

## Ecological site R097XB051IL Chicago Mucky Depression

Last updated: 1/16/2024  
Accessed: 05/16/2024

### 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.



Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

### MLRA notes

Major Land Resource Area (MLRA): 097X–Southwestern Michigan Fruit and Vegetable Crop Belt

Physiography consists of sandy lake plains and dunes along the western side adjacent to Lake Michigan, and moderately sloping fine-loamy moraine from the Lake Michigan lobe of the Wisconsin Ice Sheet.

Vegetation is mostly mesophytic forests of central and northern hardwood and conifer species with prairie and oak savanna to the south. Compared to inland locations, cold sensitive hardwood species extend further north due to milder winters, and conifers extend further south due to cooler summers, heavier snowfall, and sandier soils. Lake effect snow and delayed spring warm up dampen the fire frequency relative to similar inland sites, except along the south side of Lake Michigan. The northern extent is defined by a major floristic boundary where several central hardwoods species drop out. The southern boundary is defined by fine-loamy moraines with predominantly prairie vegetation.

The ecological site inference area for MLRA 97 is subdivided along a floristic/climatic break roughly from New Buffalo, Michigan to Portage, Indiana. This corresponds to the heaviest lake effect snow belt (>160 cm) south and east of this line and is associated lower historic fire frequencies. The snow belt portion “A”, has more frequent conifer and beech, while the less snowy portion “B” has more prairie and savanna elements. Although differing in precise boundary location, both USFS and EPA ecoregions support a climatic/floristic break at the next higher rank in their respective hierarchies.

## Classification relationships

Among the USFS ecoregional framework (Cleland et al., 2007), most of MLRA 97 is represented by the Humid Temperate Domain (200), Hot Continental Division (220), Midwest Broadleaf Forest Province (222), South Central Great Lakes Section (222J), subsections 222Ja and 222Jb. MLRA 97 was recently extended northward to be more consistent with the limits of the USFS ecoregions subsections 222Ja and 222Jb, because it is more consistent with vegetation patterns and species distributions. A former portion of MLRA 97 that extended westward from the southern end of Lake Michigan (including most of the city of Chicago) was recently removed from the MLRA due to its predominantly non-sandy deposits and reduced lake effect climate, and would have overlapped USFS ecoregion 222K.

Among the EPA ecoregional framework (Omernik and Griffith, 2014), most of MLRA 97 falls within Eastern Temperate Forests (Level I: 8), Mixed Wood Plains (Level II: 8.1), Southern Michigan/Northern Indiana Drift Plains (Level III: 56), and Level IV: 56d and 56f. Ecoregion 56f continues north beyond MLRA 97. Former portions of MLRA 97 that encompassed the city of Chicago included Level III ecoregion 54, Central Corn Belt Plains, before the last revision of MRLA boundaries.

## Ecological site concept

The central concept of the Mucky Depression is organic soils (typically muck) of intermediate pHs (5-7). Small delineations occur as base slope seeps. May occur on former lake beds as organic flats with minerotrophic ground water influence, but without marl. A variety of higher or lower fertility marshes and shrub swamps may form, but wetness and fire frequency limits the degree to which swamp forest can form.

## Associated sites

R097XB036IN	Chicago Wet Sandy Swale
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## Similar sites

F097XA030MI	Mucky Depression
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Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Cephalanthus occidentalis</i>
Herbaceous	(1) <i>Carex lacustris</i>

## Physiographic features

Organic deposits on former lake beds and base slope seeps.

Table 2. Representative physiographic features

Landforms	(1) Lakebed (2) Fen
Runoff class	Negligible to low
Ponding duration	Brief (2 to 7 days) to very long (more than 30 days)
Ponding frequency	Rare to frequent
Elevation	177–226 m
Water table depth	0 cm
Aspect	Aspect is not a significant factor

## Climatic features

The southern Lake Michigan lake plain has a humid warm continental climate with cold winters and warm summers. Almost two thirds of the precipitation is distributed during the warmer half of the year with a significant portion of the precipitation occurring as heavy downpours during thunderstorms. Thunderstorm activity is enhanced inland by lake breeze fronts, while it is diminished near the lakeshore by the stabilizing effect of the cooler lake waters.

Occasionally, thunderstorm microbursts cause localized high winds which open single tree gaps in forest canopies, or more rarely, tornados and derechos (severe straight-line winds) open larger gaps. Fall storms bring more frequent strong winds, but with impacts moderated by the lack of leaves (wind resistance) in the canopy. During July, average precipitation lags potential evapotranspiration, resulting in droughty conditions in the upper soil horizons of upland sites. During dry years, this droughty period is extended into August and September, resulting in dry fuels and potential for wildfire over oak and pine dominated areas.

Winter precipitation light with annual snowfall of 0.7 to 1.0 m (28-40 inches), which is only occasionally enhanced by lake effect during instances of cold north or northeast winds. The combination of lower snowfall, and more limited lake amelioration of warm southwesterly winds, contribute to higher fire frequencies relative to similar sites to the north and east.

The area falls within USDA Hardiness zones (-22 to -24 C) 5b and 6a (slightly colder than areas to the north and east) and has limited lake protection from premature spring warm up prior to the last killing frosts, limiting the potential for fruit crops relative to other portions of MLRA 97.

**Table 3. Representative climatic features**

Frost-free period (characteristic range)	154-176 days
Freeze-free period (characteristic range)	199-204 days
Precipitation total (characteristic range)	965-991 mm
Frost-free period (actual range)	150-184 days
Freeze-free period (actual range)	198-204 days
Precipitation total (actual range)	965-991 mm
Frost-free period (average)	165 days
Freeze-free period (average)	201 days
Precipitation total (average)	991 mm

## Climate stations used

- (1) CHICAGO UNIV [USW00014892], Chicago, IL
- (2) INDIANA DUNES NATL LKS [USC00124244], Chesterton, IN
- (3) CHICAGO MIDWAY AP [USW00014819], Chicago, IL

## Influencing water features

Site is semi-permanently saturated.

## Soil features

Soils are very poorly drained organics. They are commonly classified as Terric Haplosaprists and Typic Haplosaprists, and commonly mapped as Adrian, Houghton, and Palms series.

**Table 4. Representative soil features**

Parent material	(1) Organic material
Surface texture	(1) Muck (2) Marl

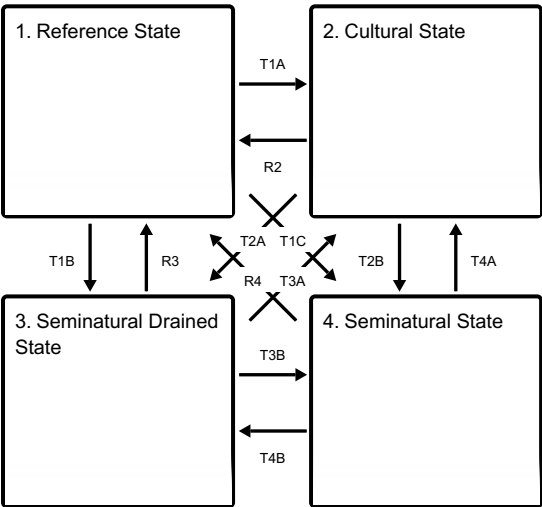
Drainage class	Very poorly drained
Permeability class	Slow to moderately rapid
Soil depth	201 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-100.1cm)	35–54.99 cm
Soil reaction (1:1 water) (0-50cm)	5.5–8
Subsurface fragment volume <=3" (0-150.1cm)	0%
Subsurface fragment volume >3" (0-150.1cm)	0%

### Ecological dynamics

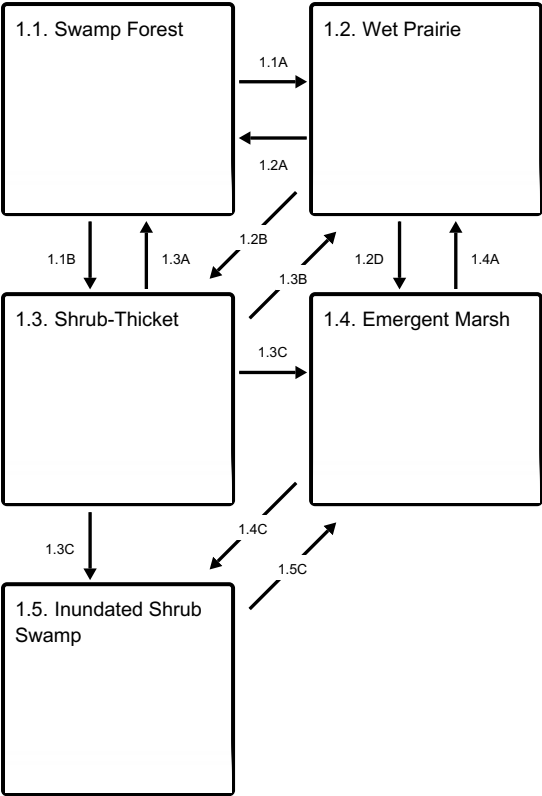
Fire was locally important adjacent to other fire prone ecological sites. Wet anoxic soils favor facultative and obligate wetland species. The combination of prolonged wetness alternating with frequent fire may inhibit establishment of forest vegetation. Tree species that are fire tolerant tend to be somewhat less flood tolerant, and require elevated tip-up mounds for establishment, which are precluded by the lack of preexisting forest vegetation. Wet prairie communities tend to develop with a species composition reflecting medium to high nutrient conditions.

### State and transition model

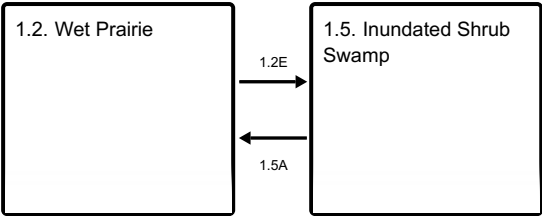
#### Ecosystem states



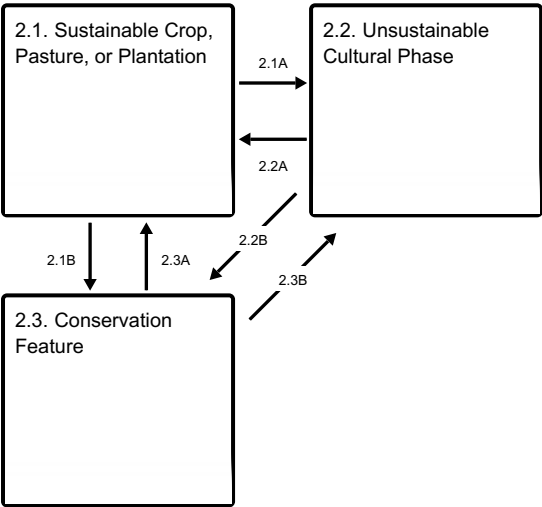
State 1 submodel, plant communities



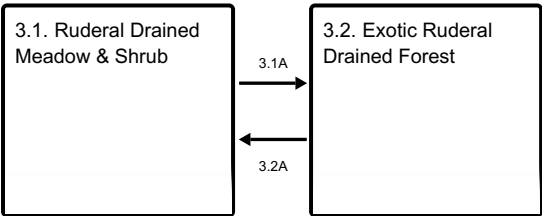
Communities 2 and 5 (additional pathways)



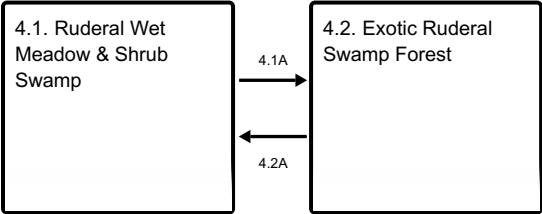
State 2 submodel, plant communities



State 3 submodel, plant communities



State 4 submodel, plant communities



## State 1

### Reference State

The Reference State consists of wet meadows, shrub swamps, and marshes

#### Dominant plant species

- common buttonbush (*Cephalanthus occidentalis*), shrub
- hairy sedge (*Carex lacustris*), grass

### Community 1.1

#### Swamp Forest

### Community 1.2

#### Wet Prairie

### Community 1.3

#### Shrub-Thicket

### Community 1.4

#### Emergent Marsh

### Community 1.5

#### Inundated Shrub Swamp

### Pathway 1.1A

#### Community 1.1 to 1.2

Temporary prolonged inundation or other factor that induces tree mortality; followed by a frequent fire interval.

#### Conservation practices

Prescribed Burning
Early Successional Habitat Development/Management
Forest Stand Improvement

### Pathway 1.1B

#### Community 1.1 to 1.3

Clearcut/Blowdown.

#### Conservation practices

Early Successional Habitat Development/Management
Forest Stand Improvement

### Pathway 1.2A

#### Community 1.2 to 1.1

Succession; lack of fire.

#### Conservation practices

Tree/Shrub Site Preparation
Tree/Shrub Establishment

**Pathway 1.2B**  
**Community 1.2 to 1.3**

Succession from reduced fire frequency. Shrub establishment.

**Conservation practices**

Tree/Shrub Site Preparation
Tree/Shrub Establishment

**Pathway 1.2D**  
**Community 1.2 to 1.4**

Permanent inundation.

**Pathway 1.2E**  
**Community 1.2 to 1.5**

Shrub establishment; permanent inundation.

**Conservation practices**

Tree/Shrub Establishment
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**Pathway 1.3A**  
**Community 1.3 to 1.1**

Succession.

**Conservation practices**

Tree/Shrub Site Preparation
Tree/Shrub Establishment

**Pathway 1.3B**  
**Community 1.3 to 1.2**

Temporary prolonged inundation or other factors leading to shrub mortality followed by increased fire frequency.

**Conservation practices**

Brush Management
Prescribed Burning

**Pathway 1.3C**  
**Community 1.3 to 1.4**

Permanent inundation.

**Pathway 1.3C**  
**Community 1.3 to 1.5**

Permanent inundation.

**Pathway 1.4A**

## Community 1.4 to 1.2

Drop in water table; increased fire frequency.

### Conservation practices

Prescribed Burning
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## Pathway 1.4C

### Community 1.4 to 1.5

Temporary drop water table; shrub establishment.

## Pathway 1.5A

### Community 1.5 to 1.2

Drop water table; increased fire frequency with shrub mortality.

### Conservation practices

Brush Management
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Prescribed Burning
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## Pathway 1.5C

### Community 1.5 to 1.4

Temporary drought; shrub mortality.

## State 2

### Cultural State

[Alternative States to be developed; refer to component communities.]

## Community 2.1

### Sustainable Crop, Pasture, or Plantation

## Community 2.2

### Unsustainable Cultural Phase

## Community 2.3

### Conservation Feature

Can be a grassed waterway, conservation reserve, a small patch pollinator garden, or other land taken out of its primary cultural production to mitigate or reduce impacts of adjacent land use, and is not by itself a permanent restoration of a complete native biological community and associated ecosystem services.

## Pathway 2.1A

### Community 2.1 to 2.2

Revert to unsustainable cultural practices.

## Pathway 2.1B

### Community 2.1 to 2.3

Establish conservation feature.

### Conservation practices



Conservation Cover
Grassed Waterway

## Pathway 2.2A Community 2.2 to 2.1

Implement sustainable cultural practices.

### Conservation practices

Conservation Crop Rotation
Cover Crop
Nutrient Management
Integrated Pest Management (IPM)

## Pathway 2.2B Community 2.2 to 2.3

Establish conservation feature.

### Conservation practices

Conservation Cover
Grassed Waterway

## Pathway 2.3A Community 2.3 to 2.1

Implement sustainable cultural practices.

### Conservation practices

Conservation Crop Rotation
Cover Crop
Nutrient Management
Integrated Pest Management (IPM)

## Pathway 2.3B Community 2.3 to 2.2

Revert to unsustainable cultural practices.

## State 3 Seminatural Drained State

[Alternative States to be developed; refer to component communities.]

## Community 3.1 Ruderal Drained Meadow & Shrub

## Community 3.2 Exotic Ruderal Drained Forest

**Pathway 3.1A**  
**Community 3.1 to 3.2**

Succession

**Pathway 3.2A**  
**Community 3.2 to 3.1**

Blowdown/clearcut.

**Conservation practices**

Early Successional Habitat Development/Management
Forest Stand Improvement

**State 4**  
**Seminatural State**

[Alternative States to be developed; refer to component communities.]

**Community 4.1**  
**Ruderal Wet Meadow & Shrub Swamp**

**Community 4.2**  
**Exotic Ruderal Swamp Forest**

**Pathway 4.1A**  
**Community 4.1 to 4.2**

Succession.

**Pathway 4.2A**  
**Community 4.2 to 4.1**

Blowdown/clearcut.

**Conservation practices**

Early Successional Habitat Development/Management
Forest Stand Improvement

**Transition T1A**  
**State 1 to 2**

Drain; clear vegetation; cultivate domesticated species.

**Transition T1B**  
**State 1 to 3**

Drain; clear vegetation, invasive species introduced.

**Transition T1C**  
**State 1 to 4**

Clear vegetation, invasive species introduced.

## Restoration pathway R2

### State 2 to 1

Restore hydrology; remove domesticated species; restore native species.

#### Conservation practices

Brush Management
Restoration and Management of Rare and Declining Habitats
Wetland Wildlife Habitat Management
Wetland Restoration
Herbaceous Weed Control

## Transition T2A

### State 2 to 3

Abandon, succession.

## Transition T2B

### State 2 to 4

Restore hydrology; abandon; succession.

#### Conservation practices

Wetland Restoration
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## Restoration pathway R3

### State 3 to 1

Restore hydrology; control invasive species; restore native species

#### Conservation practices

Brush Management
Restoration and Management of Rare and Declining Habitats
Wetland Wildlife Habitat Management
Wetland Restoration
Herbaceous Weed Control

## Transition T3A

### State 3 to 2

Clear vegetation; cultivate domesticated species.

## Transition T3B

### State 3 to 4

Restore hydrology.

#### Conservation practices

Wetland Restoration
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## **Restoration pathway R4**

### **State 4 to 1**

Control invasive species; restore native species.

#### **Conservation practices**

Brush Management
Restoration and Management of Rare and Declining Habitats
Wetland Wildlife Habitat Management
Herbaceous Weed Control

## **Transition T4A**

### **State 4 to 2**

Drain; clear vegetation; cultivate domesticated species.

## **Transition T4B**

### **State 4 to 3**

Drain.

## **Additional community tables**

### **Inventory data references**

Site Development and Testing Plan

Future work is needed, as described in a future project plan, to validate the information presented in this provisional ecological site description. Future work includes field sampling, data collection and analysis by qualified vegetation ecologists and soil scientists. As warranted, annual reviews of the project plan can be conducted by the Ecological Site Technical Team. A final field review, peer review, quality control, and quality assurance reviews of the ESD are necessary to approve a final document.

### **Other references**

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## Contributors

Greg J. Schmidt

## Approval

Nels Barrett, 1/16/2024

## 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.

Author(s)/participant(s)	
Contact for lead author	
Date	05/16/2024
Approved by	Nels Barrett
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:**
- 
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:

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17. Perennial plant reproductive capability:

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