Ecological site F094BY004MI
Wet Sandy Lowland

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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): 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), Abies-Thuja-Acer/Acer (AbThArAsp), Acer-Abies/Vaccinium-Coptis (ArAbVC), Acer-Tsuga/Athyrium-Onoclea (ATAtOn) Biophysical Settings (Landfire, 2014): Laurentian-Acadian Alkaline Conifer-Hardwood Swamp, Laurentian-Acadian Floodplain Forest WDNR Natural Communities (WDNR, 2015): Northern Hardwood Swamp Hierarchical Framework Relationships: Major Land Resource Area (MLRA): Michigan Eastern Upper Peninsula MLRA (94B) USFS Subregions: Athelstane Sandy Outwash and Moraines (212Tc)

Ecological site concept

The Wet Sandy Lowland ecological site accounts for approximately 12,000 acres in MLRA 94B, or about 1.1% of total land area. It is found in depressions and drainageways primarily on pitted outwash plains. This site is characterized by very deep, poorly drained, sandy soils. Some sites are subject to frequent ponding in the spring and fall. Soils remain saturated for long periods during the growing season and meet hydric soil requirements. Precipitation, runoff from adjacent uplands, groundwater discharge, and stream inflow are the primary sources of water. These sites are wetlands.

Associated sites

F094BY001MI	**Poor Fen** Poor Fen are wetland sites occupying landscape depressions and drainageways. They form in deep, herbaceous organic deposits and are very poorly drained. These sites have limited interaction with groundwater and are very acidic (dysic). They are found in lower positions along the same drainage sequence as Wet Sandy Lowland.
F094BY006MI	**Moist Sandy Lowland** Moist Sandy Lowland are found in lower landscape positions on outwash plains. They are somewhat poorly drained. They are found in higher positions along the same drainage sequence as Wet Sandy Lowland.
F094BY008MI	**Sandy Upland** Sandy Upland are found in upland landscape positions on outwash plains, stream terraces, sandy lake plains, and moraines. They are moderately well to somewhat excessively drained. They are found in higher positions along the same drainage sequence as Wet Sandy Lowland.
F094BY011MI	**Dry Upland** Dry Upland are found in upland landscape positions on outwash plains and stream terraces. They are excessively drained. They are occupy the highest positions along the same drainage sequence as Wet Sandy Lowland.

Similar sites

F094BY003MI	**Floodplain** These sites are found on floodplains adjacent to streams and rivers. They form in sandy to loamy alluvium deposits. They are seasonally flooded with flooding durations lasting up to a month. They are poorly to moderately well drained. Some sites are wetlands. They sometimes support vegetative communities similar to those supported by Wet Sandy Lowland.
F094BY005MI	**Wet Loamy Lowland** Wet Loamy Lowland are wetland sites that occupy landscape depressions on moraines, lake plains, or outwash plains. They are very poorly to poorly drained. They are very similar to West Sandy Lowland except have finer textures and a high nutrient status.

Table 1. Dominant plant species

Tree	(1) *Acer rubrum* (2) *Abies balsamea*

Shrub	(1) *Corylus cornuta*
Herbaceous	(1) *Maianthemum canadense* (2) *Pteridium aquilinum*

Physiographic features

This site is found in depressions and drainageways on outwash plains, moraines, and lake plains. Slopes range from 0 to 2 percent. Elevation of the landform ranges from 557 to 972 feet above sea level.

Some sites are subject to frequent ponding. Ponding may last between 7 and 30 days. The soil has an apparent seasonally-high water table (endosaturation) at the surface. The water table may drop in dry conditions. Runoff potential is negligible to low.

Table 2. Representative physiographic features

Hillslope profile	(1) Toeslope
Slope shape across	(1) Concave
Slope shape up-down	(1) Concave
Landforms	(1) Depression (2) Drainageway (3) Moraine (4) Lake terrace (5) Outwash plain
Runoff class	Negligible to low
Flooding frequency	None
Ponding duration	Long (7 to 30 days)
Ponding frequency	None to frequent
Elevation	170 – 300 m
Slope	0 %
Ponding depth	0 – 30 cm

Water table depth	0 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. This site occurs on landscape depressions and may have a microclimate with shorter freeze-free and frost-free periods than what is represented by the weather station data.

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) SURING [USC00478376], Suring, WI
- (3) BREED 6 SSE [USC00471044], Suring, WI

Influencing water features

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

Wetland description

Under the Cowardin System of Wetland Classification, or National Wetlands Inventory (NWI), the wetlands can be classified as:
1) Palustrine, forested, broad-leaved deciduous, saturated, or
2) Palustrine, scrub-shrub, broad-leaved deciduous, saturated, or
3) Palustrine emergent, persistent, saturated

Under the Hydrogeomorphic Classification System (HGM), the wetlands can be classified as:

1) Depressional, forested/organic, or
2) Depressional, scrub-shrub/organic

Permeability of the soils is impermeable to moderately rapid.
Hydrologic Group: A/D, C/D
Hydrogeomorphic Wetland Classification: Depressional, forested/organic; Depressional, scrub-shrub/organic
Cowardin Wetland Classification: PFO1B, PSS1B, PEM1B

Soil features

The soils of this site are represented by the Deford, Kinross, Pinconning, and Roscommon soil series, classified as Typic Psammaquents, Mollic Psammaquents, Typic Endoaquods, and Mollic Epiaquents, respectively. Psammaquents make up 84% of the acreage of this site.

These sites primarily form in sandy outwash deposits. They lack bedrock within 6.5 feet (two meters). They are poorly drained and meet hydric soil requirements.

The surfaces of these soils are sand to loamy sand, sometimes mucky. The substratum is generally sand or loamy sand, though a few sites in northwestern Marinette county have subsurface horizons composed of clayey lacustrine deposits. Small fragments (gravel) may occupy up to 5 percent of the substratum. Soils are extremely acid to moderately alkaline. Secondary carbonates may occupy up to 19 percent volume.

Figure 7. Kinross Soil Series sample taken in Marinette County, WI on 06/25/2020. Courtesy of UWSP.

Table 4. Representative soil features

Parent material	(1) Outwash (2) Lacustrine deposits
Surface texture	(1) Mucky sand (2) Mucky loamy sand
Drainage class	Poorly drained
Permeability class	Very slow to moderately rapid
Soil depth	200 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-152.4cm)	10.41 – 14.73 cm

Calcium carbonate equivalent (0-101.6cm)	0 – 20 %
Soil reaction (1:1 water) (0-101.6cm)	0 – 7.9
Subsurface fragment volume <=3" (0-2.5cm)	0 – 10 %
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

In pre-European settlement time wildfire was the main controlling factor of forest community dynamics. Following a severe, stand-replacing fire, any of the species present on the landscape could become established, depending on seed source availability and specific conditions of post-fire seedbed. The newly established young stands of any species were easily eliminated by recurring fires, but differences in fire-resisting properties among the species began to play a role in any species' survival success. Many pine and oak species were dominant in the region because of their fire-resistant properties and successful regeneration post-fire. With clear cutting and continued fire suppression, many of the species that are fire-tolerant and intolerant of shade, are replaced by other species. Species such as white pine and red oak are still common on the landscape based on their tolerance to some shade; these species may establish under a canopy, and in time, may become a component of the canopy. Red maple is sensitive to fire, but in its absence, it has the ability to dominate sites based on its shade tolerance and prolific seed production.

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 (%)

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): Acer-Tsuga/Dryopteris-Hydrophyllum (ATDH), Acer-Tsuga/Athyrium-Onoclea (ATAtOn) Biophysical Settings (Landfire, 2014): Laurentian-Acadian Floodplain Forest, Laurentian-Acadian Alkaline Conifer-Hardwood Swamp WDNR Natural Communities (WDNR, 2015): Floodplain 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
Kade Anderson, NRCS Ecologist

Approval

Suzanne Mayne-Kinney, 11/16/2023

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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	08/30/2026
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:**