Ecological site R075XY083NE
Saline Depression

Accessed: 04/25/2024

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.

MLRA notes

Major Land Resource Area (MLRA): 075X–Central Loess Plains

This PROVISIONAL ECOLOGICAL SITE has been developed to meet the standards established in the National Ecological Site Handbook. The information associated with this ecological site does not meet the Approved Ecological Site Description Standard, but it has been through a Quality Control and Quality Assurance processes to assure consistency and completeness. Further investigations, reviews and correlations are necessary before it becomes an Approved Ecological Site Description.

Named “The Central Loess Plains,” MLRA 75 is located primarily in south-central Nebraska, with about 10 percent lying in north-central Kansas. The approximately 5.3 million acre landscape covers all or parts of 21 counties: mainly Phelps, Kearney, Adams, Clay, Fillmore, York, Hamilton, Seward, Butler, Saline, Thayer, Nuckolls, and Webster in Nebraska, with a significant presence in Republic and Washington counties in Kansas. The physical appearance primarily consists of gently rolling plains, with a number of narrow, shallow stream valleys. The river valleys are broader, and most feature a number of terraces. The northern border is defined by the Platte River. This MLRA is home to the unique ecological system called “The Rainwater Basin,” which is comprised of a 24,000 acre network of wetlands and uplands that occupy portions of 13 of the northern counties.
The elevation in MLRA 75 ranges from nearly 2,600 to less than 1,100 feet above sea level. The local relief averages from 10 to 25 feet, but may stretch to a maximum of 165 feet in some areas.

The predominate soil orders in this geographic area are mesic, ustic Mollisols.

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 average annual precipitation ranges from 23 to 36 inches, and the number of freeze-free days range from 150 to 200.

The matrix vegetation type is mixed-grass prairie, with big and little bluestem, switchgrass, Indiangrass, and sideoats and blue grama make up the bulk of the warm-season species, while western wheatgrass is the dominant cool-season grass.

Seventy two percent of the land in this MLRA has been broken out of native prairie and farmed; the land is primarily planted to corn, wheat, and grain sorghum, while only eighteen percent of the grasslands remain intact. Livestock grazing, primarily by cattle, is the main industry on these remnants. Irrigation of croplands uses over 90 percent of the total annual water withdrawal in this area.

Wildlife flourishes in this combination of crop and grassland environment, with both mule and white-tailed deer being the most abundant wild ungulates. A variety of smaller species, including coyote, raccoon, opossum, porcupines, muskrat, beaver, squirrel, and mink thrive in the region, as well as several upland bird species. Grassland bird populations are somewhat limited by the lack of contiguous native prairie and fragmented habitat created by the farmland.

The rivers, streams, and lakes harbor excellent fisheries, and an estimated tens of millions of migrating and local waterfowl use the wetland complexes. These complexes provide ideal habitat for a number of wading and shore bird species as well.

This landscape serves as a backdrop for a disturbance-driven ecosystem, evolving under the influences of herbivory, fire, and variable climate. Historically, these processes created a heterogeneous mosaic of plant communities and structure heights across the region. Any given site in this landscape experienced fire every 6 to 8 years. The fires were caused by lightning strikes and also 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.

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 (ERC) as a windbreak species further facilitates invasion by this species.
While eastern redcedar is native to Nebraska, the historic population in MLRA 75 was limited to isolated pockets in rugged river drainages that were subsequently insulated from fire. Widespread plantings of windbreaks with eastern redcedar as a primary component have provided 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 redcedars can also be controlled with fire, but successful application requires the use of specifically designed ignition and holding techniques.
Fragmentation of the native grasslands by conversion to cropland, transportation corridors, and other developments have 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.

Classification relationships

NRCS FOTG Section 1 - Nebraska Vegetation Zone 3.

Major Land Resource Area (MLRA): Major Land Resource Area (MLRA) 75 (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 Saline Depression is an upland run-on basin on the landscape, with no outlet. As the name implies, the soils associated with this site have high salinity. Surface salts are visible.

Associated sites

R075XY057NE	**Clayey Plains** Clayey Plains- Adjacent to Saline Depression, but occupies a run-off position on the landscape.
R075XY058NE	**Loamy Plains** Loamy Plains- May be adjacent to Saline Depression, but occupies a run-off position on the landscape.

Similar sites

R075XY049NE	**Closed Upland Depression** Closed Upland Depression- Similar landscape position, but has no visible surface salts.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Sporobolus airoides* (2) *Pascopyrum smithii*

Physiographic features

This site occurs in playas and depressions of the uplands, and occasionally on a depression on a fan. It receives runoff from areas higher on the landscape and is ponded for brief to long periods from run-in water. It is not subject to flooding.

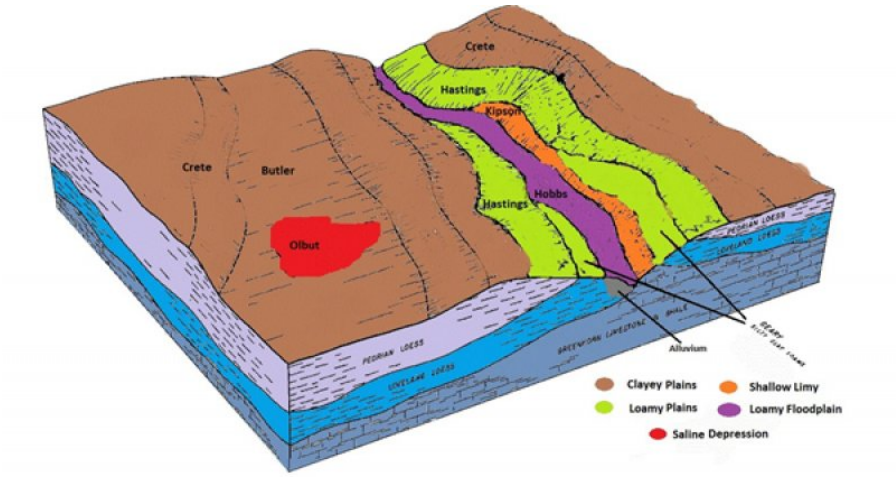


Figure 2. Block Diagram

Table 2. Representative physiographic features

Landforms	(1) Playa (2) Depression
Ponding duration	Brief (2 to 7 days) to long (7 to 30 days)
Ponding frequency	Rare to frequent
Elevation	1,630–2,650 ft
Slope	0–2%
Ponding depth	0–24 in
Water table depth	60–80 in
Aspect	Aspect is not a significant factor

Climatic features

Like most Great Plains landscapes, the climate in this MLRA is under the sway of the continental effect. This creates a regime of extremes, with summer highs often in the triple digits, and winter lows plunging well below zero. Blizzards can occur anytime between early fall and late spring, often dropping the temperature more than 50 degrees in just a few hours. These events can pile up several feet of snow, often driven by winds in excess of 50 miles an hour. The resulting huge snow drifts can cause serious hardship for livestock, wildlife, and humans. Winters can be open, with bare ground for most of the season, or closed, with up to several feet of snow persisting until March. Most winters have a number of warm days, interspersed with dropping temperatures, usually associated with approaching cold fronts. Spring brings violent thunderstorms, hail, and high winds. Tornadoes occur frequently.
Daily winds range from an average of 14 miles per hour during the spring to 11 miles per hour during the late summer. Occasional strong storms may bring brief periods of high winds with gusts to more than 80 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 (average)	155 days
Freeze-free period (average)	177 days
Precipitation total (average)	30 in

Climate stations used

- (1) FAIRMONT [USC00252840], Fairmont, NE
- (2) SURPRISE [USC00258328], Surprise, NE
- (3) FRIEND 3E [USC00253065], Friend, NE
- (4) YORK [USC00259510], York, NE
- (5) HEBRON [USC00253735], Hebron, NE
- (6) OSCEOLA [USC00256375], Osceola, NE

Influencing water features

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

Soil features

The features common to the soils in this site include a closed upland depression landform, frequent ponding, moderately low saturated hydraulic conductivity and slopes of 0 to 2 percent. These soils are saline, with the depth to salt accumulations ranging from 10 to 24 inches. The soils in this site are all formed in loess. 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. Runoff as evidenced by patterns of rill, gully or other water flow is negligible due to the low slope gradient. Pedestalling of plants does not typically occur on this site, however mucking by excessive hoof traffic can create an effect which appears exaggerated, but similar to pedestalling.

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.

Major soils series correlated to this ecological site include: Olbut.

Table 4. Representative soil features

Surface texture	(1) Sandy loam (2) Silty clay loam (3) Very fine sandy loam
Drainage class	Somewhat poorly drained
Permeability class	Slow to very slow
Soil depth	80 in
Available water capacity (0-40in)	0.1–0.2 in
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	2–13
Soil reaction (1:1 water) (0-40in)	6.1–9

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.

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.

Inundation is the driving force that controls vegetative dynamics of the site. Vegetation shifts as a result of climatic

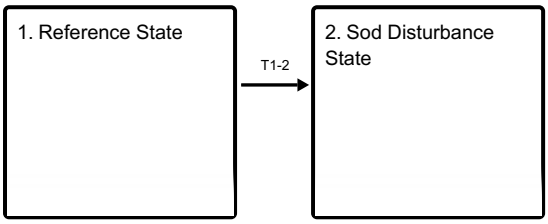
cycles. This site is rarely managed as a separate unit for livestock grazing. However, it is recognized as an important site for migratory waterfowl.
Growth of native cool season plants begins about April 1, and continues to about June 15. Native warm season plants begin growth about May 15, and continue 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, research literature, expert opinions, and historical accounts.

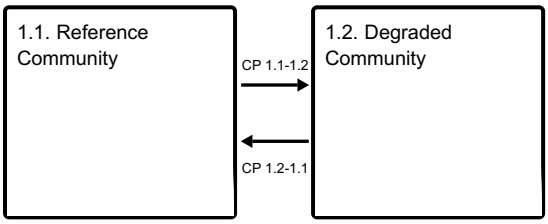
The following diagram illustrates the states and the plant communities within the states that can occur on the site. The transitions between the states, and between the communities are represented by the arrows.
The processes that cause the fluctuation between the states and communities are discussed in more detail in the plant community descriptions following the diagram.

State and transition model

Ecosystem states



State 1 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. Human induced activities such as unregulated grazing by domestic livestock, or interruption of the natural disturbance processes can result in community phase changes within the reference state. As this is a small-patch vegetative community in a larger matrix, the site is seldom managed independently. 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.

Community 1.1
Reference Community

This community serves as a baseline for the reference state. Alkali sacaton and bluegrama are the dominant warm-season grasses, while western and slender wheatgrass provide the majority of the cool-season grass component. Rushes and sedges are common, and forbs present include cuman ragweed and heath aster.

Figure 7. Plant community growth curve (percent production by month). NE7508, Central Loess Plains Cool Season/Warm Season co-dominant. Cool-season grasses co-dominate with warm-season grass plants in the plant community.

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

The mid-grasses decline, and grazing evasive short-grasses increase. Blue grama and inland saltgrass become the warm-season dominants, while bluegrasses and sedges are now the cool-season species. Annual forbs increase in the community.

Pathway CP 1.1-1.2
Community 1.1 to 1.2

Timing, frequency, and degree of herbivory/haying that negatively affects desirable grass species; long-term drought.

Pathway CP 1.2-1.1
Community 1.2 to 1.1

Altering herbivory/haying regime to allow growing season rest of desirable grass species will facilitate a return to the reference community; In the case of extreme drought, restoration can occur with the return to a normal precipitation regime.

State 2
Sod Disturbance State

This state is a result of sod-busting native grasslands to facilitate conversion to production agriculture. 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 sod disturbance state is crossed. It is unlikely that complete restoration of the ecological processes to the reference state is possible.

Transition T1-2
State 1 to 2

The native sod is broken mechanically to facilitate conversion to production agriculture. It may be planted to a commodity crop, or excavated to provide more capacity for use as a tail-water recovery pit. The resulting severe alterations to the soil properties and the disruption of the hydrologic cycle make return to the reference state highly unlikely

Additional community tables

Animal community

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. It is no less true today that these sites are often over utilized 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.
These depressions remain critically important to migratory birds. The aquatic vegetation and associated invertebrates provide a high energy source for several groups of migratory birds such as shorebirds, ducks and geese during their stops in the spring and fall. Saline Depressions also provide important breeding habitat for many species of amphibians during periods of inundation in the spring.
Periodic events such as prolonged drought, wildfire, disease, or high insect numbers may alter plant community diversity and structure and associated wildlife species.
The reference vegetative 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. Whitetail and mule deer both use these depressions for water when present,and as a food source, mainly utilizing a wide diversity of forbs. These sites are of critical importance to many species of water birds, especially when their inundated periods coincide with spring and fall migrations. 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 such as annual smartweed. Waterfowl often winter on these sites until they freeze. Ring-necked pheasants may use the Saline Depressions for nesting, brood-rearing and roosting if adequate cover and forbs are present.

Grazing Interpretations

Saline Depressions are a small-patch community in the matrix of the landscape, and grazing management has historically been in conjunction with adjacent upland sites. During drier periods, livestock tend to concentrate near water sources and the associated lush vegetative communities. This can lead to overgrazing, and a reduction of the primary mid-grass species.

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, plant collecting, etc.
The site exhibits some 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.

Other information

Revision Notes: “This PROVISIONAL ecological site concept has gone through the Quality Control and Quality Assurance processes to ensure that it meets the NESH standards for a provisional ecological site. This site should not be considered an Approved ESD until further data entry and editing is completed. Annual reviews of the Project Plan are to be conducted by the Ecological Site Technical Team. The project plan is: ES R075XY083NE- MLRA 75 -

Inventory data references

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

Other references

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Contributors

Doug Whisenhunt

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I would like to thank the MLRA 75 soils review team, the local practitioners team, and the technical team as well as the Quality Control and Quality Assurance folks for all of their hard work and diligence in reviewing this document.

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:**

   _____

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

   _____

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

   _____

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

   _____

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

   _____

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

   _____

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

   _____

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

   _____

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

   _____

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

    _____

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

    _____

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:

    ___

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

    ___

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

    ___

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

    ___

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:**

    ___

17. **Perennial plant reproductive capability:**

    ___