Ecological site F103XY029MN
Footslope/Drainageway 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

Major Land Resource Area (MLRA): Central Iowa and Minnesota Till Prairies (103) (USDA Handbook 296, 2006) USFS Subregions: North Central Glaciated Plains Section (251B); Upper Minnesota River-Des Moines Lobe (251BA) and Southern Des Moines Lobe (251Be) Subsections (Cleland et al. 2007) Relationship to Other Established Classifications: This ecological site shares similarities to Minnesota Department of Natural Resources MHs39 Southern Mesic Maple-Basswood Forest

Ecological site concept

The Footslope/Drainageway Forests ecological site is located in drainageways and on footslopes in the northeastern portion of MLRA 103. Soil drainage class is somewhat poorly drained to well drained. This site does not flood or pond.

Associated sites

F103XY030MN	**Wet Footslope/Drainageway Forests** The Wet Footslope/Drainageway Forest ecological site is on poorly drained to somewhat poorly drained soils on base slopes, head slopes, footslopes, toeslopes and drainageways.
F103XY025MN	**Loamy Upland Forests** The Loamy Upland Forests ecological site occurs on uplands and on soils which are derived from loamy till and have a thin or moderately thick dark (mollic) surface layer. The drainage class ranges from somewhat poorly drained to well drained.

Table 1. Dominant plant species

Tree	(1) *Acer saccharum* (2) *Celtis occidentalis*
Shrub	(1) *Sambucus racemosa*
Herbaceous	(1) *Laportea canadensis*

Physiographic features

The Footslope/Drainageway Forests ecological site is located primarily in the Big Woods ecoregion of Minnesota. The site occurs on drainageways, end moraines, lateral moraines, and valleys. Landform positions include footslopes and drainageways that are linear to slightly concave both horizontally and vertically. Fire intolerant forests became established in the northeastern part of MLRA 103 due to the combination of relatively rough topography, a high concentration of wet depressions, and a higher annual rainfall than areas to the west.

Figure 1. Block diagrams of the representative Footslope/Drainageway Forests and associated ecological sites.

Figure 2. Distribution of the Footslope /Drainageway Forests 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.

Figure 3. The state of Minnesota with the Big Woods ecoregion shaded in dark green. (Minnesota Department of Natural Resources)

Table 2. Representative physiographic features

Hillslope profile	(1) Footslope
Landforms	(1) End moraine (2) Lateral moraine (3) Valley (4) Drainageway
Runoff class	Negligible to low
Elevation	210 − 480 m
Slope	0 − 10 %
Water table depth	30 − 150 cm
Aspect	W, NW, N, NE, E, SE, S, SW

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 is 32 inches. The average frost free period is 127 days and the average freeze free period is 148

days. Cold air drainage, a lower water table, and the fact that dry soils are generally warmer than wet soils make this site often warmer than adjacent, downslope areas.

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)	790-810 mm
Frost-free period (actual range)	110-140 days
Freeze-free period (actual range)	130-160 days
Precipitation total (actual range)	790-840 mm
Frost-free period (average)	130 days
Freeze-free period (average)	150 days
Precipitation total (average)	810 mm

- (1) OWATONNA [USC00216287], Owatonna, MN
- (2) GAYLORD [USC00213076], Gaylord, MN
- (3) CHANHASSEN WSFO [USC00211448], Chanhassen, MN
- (4) CHASKA [USC00211465], Chaska, MN
- (5) JORDAN 1SSW [USC00214176], Jordan, MN
- (6) DELANO [USC00212088], Delano, MN

Influencing water features

The Footslope/Drainageway Forests ecological site receives water from precipitation, lateral subsurface flow, and runoff. This site is a recharge area, and spring is the wettest time of the year. Soils of this site are classified as endosaturated. The depth to saturation for the central concept soil components is between 30 and 50 cm during the spring months and may drop to as low as six or more feet (200+cm) later in the growing season during dry periods.

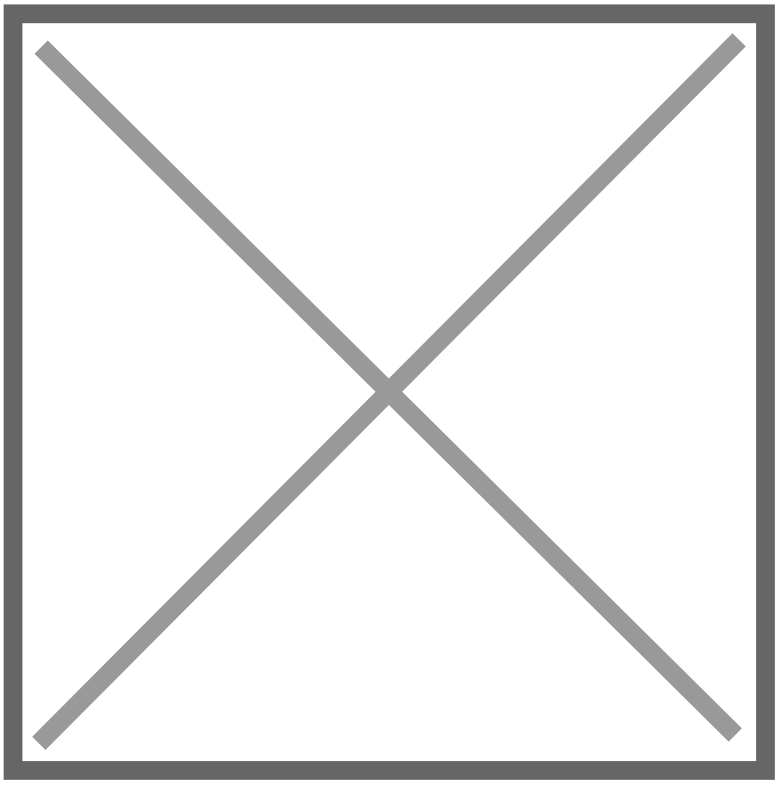

Figure 10. Representation of hydrologic factors in a typical area of Footslope/Drainageway Forests and associated ecological sites on the Des Moines Lobe (MLRA 103).

Soil features

The Footslope/Drainageway Forests ecological site is located predominantly on Moingona, Terril, Forestcity, and Hamel soils. These soils developed under deciduous forest vegetation and are classified as Typic Argiudolls or Cumulic Hapludolls. In the Argiudolls, clay particles were illuviated from higher in the profile and accumulated deeper. 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).

Soils are very deep (>60 inches to bedrock), and the drainage class is somewhat poorly drained, moderately well drained, or well drained. Soil parent material is loamy slope alluvium and loamy glacial till. Soil textures include loam, clay loam, fine sandy loam, sandy clay loam, sandy loam, and silty clay loam. The soil family particle size class is fine loamy. Course fragments are 0 to 9 percent by volume. Soil pH classes are moderately acid to moderately alkaline throughout the series control section.

Table 4. Representative soil features

Parent material	(1) Alluvium (2) Colluvium (3) Till
Surface texture	(1) Clay loam (2) Loam (3) Silty clay loam (4) Fine sandy loam (5) Sandy clay loam (6) Sandy loam

Drainage class	Somewhat poorly drained to well drained
Permeability class	Moderately slow to moderate
Soil depth	200 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	0 – 10 %
Available water capacity (0-152.4cm)	22.61 – 29.97 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 30 %
Soil reaction (1:1 water) (0-101.6cm)	5.6 – 8.4
Subsurface fragment volume <=3" (0-101.6cm)	0 – 10 %
Subsurface fragment volume >3" (0-101.6cm)	0 – 10 %

Ecological dynamics

The Footslope/Drainageway Forests ecological site reference state is a mesic hardwood forest. This site is predominantly in northeastern sections of MLRA 103 where fires were historically suppressed by topography and density of waterbodies. Following European settlement, most areas were cleared of their trees and converted to agriculture. Currently, the dominant land use is corn and soybean production.

The state and transition model consists of the Reference State, Tillage State, and the Degraded Woodland State. The Reference State describes a site with wet tolerant native grasses and scattered hardwoods. 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 Disturbed Forest State in which human disturbances have modified the plant community composition and structure. Lack of natural fire, hydrological alterations, unmanaged grazing, and invasive species are common triggers transitioning a site to State 3.

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

Cleland, D.T., J.A. Freeouf, J.E. Keys, G.J. Nowacki, C. Carpenter, and W.H. McNab. 2007. Ecological Subregions: Sections and Subsections of the Conterminous United States. USDA Forest Service, General Technical Report WO-76. Washington, DC.

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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	09/16/2026
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:**
