Ecological site F103XY028MN
Clayey Wet Forests

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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): 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

Land Resource Regions and Major Land Resource Areas (USDA NRCS, 2006) Major Land Resource Area (MLRA): Central Iowa and Minnesota Till Prairies (MLRS 103) U.S. Forest Service (USFS) National Hierarchical Framework of Ecological Units (Cleland et al., 2007) Section: North central Glaciated Plains (251B) Subsections: Upper Minnesota River-Des Moines Lobe (251BA) and Southern Des Moines Lobe (251Be) Relationship to Other Established Classifications: The reference state shares similarities to Minnesota Department of Natural Resources MHs49 Southern Wet-Mesic Hardwood Forest

Ecological site concept

The Clayey Wet Forests ecological site occurs in concave or linear and low slope gradient areas on lake plains and moraines in northeastern MLRA 103. The site is characterized by clayey, poorly drained soils with a seasonal depth to soil saturation of 0-30 cm. These soils developed predominantly under forest vegetation.

Associated sites

F103XY026MN	**Clayey Upland Forests** The Clayey Upland Forests ecological site is located on uplands. The soils are derived from clayey till and lacustrine (lake) materials, and drainage class ranges from somewhat poorly drained to well drained. The soils have a thin or moderately thick mollic (dark) surface.
R103XY017MN	**Organic Wet Meadow/Carr** The Organic Wet Meadow/Carr ecological site occurs in low wetland areas. These sites are often ponded, have a high water table (i.e. endosaturated) and are classified as very poorly drained. Water-tolerant vegetation such as cattails, bulrushes, and sedges are common.

R103XY015MN	**Depressional Marsh** The Depressional Marsh ecological site is located on landscape positions that include linear to slightly concave (depressional) segments. Soils are very poorly drained and are frequently ponded. The soils also have a relatively high organic matter content in the surface and near surface horizons.

Table 1. Dominant plant species

Tree	(1) *Acer saccharum* (2) *Fraxinus nigra*
Shrub	(1) *Prunus virginiana*
Herbaceous	(1) *Erythronium albidum*

Physiographic features

The Clayey Wet Forests ecological site occurs primarily on end and lateral moraines in the northeastern part of MLRA 103 including the Big Woods ecoregion. They also occur in Glacial Lake Minnesota. Landform positions include depressions, drainageways, footslopes, toeslopes, and low gradient linear segments. These positions are linear to slightly concave vertically and horizontally.

Figure 1. Block diagrams of representative Clayey Wet Forests and associated ecological sites.

Figure 2. Distribution of Clayey Wet Forests 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. county subsets.

Figure 3. The state of Minnesota with the Big Woods ecoregion shaded in deep green. (MN DNR)

Table 2. Representative physiographic features

Hillslope profile	(1) Footslope (2) Toeslope
Landforms	(1) End moraine (2) Lateral moraine (3) Lake plain (4) Depression (5) Drainageway
Runoff class	Negligible to low
Elevation	200 − 490 m
Slope	0 %

Water table depth	0 – 120 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 mean annual precipitation for this site is 31 inches. The average freeze-free period is 157 days, and the average frost-free period is 129 days. Cold air drainage and the fact that wet soils are colder than dry soils make this ecological site slightly colder than adjacent sloping landforms.

Table 3 Representative climatic features

Frost-free period (characteristic range)	130-130 days
Freeze-free period (characteristic range)	160-160 days
Precipitation total (characteristic range)	790 mm
Frost-free period (actual range)	130-130 days
Freeze-free period (actual range)	150-160 days
Precipitation total (actual range)	790 mm
Frost-free period (average)	130 days
Freeze-free period (average)	160 days
Precipitation total (average)	790 mm

- (1) AMBOY [USC00210157], Amboy, MN
- (2) CHANHASSEN WSFO [USC00211448], Chanhassen, MN

Influencing water features

The Clayey Wet Forests ecological site receives water through precipitation, runoff, and lateral subsurface flow. This site is primarily a groundwater recharge area. Since some of these components have little for contributing area, direct precipitation may be the only water source they receive. Spring is the wettest time of the year for this site. Soils are classified as endosaturated, as the saturation is at or very near the soil surface during the spring months. However, soil saturation levels may drop to as low as six feet during dry periods. In the hydrogeomorphic (HGM) classification system, this site is considered a Mineral Flat wetlands within upland areas which produce ground water recharge. (USDA-NRCS, 2008; Gilbert et al., 2006). This site has a Saturated Cowardin Hydrologic Regime of Palustrine; Forested, Broad-Leaved Deciduous. It also has a United States Army Corps of Engineers Wetland Plant Community of C; Hardwood Swamps, Shrub-Carrs and Alder Thickets (Mineral Soils).

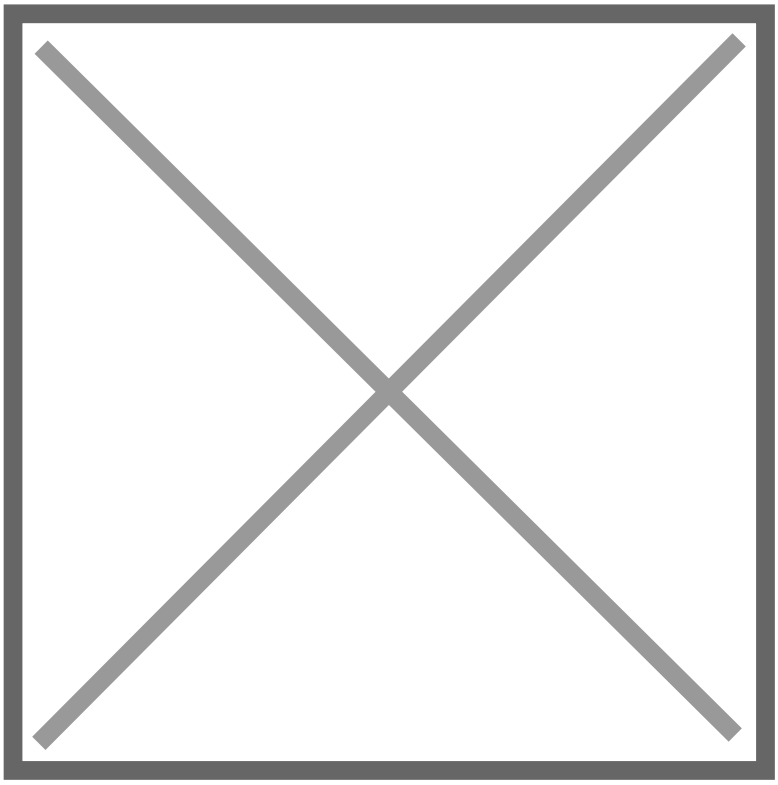

Figure 10. Representation of hydrological factors in a typical area of Clayey Wet Forests and associated ecological sites on the Des Moines Lobe (MLRA 103).

Soil features

The soils associated with the Clayey Wet Forests ecological site are classified as Vertic Argiaquolls. Soil series are Minnetonka and Mazaska. These soils developed under deciduous forest vegetation. Clay particles in these soils were illuviated from the higher albic horizons and accumulated in lower horizons of the soil profile. Argillic horizons form readily in Des Moines Lobe materials after leaching of all carbonates from the upper portion of the soil takes place (Grimm 1984). This site often occurs in slight depressions and accumulates slope alluvium. As a result of this accumulation, dark epipedons (some thicker than prairie soils) formed in these forested areas.

These soils formed under saturated conditions that produced anaerobic conditions during part of the year. Organic matter tends to mask the redoximorphic features that are used to determine seasonal high depth to saturation. The primary hydric soil indicator is a thick, dark surface (A12; USDA-NRCS, 2010). Parent materials are deep fine lacustrine or fine till over loamy till. The soil family particle size class is fine. The epipedon textures include silty clay loam, clay loam, or silty clay. Soil depth is very deep (>60 inches to bedrock). The drainage class is poorly drained, and the seasonal high-water table is at or very near the surface. Coarse fragments are between 0 and 15 percent by volume. Soil pH classes are very strongly acid to moderately alkaline throughout the soil profile.

Table 4. Representative soil features

Parent material	(1) Lacustrine deposits (2) Till
Surface texture	(1) Clay loam (2) Silty clay (3) Silty clay loam
Drainage class	Poorly drained

Permeability class	Very slow to moderate
Soil depth	200 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-152.4cm)	22.1 – 27.69 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 30 %
Soil reaction (1:1 water) (0-101.6cm)	4.5 – 8.4
Subsurface fragment volume <=3" (0-101.6cm)	0 – 20 %
Subsurface fragment volume >3" (0-101.6cm)	Not specified

Ecological dynamics

The state and transition model (STM) consists of three states: Reference State, Tillage State, and the Degraded Woodland State. The model Reference State describes a mature, wet-mesic, mixed hardwood forest. State 2 is the Tillage State which describes land transitioned to agricultural production. This is the most common state in MLRA 103 for this site. A few areas within this State have been reseeded to native warm season or cool-season grasses. State 3 is a Degraded Woodland State in which human disturbances have modified the plant community composition and structure. Invasive species, an absence of a natural fire regime, hydrological alterations, and unmanaged grazing are common triggers transitioning a site to State 3.

This site is largely confined to the eastern and northeastern portion of MLRA 103 where fire has been historically suppressed by topography and density of water bodies. This site is common within the Big Woods ecoregion of Minnesota.

The current dominant land use is corn and soybean production. Areas not in row crop agriculture tend to exist as forested preserves or are in other miscellaneous land uses.

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 2.1 plant community composition

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

Table 7. Community 2.2 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

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

Suzanne Mayne-Kinney, 10/04/2023

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	08/31/2026
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:**

    _____

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:**
