Ecological site R102CY062NE
SHALLOW TO GRAVEL

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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 upland ecological site has shallow, gravelly soils and a reference vegetation community of grasses. The foremost diagnostic feature of this site is the depth to sandy-skeletal subsoil (0 to 61 centimeters / 0 to 24 inches). The site does not receive additional moisture from higher adjacent areas but is not subject to significant runoff due to sandy-skeletal nature of the soils. This site predominantly occurs on gently to very steeply sloping upland positions (0 - 60% slopes) of glacial outwash plains. These sites do not receive run-on water from adjacent sites, but runoff is low due to the gravelly / sandy nature of the soils. It has a seasonally high-water table that is below 180 centimeters (71 inches) year around. The site does not pond and does not flood. These are moderately deep to very deep, excessively drained soils that formed in glaciofluvial deposits. The surface texture is predominantly loam or gravelly loam from 18 to 25 centimeters (7 to 10 inches) and the Subsurface Texture Groups are sandy-skeletal from 20 to 203 centimeters (8 to 80 inches). The plant community consists of 80-95% grasses and grass-likes, 5-10% forbs and 0-5% shrubs. Dominant grasses include Little bluestem, Sideoats grama, Blue grama, Needleandthread, and Prairie sandreed. Other grasses and grass-likes are Hairy grama, Prairie junegrass, Purple lovegrass, Sand dropseed, Scribner panicum, Big bluestem, Clubmoss and other forbs and shrubs.

Associated sites

R102CY058NE	**Loamy Upland** Occurs on uplands and other run-off landscapes with silty and loamy textures

R102CY059NE	**Limy Upland** Occurs on uplands and other run-off landscapes with secondary carbonates at or near the surface.

Similar sites

R102CY060NE	**SHALLOW CLAY** Bedrock or other root restrictive layer between 10 and 20 inches.
R102CY061NE	**SHALLOW LIMY** Bedrock or other root restrictive layer between 10 and 20 inches and CaCO3 content with strong or violent effervescence above restrictive layer.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Schizachyrium scoparium* (2) *Bouteloua curtipendula*

Physiographic features

This site predominantly occurs on gently to very steeply sloping upland positions (0 - 60% slopes) of glacial outwash plains. These sites do not receive run-on water from adjacent sites, but runoff is low due to the gravelly / sandy nature of the soils. It has a seasonally high-water table that is below 180 centimeters (71 inches) year around. The site does not pond and does not flood.

Table 2. Representative physiographic features

Landforms	(1) Outwash plain
Runoff class	Negligible to low
Elevation	340 – 440 m
Slope	0 – 60 %
Water table depth	180 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)	140-150 days
Precipitation total (characteristic range)	710-740 mm
Frost-free period (actual range)	120-130 days
Freeze-free period (actual range)	140-150 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) HAWARDEN [USC00133718], Hawarden, IA
- (2) LUVERNE [USC00214937], Luverne, MN
- (3) ELGIN [USC00252595], Elgin, NE
- (4) GENOA 2 W [USC00253185], Genoa, NE
- (5) NORFOLK 4W [USC00255997], Norfolk, NE
- (6) WALTHILL 1E [USC00258935], Walthill, NE
- (7) FLANDREAU [USC00392984], Flandreau, SD

Influencing water features

No riparian or wetland features are associated with this site.

Soil features

These are moderately deep to very deep, excessively drained soils that formed in glaciofluvial deposits. The surface texture is predominantly loam or gravelly loam from 18 to 25 centimeters (7 to 10 inches) and the Subsurface Texture Groups are sandy-skeletal

from 20 to 203 centimeters (8 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 gravelly / sandy nature.

Major soils assigned to this site include: Talmo

Table 4. Representative soil features

Parent material	(1) Glaciofluvial deposits
Surface texture	(1) Gravelly loam (2) Loam
Drainage class	Excessively drained
Permeability class	Moderate to rapid
Soil depth	150 – 200 cm
Surface fragment cover <=3"	10 – 40 %
Surface fragment cover >3"	0 – 30 %
Available water capacity (Depth not specified)	5.08 – 17.78 cm
Calcium carbonate equivalent (Depth not specified)	0 – 30 %
Electrical conductivity (Depth not specified)	Not specified
Sodium adsorption ratio (Depth not specified)	Not specified
Soil reaction (1:1 water) (Depth not specified)	6.1 – 8.4
Subsurface fragment volume <=3" (Depth not specified)	0 – 50 %

Subsurface fragment volume >3" (Depth not specified)	0 – 50 %

Ecological dynamics

The foremost diagnostic feature of this site is the depth to sandy-skeletal subsoil (0 to 61 centimeters / 0 to 24 inches). The site does not receive additional moisture from higher adjacent areas but is not subject to significant runoff due to sandy-skeletal nature of the soils. Relatively minor changes in local elevation can affect the plant community since the sandy-skeletal subsoil can fluctuate in depth. This site often occurs in complex with the Limy Upland and Loamy Upland sites.

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 2.2 plant community composition

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

Table 9. Community 3.1 plant community composition

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

Table 10. Community 4.1 plant community composition

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

Table 11. Community 5.1 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

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Acknowledgments

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an

assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

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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.**

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2. **Presence of water flow patterns:** **Typically, none. Water flow patterns may be present on slopes of 15 percent or greater. When present they are rare (10 feet or 3 meters apart), shallow (6 inches or 15 cm deep), narrow (6 inches or 15 cm wide), and short (3 feet or 1 meter long). Water flow patterns become more apparent as slopes increase. When present they are disconnected and disrupted by perennial vegetation. Drought or wildfire can contribute to increased incidences of pedestalled plants.**

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3. **Number and height of erosional pedestals or terracettes:** **Typically, none. Occurrence of pedestalled plants will be rare. If pedestalling occurs it will occur on slopes exceeding 10 percent and less than 5 percent of the plants will be pedestalled, with no exposed roots. Drought or wildfire can contribute to increased incidences pedestalled plants.**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** **Bare ground is 15 percent or less and patch sizes will be less than 3 inches (7.6 cm). Multi-year drought and/or wildfire can increase bare ground to 20 to 30 percent for up to two years following the disturbance. 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 curst (e.g., lichen, mosses, algae).**

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

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6. **Extent of wind scoured, blowouts and/or depositional areas:** **None. Wind-scoured and/or depositional areas should not be present.**

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7. **Amount of litter movement (describe size and distance expected to travel):** Small size litter classes will generally move short distances, usually less than 12 inches (30 cm). Medium size class litter will move very short distances usually less than 6 inches (15 cm). Coarse litter is not expected to move. Litter debris dams are occasionally present.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Small size litter classes will generally move short distances, usually less than 12 inches (30 cm). Medium size class litter will move very short distances usually less than 6 inches (15 cm). Coarse litter is not expected to move. Litter debris dams are occasionally present.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** A-horizon ranges from 7 to 10 inches (18 to 25 cm) thick. The A-horizon is dark gray when dry (hue: 10YR, value: 3 to 5, chroma: 1 to 2) and black or very dark grayish brown when moist (hue: 10YR, value: 2 to 3, chroma: 1 to 2). Structure is weak fine granular. Depth to sand or gravel is 14 inches (36 cm) or less. Gravel content ranges from 3 to 35 percent. See Official Soils Descriptions for additional details; the major soil series correlated to the site is Talmo.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** The functional/structural groups provide a combination of rooting depths and structure which positively influences infiltration. Plant community composition is approximately 70 percent perennial grasses and grass-likes, 5 percent forbs, 15 percent shrubs, and 10 percent cryptograms which positively influences infiltration. The perennial grass and grass-like component is made up of warm-season (C4), rhizomatous, tall grasses; warm-season (C4), mid-grasses; cool-season (C3), bunch grasses; warm-season (C4), short grasses; cool-season (C3), rhizomatous grasses; and grass-likes. Invasion of introduced cool-season grasses such as Kentucky bluegrass and smooth brome may have an adverse impact infiltration and runoff. Native trees may impact infiltration and runoff if they are present in amounts greater than in the Little Bluestem - Sideoats Grama Community or Reference Community (1.1).

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. No compaction layers are expected for this site.

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant: Phase 1.1 1. Native, perennial, warm-season midgrass (2 species minimum): little bluestem, sideoats grama, sand dropseed, purple lovegrass, prairie dropseed. Phase 1.2 1. Native, perennial, warm-season shortgrass (2 species minimum): blue grama, hairy grama. 2. Native, perennial, warm-season midgrass (2 species minimum): little bluestem, sideoats grama, sand dropseed, purple lovegrass.

    Sub-dominant: Phase 1.1 1. Native, perennial, warm-season tallgrass (1 species minimum): prairie sandreed, sand bluestem, composite dropseed. 2. Native, perennial, cool-season bunchgrass, (2 species minimum): needle and thread, porcupinegrass, green needlegrass, prairie Junegrass. 3. Native, perennial, warm-season shortgrass (1 species minimum): blue grama, hairy grama. Phase 1.2 1. Native, perennial, cool-season bunchgrass, (2 species minimum): needle and thread, porcupinegrass, green needlegrass, prairie Junegrass. 2. Native, cool-season (C3), rhizomatous grasses (1 species minimum): western wheatgrass

    Other: Minor - Phase 1.1 1. Native forbs: forbs present will vary from location to location. 2. Native, perennial, cool-season, rhizomatous grass: western wheatgrass. 3. Shrubs: Prairie sagewort and other shrubs which will vary from location to location. 4. Grass-likes: Sedges. Minor - Phase 1.2 1. Native, perennial, warm-season tallgrass (1 species minimum): prairie sandreed, sand bluestem 2. Native forbs: forbs

present will vary from location to location. 3. Shrubs: prairie sagewort and other shrubs which will vary from location to location. 4. Grass-likes: sedges:

Additional: The Little Bluestem-Sideoats Grama or Reference Community (1.1) includes eight F/S groups which include in order of relative abundance, native, perennial, warm-season (C4), midgrass; native, perennial, warm-season, (C4), tallgrass; native, perennial, cool-season (C3), bunchgrass; native, perennial, warm-season (C4), shortgrass; native forbs, native, perennial, cool-season (C3), rhizomatous grass; shrubs; and grass-likes. The Blue Grama -Sideoats Grama Community (1.2) includes eight F/S groups which include in order of relative abundance, native, perennial, warm-season (C4), shortgrass; native, perennial, warm-season (C4), midgrass; native, perennial, cool-season (C3), bunchgrass; native, perennial, cool-season (C3), rhizomatous grass; native forbs, native, perennial, warm-season (C4), tallgrass; shrubs; and grass-likes.

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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.**

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14. **Average percent litter cover (%) and depth (in): Plant litter cover is evenly distributed throughout the site and is expected to be 40 to 60 percent and at a depth of approximately 0.25 inch (0.65 cm).**

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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 1,750 pounds per acre on an air dry basis. Low and High production years should yield 1,250 and 2,250 pounds per acre respectively.**

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site: None. No non-native invasive plants are present. Annual bromes (cheatgrass and Japanese/field), common mullein, smooth brome, and eastern redcedar are known invasives that have the potential to become dominant or co-dominant on the site. Consult the state noxious weed and state watch lists for potential invasive species. Note: species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants.**

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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.**
