Ecological site F094DY004WI
Mucky Peat Bogs

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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): 094D–Northern Highland Sandy Pitted Outwash

The Northern Highland Sandy Drift region (also referred to as MLRA 94D) lies mostly in northern Wisconsin with a few narrow outwash channels extending into the upper peninsula of Michigan. MLRA 94D encompasses 1.364 million acres and is surrounded by much larger, geologically different MLRAs. MLRA 94D is characterized mainly by sandy and gravelly soils formed in outwash sediments deposited by melt-water streams from late Wisconsin-Age glaciers, which receded from the area about 10,000 years before present (Attig 1985). The Mucky Peat Bogs ecological site occupies about 80,000 acres in MLRA 94D.

Classification relationships

This ecological site is one of four non-floodplain peatland ecological sites that are closely identified with MLRA 94D but occur beyond the borders of 94D. The soil components (all Histosols) found on this site occur across the northern tier of states from the northeast to the Midwest, as do other many peatland soil series. Most of Histosol soil series were first correlated in Michigan, as were some in Minnesota, but it was common practice to correlate these peatland soils across the widest extent possible, while accounting for local or regional variation in the map unit descriptions.

Ecological site concept

ATTENTION: This ecological site meets the NESH 2014 requirements for PROVISIONAL. A provisional ecological site is established after broad ecological site concepts are identified and an initial state-and-transition model is drafted. Following quality control and quality assurance reviews of the ecological site concepts, an identification number and name for the provisional ecological site are entered into ESIS. A provisional ecological site may include literature reviews, land use history information, some soils data, legacy data, ocular estimates for canopy and/or species composition by weight, and even some line-point intercept information. A provisional ecological site does not meet the NESH 2014 standards for an Approved ESD, but does provide the conceptual framework of soil-site correlation for the development of the ESD. For more information about this ecological site, please contact your local NRCS office. The modal concept for Mucky Peat Bogs is a peatland that has highly acidic conditions but receives enough nutrients and drains well enough to produce a growing forest of black spruce (Picea mariana) and tamarack (Larix laricina). On this ecological site, Sphagnum moss thickness has not reached the level where access to nutrients is severely restricted as it is on Peat Bog ecological sites. Also, sufficient aeration of the root zone occurs on this site to allow for moderately productive tree growth for at least the aforementioned species. The resulting closed canopy forest can prevent Sphagnum moss from dominating the site, as those moss plants are shade intolerant. Also, the understory in general has fewer species compared to more nutrient-rich or open-canopy sites. The organic soils on this site have thin moss peat layer over well decomposed organic material of mainly herbaceous origin and the soil pH is below 4.5, an indication of low groundwater input from mineral uplands. However with abundant trees, nitrogen-fixing lichen habitat is increased, and therefore more productivity boosting nitrogen is leached into root zone from lichens on this site than on less densely forested sites.

Table 1. Dominant plant species

Tree	(1) *Picea mariana* (2) *Larix laricina*
Shrub	(1) *Chamaedaphne calyculata* (2) *Nemopanthus mucronatus*

Herbaceous	(1) *Sphagnum magellanicum* (2) *Carex trisperma*

Physiographic features

Mucky Peat Bogs often lie a little lower on the landscape than Peat Bogs. This elevational difference between Mucky Peat Bogs and Peat Bogs occurs on both large glacial landforms and within larger peatland complexes. Even this slight amount of relief results in a richer site for Mucky Pet Bogs due to increased groundwater inflow.

Figure 1. Peatland ecological sites on pitted outwash

Table 2. Representative physiographic features

Landforms	(1) Depression
Flooding frequency	None
Ponding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Ponding frequency	Occasional to frequent
Elevation	420 – 570 m
Slope	0 %
Ponding depth	0 – 20 cm
Water table depth	0 – 30 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate is humid continental with very cold winters and warm summers. As is common across northern Wisconsin, two-thirds of the precipitation falls as rain during the relatively short growing season of late May to early September. Most of the rainfall is transpired by plants. Snow cover is likely in the months of November through April. Snow cover prevents deep frost penetration which promotes groundwater recharge. The microclimate on this site slightly cooler than the local climate due to wetness and cold air drainage.

Table 3 Representative climatic features

Frost-free period (average)	110 days
Freeze-free period (average)	130 days

Precipitation total (average)	840 mm

- (1) EAGLE RIVER [USC00472314], Eagle River, WI
- (2) MINOCQUA [USC00475516], Minocqua, WI
- (3) REST LAKE [USC00477092], Manitowish Waters, WI
- (4) RHINELANDER [USC00477113], Rhinelander, WI

Influencing water features

This is a wetland site, in which the properties are determined by the quantity and quality of water it receives, and by which means the water leaves the system. The source of most the water arriving on this site is precipitation. However, most importantly, groundwater inflow and outflow rates, as evidenced by the vegetation, are hypothetically greater on the Mucky Peat Bog ecological site than for the Peat Bog ecological site. Also, this site is likely to have a greater outflow rate through evapotranspiration because of higher plant productivity. Surface water outlets are uncommon but not unknown, and in addition, fluctuating water levels in lakes and flowages may also impact drainage on some parts of these sites. The net effect of more groundwater input and more efficient outflow is a more productive site.

Soil features

This site has Histosols with highly variable organic material depth, the deeper organic soil is the Loxley and similar soils component, and the shallowest component is Dawson and similar soils. The thickness of organic layers ranges from 17 inches to greater than 6 feet. In contrast to Peat Bog ecological sites, the live and dead Sphagnum moss thickness on these sites is only in 6 to 12 inch range, probably as a result of shading by trees. The rest of the organic soil material is black muck. Beneath the organic soil layers is the sandy substratum at some variable depth. The vegetation does not appear to change fundamentally across this site with changes in the thickness of the organic soil material, until an aerated root zone reaches the mineral soil horizons. This crosses a boundary to a different ecological site. The key soil variables on this site are pH and wetness. A pH of less than 4.5 is most common, although some soil layers may exceed that level. The water table in this soil drops low enough and long enough for a productive forest to grow. But low nutrient levels restrict the number of tree species that will thrive on the site to two--black spruce and tamarack.

Table 4. Representative soil features

Surface texture	(1) Mucky peat
Drainage class	Very poorly drained
Permeability class	Moderately slow to moderately rapid
Soil depth	200 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	25.4 – 38.1 cm

Calcium carbonate equivalent (0-101.6cm)	Not specified
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	0 – 4.6
Subsurface fragment volume <=3" (Depth not specified)	Not specified
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

Mucky Peat Bog ecological sites are related to Peat Bogs in that they have many species in common but Mucky Peat Bogs are much richer sites in terms of tree growth rate. Again, this is likely due to the greater groundwater contribution found in Mucky Peat Bogs over Peat Bogs. On productive forest sites, as tree canopy cover increases, Sphagnum dominance decreases, due to less light penetration to the ground. Less Sphagnum means less negative feedback to tree growth. Sphagnum moss is very efficient at intercepting nutrients from precipitation before they reach the root zone, and this cation-exchange process also acidifies the soil; both processes are adverse to trees. On the other hand, as lichen habitat increases through more trees per acre, nutrients leached from lichens into the soil further increase forest productivity. Also, a productive forest transpires enough water to maintain an aerated root zone. Thus, these two positive feedbacks enhance forest productivity on this site.

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 2.2 plant community composition

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

Table 9. Community 3.1 plant community composition

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

Table 10. Community 3.2 plant community composition

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

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Contributors

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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	
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:**

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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:**
