

# Ecological site R111XC013IN

## Deep Muck

Accessed: 06/30/2024

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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

A PROVISIONAL ECOLOGICAL SITE is a conceptual grouping of soil map unit components within a Major Land Resource Area (MLRA) based on the similarities in response to management. Although there may be wide variability in the productivity of the soils grouped into a Provisional Site, the soil vegetation interactions as expressed in the State and Transition Model are similar and the management actions required to achieve objectives, whether maintaining the existing ecological state or managing for an alternative state, are similar. Provisional Sites are likely to be refined into more precise group during the process of meeting the APPROVED ECOLOGICAL SITE DESCRIPTION criteria.

This PROVISIONAL ECOLOGICAL SITE has been developed to meet the standards established in the National Ecological Site Handbook. The information associated with this ecological site does not meet the Approved Ecological Site Description Standard, but it has been through a Quality Control and Quality Assurance processes to assure consistency and completeness. Further investigations, reviews and correlations are necessary before it becomes an Approved Ecological Site Description.

111C – Indiana and Ohio Till Plain, Northwestern Part. This MLRA is in the glaciated part of north-central Indiana and is dominated by glacial till plains broken in places by lake plains, outwash plains, and flood plains. Areas that parallel most of the major rivers and streams have deposits of sand.

Although it is an important agricultural region, MLRA 111C hosts a large proportion of Indiana's biodiversity.

### Classification relationships

Major Land Resource Area (MLRA)(USDA-Natural Resources Conservation Service, 2006)

USFS Ecological Regions (USDA, 2007):

Sections - Central Till Plains, Beech Maple (222H), South Central Great Lakes (222J), Central Till Plains and Grand Prairies (251D)

Subsections - Kalamazoo-Elkhart Moraines and Plains (222Jh), Steuben Interlobate Moraines (222Ji), Bluffton Till Plains (222Ha), Entrenched Valleys (222Hf), Miami-Scioto Plain-Tipton Till Plain (222Hb), Kankakee Sands (251Dg) and Eastern Grand Prairie (251Dd).

NatureServe Systems anticipated (NatureServe, 2011): Agriculture-Pasture/Hay, Agriculture-Cultivated Crops and Irrigated Agriculture, Central Tallgrass Prairie, Laurentian-Acadian Wet Meadow-Shrub Swamp, North-Central Interior and Appalachian Acidic Peatland, North-Central Interior Freshwater Marsh, North-Central Interior Wet Meadow-Shrub Swamp.

LANDFIRE Biophysical Settings anticipated (USGS, 2010): Central Interior and Appalachian Swamp Systems,

Central Interior and Appalachian Shrub-Herbaceous wetland systems, North Central Wet Flatwoods, Central Tallgrass Prairie, Great Lakes Wet-Mesic Lakeplain Prairie, Laurentian-Acadian Shrub-Herbaceous Wetland Systems.

## Ecological site concept

This site is an upland site formed on very deep herbaceous organic soil parent material in depressions on lake and till plains that are very poorly drained. There are 4 distinct states: 1. deep muck wetland, 2. fire suppressed state, 3. agriculture state and 4. invaded state. This is a fire dependent community in which regular fires allowed for the dominance of herbaceous species. Currently almost 80% of the site is in agricultural production.

## Associated sites

R111XC011IN	<b>Limnic Muck</b> Soils underlain by marly materials. Dominated by grass species.
R111XC012IN	<b>Mineral Muck</b> Soils underlain by mineral materials. Dominated by grass species.

## Similar sites

R111XC005IN	<b>Glacial Depression</b> Soils types differ greatly; this one is till parent material. Site dominated by prairie grasses.
R111XC002IN	<b>Wet Sandy Interdune</b> Soils types differ greatly; this one is sandy parent material. Site dominated by prairie grasses.

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 111C - Indiana and Ohio Till Plain, Northwestern Part MLRA. This site was formed on herbaceous organic material that extends at least 51 inches. It is located in closed depressions on till plains, lake plains, and flood plains.

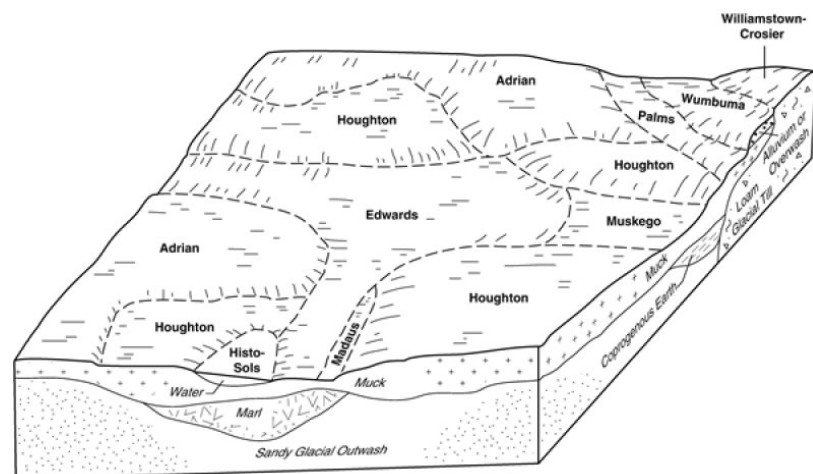


Figure 1. Houghton shows position of site

Table 2. Representative physiographic features

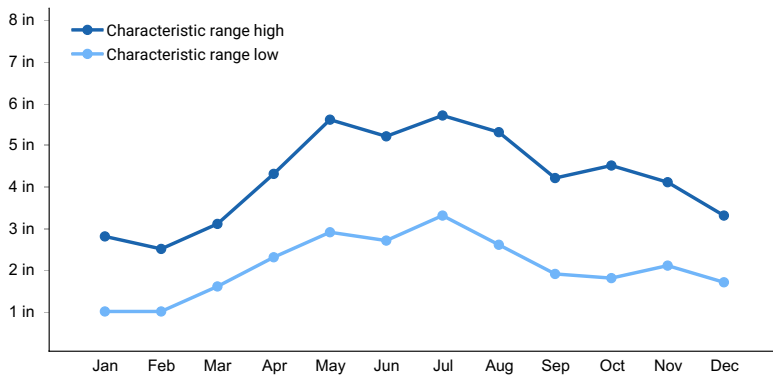
Landforms	(1) Depression
Ponding duration	Long (7 to 30 days) to very long (more than 30 days)
Ponding frequency	Occasional to frequent
Slope	0–2%
Ponding depth	0–24 in
Water table depth	0–12 in
Aspect	Aspect is not a significant factor

## Climatic features

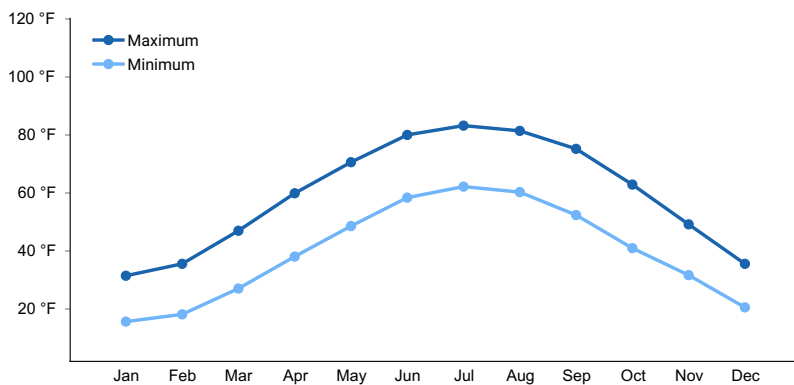
The climate is humid continental in nature typified by large season temperature differences, with warm to hot, humid summers and cold winters. Precipitation is relatively well distributed year-round.

**Table 3. Representative climatic features**

Frost-free period (average)	156 days
Freeze-free period (average)	185 days
Precipitation total (average)	41 in



**Figure 2. Monthly precipitation range**



**Figure 3. Monthly average minimum and maximum temperature**

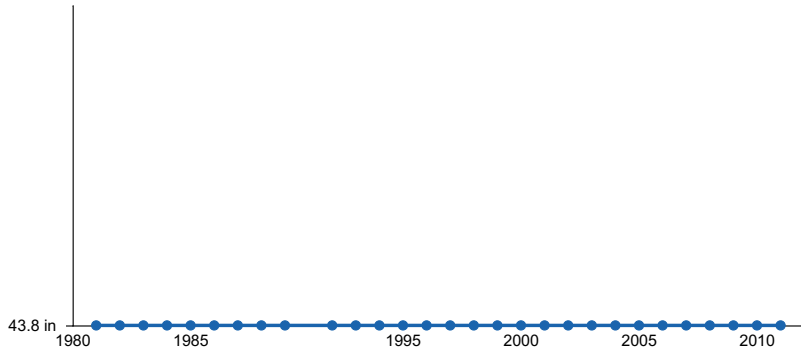


Figure 4. Annual precipitation pattern

### Climate stations used

- (1) FRANCESVILLE [USC00123078], Francesville, IN
- (2) LAKEVILLE [USC00124782], Lakeville, IN
- (3) PRAIRIE HEIGHTS [USC00127102], LaGrange, IN
- (4) ROCHESTER [USC00127482], Rochester, IN
- (5) WARSAW [USC00129240], Warsaw, IN
- (6) WINAMAC 2SSE [USC00129670], Winamac, IN
- (7) LAGRANGE 1 S [USC00124730], LaGrange, IN
- (8) PLYMOUTH [USC00126989], Plymouth, IN

### 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. Water levels typically remain at or near the soils surface throughout the year.

### Soil features

In a representative profile for the Deep Muck ecological site, the soils are black at the surface. The surface organic layer extends down to at least 51 inches and is herbaceous based.

Table 4. Representative soil features

Surface texture	(1) Muck
Drainage class	Very poorly drained
Permeability class	Moderately slow to moderately rapid
Soil depth	51–80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

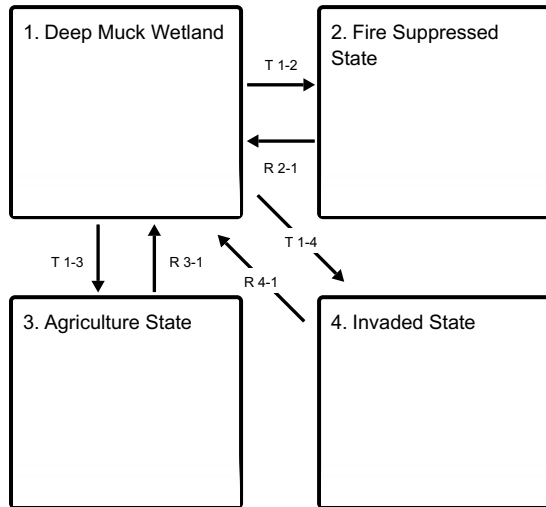
### Ecological dynamics

The historic plant community of the Deep Muck ecological site is a deep muck wetland. This site is characterized by the soil parent material being composed of herbaceous organic matter to depths of 51-80 inches. The plant community is dominated by bulrush species and cattails. The site is located in closed depressional areas principally associated with glacial lake plains, outwash plains, and till plains. 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

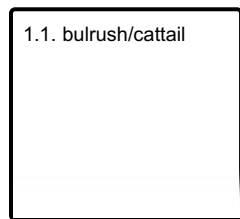
summer. This fluctuation and dominate herbaceous species create a fire dependent system. Replacement fires about every 15 years and seasonal flooding worked in concert to drive the species dominance and richness of the site. Lack of fire for any given time would move this site to one dominated by woody species. Since settlement, most of this site has been converted to agricultural use by drainage installation.

## State and transition model

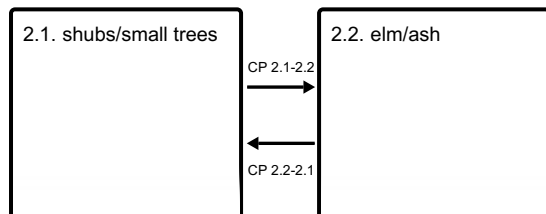
### Ecosystem states



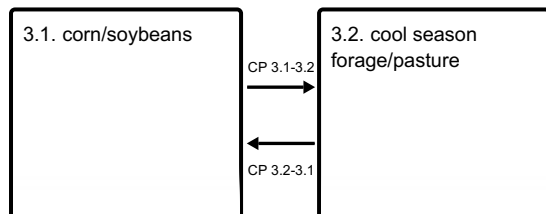
### State 1 submodel, plant communities



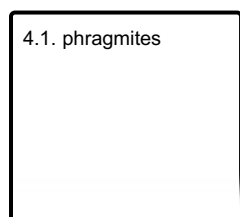
### State 2 submodel, plant communities



### State 3 submodel, plant communities



### State 4 submodel, plant communities



## State 1 Deep Muck Wetland

This is the reference or diagnostic plant community for this site. In reference conditions, this site was dominated by bulrush and cattails. Sedge species were also a large component of this site along with bluejoint grass. This state was maintained by nearly seasonal flooding and a fire frequency of 15 years. Absence of fire would transition this state to the fire suppressed state, which is dominated by woody species. Shrub or tree removal and the application of fire would transition the site back to this state.

### **Community 1.1 bulrush/cattail**

This is the reference or diagnostic plant community for this site. In reference conditions, this site was dominated by bulrush and cattail. Sedge species were also a large component of this site.

### **State 2 Fire Suppressed State**

This state is characterized by a longer than normal fire return interval or the absence of fire as a disturbance agent. Absence of fire allows for a thick layer of leaf litter to accumulate which suppresses the production of the herbaceous species and allows the woody species to establish and flourish.

### **Community 2.1 shubs/small trees**

This phase is characterized by the establishment and dominance shrubby species and small trees. Common species include dogwood, white sweetmeadow, and willow species.

### **Community 2.2 elm/ash**

This phase is characterized by the establishment and dominance tree species that convert the site to a forest. Common species include American elm, silver maple, and blue ash as dominate.

### **Pathway CP 2.1-2.2 Community 2.1 to 2.2**

Continued absence of fire and/or woody species management will move the site towards phase 2.2.

### **Pathway CP 2.2-2.1 Community 2.2 to 2.1**

Removal of most or all the trees without the application of fire will move the site towards phase 2.1.

### **State 3 Agriculture State**

This site has largely been converted to agricultural use. Most of the historic acres are now in row crop agricultural use. Most common is a corn and soybean rotation of various types. Roughly 14% of the site is not used to grow hay or cool season forage and used for grazing.

### **Community 3.1 corn/soybeans**

This phase is characterized by row crop agriculture of small grains, primarily corn and soybeans.

### **Community 3.2 cool season forage/pasture**

This phase is characterized by forage or grazing agriculture. Different mixes of, generally, cool season grasses and

forbs, largely clovers, are grown.

### **Pathway CP 3.1-3.2** **Community 3.1 to 3.2**

Planting of cool season pasture/forage species and management to maintain them.

### **Pathway CP 3.2-3.1** **Community 3.2 to 3.1**

Planting, either by conventional or no-till methods, of row crop. Management that keeps the site in row crop production

## **State 4** **Invaded State**

This site is characterized by the establishment of invasive species. Without management the invasive species come to be the dominant species to the exclusion of nearly all other species.

### **Community 4.1** **phragmites**

This phase is characterized by the establishment and eventual dominance of phragmites.

### **Transition T 1-2** **State 1 to 2**

No fire or woody species management will transition this site towards the fire suppressed state. This will result in a loss of herbaceous species production and richness.

### **Transition T 1-2** **State 1 to 2**

No fire or woody species management will transition this site towards the fire suppressed state. This will result in a loss of herbaceous species production and richness.

### **Transition T 1-3** **State 1 to 3**

The installation of drainage either through ditches or field tile or both facilitates the start of the transition to the agriculture state. Planting and management of the selected crop complete the transition.

### **Transition T 1-3** **State 1 to 3**

The installation of drainage either through ditches or field tile or both facilitates the start of the transition to the agriculture state. Planting and management of the selected crop complete the transition.

### **Transition T 1-4** **State 1 to 4**

The establishment of invasive species with out management, to include the use of fire, move the site towards the invaded state. This results in a loss in species richness of the site.

### **Transition T 1-4** **State 1 to 4**

The establishment of invasive species with out management, to include the use of fire, move the site towards the invaded state. This results in a loss in species richness of the site.

### **Restoration pathway R 2-1**

#### **State 2 to 1**

Removal of trees and other woody species then planting the site to the desired species. Following these actions with fire will help restore the site to state 1.

### **Restoration pathway R 3-1**

#### **State 3 to 1**

Removal of drainage system, site preparation, tree planting, and regular application of fire.

### **Restoration pathway R 4.1**

#### **State 4 to 1**

Chemical and mechanical treatment of the invasive species is the first restoration step. Some times biological treatment, to included grazing, can be helpful but is not common in this area. The reapplication of fire after seeding of the appropriate species.

### **Restoration pathway R 4-1**

#### **State 4 to 1**

Chemical and mechanical treatment of the invasive species is the first restoration step. Some times biological treatment, to included grazing, can be helpful but is not common in this area. The reapplication of fire after seeding of the appropriate species.

## **Additional community tables**

### **Inventory data references**

Site concept developed through expert opinion, review of the literature, and field work. Field work has included field reconnaissance.

### **Other references**

Betz, R. (1973). The prairies of Indiana. Proceedings of the Fifth Midwest Prairie Conference (pp. 34-31). Ames: Iowa State University.

Curtis, J.T. Vegetation of Wisconsin: An Ordination of Plant Communities. Univ. of Wisc. Press. Madison, WI.

Homoya, M. A., Abrell, D. B., Aldrich, J. R., & Post, T. W. (1985). The Natural Regions of Indiana. Indiana Academy of Science , 94, 245-269.

Kartesz, J. T. (2011). Density Gradient Map Samples Produced From BONAP's Floristic Synthesis. Retrieved 12 12, 2011, from Biota of North America Program: <http://bonap.org/diversity/diversity/diversity.html>

NatureServe. (2011). An online encyclopedia of life [web application]. NatureServe, Arlington, VA, USA [Online: [www. natureserve. org/explorer](http://www.natureserve.org/explorer)] .

Soil Survey Staff. (2011). Soil Survey Geographic (SSURGO) Database. Retrieved 10 04, 2011, from Natural Resources Conservation Service, United States Department of Agriculture: <http://soildatamart.nrcs.usda.gov>

Transeau, E. (1935). The prairie peninsula. Ecology vol. 16 (3) , 423-437.

U.S. Census Bureau. (2011). Population Distribution and Change: 2000 to 2010. Retrieved 10 06, 2011, from <http://www.census.gov/prod/cen2010/briefs/c2010br-01.pdf>



USDA. (2007). Ecological Subregions: Sections and Subsections for the Conterminous United States. Washington, DC: USDA - Forest Service.

USDA. (2006). Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U. S. Department of Agriculture, Natural Resources Conservation Service. U. S. Department of Agriculture Handbook 296.

USGS. (2010). LANDFIRE Biophysical Settings. Retrieved from <http://www.landfire.gov>

## Contributors

Tyler Staggs

## 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:**

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2. **Presence of water flow patterns:**

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3. **Number and height of erosional pedestals or terracettes:**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

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5. **Number of gullies and erosion associated with gullies:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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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:**

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