

# Ecological site R111XC012IN

## Mineral Muck

Accessed: 05/03/2024

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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

## Ecological site concept

This site is an upland site formed on deep herbaceous organic soil parent material over either sandy or loamy deposits in depressions on lake, outwash, and till plains. There are 4 distinct states: 1. mineral muck prairie, 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 about 90% of the site is in agricultural production.

## Associated sites

R111XC002IN	<b>Wet Sandy Interdune</b> Vegetation type and some species are in both sites. Is located in a slightly higher landscape position. Soils types differ greatly; this one is sandy parent material.
R111XC011IN	<b>Limnic Muck</b> Similar landform positions, but underlying material is marly. Prairie cordgrass is a co-dominate.
R111XC013IN	<b>Deep Muck</b> Similar landform positions. Organic material is 51" or greater. Bullrushes, cattails, and other more water dependent species are dominant.

## Similar sites

R111XC002IN	<b>Wet Sandy Interdune</b> Vegetation type and some species are in both sites. In a higher landscape position. Soils types differ greatly; this one is sandy parent material and non-organic.
R111XC005IN	<b>Glacial Depression</b> Vegetation type and some species are in both sites. In a higher landscape position. Soils types differ greatly; this one is till parent material and non-organic.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Andropogon gerardii</i> (2) <i>Panicum virgatum</i>

## Physiographic features

This site is located in the 111C - Indiana and Ohio Till Plain, Northwestern Part MLRA. This site was formed on deep herbaceous organic material over sandy or loamy material. It is located in closed depressions on till plains, lake plains, and flood plains.

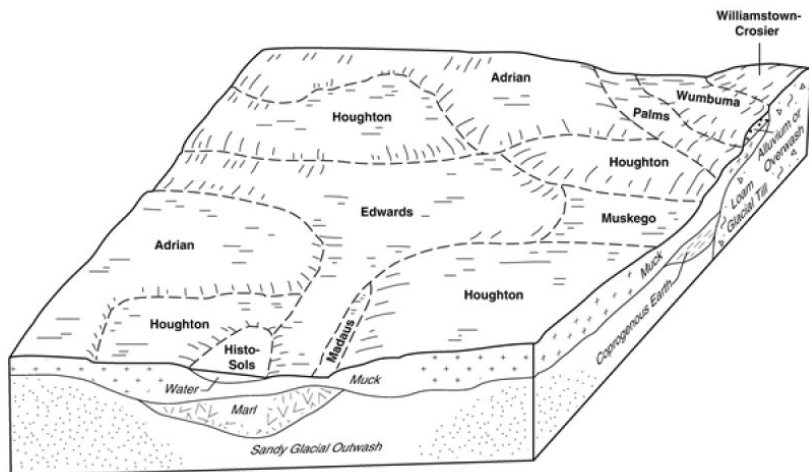


Figure 1. Palms and Adrian represent site on landscape

Table 2. Representative physiographic features

Landforms	(1) Depression
Ponding duration	Brief (2 to 7 days) to long (7 to 30 days)
Ponding frequency	Occasional to frequent
Slope	0–2%
Ponding depth	0–30 cm
Water table depth	0–30 cm
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)	157 days
Freeze-free period (average)	189 days
Precipitation total (average)	1,041 mm

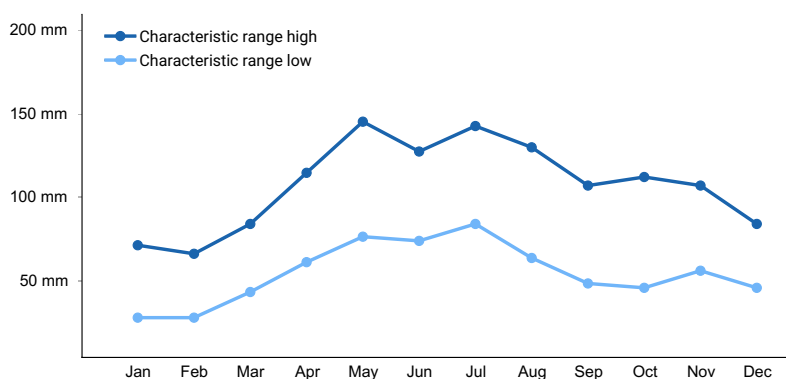


Figure 2. Monthly precipitation range

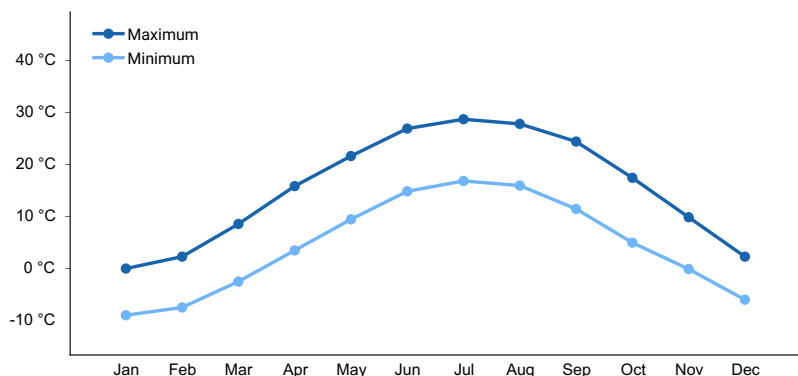


Figure 3. Monthly average minimum and maximum temperature

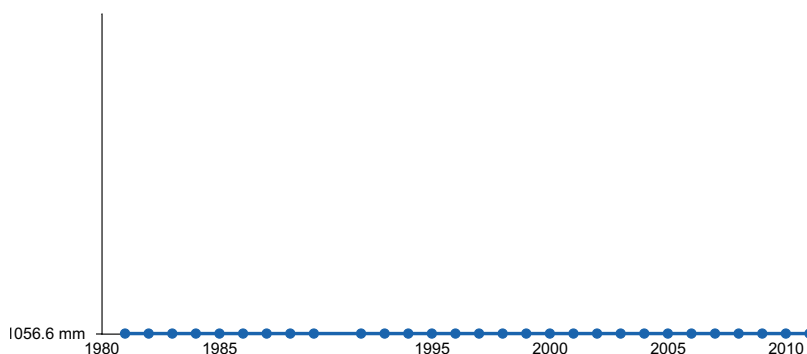


Figure 4. Annual precipitation pattern

### Climate stations used

- (1) FRANCESVILLE [USC00123078], Francesville, IN
- (2) PLYMOUTH [USC00126989], Plymouth, IN
- (3) LAGRANGE 1 S [USC00124730], LaGrange, IN
- (4) LAKEVILLE [USC00124782], Lakeville, IN
- (5) LOGANSFORT CICOTT ST [USC00125117], Logansport, 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 Mineral Muck ecological site, the soils are black at the surface. The surface organic layer extends down to 35 inches and is herbaceous. Subsurface organic layers are either sandy or loamy material that can extend from 34 to 80 inches deep. Taxonomically, most of the soils of the site are terric haplosaprists.

Table 4. Representative soil features

Surface texture	(1) Muck
Drainage class	Very poorly drained
Permeability class	Slow to moderately rapid
Soil depth	20–89 cm

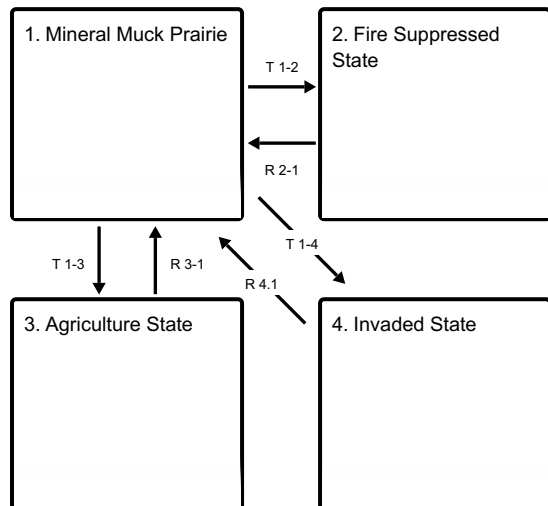
### Ecological dynamics

The historic plant community of the Mineral Muck is a mineral muck prairie. This site is characterized by the soil parent material being composed of herbaceous organic matter overlaying either sandy or loamy material. The plant

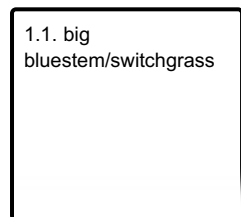
community is dominated by tall-grass prairie species along with an assortment of tall sedge species. The site is located in closed depressional areas principally associated with glacial lake plains, outwash plains, and till plains. Being the lowest portion of the local landscape, the site is dependent 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 decade 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

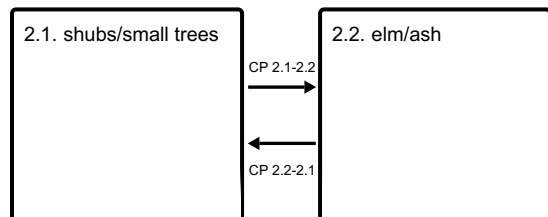
### Ecosystem states



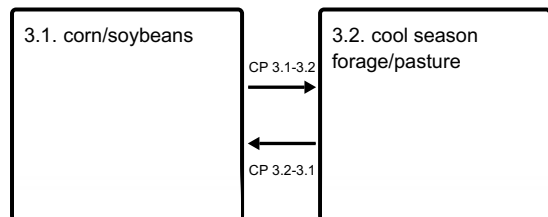
### State 1 submodel, plant communities



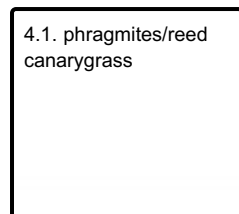
### State 2 submodel, plant communities



### State 3 submodel, plant communities



#### State 4 submodel, plant communities



### State 1 Mineral Muck Prairie

This is the reference or diagnostic plant community for this site. In reference conditions, this site was dominated by tall prairie grasses specifically big bluestem and switchgrass. Sedge species were also a large component of this site. This state was maintained by nearly seasonal flooding and a fire frequency of 10 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 big bluestem/switchgrass

This is the reference or diagnostic plant community for this site. In reference conditions, this site was dominated by tall prairie grasses specifically big bluestem and switchgrass. 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 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 1% 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/reed canarygrass**

This phase is characterized by the establishment and dominance of invasive species. The two most common for this site are phragmites and reed canarygrass. Most often only one of the two species will come to dominate the site.

### **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 without management, to include the use of fire, moves the site towards the invaded state. This results in a loss in species richness of the site.

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

The establishment of invasive species without management, to include the use of fire, moves 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. Sometimes biological treatment, including 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**

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## 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:

- 
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):**

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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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