USDA Natural Resources Conservation Service

Ecological site F103XY025MN
Loamy Upland Forests

Last updated: 10/04/2023
Accessed: 05/19/2024

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

F103XY030MN	**Wet Footslope/Drainageway Forests** 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.
F103XY027MN	**Loamy Wet Forests** 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.
R103XY017MN	**Organic Wet Meadow/Carr** 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.
F103XY036MN	**Depressional Wet Forests** 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.
R103XY018MN	**Shallow Lakes** 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.
R103XY014MN	**Recharge Depressions** 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.
F103XY024MN	**Sandy Upland Forests** 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.
F103XY029MN	**Footslope/Drainageway Forests** 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.

Similar sites

F103XY024MN	**Sandy Upland Forests** 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.

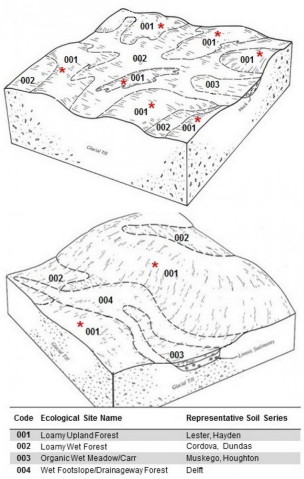
Table 1. Dominant plant species

Tree	(1) *Quercus rubra* (2) *Acer saccharum*
Shrub	(1) *Ostrya virginiana*
Herbaceous	(1) *Thalictrum thalictroides* (2) *Polygonatum pubescens*

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.



Code	Ecological Site Name	Representative Soil Series
001	Loamy Upland Forest	Lester, Hayden
002	Loamy Wet Forest	Cordova, Dundas
003	Organic Wet Meadow/Carr	Muskego, Houghton
004	Wet Footslope/Drainageway Forest	Delft

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

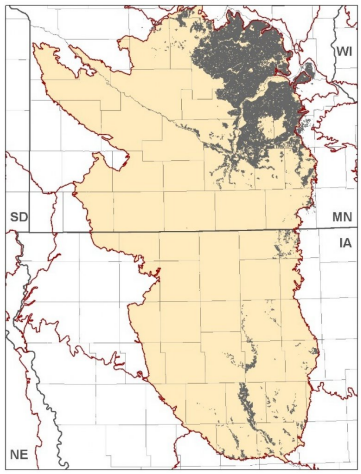


Figure 2. Distribution of the Loamy Upland Forests ecological site within MLRA 103. In many cases, data are not spatially consistent across political boundaries due to the method by which soils were mapped; e.g. due to county subsets.

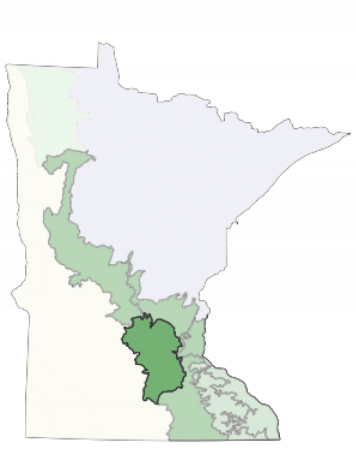


Figure 3. The state of Minnesota with the Big Woods ecoregion shaded in deep green. (Minnesota Department of Natural Resources)

Table 2. Representative physiographic features

Hillslope profile	(1) Backslope (2) Summit (3) Shoulder

Landforms	(1) Ground moraine (2) End moraine (3) Lateral moraine
Runoff class	Low to high
Elevation	213–430 m
Slope	0–40%
Water table depth	30–203 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)	118-135 days
Freeze-free period (characteristic range)	143-162 days
Precipitation total (characteristic range)	762-864 mm
Frost-free period (actual range)	112-136 days
Freeze-free period (actual range)	138-163 days
Precipitation total (actual range)	762-940 mm
Frost-free period (average)	127 days
Freeze-free period (average)	152 days
Precipitation total (average)	813 mm

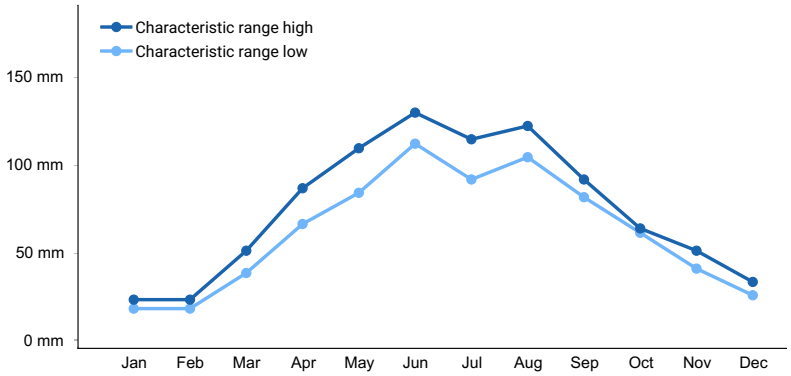


Figure 4. Monthly precipitation range

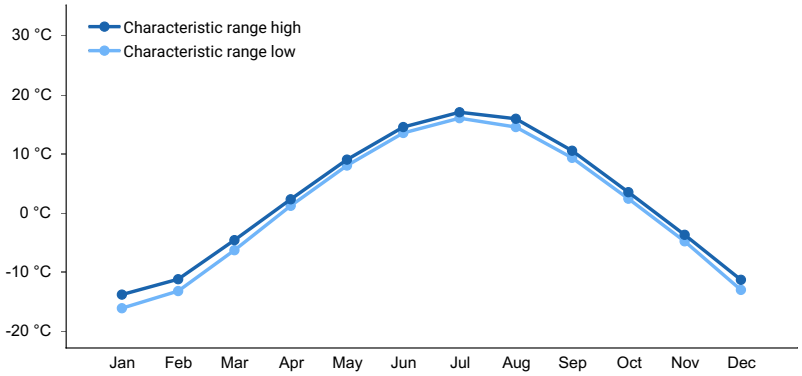


Figure 5. Monthly minimum temperature range

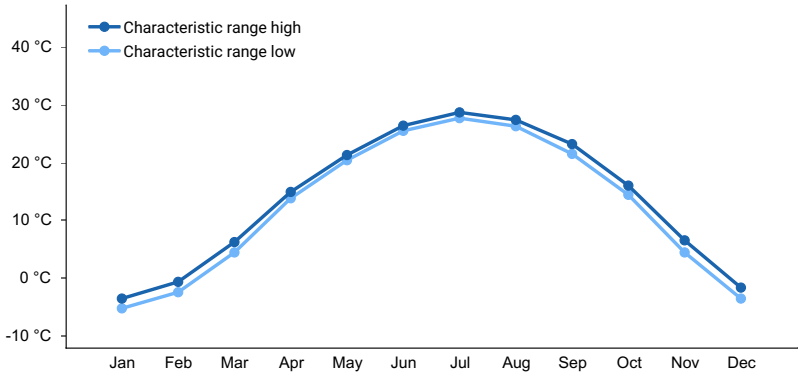


Figure 6. Monthly maximum temperature range

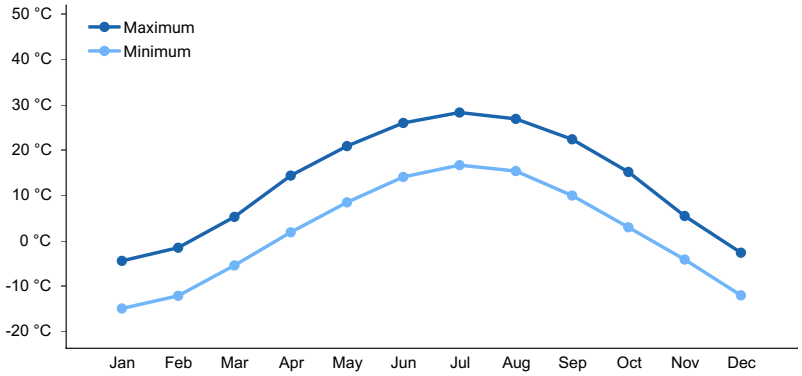


Figure 7. Monthly average minimum and maximum temperature

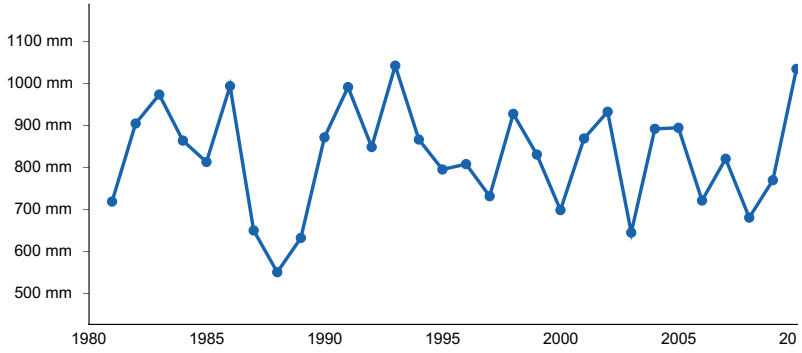


Figure 8. Annual precipitation pattern

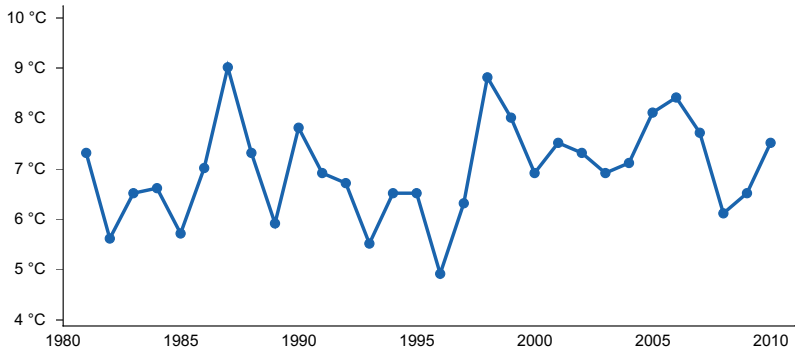


Figure 9. Annual average temperature pattern

Climate stations used

- (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.

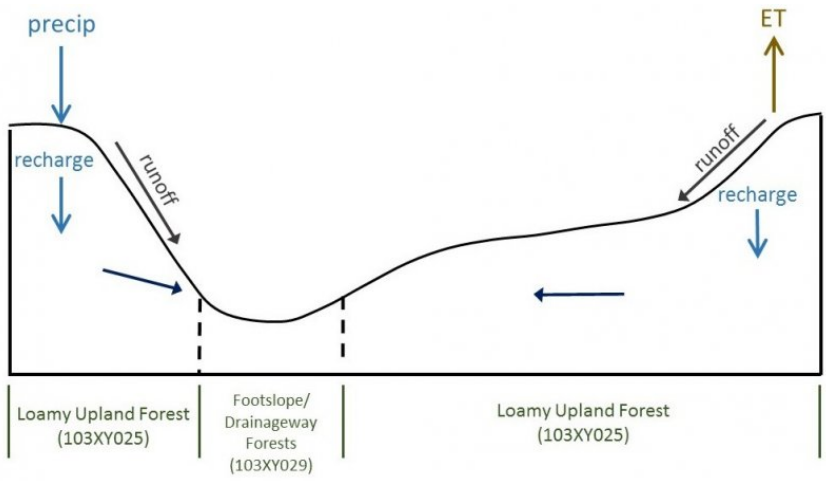


Figure 10. Representation of hydrologic factors in a typical area of Loamy Upland Forests and associated ecological sites on the Des Moines Lobe (MLRA 103).

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 course fragments. Soil pH classes range from strongly acid to moderately alkaline throughout the profile.

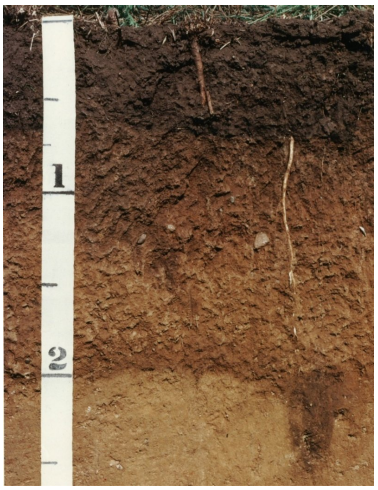


Figure 11. A profile of a Lester soil from Collinwood Township, Meeker County, Minnesota

Table 4. Representative soil features

Parent material	(1) Till
Surface texture	(1) Loam (2) Fine sandy loam (3) Clay loam (4) Silty clay loam (5) Silt loam (6) Sandy clay loam
Drainage class	Somewhat excessively drained to well drained
Permeability class	Moderately rapid to moderate
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-152.4cm)	25.4–30.48 cm
Calcium carbonate equivalent (0-101.6cm)	0–25%
Soil reaction (1:1 water) (0-101.6cm)	5.1–8.4
Subsurface fragment volume <=3" (0-101.6cm)	0–9%
Subsurface fragment volume >3" (0-101.6cm)	0–3%

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.

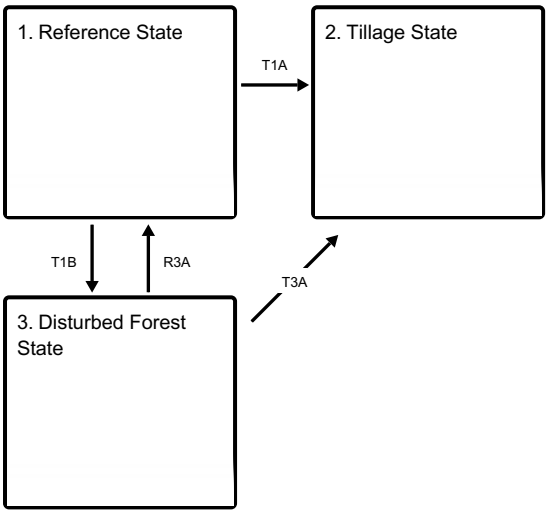
The Tillage State is characterized by tillage and agricultural crop production. The two communities under this state are the Row Crop Community and the Seeded Grassland Community. Management inputs include preparing the site, seeding, fertilizing, controlling weeds and brush, and harvesting. This land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

Ecosystem states



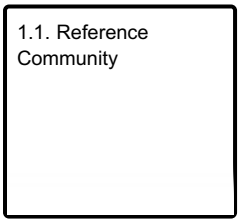
T1A - Site is cleared, tilled, seeded, and managed for crop production

T1B - Site incurs large-scale disturbance and altered plant community

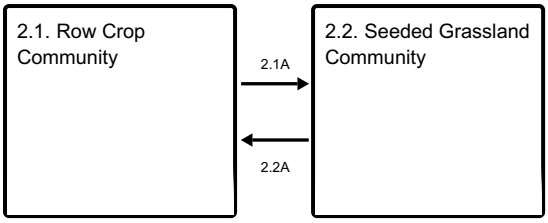
R3A - Restoration inputs include desired species establishment, disturbance exclusion, invasive species eradication, and stand management

T3A - Site cleared, soil tillage, crop establishment, and continued agriculture management

State 1 submodel, plant communities



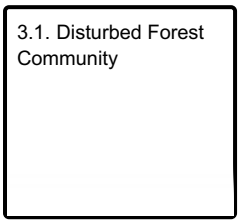
State 2 submodel, plant communities



2.1A - Seeding and management of warm or cool season grasses.

2.2A - Site preparation, soil tillage, crop establishment, weed control

State 3 submodel, plant communities



State 1
Reference State

The Loamy Upland Forests Reference State is a mature deciduous forest with dominant canopy species of northern red oak, sugar maple, basswood, and elm. The shrub layer is variable in density and includes sugar maple saplings, bitternut hickory saplings, and hophornbeam. The ground-layer consists of a variety of native herbs, grasses and sedges. Common species include rue anemone and hairy Solomon’s seal. Few high-quality reference sites remain in MLRA 103, as many sites are in agricultural production.

Resilience management. Resilience management practices include monitoring for invasive vegetation, applying herbicides as needed, and excluding grazing and logging.

Dominant plant species

- northern red oak (*Quercus rubra*), tree
- sugar maple (*Acer saccharum*), tree
- hophornbeam (*Ostrya virginiana*), shrub
- rue anemone (*Thalictrum thalictroides*), other herbaceous
- hairy Solomon's seal (*Polygonatum pubescens*), other herbaceous

Community 1.1
Reference Community

The Reference Community is characterized by multiple co-dominant canopy species, a substantial oak component, a variable shrub layer, and a diverse ground cover of native species. Community composition will exhibit variation depending on slope, aspect, and available water capacity. Canopy species include northern red oak, sugar maple, basswood , and elm. Hophornbeam is common in the shrub and subcanopy layers. Post-disturbance community successional species include quaking aspen, northern red oak, basswood, elm, and maple seedlings and saplings. Early successional sites are often dominated by quaking aspen and sugar maple.

Resilience management. Resilience management practices include monitoring for invasive vegetation, applying weed control methods as needed, and excluding human disturbances such as grazing and large-scale timber harvesting.

Dominant plant species

- northern red oak (*Quercus rubra*), tree
- sugar maple (*Acer saccharum*), tree
- hophornbeam (*Ostrya virginiana*), shrub

- rue anemone (*Thalictrum thalictroides*), other herbaceous
- hairy Solomon's seal (*Polygonatum pubescens*), other herbaceous

State 2
Tillage State

The Tillage State contains the Row Crop Community and the Seeded Grassland Community. This state describes areas currently in crop production or areas that were tilled but now are seeded to grass. Pathway mechanisms include preparing the site, planting desired species, applying herbicide, applying fertilizer, and harvesting. Hydrological modifications (tiling and ditching) may be installed to improve drainage. Soil tillage is the primary trigger to State 2. Tillage alters dynamic soil properties, including bulk density, structure, organic carbon content, and saturated hydraulic conductivity. Intensive tillage negatively impacts soil ecological functions. Conservation practices can help mediate soil health impacts. Conservation tillage minimizes soil disturbance and improves soil structure and soil health. A cover crop rotation builds soil structure, improves infiltration rates, reduces runoff and erosion, and protects water quality. Higher sloping areas within this ecological site are not appropriate for row crop production. When the slope gradient exceeds 20 percent, row crop production is unfeasible due to the farm machinery limitations. Some areas within this ecological site have been converted to a warm-season grasses under the NRCS Conservation Reserve Program (CRP). Common species include big bluestem, switchgrass, indiangrass , and little bluestem. Plantings include perennial native forbs to benefit wildlife and pollinators. Non-native, cool-season grasses are also feasible. Seed mix selection will depend on landowner goals and objectives. Seeded grasslands are not as species rich or biologically diverse as native grasslands; however, they still offer ecological benefits for wildlife, especially grassland birds, water quality protection, and soil health.

Resilience management. Prescribed fire is a resilience management practice on warm-season grasslands. Seeding, fertilizing, and controlling weeds and brush are resilience management practices for cool-season grasslands.

Dominant plant species

- corn (*Zea mays*), grass
- soybean (*Glycine max*), other herbaceous

Community 2.1
Row Crop Community

Community 2.1 consists of intensive row crop agriculture. Soil tillage and intentional plant establishment are the primary triggers. The most common crops are corn and soybeans on an annual rotation. Many crops, however, are feasible for these areas. A secondary trigger is drainage modifications (ditching and tiling), which may be installed to improve soil drainage.

Resilience management. Resilience management practices include preparing the sites, planting, fertilizing, controlling weeds, and harvesting. The maintenance of the desired vegetation community is controlled by the intensity, frequency, duration, and timing of agricultural practices.

Dominant plant species

- corn (*Zea mays*), grass
- soybean (*Glycine max*), other herbaceous

Community 2.2
Seeded Grassland Community

The Seeded Grassland Community grows in areas that were previously tilled and used for agricultural production, but have been transitioned to either warm-season or cool-season grasses. The primary trigger is the intentional establishment of a grass species. Warm-season grasses are commonly planted through conservation programs, such as the NRCS Conservation Reserve Program (CRP). Numerous native grasses and forbs are suitable for these areas. Seed mix selection depends on landowner objectives and site-specific characteristics. Cool-season grasses can also be planted, depending on landowner goals. Management inputs include seeding, fertilizing, and controlling weeds and brush. Resilience management practices include invasive plant management and a program

of planned grazing. Many of these areas are eventually transitioned to annual crop production.

Resilience management. The pasture resilience management practices may include planting desired species, managing grazing, mowing, fertilizing, and controlling unpalatable plant species. Prescribed fire is a resilience management practice for warm-season grasslands. The controlled application of fire modifies vegetation structure and influence ecological processes.

Dominant plant species

- big bluestem (*Andropogon gerardii*), grass
- switchgrass (*Panicum virgatum*), grass
- Indiangrass (*Sorghastrum nutans*), grass
- little bluestem (*Schizachyrium scoparium*), grass

Pathway 2.1A
Community 2.1 to 2.2

This pathway converts Community 2.1 (row crops) to Community 2.2 (seeded grassland). The primary mechanism of change is the seeding of desired grass species.

Conservation practices

Forage and Biomass Planting

Pathway 2.2A
Community 2.2 to 2.1

This pathway describes the site transitioning from a seeded grassland to row crop agriculture. This is a common pathway throughout MLRA 103 as sites are placed in crop production. The mechanisms of change are tillage and intentional plant establishment (crop seeding). Resilience management practices include weed control (herbicide application), disturbance management (field cultivating), and harvest management.

State 3
Disturbed Forest State

This state describes a wooded site that has been disturbed and exhibits altered forest species composition. Numerous ruderal woodland and forest plant communities may occur on this ecological site depending on the type and severity of disturbance, the length of disturbance, available seed sources, ongoing disturbances (selective harvest, grazing), and management activities. Fast-growing, shade tolerant trees are typical. Common tree species often include sugar maple and common buckthorn. Numerous invasive plants are often on these sites.

Dominant plant species

- maple (*Acer*), tree
- oak (*Quercus*), tree
- common buckthorn (*Rhamnus cathartica*), tree
- Kentucky bluegrass (*Poa pratensis*), grass

Community 3.1
Disturbed Forest Community

Community 3.1 is an altered forest community caused by previous or ongoing human disturbances. Canopy composition varies depending on the severity and type of disturbances, community age, and the availability of seed sources. Invasive, non-native species are common on these sites and will continue to increase without management intervention.

Dominant plant species

- maple (*Acer*), tree

- oak (*Quercus*), tree
- common buckthorn (*Rhamnus cathartica*), tree

Transition T1A
State 1 to 2

Transition T1A is the conversion of the Reference State to agriculture. The triggers are site clearing, soil tillage. and intentional plant establishment (crop seeding). Resilience management practices include common agricultural practices such as seeding, fertilizing, and managing invasive plants with herbicides or field cultivation. Hydrological modifications, such as ditching and tiling, may be present.

Constraints to recovery. Site clearing and soil tillage preclude recovery of the former state.

Transition T1B
State 1 to 3

Transition T1B is a transition from a mature deciduous forest to a disturbed (ruderal) forest. Triggers include timber harvest, surface site disturbance, grazing, and introduction of non-native species. The native plant community is altered, and these areas do not exhibit the ecological function or vegetative composition of State 1.

Restoration pathway R3A
State 3 to 1

Restoration to the Reference State may be feasible with long-term management inputs including establishment of desired species, forest stand management (selective thinning), and control of invasive species. Triggers include intentional plant establishment (planting desired species), absence of disturbance (site protected from grazing and other site altering disturbances), timber stand improvement inputs, and eradication of invasive plant species.

Context dependence. Ditching and tiling may be present on site altering the natural hydrology.

Conservation practices

Brush Management
Tree/Shrub Site Preparation
Tree/Shrub Establishment
Forest Stand Improvement

Transition T3A
State 3 to 2

Transition T3A is the transition of a disturbed forest state to agriculture production. This is a common pathway in MLRA 103. The mechanisms of change include timber harvest, site preparation, tillage, and intentional plant establishment (crop seeding). Continued resilience management practices are necessary and include weed control (herbicide application), disturbance management (field cultivating), and harvest management.

Constraints to recovery. Soils tillage and the transition to agriculture preclude recovery of the former state.

Additional community tables

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. Torreya 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

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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	05/19/2024
Approved by	Suzanne Mayne-Kinney
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:**

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):**

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:

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

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

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:**
