USDA Natural Resources Conservation Service

Ecological site F098XA003MI
Moist Floodplains

Last updated: 1/12/2024
Accessed: 05/12/2025

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.

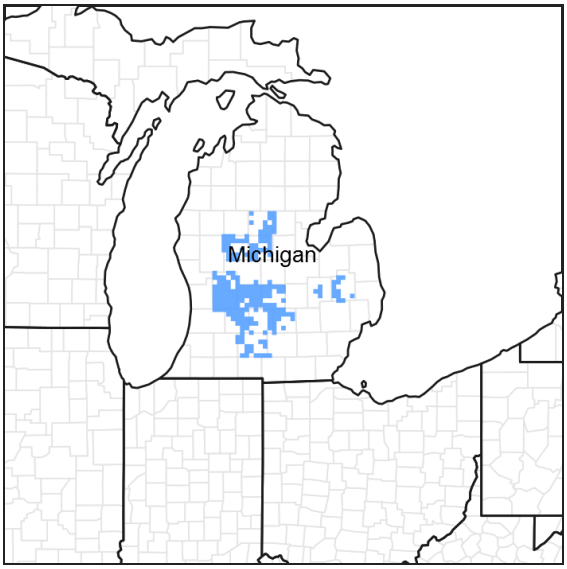


Figure 1. Mapped extent

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): 098X–Southern Michigan and Northern Indiana Drift Plains

"This area is in the Eastern Lake Section of the Central Lowland Province of the Interior Plains. It is a broad glaciated plain that is deeply mantled by till in the north and outwash to the south. Much of the area is nearly level to gently rolling. Elevation ranges from 183 to 391 m (600 to 1285 ft). Local topographic relief averages 9 m and ranges up to 74 m (30 to 245 ft). Highest relief occurs adjacent to river valleys eroded through moraines. Topography is more subdued south of the Atlantic/Gulf drainage divide near the Michigan/Indiana state line, elevations ranging from 185 to 280 m (605 to 920 ft). Local topographic relief in the south averages 4 m and ranges up to 49 m (10 to 160 ft).

The surface of this area is covered by 30 to 150 m (100 to 500 ft) of glacial drift in most areas. At the northern edge of the area, the drift is more than 100 meters (300 ft) thick. From the Grand River basin northward, most of the drift consists of till from the Saginaw Lobe of the Wisconsin Ice Sheet. From the Kalamazoo River basin southward, there are significant deposits of unconsolidated sand and gravel outwash formed between major lobes of the receding Wisconsin Ice Sheet. The outwash deposits are reworked as sand dunes in the Kankakee River basin.

The bedrock beneath the glacial deposits in this area is deformed in the shape of a basin. The center of this basin is in the north-central part of the area. Pennsylvanian-age sandstone are in the center of the basin, and Mississippian-age sandstone and shale beds form the outer rings of the basin. In a few areas the drift deposits are

less than 2 m (6 ft) thick, where glacial outwash channels have eroded to limestone bedrock in Grand Rapids, and where sandstone bedrock cuestas peak in elevation in near Hillsdale, Michigan. A sandstone cliff < 15 m high (<50 ft) occurs along a short stretch of the Grand River in Grand Ledge, Michigan.

Most of the rivers in this area are short because of their proximity to the Great Lakes east and west of the area. The largest watersheds, the St. Joseph River, Grand River, and Kalamazoo River drain into Lake Michigan. The southern extent of the MLRA is drained by the Kankakee River of the Mississippi River watershed."

Classification relationships

Among the USFS ecoregional framework (Cleland et al., 2007), most of MLRA 98 is represented by the Humid Temperate Domain (200), Hot Continental Division (220), Midwest Broadleaf Forest Province (222), South Central Great Lakes Section (222J), subsections 222Jc, 222Jg, 222Jh, and 222Jf. Similar sites within the portion of MLRA 98 that overlap the Prairie Division (250) and Prairie Parkland Province
(251) are treated as separate ecological sites. MLRA 98 recently was adjusted to exclude portions of Warm Continental Division (210), Laurentian Mixed Forest Province (212) to the north, and subsections 222Ja and 222Jb to the northwest.

Among the EPA ecoregional framework (Omernik and Griffith, 2014), most of MLRA 98 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: 56b, 56g, and 56h. Similar sites within the portion of MLRA 98 that overlap the Central USA Plains (Level II: 8.2) and Central Corn Belt Plains (Level III: 54) are treated as separate ecological sites. MLRA 98 recently was adjusted to exclude portions of Northern Forests (Level I: 5), Mixed Wood Shield (Level II: 5.2), Northern Lakes and Forests (Level III: 50) to the north, and level IV: 56d and 56f to the northwest.

Ecological site concept

The central concept of the Moist Floodplains is any soils subject to periodic flooding but of short enough duration to support primarily non-hydric plant communities (somewhat poorly drained or drier). Sites are typically composed of rich mesophytic plant species. Site concept may diverge between expressions on sand bars along major rivers, second bottom floodplain terraces, versus floodplains along creeks. Largest delineations occur on somewhat poorly drained second bottoms of larger rivers.

Associated sites

F098XA004MI	**Wet Floodplains** On wetter sites.

Similar sites

F098XB025IN	**Kankakee Moist Floodplains**

Table 1. Dominant plant species

Tree	(1) *Acer nigrum* (2) *Ulmus americana*
Shrub	(1) *Staphylea trifolia*
Herbaceous	(1) *Arisaema dracontium*

Physiographic features

Site is on floodplains eroded into outwash and till deposits. Some of the major floodplains are the bottoms of valleys carved by post-glacial outwash.

Table 2. Representative physiographic features

Landforms	(1) Flood plain

Runoff class	Negligible to low
Flooding duration	Extremely brief (0.1 to 4 hours) to very brief (4 to 48 hours)
Flooding frequency	Very rare to occasional
Elevation	184–389 m
Water table depth	25 cm
Aspect	Aspect is not a significant factor

Climatic features

This ecological site experiences a humid continental climate with mild summers and cold winters. Precipitation is moderately well distributed through the year with higher amounts during the growing season than the winter. Temperature extremes are moderated by the Great Lakes compared to other inland continental locations, though not as much as MLRAs directly bordering the Great Lakes. Mean annual extreme minimum temperatures range from -26.6 to -20.8°C (-16 to -5°F), which falls within hardiness zones 5a to 6a. Annual snowfall is enhanced by the Great Lakes, mainly on the western half of the MLRA.

Table 3. Representative climatic features

Frost-free period (characteristic range)	118-134 days
Freeze-free period (characteristic range)	152-165 days
Precipitation total (characteristic range)	813-991 mm
Frost-free period (actual range)	115-138 days
Freeze-free period (actual range)	144-172 days
Precipitation total (actual range)	813-1,041 mm
Frost-free period (average)	127 days
Freeze-free period (average)	159 days
Precipitation total (average)	889 mm

Climate stations used

- (1) CHARLOTTE [USC00201476], Roscommon, MI
- (2) EAST LANSING 4 S [USC00202395], Holt, MI
- (3) IONIA 2SSW [USC00204078], Ionia, MI
- (4) FLINT BISHOP INTL AP [USW00014826], Flint, MI
- (5) JACKSON REYNOLDS FLD [USW00014833], Jackson, MI
- (6) LANSING CAPITAL CITY AP [USW00014836], Lansing, MI
- (7) GRAND RAPIDS [USW00094860], Grand Rapids, MI
- (8) DOWAGIAC 1 W [USC00202250], Dowagiac, MI
- (9) HILLSDALE [USC00203823], Hillsdale, MI
- (10) OWOSSO WWTP [USC00206300], Owosso, MI
- (11) LAPORTE [USC00124837], La Porte, IN
- (12) ALMA [USC00200146], Alma, MI
- (13) HOWELL WWTP [USC00203947], Howell, MI
- (14) SAINT JOHNS [USC00207280], Saint Johns, MI
- (15) THREE RIVERS [USC00208184], Three Rivers, MI
- (16) BATTLE CREEK KELLOGG AP [USW00014815], Battle Creek, MI
- (17) WANATAH 2 WNW [USC00129222], Valparaiso, IN
- (18) COLDWATER ST SCHOOL [USC00201675], Coldwater, MI
- (19) FLINT 7 W [USC00202851], Flushing, MI
- (20) GREENVILLE 2 NNE [USC00203429], Greenville, MI
- (21) GULL LK BIOLOGICAL STN [USC00203504], Augusta, MI

Influencing water features

Site is intermittently flooded for short periods during the growing season, not long enough to exclude upland species.

Soil features

Soils are well drained to somewhat poorly drained sands and loams on floodplains. They are commonly classified as Aquic Udipsamments, Fluvaquentic Hapludolls, and Aeric Fluvaquents, and commonly mapped as Algansee, Ceresco, and Shoals series.

Table 4. Representative soil features

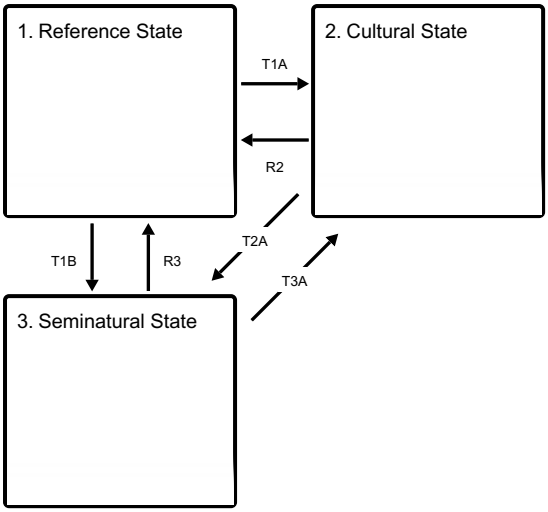
Parent material	(1) Alluvium
Surface texture	(1) Sand (2) Silt (3) Loam
Drainage class	Somewhat poorly drained to well drained
Permeability class	Slow to rapid
Soil depth	201 cm
Surface fragment cover <=3"	0–1%
Surface fragment cover >3"	0–1%
Available water capacity (0-100.1cm)	3.99–22 cm
Soil reaction (1:1 water) (0-50cm)	6–7
Subsurface fragment volume <=3" (0-150.1cm)	0–5%
Subsurface fragment volume >3" (0-150.1cm)	0–1%

Ecological dynamics

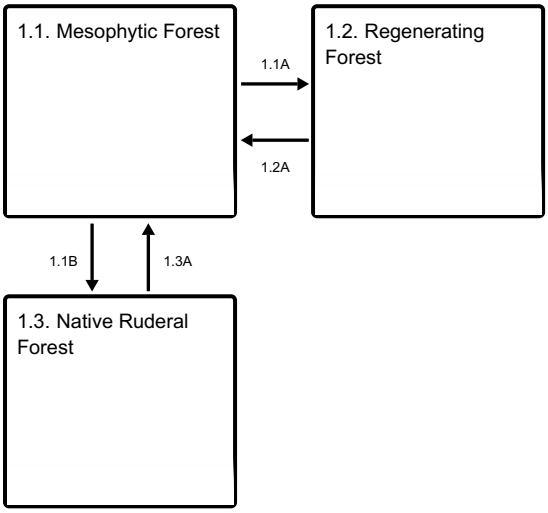
Fire was infrequent, allowing succession to fire sensitive species. High fertility from frequent flooding results in a heterogeneous assortment of mesophytic tree species and a diverse understory. Valley microclimate may prevent premature bud burst, while presence of water may extend the growing season, thereby extending the range of more frost sensitive tree species northward (e.g. redbud, paw paw, buckeye, coffeetree, honey locust). Flowing water may also serve as a dispersal aid for species formerly dispersed by extinct megafauna (e.g. paw paw, coffeetree, honey locust). The reference community is represented by black maple (*Acer nigrum*) and American elm (*Ulmus americana*) in the overstory, among many other species with no clear dominance. Bladdernut (*Staphylea trifolia*) and green dragon (*Arisaema dracontium*) are among the large number of species in the understory.

State and transition model

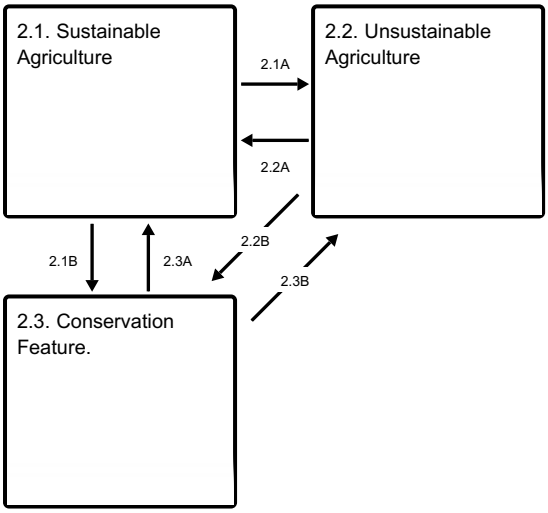
Ecosystem states



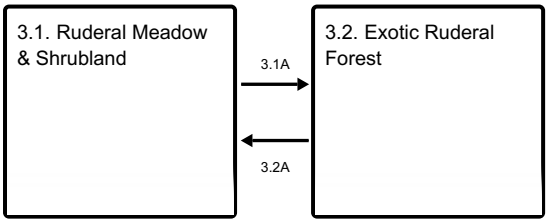
State 1 submodel, plant communities



State 2 submodel, plant communities



State 3 submodel, plant communities



State 1
Reference State

The Reference State consists of mesic hardwoods and associated successional phases.

Dominant plant species

- black maple (*Acer nigrum*), tree
- American elm (*Ulmus americana*), tree
- American bladdernut (*Staphylea trifolia*), shrub
- green dragon (*Arisaema dracontium*), other herbaceous

Community 1.1
Mesophytic Forest

Community 1.2
Regenerating Forest

Community 1.3
Native Ruderal Forest

Pathway 1.1A
Community 1.1 to 1.2

Blowdown/clearcut

Conservation practices

Forest Stand Improvement

Pathway 1.1B
Community 1.1 to 1.3

Blowdown/clearcut

Conservation practices

Early Successional Habitat Development/Management
Forest Stand Improvement

Pathway 1.2A
Community 1.2 to 1.1

Succession

Pathway 1.3A
Community 1.3 to 1.1

Succession

Conservation practices

Tree/Shrub Site Preparation
Tree/Shrub Establishment

State 2

Cultural State

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

Community 2.1
Sustainable Agriculture

Community 2.2
Unsustainable Agriculture

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

Apply unsustainable farming techniques.

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

Apply sustainable farming techniques.

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

Revert to sustainable agriculture.

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 agriculture.

State 3
Seminatural State

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

Community 3.1
Ruderal Meadow & Shrubland

Community 3.2
Exotic Ruderal Forest

Pathway 3.1A
Community 3.1 to 3.2

Succession

Pathway 3.2A
Community 3.2 to 3.1

Blowdown/clearcut

Transition T1A
State 1 to 2

Clear vegetation; cultivate domesticated species

Transition T1B
State 1 to 3

Clear vegetation, invasive species introduced

Restoration pathway R2
State 2 to 1

Remove domesticated species; restore native species

Conservation practices

Brush Management
Tree/Shrub Site Preparation

Tree/Shrub Establishment
Restoration and Management of Rare and Declining Habitats
Upland Wildlife Habitat Management
Herbaceous Weed Control

Transition T2A
State 2 to 3

Abandoned, succession

Restoration pathway R3
State 3 to 1

Control invasive species; restore native species

Conservation practices

Brush Management
Tree/Shrub Site Preparation
Tree/Shrub Establishment
Restoration and Management of Rare and Declining Habitats
Upland Wildlife Habitat Management
Herbaceous Weed Control

Transition T3A
State 3 to 2

Clear vegetation; cultivate domesticated species

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

Albert, D. A. et al., 1995. Vegetation circa 1800 of Michigan. Michigan's native landscape as interpreted from the General Land Office Surveys 1816-1856 (digital map), Lansing: Michigan Natural Features Inventory.

Barnes, B. V. and Wagner, W. H., 2004. Michigan trees: a guide to the trees of the Great Lakes region. Ann Arbor (Michigan): University of Michigan Press.

Burger, T. L. and Kotar, J., 2003. A Guide to Forest Communities and Habitat Types of Michigan. Madison, Wisconsin: Department of Forest Ecology and Management, University of Wisconsin.

Cleland, D. T. et al., 1994. Field guide: Ecological classification and inventory system of the Huron-Manistee National Forests, s.l.: USDA Forest Service, North Central Forest Experiment Station.

Cleland, D.T., J.A. Freeouf, J.E. Keys, G.J. Nowacki, C. Carpenter, and W.H. McNab. 2007. Ecological Subregions: Sections and Subsections of the Coterminous United States. USDA Forest Service, General Technical Report WO-76. Washington, DC. 1–92.

Jacquart, E., Homoya, M. and Casebere, L., 2002. Natural Communities of Indiana (Working Draft), Indianapolis: Indiana Department of Natural Resources, Division of Nature Preserves.

Kost, M. A. et al., 2010. Natural Communities of Michigan: Classification and Description, Lansing, MI: Michigan Natural Features Inventory.

Moran, R. C., 1981. Prairie fens in northeastern Illinois: floristic composition and disturbance. Ohio Biol Surv Biol Notes, 15, 164-168.

Omernik, J.M. and G.E. Griffith. 2014. Ecoregions of the Conterminous United States: Evolution of a Hierarchical Spatial Framework. Environmental Management 54:1249–1266.

Swink, F. and Wilhelm, G., 1994. Plants of the Chicago Region. Indianapolis(Indiana): Indiana Academy of Science.

U.S. Department of the Interior, Geological Survey, 2008. LANDFIRE: LANDFIRE 1.1.0 Vegetation Dynamics Models. Accessed August 28, 2012 http://landfire.cr.usgs.gov/viewer/.

U.S. Department of the Interior, Geological Survey, 2011. LANDFIRE: LANDFIRE 1.1.0 Existing Vegetation Type layer. http://landfire.cr.usgs.gov/viewer/

Contributors

Greg Schmidt

Approval

Nels Barrett, 1/12/2024

Acknowledgments

Matt Bromley and Andy Henriksen reviewed the narratives. Matt Bromley reviewed associated soil map units.

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	05/12/2025
Approved by	Nels Barrett
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:**