

# Ecological site F103XY025MN

## Loamy Upland 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

U.S. Department of Agriculture (USDA) Land Resource Regions and Major Land Resource Areas (USDA NRCS, 2006) Major Land Resource Area (MLRA): Central Iowa and Minnesota Till Prairies (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) International Vegetation Classification Hierarchy (NatureServe) Class: 1 Forest & Woodland Subclass: 1.B Temperate & Boreal Forest & Woodland Formation: 1.B.2 Cool Temperate Forest & Woodland Division: 1.B.2.Na Eastern North American Forest & Woodland Relationship to Other Established Classifications: This ecological site shares similarities with Minnesota Department of Natural Resources MHs38 Southern Mesic Oak-Basswood Forest; MHs39 Southern Mesic Maple-Basswood Forest

### Ecological site concept

The Loamy Upland Forests ecological site is located on upland soils that have relatively thin epipedons, loamy textures, and argillic subsurface horizons. These soils were formed predominantly under forest vegetation and are classified as Alfisols. This ecological site does not pond or flood.

### Associated sites

|                    |                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>F103XY030MN</b> | <p><b>Wet Footslope/Drainageway Forests</b></p> <p>The Wet Footslope/Drainageway Forests ecological site is located on lower footslopes or in wet drainageways. The soils are somewhat poorly drained to poorly drained. This site is lower on the landscape and wetter than the Loamy Upland Forests site.</p>                                                 |
| <b>F103XY027MN</b> | <p><b>Loamy Wet Forests</b></p> <p>The Loamy Wet Forests ecological site is located on footslopes and toeslopes. The soils have a dark surface layer (mollic epipedon) and are poorly drained. The soils are derived from fine loamy till, so have a loamy surface texture. This site is located lower in the landscape than the Loamy Upland Forests site.</p> |

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>R103XY017MN</b> | <p><b>Organic Wet Meadow/Carr</b></p> <p>The Organic Wet Meadow/Carr ecological site occurs in low wetland areas. These sites are 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 dominant.</p>                                                                                                                        |
| <b>F103XY036MN</b> | <p><b>Depressional Wet Forests</b></p> <p>The Depressional Wet Forests ecological site is characterized by a water table that is typically above the soil surface (ponded) during the spring months and may drop to as low as three feet later in the growing season during dry periods. The included soils are classified as Cumulic Endoaquolls that developed under forest vegetation and have a thick accumulation of slope alluvium.</p> |
| <b>R103XY018MN</b> | <p><b>Shallow Lakes</b></p> <p>The Shallow Lakes ecological site is ponded in a natural state. Soils are poorly drained and endosaturated. Characteristic vegetation includes waterlily, coon's tail, and soft stem bulrush.</p>                                                                                                                                                                                                              |
| <b>R103XY014MN</b> | <p><b>Recharge Depressions</b></p> <p>The Recharge Depressions ecological site ponded in the natural state and soils are classified as very poorly drained. Soils have a relatively high organic matter content in the surface and near surface horizons. Hydrologic interactions with adjacent sloping ground classifies this site as a recharge wetland.</p>                                                                                |
| <b>F103XY024MN</b> | <p><b>Sandy Upland Forests</b></p> <p>The Sandy Upland Forests ecological site is located on soils that have a surface texture of loam, sandy loam, or sand and have a layer of sandy or gravelly material below the surface horizon. These soils were formed predominantly under forest vegetation.</p>                                                                                                                                      |
| <b>F103XY029MN</b> | <p><b>Footslope/Drainageway Forests</b></p> <p>The Footslope/Drainageway Forest ecological site is located on end and lateral moraines within the northeastern part of MLRA 103. Sites are in drainageways and on footslopes, but generally do not flood or pond.</p>                                                                                                                                                                         |

#### Similar sites

|                    |                                                                                                                                                                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>F103XY024MN</b> | <p><b>Sandy Upland Forests</b></p> <p>The Sandy Upland Forests ecological site is located on uplands. Soils are derived from loamy-mantled outwash and outwash over till. Soil texture is course loamy. Soil drainage class is moderately well drained to well drained.</p> |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Table 1. Dominant plant species**

|            |                                                                                 |
|------------|---------------------------------------------------------------------------------|
| Tree       | <p>(1) <i>Quercus rubra</i><br/>(2) <i>Acer saccharum</i></p>                   |
| Shrub      | <p>(1) <i>Ostrya virginiana</i></p>                                             |
| Herbaceous | <p>(1) <i>Thalictrum thalictroides</i><br/>(2) <i>Polygonatum pubescens</i></p> |

Physiographic features

The Loamy Upland Forests ecological site occurs on backslopes, summits, and shoulders. The landscape positions are linear to convex both vertically and horizontally. Landforms include ground, end, and lateral moraines. This site is predominantly found in the Big Woods ecoregion of Minnesota and some additional areas in the southern portion of MLRA 103 in Iowa.

Figure 1. Block diagrams of representative Loamy Upland Forests and associated ecological sites.

Figure 2. Distribution of the Loamy Upland Forests ecological site within MLRA 103. In many cases, data are 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 deep green. (Minnesota Department of Natural Resources)

Table 2. Representative physiographic features

|                   |                                                              |
|-------------------|--------------------------------------------------------------|
| Hillslope profile | (1) Backslope<br>(2) Summit<br>(3) Shoulder                  |
| Landforms         | (1) Ground moraine<br>(2) End moraine<br>(3) Lateral moraine |
| Runoff class      | Low to high                                                  |
| Elevation         | 210 – 430 m                                                  |
| Slope             | 0 – 40 %                                                     |
| Water table depth | 30 – 200 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 degrees Fahrenheit). The average freeze-free period of the site is 152 days, and the frost-free period is 127 days. The average mean annual precipitation is 32 inches, which includes rainfall plus the water equivalent from snowfall. Cold air drainage and the fact that dry soils are generally warmer than wet soils make this site warmer than adjacent downslope areas. Snow and frost melt sooner in the spring on warmer soils, thus resulting in a longer growing season than in adjacent depressions.

Table 3 Representative climatic features

|                                           |              |
|-------------------------------------------|--------------|
| Frost-free period (characteristic range)  | 120-140 days |
| Freeze-free period (characteristic range) | 140-160 days |

|                                            |              |
|--------------------------------------------|--------------|
| Precipitation total (characteristic range) | 760-860 mm   |
| Frost-free period (actual range)           | 110-140 days |
| Freeze-free period (actual range)          | 140-160 days |
| Precipitation total (actual range)         | 760-940 mm   |
| Frost-free period (average)                | 130 days     |
| Freeze-free period (average)               | 150 days     |
| Precipitation total (average)              | 810 mm       |

- (1) BUFFALO 2NE [USC00211107], Buffalo, MN
- (2) JORDAN 1SSW [USC00214176], Jordan, MN
- (3) CHANHASSEN WSFO [USC00211448], Chanhassen, MN
- (4) DELANO [USC00212088], Delano, MN
- (5) DASSEL [USC00212023], Dassel, MN
- (6) FARIBAULT [USC00212721], Faribault, MN
- (7) BOONE [USC00130807], Boone, IA
- (8) FT DODGE 5NNW [USC00132999], Fort Dodge, IA

### Influencing water features

The Loamy Upland Forests ecological site mainly receives water from precipitation and lateral subsurface flow and to a lesser extent runoff. Direct precipitation may be the only water source for some areas. Spring is the wettest time of the year for this site. The soils are classified as endosaturated. The seasonal high depth to saturation is between 30 and 100 cm during the spring months, and the saturation level may drop to six feet (200cm) during dry periods.

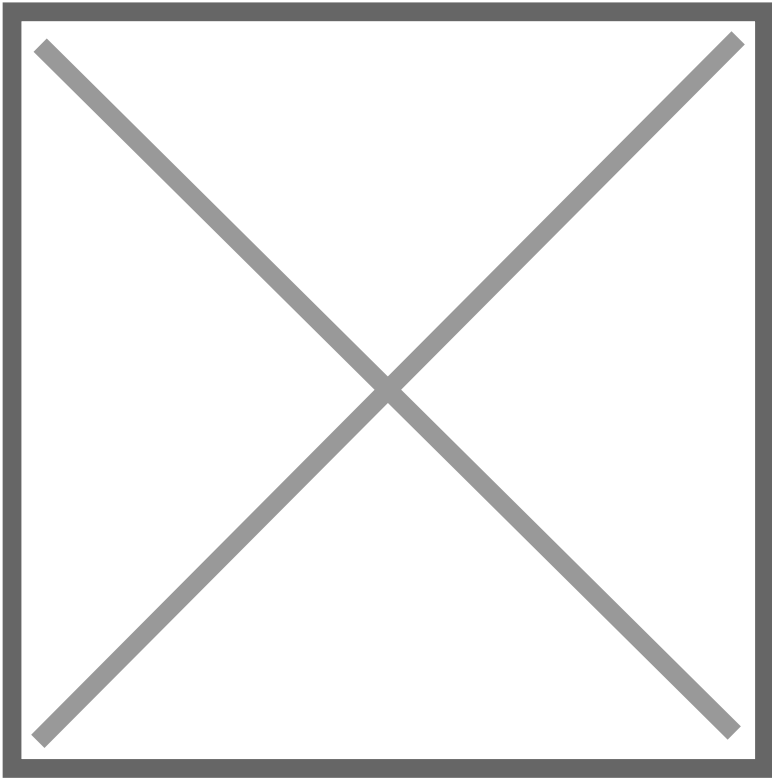


Figure 10. Representation of hydrologic factors in a typical area of Loamy Upland Forests and associated ecological sites on the Des Moines Lobe (MLRA 103).

Soil features

Soils associated with this ecological site are classified as Mollic Hapludalfs or Glossic Hapludalfs. These soils developed predominantly under deciduous forest vegetation. Clay particles were illuviated from horizons 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). The soil series associated with this site include Lester, Hayden, Angus, and Le Sueur.

The parent material is fine loamy glacial till. Soils are very deep (>60 inches to bedrock). The drainage classes range from somewhat poorly drained to well drained, and the seasonal high depth to saturation stays below 30 cm from the surface. The typical soil surface textures are loam, fine sandy loam, clay loam, silty clay loam, silt loam, and sandy clay loam. Coarse fragment content is generally between 0 and 9 percent by volume, although some soils in this group may have up to 20 percent coarse fragments. Soil pH classes range from strongly acid to moderately alkaline throughout the profile.

Figure 11. A profile of a Lester soil from Collinwood Township, Meeker County, Minnesota

Table 4. Representative soil features

|                 |                                                                                                                 |
|-----------------|-----------------------------------------------------------------------------------------------------------------|
| Parent material | (1) Till                                                                                                        |
| Surface texture | (1) Loam<br>(2) Fine sandy loam<br>(3) Clay loam<br>(4) Silty clay loam<br>(5) Silt loam<br>(6) Sandy clay loam |

|                                                |                                              |
|------------------------------------------------|----------------------------------------------|
| Drainage class                                 | Somewhat excessively drained to well drained |
| Permeability class                             | Moderately rapid to moderate                 |
| Soil depth                                     | 200 cm                                       |
| Surface fragment cover <=3"                    | Not specified                                |
| Surface fragment cover >3"                     | Not specified                                |
| Available water capacity<br>(0-152.4cm)        | 25.4 – 30.48 cm                              |
| Calcium carbonate equivalent<br>(0-101.6cm)    | 0 – 30 %                                     |
| Soil reaction (1:1 water)<br>(0-101.6cm)       | 5.1 – 8.4                                    |
| Subsurface fragment volume <=3"<br>(0-101.6cm) | 0 – 10 %                                     |
| Subsurface fragment volume >3"<br>(0-101.6cm)  | Not specified                                |

### Ecological dynamics

The Loamy Upland Forests ecological site has three states: the Reference State, the Tillage State and the Disturbed Forest State.

The Reference State is a mature, deciduous forest with a substantial oak component. This is a relatively stable community in the absence of large-scale natural or anthropological disturbance. Small-gap disturbances occur naturally and result in a series of successional communities. This ecological site can be affected by multiple natural triggers (disturbance processes) including wildfire, drought, insects, and windstorms. Wildfire intensity and frequency was historically reduced due to topography and density of waterbodies.

The Tillage State is characterized by tillage and agricultural crop production. The two communities under this state are the Row Crop Community and the Seeded Grassland Community. Management inputs include preparing the site, seeding, fertilizing, controlling weeds and brush, and harvesting. This land use is appropriate for lower slope sites only.

The Disturbed Forest State is a wooded site that has undergone plant community changes due to human disturbance. Triggers include tree removal, invasive plants, and unmanaged grazing. Some areas in this ecological site preclude agricultural use due to slope. Often, these areas have been disturbed (logging, grazing, development, etc.), and exhibit an understory with non-native vegetation and an altered canopy composition. Species will vary depending on the severity of disturbance and available seed sources. These sites do not have the ecological stability or native plant diversity of a reference state.

The most common triggers are timber harvest or clearing the site for agricultural production (lower slope sites). Once a reference state

has been transitioned to a tillage field, the reversibility class is irreversible.

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.

Minnesota Department of Natural Resources. 2005. Field guide to the native plant communities of Minnesota: The Eastern Broadleaf Forest Province. Ecological Land Classification Program, Minnesota County Biological Survey, and Natural Heritage and Nongame Research Program. MNDNR St. Paul, Minnesota.

Ojakangas, R.W., and C.L. Matsch. 1982. Minnesota's geology. University of Minnesota Press. Minneapolis, MN. Gleason, H.A. 1913. The relation of forest distribution and prairie fires in the middle west. Torreyia 13 (8), 173-181.

U.S. Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. Agricultural Handbook 296.

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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                                        | 08/20/2026        |
| Approved by                                 |                   |
| Approval date                               |                   |
| Composition (Indicators 10 and 12) based on | Annual Production |

## Indicators

### 1. Number and extent of rills:

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### 2. Presence of water flow patterns:

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### 3. Number and height of erosional pedestals or terracettes:

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### 4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):

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### 5. Number of gullies and erosion associated with gullies:

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### 6. Extent of wind scoured, blowouts and/or depositional areas:

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### 7. Amount of litter movement (describe size and distance expected to travel):

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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):

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### 9. Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):

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### 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:

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