USDA Natural Resources Conservation Service

Ecological site F111XE404OH
Dry Outwash Upland

Last updated: 9/11/2024
Accessed: 05/20/2025

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.

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, North-Central Interior Beech-Maple Forest, Ruderal Forest

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

Ecological site concept

This site is an upland site formed on glacial outwash and colluvium parent materials in soils that are moderately well drained or drier. The soils have a relatively light soil surface color (lighter than 3/2 Munsell). This site is found on, generally, steeper topography than the Outwash Upland site which leads to it being better drained and drier. Slopes for this site can range from flat (summits) to quite steep with an average maximum of 18 percent.

The characteristic vegetation of the site is that of a somewhat dry forest dominated largely by oak species, such as white oak and black oak that can tolerate the increased drainage of the site. Hickory species are also common throughout the site along with sugar maple in somewhat fire protected areas, black cherry, and sassafras. Moderate fire return interval (40-60yrs) for low intensity fires and stand replacing fires every 100-200yrs contributed to the dominance of oak species on the site. Changes in the fire regime have led to many of the extant representation of the site to have a greater amount of fire sensitive, shade tolerate species occupying both the understory and canopy than what was present at the time of European settlement. In this state, the site progress through a phase that in characterized by a co-dominance in the canopy of oaks and sugar maples. Continued absence of fire or lack of timber stand management allows the site to more resemble a mesic forest as dominated by sugar maple and American beech. Currently, the majority of the site is in agricultural production, with the majority being used for growing corn and soybeans, though some areas are used for growing cool season forage and pasture.

Associated sites

F111XE403OH	**Outwash Upland** Soils are very poorly to somewhat poorly drained
R111XE401OH	**Wet Outwash Mollisol** Soils are very poorly or poorly drained; soil surface is darker in color

R111XE402OH	**Dry Outwash Mollisol** Soils are somewhat poorly drained or dried; soil surface is darker in color

Similar sites

R111XE402OH	**Dry Outwash Mollisol** Soils are somewhat poorly drained or dried; soil surface is darker in color
F111XE302OH	**Dry Restricted** Located on residuum parent material; restrictive layer within 36 inches of soil surface.

Table 1. Dominant plant species

Tree	(1) *Quercus alba* (2) *Quercus velutina*
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This ecological site is found in a variety of upland landscapes in MLRA 111E: Indiana and Ohio Till Plain, Eastern Part. The site can be found on the backslope, shoulder, and summits with slopes that range from 0 to 18 percent. Unique landforms that can contain this site include dunes, glacial drainage channel, kames, and outwash plains and terraces.

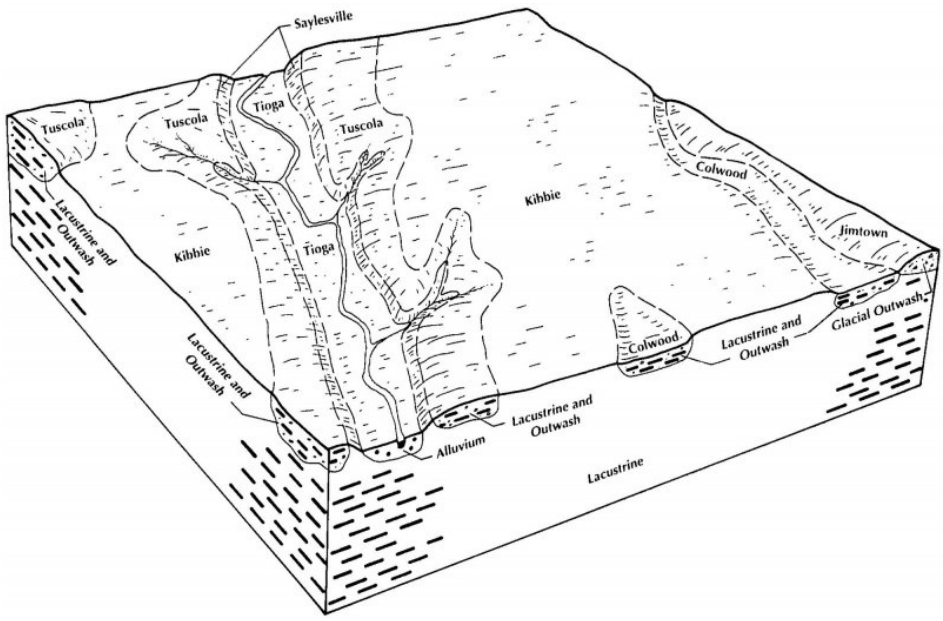

Figure 1. block diagram showing soils on the landscape

Table 2. Representative physiographic features

Landforms	(1) Glacial drainage channel (2) Terrace (3) Dune (4) Outwash plain
Runoff class	Low to high
Flooding frequency	None
Ponding frequency	None
Elevation	110–354 m
Slope	0–18%
Water table depth	84–152 cm
Aspect	W, NW, N, NE, E, SE, S, SW

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)	132-147 days
Freeze-free period (characteristic range)	170-181 days
Precipitation total (characteristic range)	965-1,041 mm
Frost-free period (actual range)	128-149 days
Freeze-free period (actual range)	166-183 days
Precipitation total (actual range)	965-1,067 mm
Frost-free period (average)	140 days
Freeze-free period (average)	175 days
Precipitation total (average)	991 mm

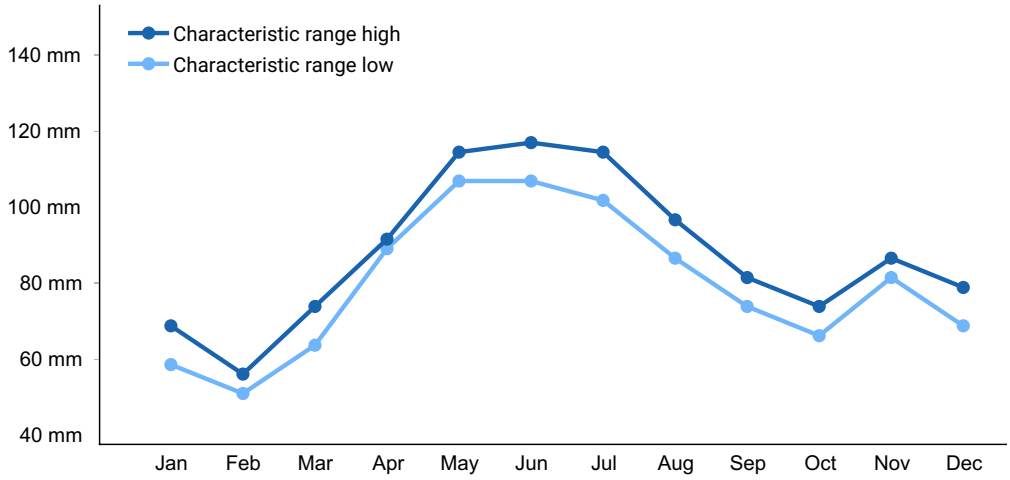

Figure 2. Monthly precipitation range

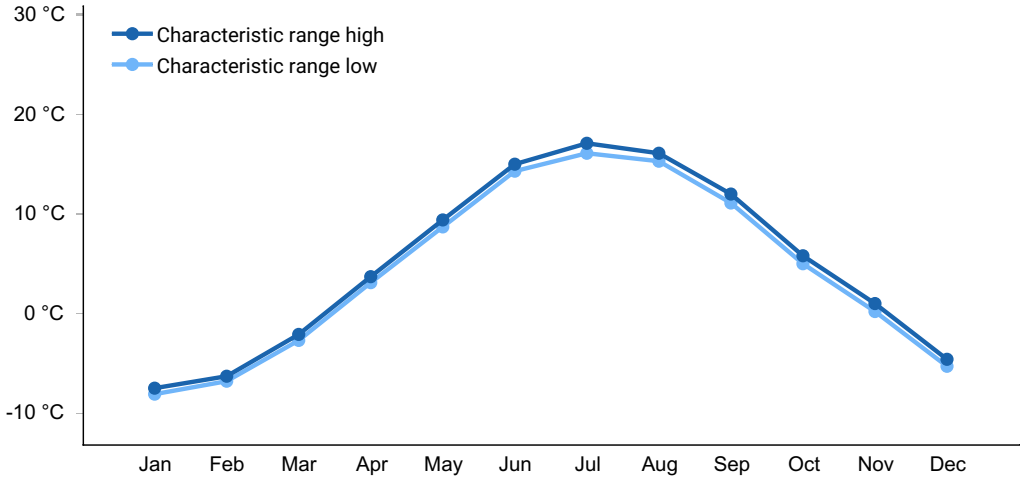

Figure 3. Monthly minimum temperature range

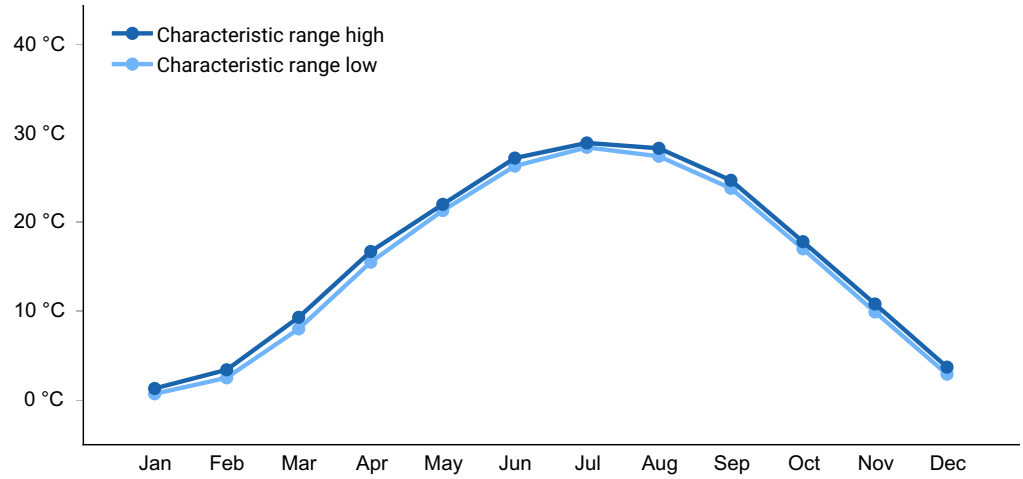

Figure 4. Monthly maximum temperature range

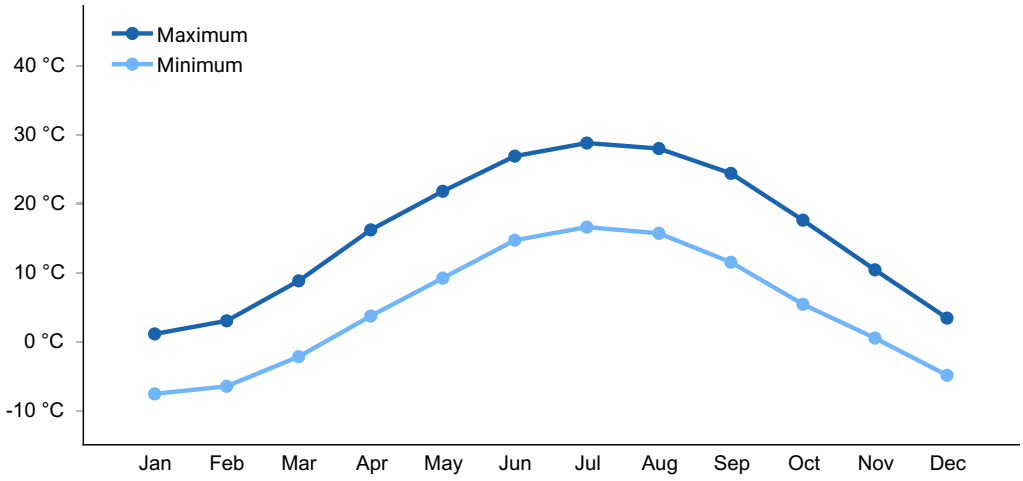

Figure 5. Monthly average minimum and maximum temperature

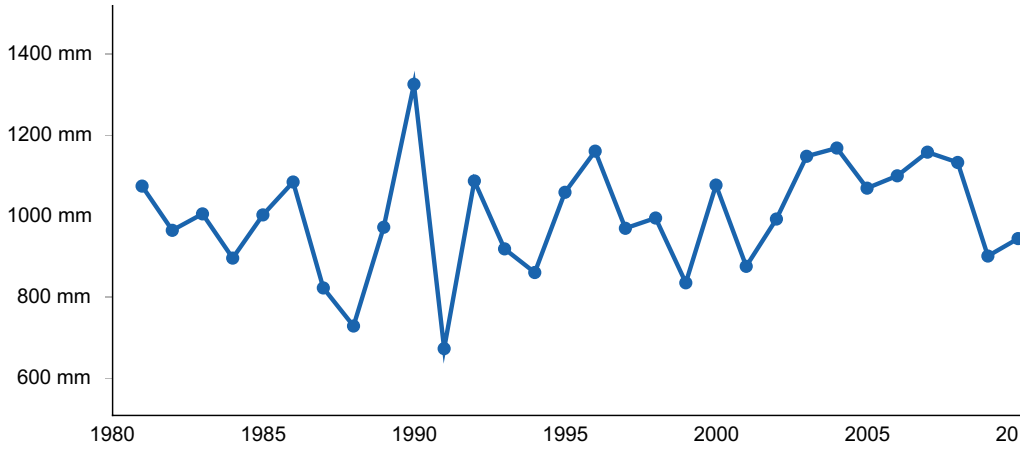

Figure 6. Annual precipitation pattern

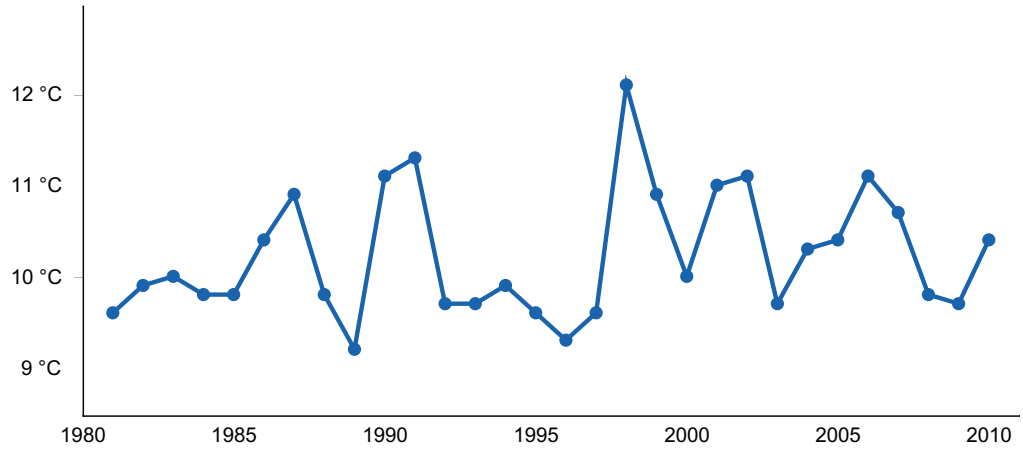

Figure 7. Annual average temperature pattern

Climate stations used

- (1) ASHLAND 2 SW [USC00330256], Ashland, OH
- (2) CENTERBURG 2 SE [USC00331404], Centerburg, OH
- (3) NORWALK WWTP [USC00336118], Norwalk, OH
- (4) UPPER SANDUSKY [USC00338534], Upper Sandusky, OH

- (5) BUCYRUS [USC00331072], Bucyrus, OH
- (6) WESTERVILLE [USC00338951], Westerville, OH
- (7) GALION WTR WKS [USC00333021], Galion, 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: Wheeling, Spinks, Oshtemo, Ockley, Martinsville, Haney, Gallman, Fox, Chili, Bixler. They are moderately deep, somewhat poorly drained to well drained, and moderate to very rapid permeable soils, with strongly acidic to neutral soil reaction, that formed in eolian deposits, glaciofluvial deposits, outwash.

Parent Materials Kind: outwash
Surface Texture: fine sandy loam, loam, loamy fine sand, silt loam
Subsurface Texture group: loamy

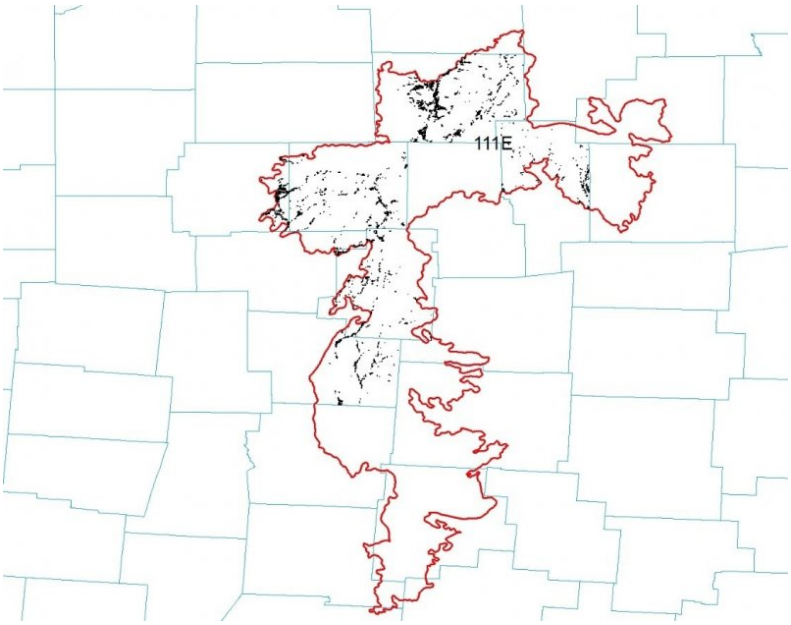

Figure 8. Location of mapunit in the MLRA

Table 4. Representative soil features

Parent material	(1) Outwash (2) Glaciofluvial deposits (3) Eolian deposits
Surface texture	(1) Loam (2) Loamy fine sand (3) Silt loam (4) Fine sandy loam

Drainage class	Somewhat poorly drained to well drained
Permeability class	Moderate to very rapid
Soil depth	76–91 cm
Surface fragment cover <=3"	0–2%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	6.86–18.54 cm
Calcium carbonate equivalent (Depth not specified)	0–3%
Electrical conductivity (Depth not specified)	0 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	5.3–7.7
Subsurface fragment volume <=3" (Depth not specified)	2–21%
Subsurface fragment volume >3" (Depth not specified)	0–4%

Ecological dynamics

The historic plant community of the Dry Outwash Upland is that of an oak-hickory forest. The forest canopy is dominated by white oak, black oak, and hickory species, with sugar maple, black cherry and sassafras being present as well. Fire was a major disturbance mechanism for this site. Ground fires occurred every 40-60 years and stand replacing fires nearly every 200 years.

State and transition model

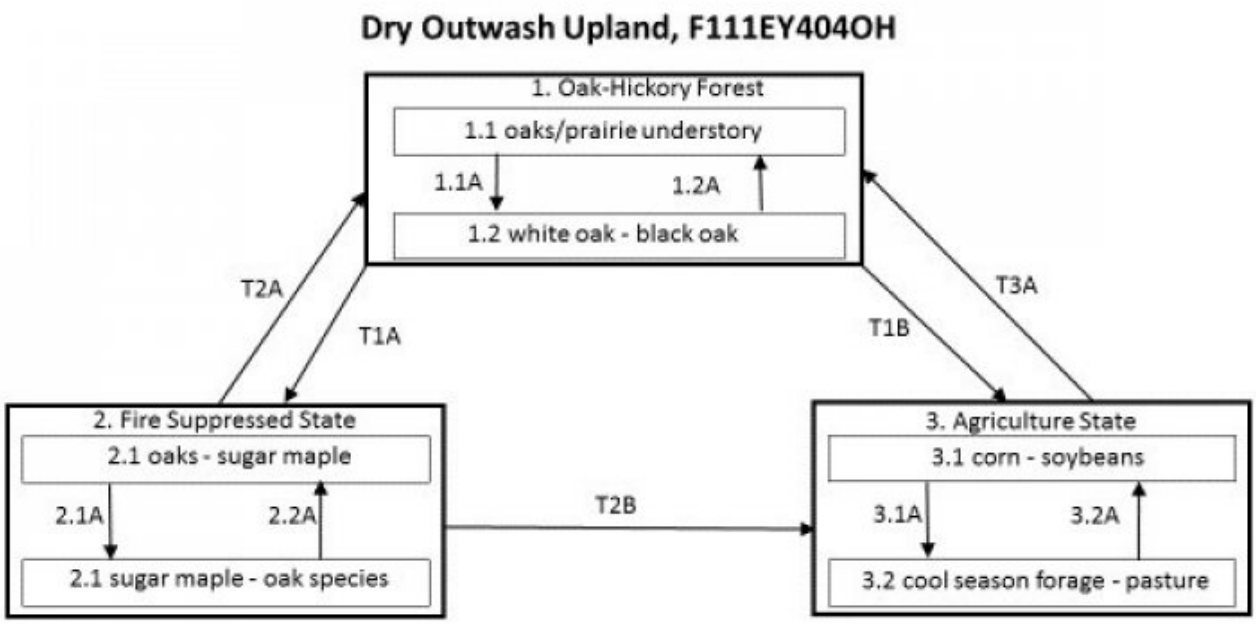

Figure 9. STM

Dry Outwash Upland, F111EY404OH

Diagram Legend

T1A	No management, no fire
T1B	Remove woody species, site preparation, planting, management
T2A	Prescribed tree thinning, fire
T2B	Remove woody species, site preparation, planting, management
T3A	Tree planting, timber stand improvement practices, fire
1.1A	Succession
1.2A	Fire, disturbance that removes canopy trees
2.1A	No management or disturbance
2.2A	Selective tree harvest
3.1A	Pasture/forage planting and maintenance
3.2A	Tillage/no-till planting and management of row crops.

Figure 10. Legend

State 1
Oak hickory Forest

This is the reference or diagnostic plant community for this site. In reference conditions, this forested site was dominated by white oak, black oak, and hickory species in the

canopy. Secondary species included sugar maple, black cherry and sassafras. Brambles and native roses were common in the understory. Less common, but present were some of the prairie species such as Pennsylvania sedge and big bluestem.

Dominant plant species

- white oak (*Quercus alba*), tree
- black oak (*Quercus velutina*), tree
- hybrid hickory (*Carya*), tree
- big bluestem (*Andropogon gerardii*), grass

Community 1.1
oaks / prairie understory

Short time since the last fire or more frequent fires or timber stand improvement have this phase closely resembling that of an oak savanna. Prairie grass species such as big bluestem and Indiangrass become more prominent and abundant.

Dominant plant species

- oak (*Quercus*), tree
- big bluestem (*Andropogon gerardii*), grass
- Indiangrass (*Sorghastrum*), grass

Community 1.2
white oak - black oak

This community phase is an oak-hickory forest. The forest canopy is dominated by white oak, black oak, and hickory species, with sugar maple, black cherry and sassafras being present as well. Fire was a major disturbance mechanism for this site with return intervals greater than 15 years.

Dominant plant species

- white oak (*Quercus alba*), tree
- black oak (*Quercus velutina*), tree

Pathway P1.1A
Community 1.1 to 1.2

Fire intervals exceeding 15 years and succession of the site will move this community phase towards 1.2.

Pathway P1.2A
Community 1.2 to 1.1

Fire or any disturbance or management that removes the majority of the canopy trees will move this towards community phase 1.1.

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. Shade tolerant species, specifically sugar maple and beech, that are present in the understory in relatively small amounts become the dominant tree species.

Dominant plant species

- white oak (*Quercus alba*), tree
- sugar maple (*Acer saccharum*), tree

Community 2.1
white oak - sugar maple

This state is characterized by a longer than normal fire return interval (100+ years) or the absence of fire. Sugar maple becomes quite common in the canopy.

Dominant plant species

- sugar maple (*Acer saccharum*), tree
- white oak (*Quercus alba*), tree

Community 2.2
sugar maple - white oak

This state is characterized by a longer than normal fire return interval (150+ years) or the absence of fire. Sugar maple becomes the dominant canopy tree species with some oaks being present

Dominant plant species

- sugar maple (*Acer saccharum*), tree
- white oak (*Quercus alba*), tree

Pathway P2.1A
Community 2.1 to 2.2

No management or disturbance to remove trees allow shade tolerant, fire resistant trees to become dominant.

Pathway P2.2A
Community 2.2 to 2.1

Selective tree harvest to create openings for oaks species.

State 3
Agricultural State

This state is characterized by the conversion of the site to agricultural use. Most common practice is a corn and soybean rotation of various types. A small portion of the historic acres are used for forage and pasture.

Community 3.1
row crops (corn -soybeans)

This phase is characterized by row crop agriculture, 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 P3.1A
Community 3.1 to 3.2

Planting of cool season forage and pasture species along with appropriate management of those species will move this phase to 3.2.

Pathway P3.2A
Community 3.2 to 3.1

Conventional or no-till planting of row crops and associated practices will move this phase to 3.1.

Transition T1A
State 1 to 2

No management, to include fire, or other large disturbance to remove trees from the canopy will allow the site to move towards State #2.

Transition T1B
State 1 to 3

Removal of the tree species, tillage, and planting of the agricultural crop transition the site to state 3.

Restoration pathway R2A
State 2 to 1

Prescribed tree thinning to give competitive advantage to desired species and fire move the site back to the reference state.

Transition T2B
State 2 to 3

All trees removed, the site prepared, tillage and planting of the agricultural crop.

Restoration pathway R3A
State 3 to 1

Removal of drainage system (if warranted), site preparation, and tree planting, followed by fire on a 15+ year interval.

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

Greg Schmidt, 9/11/2024

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)	TYLER STAGGS
Contact for lead author	

Date	02/07/2022
Approved by	Greg Schmidt
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:**

17. **Perennial plant reproductive capability:**