Ecological site F094BY007MI
Moist Loamy Lowland

Last updated: 11/16/2023
Accessed: 08/29/2026

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): 094B–Michigan Eastern Upper Peninsula Sandy Glacial Deposits

The Michigan Eastern Upper Peninsula MLRA (94B) corresponds closely with the Northwestern Sands Ecological Landscape. Some of the following brief overview is borrowed from the Wisconsin Department of Natural Resources ecological landscape publication (2015). The Michigan Eastern Upper Peninsula MLRA is in northeast Wisconsin on the border of the Upper Peninsula of Michigan, with a very small portion on the Lake Michigan coast disjoined from the rest of the MLRA. The Wisconsin portion of the MLRA is a bit shy of 1.1 million acres (1,668 square miles). This region, which was covered entirely by the Green Bay Lobe in Wisconsin's most recent glaciation, has a unique glacial landscape defined by intermingled loamy moraines and sandy heads-of-outwash. Extensive pitted outwash plains dominate the region, with significant glaciolacustrine sediments in the southeast portion of this region. A prominent landform in this MLRA is the hummocky ridges of intermingled loamy moraines and sandy heads-of-outwash that protrude from extensive pitted outwash plains. These north-south trending, loamy morainal ridges were deposited as the Green Bay Lobe was stagnant—the rate of melting was relatively equal to the rate of advancement. This stagnation allowed the deposition of a ridge of sandy loam materials. Supraglacial till was deposited unevenly, and buried ice blocks melted and collapsed the surface to form hummocky topography on the moraines. The heads-of-outwash formed while the ice was melting and thinning rapidly. Large amounts of sand and gravel outwash materials, and some till and loamy debris-flow sediment, were deposited on top of the thin edge of ice. They, too, have hummocky topography resulting from the collapse of buried ice. The topographically similar appearances of the moraines and heads-of-outwash make them difficult to distinguish superficially, but they are formed in different-textured materials and the vegetation divergence is often evident. These moraines and heads-of-outwash mark the western extent of the Green Bay Lobe and are sometimes referred to as the Athelstane Moraines. As the Green Bay Lobe receded, meltwaters carried sand and gravel outwash sediments to lower-lying areas. The outwash buried broken ice that melted, collapsed the surface, and created extensive pitted outwash plains that occur between the high elevation moraines and heads-of-outwash. More than 50% of this land region is covered in outwash sediments, and most of the outwash is pitted or collapsed. The southeast portions of this MLRA are dominated by glacial lake sediments. Glacial Lake Oshkosh covered a portion of this MLRA when it was at its largest extent (1.4 million acres). The lake deposited silts and clays along the southeast portion of the inland section of this MLRA. Beach terraces, ridges, and dunes were also formed by the lake. In the Lake Michigan coastal section of this MLRA, Glacial Lake Nipissing deposited a level lake plain full of sandy lacustrine material that overlies dolomite and limestone bedrock. Glacial Lake Nipissing was a postglacial lake that occurred in the Lake Michigan Basin as the Lake Michigan Lobe was receding. Wetlands are abundant in this area of the MLRA. In the north section, Glacial Lake Dunbar formed when ice dams impounded glacial meltwater between the Athelstane Moraine and the Inner Athelstane Moraine. This glacial lake deposited small areas of level sandy lacustrine materials. The northeast section of this MLRA is a till plain that formed in later advances of the Green Bay Lobe. Some pitted outwash is present, but the till plain is much more exposed here than elsewhere in the MLRA. The till deposited throughout 94B is primarily sandy, dolomitic till. The dolomite was scraped off the Niagara Escarpment as the Green Bay Lobe moved across it. In some areas, the carbonates are deeply leached. Historically, this MLRA was dominated by a mixture of northern hardwood forests, Jack pine-scrub oak barrens, and forested coniferous wetlands at 30%, 29%, and 20%, respectively. White pine (Pinus strobus) and red pine (Pinus resinosa) were dominant tree species and covered an estimated 15% of the area. Northern hardwood forests were dominated by eastern white pine, eastern hemlock (Tsuga canadensis), and American beech (Fagus grandifolia). The Jack pine-scrub oak barrens were dominant in the sandy portions of this MLRA. Forested coniferous wetlands were occupied by norther white-cedar (Thuja occidentalis), black spruce (Picea mariana), and tamarack (Larix laricina).

Classification relationships

Relationship to Established Framework and Classification Systems: Habitat Types of N. Wisconsin (Kotar, 2002): Tsuga/Maianthemum-Coptis (TMC), Acer-Tsuga/Athyrium-Onoclea (ATAtOn) Biophysical Settings (Landfire, 2014): Laurentian-Acadian Northern Hardwoods Forest, Laurentian-Acadian Alkaline Conifer-Hardwood Swamp, Laurentian-Acadian Sub-boreal Aspen-Birch Forest WDNR Natural Communities (WDNR, 2015): Northern Mesic Forest Hierarchical Framework Relationships: Major Land Resource Area (MLRA): Michigan Eastern Upper Peninsula MLRA (94B) USFS Subregions: Athelstane Sandy Outwash and Moraines (212Tc) Wisconsin DNR

Ecological Landscapes: Northeast Sands

Ecological site concept

The Moist Loamy Lowland ecological site accounts for approximately 7,000 acres in MLRA 94B, or about 0.7% of total land area. It is the third-least extensive site in MLRA 94B. It is found in depressions and drainageways on moraines, lake plains, and outwash plains throughout the MLRA. These sites are characterized by moderately deep to very deep, somewhat poorly drained, loamy soils. Precipitation, runoff from adjacent uplands, and groundwater discharge are the primary sources of water. Soils are very strongly acid to moderately alkaline. These sites can support vegetative communities with higher nutrient requirements than their Moist Sandy Lowland counterparts.

Associated sites

F094BY002MI	**Mucky Swamp** Mucky Swamp are wetland sites occupying landscape depression and drainageways. They form in deep, herbaceous organic deposits and are very poorly drained. They occupy the lowest, wettest positions along the same drainage sequence as Moist Loamy Lowland and are sometimes found directly adjacent to Moist Loamy Lowland.
F094BY005MI	**Wet Loamy Lowland** Wet Loamy Lowland are sites that occupy landscape depressions on moraines, lake plains, or outwash plains. They are very poorly to poorly drained. They occupy the lower, wetter positions along the same drainage sequence as Moist Loamy Lowland.
F094BY009MI	**Loamy Upland** Loamy Upland are found in upland landscape positions on moraines, lake plains, and outwash plains. They are moderately well to somewhat excessively drained. They occupy the higher, drier positions along the same drainage sequence as Moist Loamy Lowland and are often found directly adjacent to Moist Loamy Lowland.
F094BY010MI	**Clayey Upland** Clayey Upland are found in upland landscape positions on moraines, drumlins, and lake plains. They are moderately well to well drained. They occupy the higher, drier positions along the same drainage sequence as Moist Loamy Lowland.

Similar sites

F094BY006MI	**Moist Sandy Lowland** Moist Sandy Lowland are found in lower landscape positions on outwash plains. They are somewhat poorly drained. They are very similar to Moist Sandy Lowland except have coarser textures and a lower nutrient status.

Table 1. Dominant plant species

Tree	(1) *Acer rubrum* (2) *Acer saccharum*
Shrub	(1) *Corylus cornuta* (2) *Ilex verticillata*

Herbaceous	(1) *Dryopteris* (2) *Anemone quinquefolia*

Physiographic features

This site is found on moraines, lake plains, outwash plains, and stream terraces in lower landscape positions throughout the MLRA. Slopes range from 0 to 4 percent.

This site is subject to neither flooding nor ponding. The soil has evidence of a seasonally-high water table within 12 inches (30 cm) of the surface, though the actual water table may be found at greater depths when conditions are dry. The water table may sometimes be perched (episaturated) on bedrock or dense, clayey layers. Runoff potential is generally low or medium but may be high where the soil surface is silty and the slope is relatively steep.

Table 2. Representative physiographic features

Hillslope profile	(1) Footslope
Slope shape across	(1) Concave
Slope shape up-down	(1) Linear
Landforms	(1) Depression (2) Drainageway (3) Outwash plain (4) Stream terrace (5) Moraine (6) Lake plain (7) Flat
Runoff class	Low to high
Flooding frequency	None
Ponding frequency	None
Elevation	200 – 260 m
Slope	0 %
Water table depth	10 – 30 cm

Aspect	Aspect is not a significant factor

Climatic features

The continental climate of the Michigan Eastern Upper Peninsula MLRA is typical of northern Wisconsin: cooler summers, colder winters, and shorter growing seasons.

Table 3 Representative climatic features

Frost-free period (characteristic range)	100-110 days
Freeze-free period (characteristic range)	130-140 days
Precipitation total (characteristic range)	760-790 mm
Frost-free period (actual range)	100-110 days
Freeze-free period (actual range)	120-140 days
Precipitation total (actual range)	760-810 mm
Frost-free period (average)	100 days
Freeze-free period (average)	130 days
Precipitation total (average)	790 mm

- (1) CRIVITZ HIGH FALLS [USC00471897], Crivitz, WI
- (2) BREED 6 SSE [USC00471044], Suring, WI
- (3) SURING [USC00478376], Suring, WI

Influencing water features

Water is received through precipitation, runoff from adjacent uplands, and groundwater discharge. Water levels are greatly influenced by precipitation rates and runoff from upland sites. Water leaves the site primarily through runoff, evapotranspiration, and groundwater recharge.

Wetland description

Permeability of these sites is impermeable to moderately slow.
Hydrologic Group: A/D, B/D, C/D
Hydrogeomorphic Wetland Classification: None
Cowardin Wetland Classification: None

Soil features

The soils of this site are represented by the Banat, Crossett, Gaastra, Lablatz, Peshtigo, Robago, Selkirk, Wayka, and Worcester soil series. Endoaquods make up 44% of the acreage of this site. Glossudalfs make up 26%. Endoaqualfs make up 20%. Epiaquods make up 9%.

These sites form in loamy outwash and till or silty and clayey lacustrine deposits. Some sites are underlain by sandy and gravelly outwash. Soils generally lack bedrock contact within two meters, though some sites in Menominee county have contact with granitic bedrock as high as 27in. Soils are somewhat poorly drained and do not meet hydric soil conditions.

The surfaces of these soils may be sandy loam to silt loam. The subsurface may be sand to clay. Small fragments (gravel) may occupy up to 24 percent volume of the substratum. Soils are very strongly acid to moderately alkaline. Accumulations of secondary carbonates may be found soils in northern Marinette county and may occupy up to 15 percent volume.

Figure 7. Banat Soil Series sample taken in Marinette County, WI on 06/19/2020. Courtesy of UWSP.

Table 4. Representative soil features

Parent material	(1) Till (2) Outwash (3) Lacustrine deposits
Surface texture	(1) Sandy loam (2) Loam (3) Silt loam
Drainage class	Somewhat poorly drained
Permeability class	Very slow to moderately slow
Soil depth	70 – 200 cm
Surface fragment cover <=3"	0 – 10 %
Surface fragment cover >3"	Not specified
Available water capacity (0-152.4cm)	9.4 – 28.96 cm
Soil reaction (1:1 water) (0-101.6cm)	4.6 – 7.9

Subsurface fragment volume <=3" (Depth not specified)	0 – 20 %
Subsurface fragment volume >3" (Depth not specified)	0 – 10 %

Ecological dynamics

Historically, mature forests on this ecological site were dominated by shade tolerant sugar maple and hemlock, often with an admixture of yellow birch (Wilde, 1933, Finley, 1976). This association was self-maintained with new cohorts of advance regeneration gaining canopy status through gaps formed by small-scale disturbances and natural mortality in the dominant canopy. Scattered large individuals of less shade tolerant white pine also were a common component of mesic hardwood forests. These presumably became established following relatively rare disturbances that included fire (Schulte and Mladenoff, 2005). It is now uncommon to find large stands containing hemlock.

Current stands on this Ecological Site represent the entire array of potential successional stages from pure aspen, or aspen-white birch, stands to sugar maple dominated mixed northern hardwoods stands. Succession to sugar maple dominance is evident everywhere that seed sources are present. However, hemlock regeneration is scarce. In old forests, hemlock finds optimal conditions for germination and seedling establishment on rotten logs, stumps and mounds that normally have warmer surfaces and better moisture retention than the forest floor (USDA, 1990). Most present forest communities lack these conditions.

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 3.1 plant community composition

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

Inventory data references

Plot and other supporting inventory data for site identification and community phases is located on a NRCS North Central Region shared and one drive folder. University Wisconsin-Stevens Point described soils, took photographs, and inventoried vegetation data at community phases within the reference state. The data sources include WI ESD Plot Data Collection Form - Tier 2, Releve Method, NASIS pedon description, NRCS SOI 036, photographs, and Kotar Habitat Habitat Types of N. Wisconsin (Kotar, 2002): Tsuga/Maianthemum-Coptis (TMC), Acer-Tsuga/Athyrium-Onoclea (ATAtOn) Biophysical Settings (Landfire, 2014): Laurentian-Acadian Northern Hardwoods Forest, Laurentian-Acadian Alkaline Conifer-Hardwood Swamp, Laurentian-Acadian Sub-boreal Aspen-Birch Forest WDNR Natural Communities (WDNR, 2015): Northern Mesic Forest

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Contributors

Bryant Scharenbroch, Assistant Professor at University of Wisconsin Stevens Point
Jacob Prater, Associate Professor at University of Wisconsin Stevens Point
John Kotar, Ecological Specialist, independent contractor

Approval

Suzanne Mayne-Kinney, 11/16/2023

Acknowledgments

NRCS contracted UWSP to write ecological sites in MLRA 94B, completed in 2021.

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	08/29/2026
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):**

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):**

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:

17. **Perennial plant reproductive capability:**