

Ecological site R111XE402OH Dry Outwash Mollisol

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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

111E – Indiana and Ohio Till Plain, Eastern Part. Most of this area is in the Till Plains Section of the Central Lowlands Province of the Interior Plains. The northeast tip of the area is in the Southern New York Section of the Appalachian Highlands. The entire area has been glaciated. It is dominated by ground moraines that are broken in places by kames, lake plains, outwash plains, terraces, and stream valleys. Narrow, shallow valleys commonly are along the few large streams in the area. Elevation ranges from 580 to 1,400 feet (175 to 425 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 plain.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Scioto (0506), 33 percent; Muskingum (0504), 31 percent; and Western Lake Erie (0410), 28 percent; Upper Ohio (0503), 5 percent; and Southern Lake Erie (0411), 3 percent. The headwaters of many rivers in central Ohio, including the Vermillion, Black Fork, Sandusky, Little Scioto, and Olentangy Rivers, are in this MLRA.

This MLRA is underlain by late Devonian shale and sandstone. Surficial materials include glacial deposits of till, glaciolacustrine sediments, and outwash from Wisconsin and older glacial periods.

Classification relationships

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

USFS Ecological Regions (USDA, 2007):

Sections –Central Till Plains, Beech Maple (222H), Western Glaciated Allegheny Plateau (221F)

Subsections – Allegheny Plateau (221Fa), Bluffton Till Plains (222Ha), Miami-Scioto Plain – Tipton Till Plain (222Hb)

NatureServe Systems anticipated (NatureServe, 2011): Agriculture - Cultivated Crops and Irrigated Agriculture, Agriculture – Pasture/Hay, North-Central Interior Dry-Mesic Oak Forest and Woodland

LANDFIRE Biophysical Settings anticipated (USGS, 2010): North-Central Interior Dry-Mesic Oak Forest and Woodland

Ecological site concept

The historic plant community of the Dry Outwash Mollisol ecological site is an oak savanna. This site is characterized by the co-dominance of oak trees, especially white and bur oak, and tall prairie grass species, particularly big bluestem and little bluestem. This site was maintained by frequent, low intensity fires, often with a return interval of no more than 5 years, which allowed the co-dominance of growth types to persist. Stand replacing

fires occurred approximate every 200 years. Insect and small mammal herbivory would impact local composition and dominance of the species in a localized and infrequent nature.

Associated sites

R111XE401OH	Wet Outwash Mollisol Soils are very poorly or poorly drained
F111XE403OH	Outwash Upland Soil surface is lighter in color and can is very poorly to somewhat poorly drained
F111XE404OH	Dry Outwash Upland Soil surface is lighter in color and is moderately well drained or dried

Similar sites

R111XE401OH	Wet Outwash Mollisol Soils are very poorly or poorly drained
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Table 1. Dominant plant species

Tree	(1) <i>Quercus alba</i> (2) <i>Quercus macrocarpa</i>
Shrub	Not specified
Herbaceous	(1) <i>Schizachyrium scoparium</i> (2) <i>Andropogon gerardii</i>

Physiographic features

This ecological site is found on outwash plain landscapes in MLRA 111E: Indiana and Ohio Till Plain, Eastern Part on outwash parent materials. Unique landforms that can contain this site include outwash plains and end moraines. The slopes range from 0 to 6 percent and their positions are primarily backslopes, summits, and shoulders.

Table 2. Representative physiographic features

Landforms	(1) Outwash plain (2) Moraine
Flooding frequency	None
Ponding frequency	None
Elevation	335–344 m
Slope	0–6%
Water table depth	66–71 cm
Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation in this area is 35 to 41 (890 to 1,040 millimeters). Most of the rainfall occurs as convective thunderstorms during the growing season. About half or more of the precipitation occurs during the freeze-free period. Snowfall is common in winter. The average annual temperature is 48 to 52 degrees F (9 to 11 degrees C). The freeze-free period averages about 185 days and ranges from 165 to 205 days.

Table 3. Representative climatic features

Frost-free period (characteristic range)	139-144 days
Freeze-free period (characteristic range)	174-177 days
Precipitation total (characteristic range)	991-1,016 mm

Frost-free period (actual range)	139-146 days
Freeze-free period (actual range)	174-179 days
Precipitation total (actual range)	965-1,041 mm
Frost-free period (average)	142 days
Freeze-free period (average)	176 days
Precipitation total (average)	991 mm

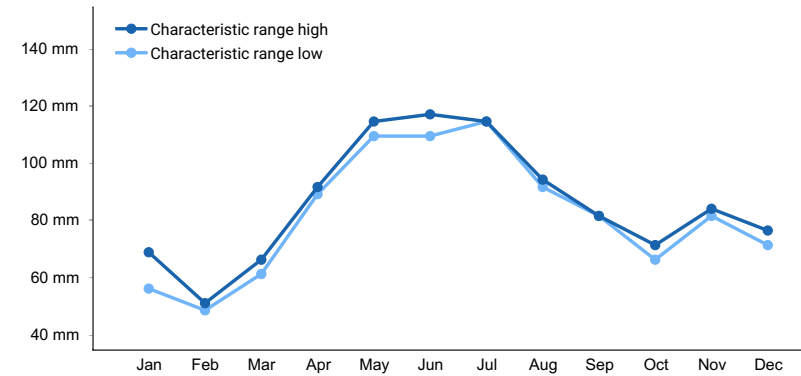


Figure 1. Monthly precipitation range

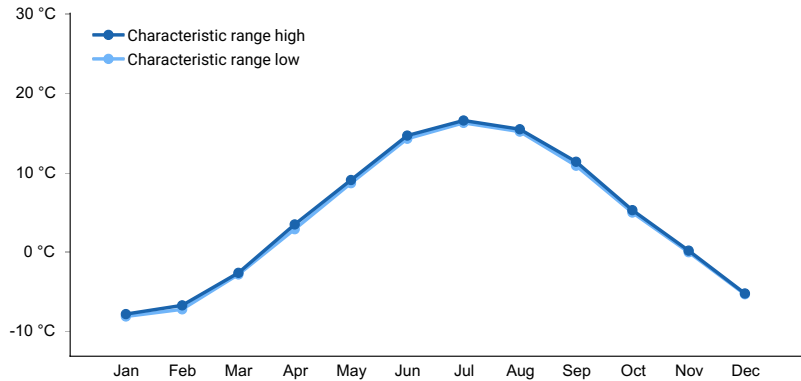


Figure 2. Monthly minimum temperature range

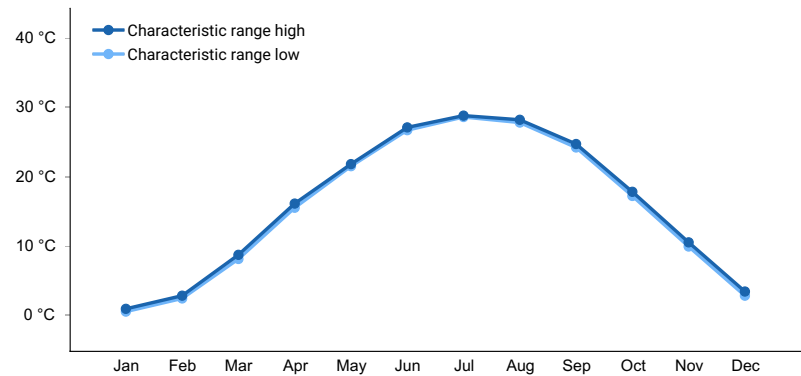


Figure 3. Monthly maximum temperature range

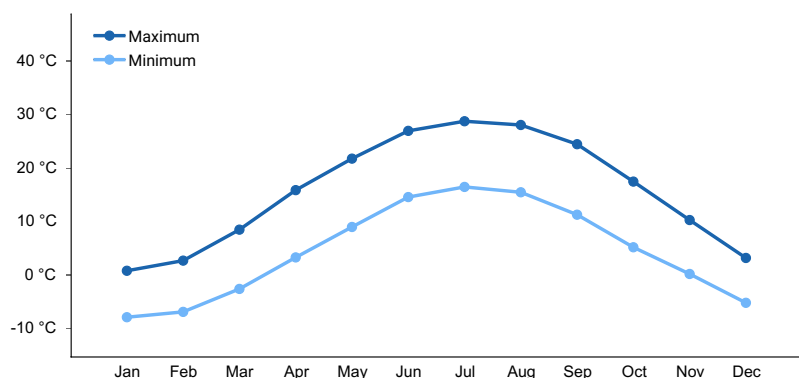


Figure 4. Monthly average minimum and maximum temperature

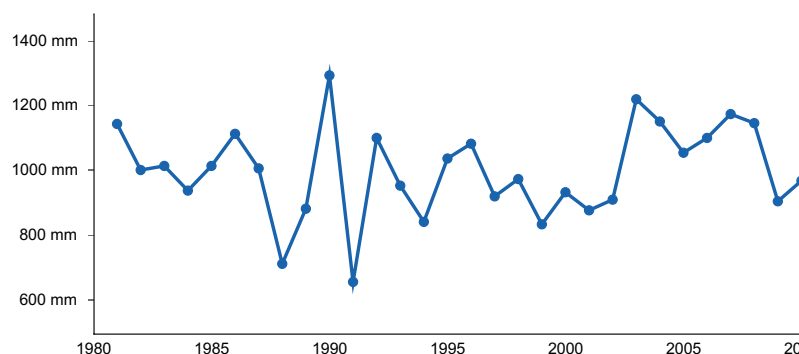


Figure 5. Annual precipitation pattern

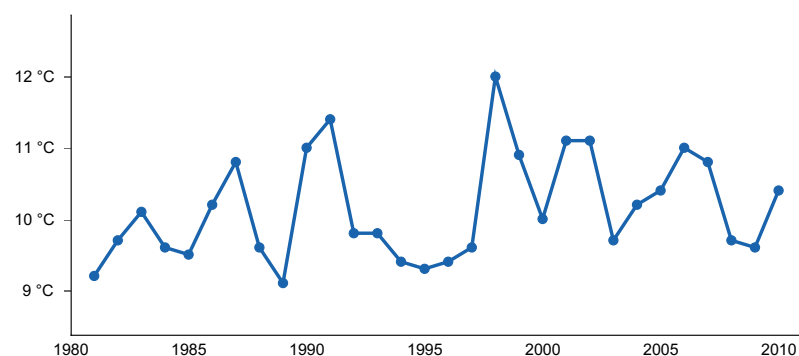


Figure 6. Annual average temperature pattern

Climate stations used

- (1) BUCYRUS [USC00331072], Bucyrus, OH
- (2) UPPER SANDUSKY [USC00338534], Upper Sandusky, OH
- (3) GALION WTR WKS [USC00333021], Galion, OH
- (4) MARION 2 N [USC00334942], Marion, OH

Influencing water features

This ecological site is not influenced by wetland or riparian water features.

Soil features

The soil series associated with this site are: Wilmer Variant. They are very deep, moderately well drained, and moderate to moderately rapid permeable soils, with slightly acidic to neutral soil reaction that formed in outwash.

Parent Materials Kind: outwash

Surface Texture: silt loam

Subsurface Texture group: loamy



Figure 7. Location of mapunit in the MLRA

Table 4. Representative soil features

Parent material	(1) Outwash
Surface texture	(1) Silt loam
Drainage class	Moderately well drained
Permeability class	Moderate to moderately rapid
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	16.76–18.29 cm
Calcium carbonate equivalent (Depth not specified)	0–5%
Electrical conductivity (Depth not specified)	0 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	6.5–7.2
Subsurface fragment volume <=3" (Depth not specified)	2–8%
Subsurface fragment volume >3" (Depth not specified)	1–2%

Ecological dynamics

The historic plant community of the Dry Outwash Mollisol ecological site is an oak savanna. This site is characterized by the co-dominance of oak trees, especially white and bur oak, and tall prairie grass species, particularly big bluestem and little bluestem. This site was maintained by frequent, low intensity fires, often with a return interval of no more than 5 years, which allowed the co-dominance of growth types to persist. Stand replacing fires occurred approximate every 200 years. Insect and small mammal herbivory would impact local composition and dominance of the species in a localized and infrequent nature.

State and transition model

Dry Outwash Mollisol, R111EY402OH

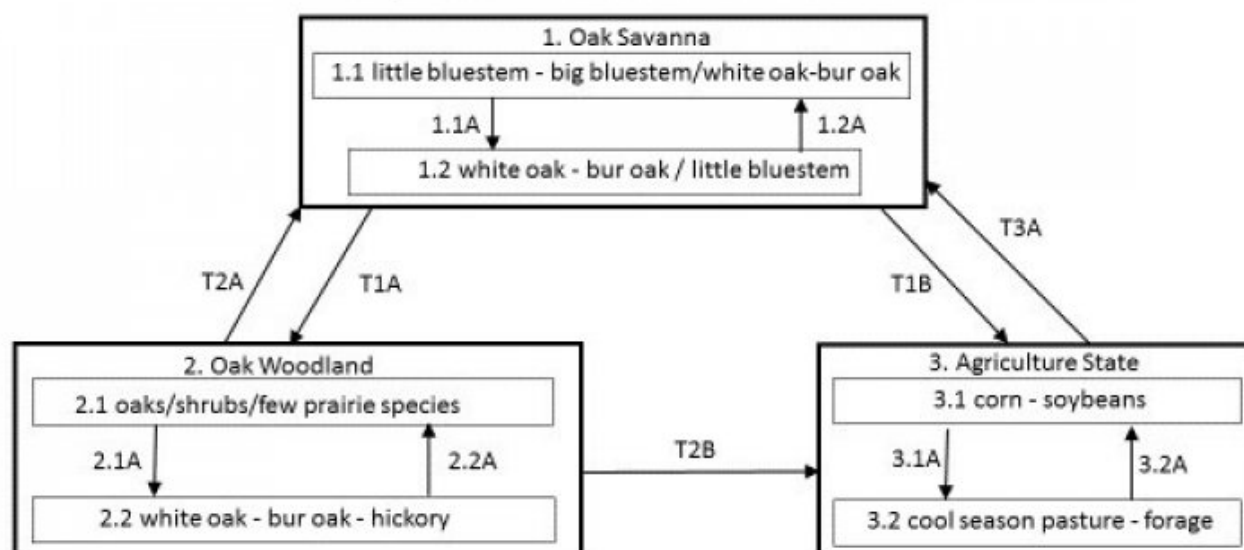


Figure 8. STM

Dry Outwash Mollisol, R111EY402OH

Diagram Legend

T1A	Increased fire absence, no woody species management
T1B	Remove woody species, site preparation, planting
T2A	Remove canopy trees, increase fire frequency/intensity, planting
T2B	Remove woody species, site preparation, planting
T3A	Planting, fire
1.1A	Succession, increase in fire return interval
1.2A	More frequent/intense fire
2.1A	Lack of fire, no woody species management
2.2A	Tree removal, fire
3.1A	Pasture/forage planting and management
3.2A	Conventional/no-till planting and management of row crops

Figure 9. Legend

State 1 Oak Savanna

This is the reference or diagnostic plant community for this site. In reference condition, this site was a co-dominance of white and bur oaks with herbaceous prairie species, principally little bluestem and big bluestem. Fire was the main disturbance agent that maintained the site. Frequent, but lower intensity fires, in conjunction with wind throw would maintain the function of the site. Replacement fires would have occurred roughly every 200 years. The more recent the fire the greater the dominance of grasses. Longer time between fires would sway dominance

towards the black oak trees.

Dominant plant species

- white oak (*Quercus alba*), tree
- bur oak (*Quercus macrocarpa*), tree
- big bluestem (*Andropogon gerardii*), grass
- little bluestem (*Schizachyrium scoparium*), grass

Community 1.1

white oak - bur oak / little bluestem - big bluestem

This phase is characterized by recent or frequently occurring ground fires that shift the co-dominance towards the herbaceous species

Dominant plant species

- white oak (*Quercus alba*), tree
- bur oak (*Quercus macrocarpa*), tree
- little bluestem (*Schizachyrium scoparium*), grass
- big bluestem (*Andropogon gerardii*), grass

Community 1.2

white oak - bur oak / little bluestem

This phase is characterized by protection from or longer time since the last fire. Trees and herbaceous species are co-dominant during this phase.

Dominant plant species

- white oak (*Quercus alba*), tree
- bur oak (*Quercus macrocarpa*), tree
- little bluestem (*Schizachyrium scoparium*), grass

Pathway P1.1A

Community 1.1 to 1.2

Longer fire return intervals will move this towards phase 2.

Pathway P1.2A

Community 1.2 to 1.1

More frequent/intense fire will shift this phase back to phase 1.

State 2

Oak Woodland

Absence of fire and/or lack of woody vegetation management will move this site to the black oak woodland state. This state is characterized by an increase in tree canopy (61-100%) concomitant with shrub species becoming the dominant growth form in the understory. Black oaks will still be the dominant tree species, but white oaks and hickory become more dominant. Sub canopy and shrub species include the dogwood species, sassafras, and hazelnut species. Continued suppression of disturbance will lead to this site being a closed canopy oak-dominated forest at the higher end of the suggested canopy range. White oak eventually becomes the dominant tree species with black oak, shagbark hickory and black cherry also in the canopy.

Dominant plant species

- black oak (*Quercus velutina*), tree

Community 2.1

oak /shrubs / few prairie species

This phase is characterized by protection from or longer time since the last fire. Trees are the dominant growth form and shrubs are the secondary growth form.

Community 2.2

white oak - bur oak - hickory

This phase is characterized by near lack of fire. Trees are the dominant growth form. White oaks and hickory species become more common/prevalent in the canopy

Pathway P2.1A

Community 2.1 to 2.2

Increased fire absence and no woody species management will move this site toward phase 2, characterized by shift in tree species

Pathway P2.2A

Community 2.2 to 2.1

Timber cutting, more frequent/intense fire, and seeding will transition this phase back to phase 1.

State 3

Agricultural State

This site has largely been converted to agricultural use. The majority of the historic acres are now in row crop agricultural use. Most common is a corn and soybean rotation of various types. A small portion of the site is 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, soybeans, and occasionally wheat.

Community 3.2

forage -pasture

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

Pathway P3.1A

Community 3.1 to 3.2

Planting of cool season pasture/forage species and management.

Pathway P3.2A

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

Transition T1A

State 1 to 2

Increased fire absence and no woody species management will move this site toward State 2, characterized by the

marked increase in shrubs.

Transition T1B

State 1 to 3

Removal of woody vegetation, tillage and regular agricultural practices will convert this site to State 3.

Restoration pathway R2A

State 2 to 1

Remove trees and woody vegetation, except small amounts of desired oak species, seeding, and fire restores the site to the reference state.

Transition T2B

State 2 to 3

Removal of the trees, tillage and planting of the crop move this site to the agriculture state.

Restoration pathway R3A

State 3 to 1

Remove drainage, site preparation, planting of desired species, and regular application of fire.

Additional community tables

Inventory data references

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

Other references

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Approval

Chris Tecklenburg, 5/28/2020

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)	TYLER STAGGS
Contact for lead author	
Date	05/16/2024
Approved by	Chris Tecklenburg
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:**
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17. **Perennial plant reproductive capability:**
