zone occupies the outer rim of the depression, where ponding is infrequent. The dominant vegetation for this zone is primarily western wheatgrass, buffalograss, wedgeleaf fog-fruit, and spotted evening-primrose. Deeper into the playa, as ponding increases, the amount of perennial grasses decreases and water-tolerant forbs, sedges, and annuals increase. This creates the Sedge Meadow Zone. Dominant grass and grass-like species include shortbeak sedge, ticklegrass, and bald spikerush. Plains coreopsis, western water clover, docks, and smartweeds make up the bulk of the herbaceous plants. Some of these areas may pond water long enough to drown out vegetation leaving bare soil during dry cycles or sparse annual vegetation. Continuous grazing without adequate recovery periods will convert this community to a Degraded Community. Heavy grazing will accelerate the movement, but in the absence of excessive inundation, prescribed grazing with adequate recovery periods will maintain the original community. Non-use or lack of fire will convert the Reference Community to an Excessive Litter Community.

Dominant plant species

- buffalograss (*Bouteloua dactyloides*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- shortbeak sedge (*Carex brevior*), other herbaceous
- bald spikerush (*Eleocharis erythropoda*), other herbaceous
- spotted evening primrose (*Oenothera canescens*), other herbaceous
- wedgeleaf (*Phyla cuneifolia*), other herbaceous

Figure 10. Plant community growth curve (percent production by month). NE7136, Central NE Loess Hills, cool season/warm season co-dominant. Cool-season grass and warm-season grass co-dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	10	20	25	20	10	5	5	0	0

Community 1.2
Degraded Community

In the upper zone, buffalograss, annual grasses, and forbs are the dominant species. The community has a sod bound appearance in this phase, where the sod is broken and intermixed with areas of bare ground. Western wheatgrass may only be present in remnant amounts at this point. Annual grasses and forbs occupy the bare areas

when moisture conditions allow for establishment. Perennial plant diversity is low and plant vigor is reduced.

Dominant plant species

- buffalograss (*Bouteloua dactyloides*), grass
- scratchgrass (*Muhlenbergia asperifolia*), grass
- golden tickseed (*Coreopsis tinctoria*), other herbaceous
- spotted evening primrose (*Oenothera canescens*), other herbaceous
- curly dock (*Rumex crispus*), other herbaceous

Community 1.3
Excessive Litter Community

This plant community occurs in the upper zone of the site when grazing is removed for long periods of time with the absence of fire. Plant composition will shift to a plant community dominated by western wheatgrass, due to the plant's growth characteristics. Much of the nutrients on the site are tied up in excessive litter and recycling is severely reduced by the lack of animal impact. Individual plant mortality is high, and the thick litter formed from absence of natural vegetative disturbance reduces the reproductive potential of the surviving perennial plants.

Dominant plant species

- western wheatgrass (*Pascopyrum smithii*), grass

Pathway 1.1A
Community 1.1 to 1.2

Continuous season-long grazing, growing season haying, overstocking, and prolonged drought will move this community to the Degraded Community.

Pathway 1.1B
Community 1.1 to 1.3

Lack of natural disturbance processes like fire and grazing will shift the Reference Community to the Excessive Litter Community.

Pathway 1.2A
Community 1.2 to 1.1

Managed grazing, reduced stocking rate, and appropriately timed prescribed fire will restore the Degraded Community to the Reference Community.

Pathway 1.3A
Community 1.3 to 1.1

Reintroduction of the natural processes of herbivory and fire will allow the vegetation to return to the Reference Community.

State 2
Sodbusted State

This state is a result of tilling native grasslands to facilitate farming practices. The initial mechanical disturbance of the soil, and the repeated tillage associated with farming impacts the soil properties and disrupts the hydrological cycle to the degree that the threshold between the Reference State and the Sodbusted State is crossed. It is unlikely that complete restoration of the ecological processes to the reference state is possible.

Community 2.1
Tilled and Abandoned Community

This community phase results when the native grassland is broken out, farmed, then abandoned to natural restoration. The vegetative community found here is comprised of those species adapted to extremely disturbed soil and hydrological processes.

Dominant plant species

- golden tickseed (*Coreopsis tinctoria*), grass
- reed canarygrass (*Phalaris arundinacea*), grass
- barnyardgrass (*Echinochloa crus-galli*), grass

State 3
Mechanically Altered State

This site has often been mechanically altered to either drain it to allow the land to be placed into production agriculture or excavated to increase the water holding capacity of the basin as a re-use pit. These actions disrupt the ecological balance of the site to a degree that forces the site across the state threshold to the Mechanically Altered State. The magnitude of disruption of the soil processes and the hydrological cycle make it unlikely that return to the Reference State is possible.

Community 3.1
Mechanically Altered Community

This plant community is the result of drainage to accommodate farming. The depression may be farmed, or a pit may have been dug to eliminate ponding on land adjacent to or located within the depression.

Dominant plant species

- reed canarygrass (*Phalaris arundinacea*), grass
- bald spikerush (*Eleocharis erythropoda*), other herbaceous
- golden tickseed (*Coreopsis tinctoria*), other herbaceous

Transition T1A
State 1 to 2

Tillage to convert the site to production agriculture significantly degrades the soil properties to the degree that a full recovery to the Reference State is unlikely.

Transition T1B
State 1 to 3

Mechanical alteration to either drain the site to allow the land to be placed into production agriculture or excavated to increase the water holding capacity of the basin as a re-use pit.

Additional community tables

Animal community

LIVESTOCK - GRAZING INTERPRETATIONS:
Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide yearlong forage for cattle, sheep, or horses. Closed Upland Depressions are small-patch communities in the matrix of the landscape, and grazing is usually in conjunction with adjacent upland sites. These sites can provide good forage, although generally not to the extent that native mixed-grass prairies can. When sites are dry, they can provide hay. During the dormant period, the forage for livestock use needs to be supplemented with protein because the quality does not meet minimum livestock requirements.

WILDLIFE INTERPRETATIONS:
Historically these sites were often utilized for extended periods by large grazers such as elk and bison during wet periods because of their high forage production and ample water supply. These sites are still often overutilized

during wet periods causing the plant communities to vary in species composition. Other species of wildlife also utilized these sites during periods of inundation. Mammals such as raccoons, coyotes, and badgers took advantage of the abundant small mammal prey as did raptors such as short-eared owls and northern harriers. These areas also provided excellent habitat for ground nesting birds native to grassland habitats.

Tree invasion is a potential problem on these sites due to the removal of fire. Once tree invasion begins wildlife species favoring woody habitat begin replacing traditional grassland and wetland species. Periodic events such as prolonged drought, wildfire, disease, or high insect numbers will also alter associated wildlife species as the plant community diversity and structure changes.

The Reference Community has the potential to provide excellent habitat for a variety of wildlife, especially under wet conditions. Several small mammal species thrive under these conditions. Due to the abundance of these small mammals, these sites are often favorite hunting areas for predators including coyotes, short-eared owls, red-tailed hawks, and northern harriers. White-tailed deer and mule deer will both use these depressions for water when present, and as a food source, mainly utilizing the wide diversity of forbs. Ring-necked pheasants use this site for nesting, brood-rearing, and roosting if adequate cover and forbs are present.

These depressions are of critical importance to migratory birds, especially when their inundated periods coincide with spring and fall migrations. The aquatic vegetation and associated invertebrates such as fairy shrimp, tadpole shrimp, and clam shrimp provide a high energy source for several groups of migratory birds during their stops in the spring and fall. Shorebirds take advantage of these abundant invertebrates. Ducks, geese, and cranes use these sites as roosting and feeding areas, taking advantage of a high energy food source supplied by seeds from wetland plants. Waterfowl will often utilize sites until they ice over. These sites also provide important breeding habitat for many species of amphibians during periods of inundation in the spring.

Hydrological functions

This ecological site is found on nearly level uplands and is characterized by slight depressions or swales that have slow permeability due to a compact clay layer. Most of these upland depressions have been farmed because of the productivity of the adjacent soils and, as a result, are subject to sedimentation which can alter their hydrology. Pits are often dug in these sites in an attempt to enhance them by ponding water for longer periods of time. This practice can be detrimental to the proper functioning of these systems, altering the hydrology to the extent that the beneficial plant community structure and diversity is greatly diminished.

These sites are found in areas susceptible to drought and as a result offer an unpredictable yet highly important source of water for wildlife, especially waterfowl. The amount of water and length of inundation will also depend on the drainage area, the frequency of rainfall, and the depth of the depression

Recreational uses

Because of the additional water that is sometime present, these sites are popular for hunting, bird watching, and plant collecting. The site exhibits a visual contrast and present a panoramic view of the wide-open spaces cherished by many in the Great Plains states.

Wood products

This site is not an important wood producing site.

Other products

No other products are produced in quantity.

Inventory data references

Information presented here has been derived from field observations by trained and experienced range personnel.

Field Offices:
Albion, Broken Bow, Burwell, Central City, Fullerton, Grand Island, Greeley, Kearney, Lexington, Loup City, North

Platte, Ord, St. Paul, Thedford

Other references

High Plains Regional Climate Center, University of Nebraska, 830728 Chase Hall, Lincoln, NE 68583-0728. (http://hpcc.unl.edu)

LaGrange, T.G. 2015. Final Report submitted to EPA for the project entitled: Nebraska's Wetland Condition Assessment: An Intensification Study in Support of the 2011 National Survey (CD# 97714601), and the related project entitled: Nebraska's Supplemental Clean Water Act §106 Funds, as Related to Participation in National Wetland Condition Assessment (I – 97726201). Nebraska Game and Parks Commission, Lincoln. 183 pp.

Personal communications with professional ecologists and wildlife experts.

Rolfsmeier, S.B. and G. Steinauer. 2010. "Terrestrial Ecological Systems and Natural Communities of Nebraska", (version IV), Nebraska Natural Heritage Program

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. 2002. The PLANTS Database, Version 3.5 (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

Contributors

Doug Whisenhunt
Nadine Bishop

Approval

Suzanne Mayne-Kinney, 1/08/2025

Acknowledgments

Many thanks to the soils, local practitioner, and state technical teams for your input and expertise, as well as to the editor.

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 Nichols, Nadine Bishop
Contact for lead author	jeffrey.nichols@usda.gov
Date	11/30/2024
Approved by	Suzanne Mayne-Kinney

Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None. Rills are not expected on this site.

2. **Presence of water flow patterns:** None. Water flow patterns are not expected on this site.

3. **Number and height of erosional pedestals or terracettes:** None. Pedestals and terracettes are not expected to occur on this site.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is typically less than 10 percent. Bare ground patches should be small, less than 2 inches (5 cm) in diameter and scattered across the site. After prolonged ponding, bare ground may approach 35 percent with patch sizes of 12 to 18 inches (30 to 45 cm). Bare ground is exposed mineral soil that is not by vegetation (basal and/or foliar canopy), litter, standing dead vegetation, gravel/rock, and visible biological curst (e.g., lichen, mosses, algae).

5. **Number of gullies and erosion associated with gullies:** None. Gullies are not expected on this site.

6. **Extent of wind scoured, blowouts and/or depositional areas:** None. Wind scoured and depositional areas are not expected on this site.

7. **Amount of litter movement (describe size and distance expected to travel):** Litter should fall in place. Slight amount of movement (less than 6 inches or 15 cm) of fine litter from water is possible, but not normal. Litter movement from wind is not expected.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil stability ratings will be 5 to 6, typically 6. Interspaces are quite small and there should be no difference between interspaces and under canopy. High root content and organic matter will be present in the soil surface.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** A-horizon should be a minimum of 7 inches (18 cm) thick. Soil colors range from very dark gray (10YR 3/1) to dark gray (10YR 4/1) to gray (10YR 5/1) when dry and black ((10YR 2/1) to very dark gray (10YR 3/1) when moist. Soil structure is moderate medium granular in the upper A-horizon to weak coarse platy structure in lower A-horizon. A surface layer of partially decayed leaves and stems may be present. Soil is slightly hard and slightly to moderately acid. Redoximorphic features will be present. An E-horizon, which is pale due to significant leaching of mineral and/or organic content, will exist between the A- and B-horizons. The major soil series correlated to this site include Scott, and Fillmore.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** A mixture of sod-forming grasses, bunch grasses, grass-likes, and forbs will optimize infiltration on the site.

---

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. No compaction layers are expected to occur on this site. When dry, upper horizons can be hard and appear to be compacted, but no platy structure will be present. Heavy traffic (livestock or vehicular) when these soils are wet can produce a compaction layer.

---

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: Phase 1.1
    1. Native, perennial, mid- and shortgrass (2 species minimum): western wheatgrass, slender wheatgrass, buffalograss.

    2. Native forbs (4 species minimum): wedgeleaf fogfruit, spotted evening primrose, plains coreopsis, western water clover, smartweed, dock

    3. Grass-likes (2 species minimum): shortbeak sedge, bald spikerush.

    Phase 1.2
    1. Native, perennial, shortgrass (1 species minimum): buffalograss.

    2. Native forbs (3 species minimum): golden tickseed.

    3. Native, perennial, cool-season grasses: western wheatgrass, slender wheatgrass., spotted evening primrose, curly dock.

    Phase 1.3
    1. Native, perennial, cool-season grasses (1 species minimum): western wheatgrass, slender wheatgrass.

    Sub-dominant: Phase 1.2
    1. Native, annual grass (1 species minimum): fall panic grass, scratchgrass.

    Phase 1.3
    1. Native forbs (3 species minimum): wedgeleaf fogfruit, spotted evening primrose, plains coreopsis, western water clover, smartweed, dock.

    Other: Minor - Phase 1.1
    1. Native, annual grass: fall panic grass, scratchgrass.

    Minor - Phase 1.3
    1. Native, annual grass: fall panic grass, scratchgrass.

    Additional: The Reference Community (1.1) is made up of four F/S Groups. The dominance of these groups is dependent upon the depth and duration of ponding. The dominant groups in the outer area of the closed upland depression are native, perennial, mid-and shortgrasses, forbs, and grass-likes. The interiors of these depressions are dominated by forbs and grass-likes.

    The Degraded Community (1.2) is dominated by native, perennial, shortgrasses, annual grasses and forbs.

The Excessive Litter Community (1.3) is dominated by native, perennial, cool-season, rhizomatous grasses.

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** A few (less than 3 percent) dead centers may occur in bunchgrasses.

---

14. **Average percent litter cover (%) and depth (in):** Plant litter cover is evenly distributed throughout the site. Plant litter cover ranges from 80 to 100 percent at a depth of 0.5 to 1 inch (1.3 to 2.5 cm). Reed canarygrass litter may produce excessive amounts of litter in terms of thickness of litter.

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Annual production varies significantly with the depth and duration of ponding. Production is shown in air-dry values. Representative Value for production is 3,900 pounds per acre.

---

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:** No non-native invasive species are present. Reed canarygrass, narrowleaf cattail, river bulrush, Kentucky bluegrass, and smooth brome are known invasives that have the potential to be dominant or co-dominant on the site. Consult the state noxious weed and state watch lists for potential invasive species on each ecological site.

---

17. **Perennial plant reproductive capability:** All perennial species exhibit high vigor relative to climatic conditions. Perennial grasses should have vigorous rhizomes or tillers; vegetative and reproductive structures are not stunted. All perennial species should be capable of reproducing annually.
