Ecological site R103XY010MN
Bedrock Controlled Wet Prairies

Last updated: 10/04/2023
Accessed: 08/20/2026

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): 103X–Central Iowa and Minnesota Till Prairies

MLRA 103 is in Minnesota (56 percent) and Iowa (44 percent) and consists of approximately 18 million acres. It is in the Western Lake Section of the Central Lowland Province of the Interior Plains in an area known as the "Des Moines Lobe" of the Wisconsin-age ice sheet. The MLRA is mostly on a young, nearly level to gently rolling, glaciated till plain that has moraines and glacial lake plains in some areas. The plain is covered with glacial till, outwash, and glacial lake deposits. Recent alluvium consisting of clay, silt, sand, and gravel fill the bottoms of most of the major river valleys. Paleozoic bedrock sediments, primarily shale and limestone, underlie the glacial deposits in most of the area. The annual precipitation increases from northwest to southeast. Most of the rainfall occurs as high-intensity, convective thunderstorms during the summer. Two-thirds or more of the precipitation falls during the freeze-free period. Snowfall is common in winter. Ground water supplies are adequate for the domestic, livestock, municipal, and industrial needs. Nearly all of this area is farmland, and about four-fifths is cropland.

Classification relationships

Major Land Resource Area (MLRA): Central Iowa and Minnesota Till Prairies (103) (USDA Handbook 296, 2006) USFS Subregions: North Central Glaciated Plains (251B) and Minnesota and Northeast Iowa Morainal-Oak Savannah (222M) Sections; Upper Minnesota River-Des Moines Lobe (251Ba), Southern Des Moines Lobe (251Be), and Big Woods Moraines (222Mb) Subsections (Cleland et al. 2007) Relationship to Other Established Classifications: Biophysical Setting (Landfire, 2009)-Central Tallgrass Prairie (4214210) The reference state shares similarities to Minnesota Department of Natural Resources WPs54b Southern Wet Prairie

Ecological site concept

The Bedrock Controlled Wet Prairies ecological site generally occurs near larger rivers where glacial meltwaters scoured the valley leaving areas of bedrock occurring as strath terraces above the floodplain. Soils are poorly drained and the water table is usually at or near the soil surface in wet spring months. Occasional flooding may occur on some areas.

Associated sites

R103XY006MN	**Bedrock Controlled Upland Prairies** The Bedrock Controlled Upland Prairies ecological site is characterized by shallow to moderately deep soils that are influenced by bedrock and have a low available water capacity.
F103XY032MN	**Loamy Floodplains** The Loamy Floodplains ecological site is located on medium textured alluvium throughout MRLA 103. Soils textures include loam, silt loam, sandy loam and fine sandy loam. Some areas within this ecological site will exhibit long-term flooding.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Amorpha canescens*
Herbaceous	(1) *Andropogon gerardii* (2) *Spartina pectinata*

Physiographic features

The Bedrock Controlled Wet Prairies ecological site is relatively uncommon in the MLRA since areas of bedrock exposure are uncommon. This site is generally found near larger rivers, especially in the Minnesota and Dec Moines River valleys. Glacial meltwaters scoured these broad valley leaving areas of bedrock occurring as strath terraces above the floodplain. This concept is surrounded by river deposited alluvium or outwash soils. Landscape positions are typically low gradient linear segments or depressions which tend to occur on strath terraces. Low relief, 0-2% linear to concave slopes with loamy soils textures and a bedrock substratum interact to make this ecological site wetter than the adjacent upslope areas but drier than adjacent downslope areas. The low slope gradient, bedrock substratum, and linear to slightly concave slope shapes are defining characteristics of this ecological site. This site does not typically pond, but the water table is usually at or near the soils surface in wet spring months.

Figure 1. Block diagrams of the representative Bedrock Controlled Wet Prairies and associated ecological sites.

Figure 2. Distribution of the Bedrock Controlled Wet Prairies ecological site within MLRA 103. In many cases, the data set is not spatially consistent across political boundaries due to the method by which soils were mapped; e.g. due to county subsets.

Table 2. Representative physiographic features

Landforms	(1) Strath terrace
Runoff class	Negligible to medium
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	None to occasional
Elevation	240 − 340 m
Slope	0 %
Water table depth	0 − 100 cm
Aspect	Aspect is not a significant factor

Climatic features

The soil temperature regime of MLRA 103 is classified as “mesic” (i.e., mean annual soil temperature between 46 and 59°F). The average freeze-free period of this site is 156 days, while the frost-free period is 133 days. The average mean annual precipitation is 33 inches, which includes rainfall plus the water equivalent from snowfall. Cold air drainage from above and the fact that wet soils are generally colder than dry soils make this site colder than adjacent, upslope areas. As a result, snow and frost remain longer in the spring,

thus resulting in shorter growing seasons than the adjacent uplands.

Table 3 Representative climatic features

Frost-free period (characteristic range)	130-140 days
Freeze-free period (characteristic range)	150-160 days
Precipitation total (characteristic range)	760-890 mm
Frost-free period (actual range)	130-140 days
Freeze-free period (actual range)	150-160 days
Precipitation total (actual range)	760-940 mm
Frost-free period (average)	130 days
Freeze-free period (average)	160 days
Precipitation total (average)	840 mm

- (1) BOONE [USC00130807], Boone, IA
- (2) STEWART [USC00218025], Brownton, MN
- (3) WILLMAR WWTP [USC00219004], Willmar, MN
- (4) BRITT [USC00130923], Britt, IA
- (5) STORM LAKE 2 E [USC00137979], Storm Lake, IA
- (6) PERRY [USC00136566], Perry, IA

Influencing water features

With the natural hydrology intact, this site receives water mainly from three sources: direct precipitation, runoff, and recharge through base flow from adjacent upland areas. During the wet months, this site can produce surface runoff. Soils are typically classified as endosaturated as the water table is at or near the soil surface during the spring months. During dry periods, the water table may drop to the depth to the underlying bedrock. Some areas are occasionally flooded.

In the hydrogeomorphic (HGM) classification system, areas not affected by flooding are considered a Recharge Mineral Soil Flat, producing recharge to groundwater (USDA-NRCS, 2008; Gilbert et al., 2006). This site has a Saturated Cowardin Hydrologic Regime of Palustrine; Persistent Emergent Wetlands. It also has a United States Army Corps of Engineers Wetland Plant Community of D; Fresh (wet) Meadows, Sedge Meadows and Wet Prairies (Mineral Soils).

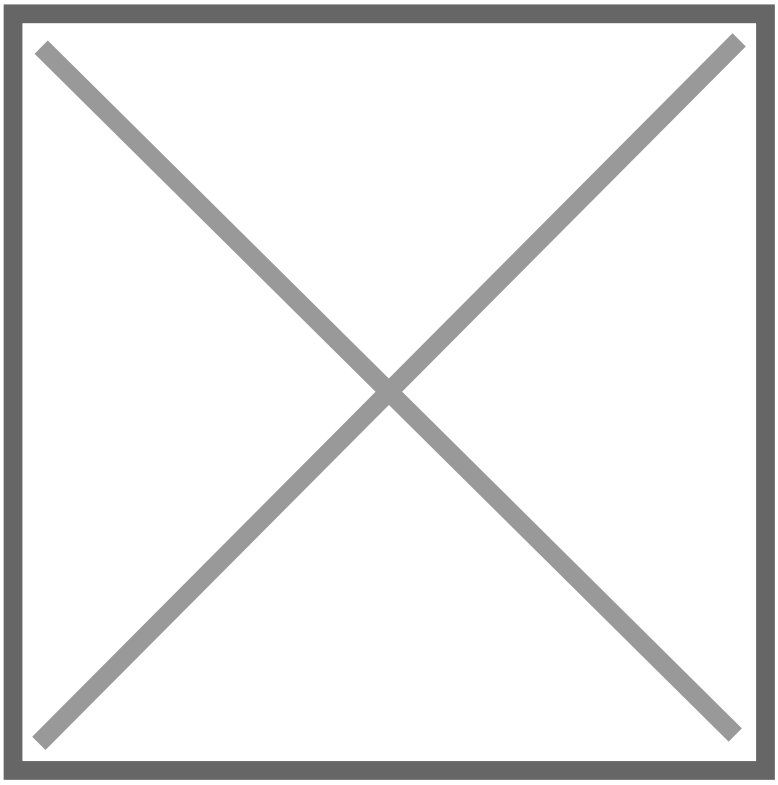

Figure 9. Representation of hydrological factors in a typical area of the Bedrock Controlled Wet Prairies and associated ecological sites on the Des Moines Lobe (MLRA 103).

Soil features

The soil series representing this site are Cedarrock, Faxon, Joliet, Little Cottonwood, Mound Creek, and Tilfer. These mineral soils are rich in organic matter and developed under prairie vegetation. Prairie soils typically have thick, nearly black, mollic epipedons. Parent materials include loamy slope alluvium and alluvial/glaciofluvial deposits overlying carbonaceous bedrock (i.e., limestone or dolomite), usually with close association with rivers valleys. Soil drainage class is poorly drained. The most common surface textures are silt loam, silty clay loam, and clay loam. The subsurface textural group is typically classified as fine loamy or coarse loamy. The soil order is Mollisol, with most components classified as Typic Endoaquolls. Some are Lithic Endaquolls.

Soils of the Bedrock Controlled Wet Prairie ecological site were formed under saturated conditions that produced anaerobic conditions during at least part of the year. Thick, dark mollic epipedons tend to mask the typical redoximorphic features used to determine seasonal high water table depths. Beneath the mollic epipedons, these soils have a depleted matrix with low chroma (2 or less) and high value (4 or more). The primary hydric soil indicators include: Depleted below Dark Surface (A11), Thick Dark Surface (A12), and Redox Dark Surface (F6, option a; USDA-NRCS, 2010).

Table 4. Representative soil features

Parent material	(1) Slope alluvium (2) Glaciofluvial deposits
Surface texture	(1) Silt loam (2) Silty clay loam (3) Clay loam
Drainage class	Poorly drained
Permeability class	Rapid to very rapid

Soil depth	30 – 100 cm
Surface fragment cover <=3"	0 – 30 %
Surface fragment cover >3"	0 – 30 %
Available water capacity (0-152.4cm)	7.62 – 20.32 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 30 %
Soil reaction (1:1 water) (0-101.6cm)	5.1 – 8.6
Subsurface fragment volume <=3" (0-101.6cm)	0 – 20 %
Subsurface fragment volume >3" (0-101.6cm)	0 – 10 %

Ecological dynamics

The Bedrock Controlled Wet Prairies ecological site is characterized by three states: the Reference State, the Tillage State, and the Woodland State. Although the Tillage State is described in this model, this does not imply that all areas of this site are suitable for tillage. Some soils in this group are shallow (less than 20" in depth) and not well suited for intensive crop production. Two grassland communities exist in the Reference State and are characterized by different fire return intervals. Grazing can also be a trigger for change on this ecological site. The Tillage State describes sites that have been tilled and generally have modified hydrology (ditching, tiling). Some areas of this ecological site are in a Woodland State. Without fire or grazing to control woody vegetation, this site will eventually revert to a woodland. These sites often are impacted by unmanaged grazing and non-native vegetation.

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 (%)

Inventory data references

No field plots were available for this site. A review of the scientific literature and professional experience were used to approximate the plant communities for this provisional ecological site. Information for the state-and-transition model was obtained from the same sources. All community phases are considered provisional based on these plots and the sources identified in ecological site description.

Other references

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Approval

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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.

Author(s)/participant(s)	
Contact for lead author	
Date	08/20/2026
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:**

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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):**

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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:

    Sub-dominant:

    Other:

    Additional:

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

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

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

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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:**

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17. **Perennial plant reproductive capability:**
