Ecological site R102CY047NE
SALINE SUBIRRIGATED

Last updated: 12/10/2024
Accessed: 09/14/2026

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.

MLRA notes

Major Land Resource Area (MLRA): 102C–Loess Uplands

Most of this area is in the Dissected Till Plains part of the Central Lowland Province of the Interior Plains. This MLRA has broad, undulating to rolling ridgetops and hilly to steep valley sides. The valleys are generally narrow, but broad flood plains and terraces are along the major rivers and the large tributaries. Elevation ranges from 335 to 610 meters (1,100 to 2,000 feet) increasing from southeast to northwest. Peorian age loess covers most of the area with depths ranging from 2 to 20 meters (6 to 70 feet). Glacial till underlies the loess in most areas. Bedrock can be found at or near the surface predominantly along the Missouri River valley found on the eastern side of the MLRA, but some bedrock can also be found in the northern part of 102C in Minnesota and South Dakota. The soils are predominantly Mollisols but Entisols are prominent in the floodplains of the area. Nearly all the area is farmed with 70% of the area being used as cropland for corn and soybeans. Feed grains and hay crops are also grown. The major resource concerns are wind erosion, water erosion, maintenance of organic matter and soil tilth, and soil moisture management. (USDA/NRCS 2006)

Classification relationships

NE Natural Heritage Program/NE Game & Parks Commission: "Lowland Tallgrass Prairie" General information for MLRA 102C: *Fenneman (1916) Physiographic Regions* Division - Interior Plains East: Province - Central Lowland Section - Till Plains West: Province - Great Plains Section - High Plains *USFS (2007) Ecoregions* Domain - Humid Temperate Division - Prairie Province - Prairie Parkland (Temperate) Section - North-Central Glaciated Plains (251B) *EPA Ecoregions (Omernik 1997)* I - Great Plains (9) II - Temperate Prairies (9.2) III - Western Corn Belt Plains (9.2.3) IV - Loess Prairies (47a) IV - Northeastern Nebraska Loess Hills (47k) IV - Transitional Sandy Plain (47l)

Ecological site concept

This ecological site is subirrigated with saline soils and a reference community dominated by grasses. The foremost diagnostic feature of this site is the high salt levels that limit plants that can occupy these sites and a seasonally high-water table from 60 to 102 centimeters (24 to 40 inches), with additional moisture received from higher adjacent areas as run-on. This site predominantly occurs on nearly level to gently sloping floodplains and stream terraces (0-2% slopes). A few areas are in micro-lows on toeslopes or flat basins on uplands. It predominantly receives runoff from adjacent sites, has a seasonally high-water table from 60 to 102 centimeters (24 to 40 inches) from November-May, does not pond, and may flood occasionally. These are mostly very deep, somewhat poorly to moderately well drained soils. The surface texture is predominantly silt loam or silty clay loam or silty clay from 0 to 20 centimeters (0 to 8 inches) and the Subsurface Texture Groups are Loamy or Silty from 18 to 203 centimeters (7 to 80 inches). These are saline soils with sodium absorption rate of 0 to 99.. The plant community consists of 80-95% grasses and grass-likes, 5-10% forbs and 0-5% shrubs. Dominant grasses include Western wheatgrass, Switchgrass, Slender wheatgrass, Kentucky bluegrass, Plains bluegrass. Other grasses and grass-likes are Blue grama, Canada wildrye, Foxtail barley, Fowl mannagrass, and sedges. Forb species are diverse and often include Western ragweed and Dandelion.

Associated sites

R102CY053NE	**LIMY SUBIRRIGATED** Occurs on similar landforms but have secondary carbonates throughout the profile.

R102CY044NE	**WET LAND** Typically occurs in the lowest areas, or where hydrology otherwise supports a community heavily dominated by hydrophytic vegetation.
R102CY045NE	**WET SUBIRRIGATED** Occurs on lower relief with a seasonally high-water table within 24 inches and a marked increase in hydrophytic vegetation.
R102CY048NE	**Loamy Overflow** Occurs on surrounding higher areas with significantly lower production.

Similar sites

R102CY053NE	**LIMY SUBIRRIGATED** Seasonally saturated 24 to 40 inches of the surface and secondary carbonates throughout the profile.
R102CY046NE	**Subirrigated** Seasonally saturated 24 to 40 inches of the surface

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Pascopyrum smithii* (2) *Panicum virgatum*

Physiographic features

This site predominantly occurs on nearly level to gently sloping floodplains and stream terraces (0-2% slopes). A few areas are in micro-lows on toeslopes or flat basins on uplands. It predominantly receives runoff from adjacent sites, has a seasonally high-water table from 60 to 102 centimeters (24 to 40 inches) from November-May, does not pond, and may flood occasionally.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Terrace
Runoff class	Negligible to medium
Flooding duration	Extremely brief (0.1 to 4 hours) to brief (2 to 7 days)

Flooding frequency	None to occasional
Elevation	340 – 580 m
Slope	0 %
Water table depth	60 – 100 cm
Aspect	Aspect is not a significant factor

Climatic features

Most of the rainfall occurs as high-intensity, convective thunderstorms during the growing season. The maximum precipitation occurs from the middle of spring to early in autumn. Precipitation in winter occurs as snow. The annual snowfall ranges from about 60 centimeters (24 inches) in the southern part of the area to 85 centimeters (34 inches) in the northern part. The average annual temperature gradient trends higher from north (7°C / 45°F) to south (11°C / 51°F), and the average annual precipitation gradient trends higher from northwest (64 centimeters / 25 inches) to southeast (79 centimeters / 31 inches).

The following data summary includes weather stations representing the full geographic extent of the MLRA and is based on 70% probabilities. This means that actual observed climate conditions may fall outside these ranges 30% of the time. Furthermore, climatic events can manifest many ways. For example, abnormally dry periods could occur as 3 consecutive drought years out of 10, 3 individual years separated by “normal” years, or some combination. Tree-ring records indicate that portions of the Great Plains have also historically experienced droughts lasting several decades, so plant community response will largely depend on the way climatic variability is realized in interaction with past and current land management.

Table 3 Representative climatic features

Frost-free period (characteristic range)	120-130 days
Freeze-free period (characteristic range)	140-160 days
Precipitation total (characteristic range)	690-760 mm
Frost-free period (actual range)	120-140 days
Freeze-free period (actual range)	140-170 days
Precipitation total (actual range)	690-760 mm
Frost-free period (average)	130 days
Freeze-free period (average)	150 days
Precipitation total (average)	740 mm

- (1) FLANDREAU [USC00392984], Flandreau, SD
- (2) YANKTON 2 E [USW00094911], Yankton, SD
- (3) WALTHILL 1E [USC00258935], Walthill, NE
- (4) ASHLAND NO 2 [USC00250375], Ashland, NE
- (5) ELGIN [USC00252595], Elgin, NE
- (6) NORFOLK 4W [USC00255997], Norfolk, NE
- (7) LUVERNE [USC00214937], Luverne, MN
- (8) GENOA 2 W [USC00253185], Genoa, NE
- (9) WAYNE [USC00259045], Wayne, NE

Influencing water features

This site has a seasonal high water table and may flood occasionally.

Soil features

These are mostly very deep, somewhat poorly to moderately well drained soils. The surface texture is predominantly silt loam or silty clay loam or silty clay from 0 to 20 centimeters (0 to 8 inches) and the Subsurface Texture Groups are Loamy or Silty from 18 to 203 centimeters (7 to 80 inches).

Rills, gullies, and water flow patterns are not inherent to this site. Pedestalling is none to slight. Soil aggregate stability should be low due to the high saline amounts.

Major soils assigned to this site include Gayville, Lute, Napa, Salmo and Saltine.

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Silt loam (2) Silty clay loam (3) Silty clay
Drainage class	Somewhat poorly drained to moderately well drained
Permeability class	Very slow to moderately slow
Depth to restrictive layer	200 cm
Soil depth	200 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (Depth not specified)	2.54 – 20.32 cm

Calcium carbonate equivalent (Depth not specified)	0 – 30 %
Electrical conductivity (Depth not specified)	0 – 20 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0 – 100
Soil reaction (1:1 water) (Depth not specified)	6.1 – 9.6
Subsurface fragment volume <=3" (Depth not specified)	Not specified
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

The foremost diagnostic feature of this site is the high salt levels that limit plants that can occupy these sites and a seasonally high-water table from 60 to 102 centimeters (24 to 40 inches), with additional moisture received from higher adjacent areas as run-on. The high-water table increases plant production while also “buffering” variability caused by fluctuating weather conditions, but the salt content is a detriment to many plants. Relatively minor changes in local elevation can dramatically affect the plant community. This site often occurs in complex with other sites, particularly Loamy Overflow, Limy Subirrigated, and Wet Subirrigated. Plant community composition may also experience similar changes through disturbances that affect the water table itself, such as extended dry or wet cycles.

This site developed with occasional fires being part of the ecological processes. It is presumed that the historic fires generally occurred every 3-4 years, were randomly distributed, and started by lightning at various times throughout the season when thunderstorms were likely to occur. It is also believed that pre-European inhabitants may have used fire as a management tool for attracting herds of large migratory herbivores (bison, elk, and/or deer.) The impact of fire over the past 100 years has been relatively insignificant due to the human control of wildfires and the lack of acceptance of prescribed fire as a management tool.

The degree of herbivory (feeding on herbaceous plants) has a significant impact on the dynamics of the site. Historically, periodic grazing by herds of large migratory herbivores was a primary influence. Secondary influences of herbivory by species such as grasshoppers and root feeding organisms impacted the vegetation historically and continue to this day. The management of herbivory by humans through grazing of domestic livestock and/or manipulation of wildlife populations has been a major influence on the ecological dynamics of the site. This management coupled with climate largely dictates the plant communities for the site.

The plant community for this site is dynamic due to the complex interaction of many ecological processes. The interpretive plant community for this site is the reference state. The reference state has been determined by the study of rangeland relic areas, areas protected from excessive disturbance and areas under long term rotational grazing strategies. Trends in plant community dynamics ranging
from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts have also been used.

The following is a diagram that illustrates the common plant communities that can occur on the site and the transition pathways among communities. The ecological processes will be discussed in more detail in the plant community descriptions following the diagram.

State and transition model

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 7. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 8. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Inventory data references

Meetings and comments of local, state and regional experts convene and created the ES concepts and STMs. Information presented here has been derived from RANGE-417 archives, Rangeland NRI, and other inventory data. Field observations from range-trained personnel were also used. In addition to the multitude of NRCS field office employees and private landowners that helped with site visits and local knowledge, those involved in developing this site include: Nebraska NRCS: Nadine Bishop, State Rangeland Management Specialist Patrick Cowsert, Resource Soil Scientist Cassidy Gerdes, Biologist Dirk Schultz, Soil Conservationist Dan Shurtliff, Asst. State Soil Scientist (retired) South Dakota NRCS: Stan Boltz, State Rangeland Management Specialist Shane Deranleau, Area Rangeland Management Specialist Kevin Luebke, State Biologist Iowa NRCS: Jess Jackson, Area Grazing Specialist Minnesota NRCS: Lance Smith, Area Grazing Specialist MLRA Office 10: Stu McFarland, Ecological Site Inventory Specialist Stacey Clark, Ecological Site Inventory Specialist, QA Michael Whited, Region 10 Director (retired) Jo Parsley, Soil Scientist / Soil Data Quality Specialist National Soil Survey Center: Mike Kucera, National Agronomist, Soil Quality & Ecosystems Steve Peaslee, GIS Specialist, Soil Survey Interpretations Nebraska Game & Parks Commission: Gerry Steinauer, Botanist Scott Wessel, Biologist Russ Hamer, Biologist Rebekah Jessen, Biologist Nebraska Forest Service: Steve Rasmussen, District Forester

Other references

USDA/NRCS 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296.

USDA/NRCS. 2012. Field Office Technical Guide (Nebraska, Natural Resources Information, Statewide Soil and Site Information, Rangeland Interpretations, Nebraska Range Site Descriptions – Vegetative Zones 3 and 4), U.S. Department of Agriculture, Natural Resources Conservation Service, Nebraska Ecological Sciences.

Fenneman, Nevin M. 1916. Physiographic Subdivision of the United States. Annals of the Association of American Geographers.

Omernik, J.M. 1997. Ecoregions of the Conterminous United States. Annals of the Association of American Geographers, v.77, no. 1, p.118-125.

Cleland_2007, USDA/USFS. 2007. Ecological Subregions: Sections and Subsections for the Conterminous United States. Washington, DC: USDA - Forest Service.

Contributors

Dana Larsen
Nadine Bishop
Greg Clark
Stan Boltz

Approval

Suzanne Mayne-Kinney, 12/10/2024

Acknowledgments

Future work, as described in a Project Plan, to validate the information in this Provisional Ecological Site Description is needed. This will include field activities to collect low and medium intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document. Vegetative states represented in the state and transition models (STMs) need to be evaluated and updated by a trained botanist or ecologist to verify the accuracy. Additional field work needs to be conducted to check the vegetation populations and to test the soil sorts and groupings for the PESDs as part of completing the approved ESDs. The details of this additional work still need to be fleshed out. Some discrepancies in NASIS between the drainage class and the wet layer depth for some components noticed during the soil sorting. This needs to be corrected at some future point. Non-discrimination Statement In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident. Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English. To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, available online and at any USDA office, or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632- 9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov.

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)	Nadine Bishop, Emily Helms, Jeff Nichols
Contact for lead author	jeffrey.nichols@usda.gov
Date	12/04/2024
Approved by	
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. Bunchgrasses may have a hummocky appearance, which may appear to be pedestalled.

---

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is 5 percent or less. Bare ground is exposed mineral soil that is not covered by vegetation (basal and/or foliar canopy), litter, standing dead vegetation, gravel/rock, and visible biological crust (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/or depositional areas should not be present.

---

7. **Amount of litter movement (describe size and distance expected to travel):** None. Litter falls into place. Litter movement is not expected on this site.

---

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. Surface organic matter adheres to the soil surface. Soil surface fragments will typically retain structure indefinitely when dipped in distilled water.

---

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** The A-horizon varies significantly with soil series; as salinity increases, the horizon decreases in depth. Typically, the combined thickness of the A-horizons ranges from 5 to 7 inches (13 to 18 cm). The surface layer of Gayville, Lute, and Napa soils is an E-horizon which ranges from 0.5 to 3 inches (1.5 to 8 cm) thick. Soil colors are gray to very dark gray when dry (Hue: 10YR; value: 3 to 6; chroma: 1) and black, very dark gray, dark gray, very dark grayish brown when moist (Hue: 10YR; value: 2 to 4; chroma: 1 or 2). Soil structure in the A-horizon ranges from weak thin platy to weak fine granular. See Official Soils Descriptions for additional details; major soil series correlated to the site are Gayville, Lute, Napa, Salmo, and Saltine.

---

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Plant community composition is approximately 80 to 95 percent perennial grasses and grass-likes, 5 to 10 percent forbs, and 0 to 5 percent shrubs which optimizes infiltration on the site. The perennial grass and grass-like component is made up of cool-season (C3), rhizomatous grasses, warm-season (C4), tallgrasses; cool-season (C3), bunchgrasses, warm-season (C4), shortgrasses, warm-season (C4), midgrasses, and grass-likes. The functional/structural groups provide a combination of rooting depths and structure which positively influences infiltration. Invasion of introduced cool-season grasses such as Kentucky bluegrass and increase of native grasses such as foxtail barley may have an adverse impact infiltration and runoff. Woody encroachment of native tree species may also negatively impact 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):** None. No compaction layers are expected 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: Phase 1.1 1.Native, perennial, cool-season, rhizomatous grass (1 species minimum): western wheatgrass. 2. Native, perennial, warm-season, tallgrasses (1 species minimum): switchgrass, alkali cordgrass. 3. Native, perennial, cool-season bunchgrass (2 species minimum): Slender wheatgrass, Canada wildrye, foxtail barley, fowl manna grass, Indian ricegrass, plains bluegrass. Phase 1.2 1. Native, perennial, warm-season, tallgrasses (1 species minimum): switchgrass, alkali cordgrass. 2. Native, perennial, warm-season, shortgrass (1 species minimum): inland saltgrass, alkali muhly (scratchgrass).

Sub-dominant: Phase 1.1 1. Native, perennial, warm-season, shortgrass (1 species minimum): inland saltgrass, alkali muhly (scratchgrass). Phase 1.2 1. Native, perennial, cool-season, rhizomatous grass (1 species minimum): western wheatgrass. 2. Native, perennial, cool-season bunchgrass (2 species minimum): Slender wheatgrass, Canada wildrye, foxtail barley, fowl manna grass, Indian ricegrass, plains bluegrass. 3. Native, perennial, warm-season, midgrass (1 species minimum): little bluestem.

Other: Minor - Phase 1.1 1. Native, perennial, warm-season, midgrass (1 species minimum): little bluestem. 2. Grass-likes: sedges 3. Native forbs: forbs present vary from location to location. 4. Shrubs: shrubs present vary from location to location. Minor - Phase 1.2 1. Native forbs: forbs present will vary from location to location. 2. Grass-likes: sedges. 3. Shrubs: shrubs present will vary from location to location.

Additional: The Western-Wheatgrass – Switchgrass – Slender wheatgrass Community or Reference Community (1.1) includes eight F/S groups which include in order of relative abundance, native, perennial, cool-season (C3), rhizomatous grass; native, perennial, warm-season (C4) tallgrass; native, perennial, cool-season (C3), bunchgrass; grass-likes, native, perennial, warm-season (C4), shortgrass; native, perennial, warm-season (C4), midgrass; native forbs; and shrubs. The Switchgrass – Inland Saltgrass Community (1.2) includes eight F/S groups which include in order of relative abundance, native, perennial, warm-season (C4) tallgrass; native, perennial, cool-season (C3), bunchgrass; native, perennial, cool-season (C3), rhizomatous grass; native, perennial, warm-season (C4), mid-grass; native, perennial, warm-season (C4), shortgrass; native forbs; grass-likes; and shrubs.

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence): Bunchgrasses have strong, healthy centers with few (less than 3 percent) dead centers. Shrubs may show some dead branches (less than 5 percent) as plants age.**

---

14. **Average percent litter cover (%) and depth (in): Plant litter cover is evenly distributed throughout the site and is expected to be 60 to 80 percent and at a depth of approximatelyinch (0.65 to 1.3 cm).**

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production): The representative value (RV) for annual production is 5,000 pounds per acre in a year with normal precipitation and temperatures. Low and High production years should yield 4,300 and 5,600 pounds per acre respectively.**

---

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. Canada thistle, Russian thistle, kochia, and eastern red cedar, are known invasives that have the potential to become dominant or co-dominant on the site. Note: species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants.**

---

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.**
