

Ecological site R111XB003IN

Deep Muck

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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): 111X–Indiana and Ohio Till Plain

111B – Indiana and Ohio Till Plain, Northeastern Part. This area is in the Eastern Lake and Till Plains Sections of the Central Lowland Province of the Interior Plains. The entire MLRA is glaciated, and most areas are dominated by ground moraines that are broken in places by lake plains, outwash plains, flood plains, and many recessional moraines. The ground moraines and lake plains in front of the recessional moraines are flat to undulating. In many places stream valleys occur at the leading edge of the recessional moraines. Narrow, shallow valleys commonly are along the major rivers and streams in this MLRA, and some areas along the major rivers and streams have deposits of sand. Elevation ranges from 630 to 1,550 feet (190 to 470 meters), increasing gradually from west to east. Relief is mainly a few meters, but in some areas hills rise as much as 100 feet (30 meters) above the adjoining plains. The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Western Lake Erie (0410), 41 percent; Wabash (0512), 28 percent; Scioto (0, 28 percent; Scioto (0506), 10 percent; St. Clair-Detroit (0409), 9 percent; Great Miami (0508), 6 percent; Southeastern Lake Michigan (0405), 5 percent; and Southwestern Lake Huron (0408), 1 percent. The Huron River in Michigan, Cedar Creek in Indiana, and the Sandusky River in Ohio have been designated as National Wild and Scenic Rivers in this MLRA. The surficial materials in this area include glacial deposits of till, outwash, and lacustrine sediments from Wisconsin and older glacial periods. A thin mantle of loess occurs in some areas. Most of the MLRA is underlain by Silurian and Devonian limestone and dolostone. Middle Devonian to Early Mississippian black shale and Early to Middle Mississippian siltstone and shale are in some areas of the northern part of the MLRA.

Classification relationships

Major Land Resource Area (USDA-Natural Resources Conservation Service, 2006) USFS Ecological Regions (USDA, 2007): Sections –Central Till Plains, Beech Maple (222H), South Central Great Lakes (222J) Subsections – Bluffton Till Plains (222Ha), Bluffton-Ann Arbor Till Plains (222Je), Jackson Interlobate Moraine (222Jg), Steuben Interlobate Moraines (222Ji) NatureServe Systems anticipated (NatureServe, 2011): Agriculture - Cultivated Crops and Irrigated Agriculture, Agriculture – Pasture/Hay, Appalachian (Hemlock)-Northern Hardwood Forest, North-Central Interior Beech-Maple Forest, North-Central Interior Floodplain LANDFIRE Biophysical Settings anticipated (USGS, 2010): Central Interior and Appalachian Floodplain Systems, North-Central Interior Beech-Maple Forest

Ecological site concept

This site is a wetland site formed on very deep herbaceous organic soil parent material in depressions on lake and till plains that are very poorly drained. Fire was the historic disturbance mechanism of the site and was driven by the seasonal presence of water on the site. In the spring and early summer, the site is often ponded to a depth of 30 inches for long stretches of time. The water table recedes as the summer progresses creating a much drier situation that increases the susceptibility of the site to fire. The seasonal flooding and fire return interval of about 15 years created a situation where the site is dominated by herbaceous vegetation. The characteristic vegetation is herbaceous in nature, mostly dominated by bulrushes and cattails, with a number of sedge species being also being present. The influence of water via flooding and ponding along with fire maintain the herbaceous species dominance of the site. The absence of fire will lead this site to being converted to woodland and then potentially a closed canopy forest. The lack of fire will allow hydrophilic shrub species to get established, further altering the fire cycle. Continued absence of fire will have the site progress to a forest dominated by wetland tree species such as elm and ash. Currently, a large percentage of the site is in agricultural production, notably corn and soybean rotations, after the installation of drainage. These sites can be very productive, once drained, due in large part to the high amounts of organic matter. Invasive species, specifically phragmites, can invade and come to dominate the site in the absence of management to curtail or prevent its establishment and proliferation.

Associated sites

R111XB001IN	Mineral Muck Mineral Muck. Underlain by mineral soil.
R111XB002IN	Limnic Muck Limnic Muck. Underlain by coprogenous earth
F111XB501IN	Till Depression Till Depression. On till parent material

Similar sites

R111XB001IN	Mineral Muck Mineral Muck.
R111XB002IN	Limnic Muck Limnic Muck.
R111XB401IN	Wet Outwash Mollisol Wet Outwash Mollisol.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Scirpus</i> (2) <i>Typha latifolia</i>

Physiographic features

This site is located in the 111B - Indiana and Ohio Till Plain, Northeastern Part MLRA. This site was formed on herbaceous organic material and the underlying material is not limnic (coprogenous earth) or mineral soil. It is located in closed depressions on bogs, depressions, and moraines.

Figure 1. Block diagram with Houghton representing the site on the landscape.

Table 2. Representative physiographic features

Landforms	(1) Bog (2) Moraine (3) Depression
Runoff class	Negligible to low
Flooding frequency	None
Ponding duration	Long (7 to 30 days) to very long (more than 30 days)
Ponding frequency	None
Elevation	180 – 430 m
Slope	0 %
Ponding depth	0 – 80 cm
Water table depth	0 – 30 cm
Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation in this area is 30 to 39 inches (760 to 990 millimeters). Most of the rainfall occurs as convective thunderstorms during the growing season. About half or more of the annual precipitation occurs during the freeze-free period. Snowfall is common in winter. The average annual temperature is 47 to 52 degrees F (8 to 11 degrees C). The freeze-free period averages about 180 days and ranges from 165 to 195 days.

Table 3 Representative climatic features

Frost-free period (characteristic range)	130-150 days
Freeze-free period (characteristic range)	160-180 days
Precipitation total (characteristic range)	860-990 mm
Frost-free period (actual range)	110-150 days
Freeze-free period (actual range)	140-180 days

Precipitation total (actual range)	810-1,020 mm
Frost-free period (average)	140 days
Freeze-free period (average)	170 days
Precipitation total (average)	940 mm

- (1) PONTIAC OAKLAND CO INTL AP [USW00094817], Waterford, MI
- (2) MANCHESTER [USC00205050], Manchester, MI
- (3) GARRETT 1 S [USC00123207], Garrett, IN
- (4) MARION 2 N [USC00125337], Marion, IN
- (5) CELINA 3 NE [USC00331390], Celina, OH
- (6) UPPER SANDUSKY [USC00338534], Upper Sandusky, OH
- (7) MARYSVILLE [USC00334979], Marysville, OH

Influencing water features

These wetland systems are groundwater-dependent as well as being, generally, the lowest point in the landscape. Water levels fluctuate seasonally, reaching their peak in spring and lows in late summer. Ponding can occur on the site, generally in the spring, to a depth of 30 inches and can have a very long duration (> 30 days). Water levels typically remain at or near the soils surface throughout the year.

Wetland description

The hydrogeographic model classification for this site is DEPRESSION: Muck, Ground Water Influenced, Ponded; herbaceous. . This site has a Cowardin Classification of PEM1Eg; it is a Palustrine system with persistent, emergent vegetation that is seasonally flooded/saturated on organic soil.

Soil features

The soil series associated with this site are: Napoleon, Houghton, Carlisle, Boots. They are very deep, very poorly drained, and moderate to rapid permeable soils, with very acidic soil reaction, that formed in herbaceous organic material or woody organic material.

Parent Materials Kind: herbaceous and woody organic material

Surface Texture: silty clay loam

Subsurface Texture group: loamy

Figure 8. Mapunit locations in the MLRA.

Table 4. Representative soil features

Parent material	(1) Organic material
Drainage class	Very poorly drained
Permeability class	Moderate to rapid
Soil depth	200 cm

Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (Depth not specified)	34.54 – 47.5 cm
Calcium carbonate equivalent (Depth not specified)	Not specified
Electrical conductivity (Depth not specified)	Not specified
Sodium adsorption ratio (Depth not specified)	Not specified
Soil reaction (1:1 water) (Depth not specified)	4.1 – 7.2
Subsurface fragment volume <=3" (Depth not specified)	0 – 20 %
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

The historic plant community of the Deep Muck ecological site is a deep muck prairie. This site is characterized by the soil parent material being composed of herbaceous organic matter. The plant community is dominated by bulrush species, cattails, and sedge species. The site is located in closed depression areas associated with bogs, depressions, and moraine landforms. Being the lowest portion of the local landscape, the site is dependent upon groundwater and its fluctuation, which reaches its peak in the spring and low in the late summer. This fluctuation and dominate herbaceous species create a fire dependent system. Replacement fires about every 15 years and seasonal flooding worked in concert to drive the species dominance and richness of the 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 (%)
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Table 6. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 7. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 9. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 10. Community 4.1 plant community composition

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

Site concept developed through expert opinion, review of the literature, and field reconnaissance.

Other references

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Approval

Greg Schmidt, 9/11/2024

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.

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Contact for lead author	
Date	09/01/2026
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:
