

## Ecological site F111XD017IN Outwash Upland

Last updated: 5/28/2020  
Accessed: 05/18/2024

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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.

111D – Indiana and Ohio Till Plain, Western Part. This MLRA occurs in two separate areas. One area is in the west-central part of Indiana (73 percent), and the other is in southwestern Ohio (27 percent). The MLRA makes up 5,355 square miles (13,880 square kilometers). It includes the towns of Crawfordville, Delphi, Frankfort, Lafayette, and Liberty, Indiana, and Hamilton, Lebanon, Middletown, and Wilmington, Ohio. Interstates 65 and 74 cross the part of this area in Indiana, and Interstates 71 and 75 cross the part in Ohio. Shades and Turkey Run State Parks are in the part in Indiana, and Caesar Creek and Hueston Woods State Parks are in the part in Ohio. A small portion of the Wright-Patterson Air Force Base, in Ohio, is in the northern part of the area.

This area is in the Till Plains Section of the Central Lowland Province of the Interior Plains. It is dominated by loess hills and flats that are broken in places by moraines, kames, outwash plains, and stream terraces. Narrow, shallow valleys commonly are along the few large streams in the area. Elevation ranges from 530 to 1,050 feet (160 to 320 meters), increasing gradually from southwest to northeast. Relief is mainly a few meters, but in some areas hills rise as much as 100 feet (30 meters) above the adjoining plains.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Wabash (0512), 68 percent; Great Miami (0508), 15 percent; Middle Ohio (0509), 14 percent; Scioto (0506), 2 percent; and Upper Illinois (0712), 1 percent. Wildcat Creek in Indiana and the Little Miami River in Ohio have been designated as National Wild and Scenic Rivers. Sugar Creek and Walnut Creek occur in the part of the area in northern Indiana, and the Whitewater River is in the part in southeastern Indiana. The Sevenmile, Fourmile, and Great Miami Rivers cross the part of the area in Ohio.

Most of the eastern part of this MLRA is underlain by Late Ordovician shale and limestone. The western part is underlain by shale, siltstone, sandstone, limestone, and dolostone ranging in age from Middle Pennsylvanian to Silurian. Surficial materials include glacial deposits of till, outwash, and lacustrine sediments from Wisconsin and

older glacial periods. A thin or moderately thick mantle of loess overlies much of the area.

## Classification relationships

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

USFS Ecological Regions (USDA, 2007):

Sections –Central Till Plains, Beech Maple (222H), Interior Low Plateau-Shawnee Hills (223D), Interior Low Plateau-Bluegrass (223F), Central Till Plains-Oak Hickory (223G), Central Till Plains and Grand Prairies (251D)

Subsections -Bluffton Till Plains (222Ha), Miami-Scioto Plain-Tipton Till Plain (222Hb), Little Miami Old Drift Plain (222Hc), Mad River Interlobate Plains (222Hd), Crawford Uplands (223De), Crawford Escarpment (223Df), Northern Bluegrass (223Fd), Lower Wabash Alluvial Plain (223Gc), Southwest Indiana Glaciated Lowlands (223Ge), Eastern Grand Prairie (253Dd).

NatureServe Systems anticipated (NatureServe, 2011): Agriculture - Cultivated Crops and Irrigated Agriculture, Agriculture - Pasture/Hay, Allegheny-Cumberland Dry Oak Forest and Woodland, Central Interior Acidic Cliff and Talus, Central Interior Highlands Calcareous Glade and Barrens, Central Tallgrass Prairie, Clearcut - Grassland/Herbaceous, Introduced Upland Vegetation – Treed, Managed Tree Plantation, Mississippi River Riparian Forest, North-Central Interior and Appalachian Acidic Peatland, North-Central Interior Beech-Maple Forest, North-Central Interior Dry-Mesic Oak Forest and Woodland, North-Central Interior Dry Oak Forest and Woodland, North-Central Interior Floodplain, North-Central Interior Freshwater Marsh, North-Central Interior Maple-Basswood Forest, North-Central Interior Oak Savanna, North-Central Interior Wet Flatwoods, North-Central Interior Wet Meadow-Shrub Swamp, North-Central Oak Barrens, Northern Atlantic Coastal Plain Hardwood Forest, Ruderal Forest, Ruderal Upland - Old Field, South-Central Interior / Upper Coastal Plain Wet Flatwoods, South-Central Interior Large Floodplain, South-Central Interior Mesophytic Forest, South-Central Interior Small Stream and Riparian, Southern Appalachian Oak Forest, Southern Interior Low Plateau Dry-Mesic Oak Forest, Successional Shrub/Scrub

LANDFIRE Biophysical Settings anticipated (USGS, 2010): Allegheny-Cumberland Dry Oak Forest and Woodland, Bluegrass Savanna and Woodland, Central Interior and Appalachian Floodplain Systems, Central Interior and Appalachian Riparian Systems, Central Interior and Appalachian Shrub-Herbaceous Wetland Systems, Central Interior and Appalachian Swamp Systems, Central Interior Highlands Calcareous Glade and Barrens, Central Interior Highlands Dry Acidic Glade and Barrens, Central Tallgrass Prairie, Great Lakes Coastal Marsh Systems, Mississippi River Alluvial Plain Dry-Mesic Loess Slope Forest, North-Central Interior Beech-Maple Forest, North-Central Interior Dry-Mesic Oak Forest and Woodland, North-Central Interior Dry Oak Forest and Woodland, North-Central Interior Maple-Basswood Forest, North-Central Interior Oak Savanna, North-Central Interior Wet Flatwoods, Paleozoic Plateau Bluff and Talus, Pennyroyal Karst Plain Prairie and Barrens, South-Central Interior Mesophytic Forest, South-Central Interior/Upper Coastal Plain Flatwoods, Southern Appalachian Oak Forest, Southern Interior Low Plateau Dry-Mesic Oak Forest

## Ecological site concept

This site is an upland site formed on glacial outwash and colluvium parent materials in soils that are somewhat poorly to moderately well drained. The soils have a relatively light soil surface color (lighter than 3/2 Munsell) with the subsurface texture group of loamy. Low severity surface fires maintained the dominance of oak and hickory trees with a return interval between 20-40 years. An increase in the fire return interval could lead the site to having more fire sensitive, shade tolerant species occupying substantial space in both the understory and canopy. Currently, the majority of the site is in agricultural production, with the majority being used for growing corn and soybeans.

## Associated sites

F111XD018IN	<b>Dry Outwash Upland</b> Located on adjacent landscapes; soils are well to excessively drained.
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R111XD019IN	<b>Outwash Integrate</b> Located on adjacent landscapes; soil surface color is 3/2 Munsell or darker and extends to 10 inches or less
R111XD020IN	<b>Wet Outwash Mollisol</b> Located on adjacent landscapes; soil surface color is 3/2 Munsell or darker and extends greater than 10 inches; soils are very poorly to somewhat poorly drained.
R111XD021IN	<b>Dry Outwash Mollisol</b> Located on adjacent landscapes; soil surface color is 3/2 Munsell or darker and extends greater than 10 inches; soils are moderately well to excessively drained.

## Similar sites

F111XD024IN	<b>Deep Restricted</b> Located on loess parent material; soils are somewhat poorly to well drained and taxonomically alfisols.
F111XD016IN	<b>Dry Loess Upland</b> Located on residuum parent material; soil restrictive layer is 40 inches or deeper.

**Table 1. Dominant plant species**

Tree	(1) <i>Quercus alba</i> (2) <i>Carya ovata</i>
Shrub	Not specified
Herbaceous	Not specified

## Physiographic features

This ecosite is found in till plain in MLRA 111D: Indiana and Ohio Till Plain, Western Part.

Conservation Tree and Shrub Group: 1C- Soils in this CTSG are clayey and somewhat poorly to moderately well drained and are at least moderately deep. They have favorable moisture conditions or a seasonal high water table that ranges from .5-1.5 feet from the surface during the growing season. Flooding frequency ranges from rare to none. The available water capacity is at least 3 inches in the rooting zone.

**Table 2. Representative physiographic features**

Landforms	(1) Outwash plain (2) Outwash terrace (3) Terrace
Flooding frequency	None
Ponding frequency	None
Elevation	107–366 m
Slope	0–6%
Ponding depth	0 cm
Water table depth	15–137 cm
Aspect	SE, W

## Climatic features

The average annual precipitation in this area is 36 to 43 inches (915 to 1,090 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 49 to 54 degrees F (10 to 12 degrees C). The freeze-free period averages about 200 days and ranges from 180 to 215 days.

Table 3. Representative climatic features

Frost-free period (characteristic range)	131-136 days
Freeze-free period (characteristic range)	169-181 days
Precipitation total (characteristic range)	1,041-1,092 mm
Frost-free period (actual range)	125-147 days
Freeze-free period (actual range)	162-182 days
Precipitation total (actual range)	991-1,118 mm
Frost-free period (average)	135 days
Freeze-free period (average)	174 days
Precipitation total (average)	1,067 mm

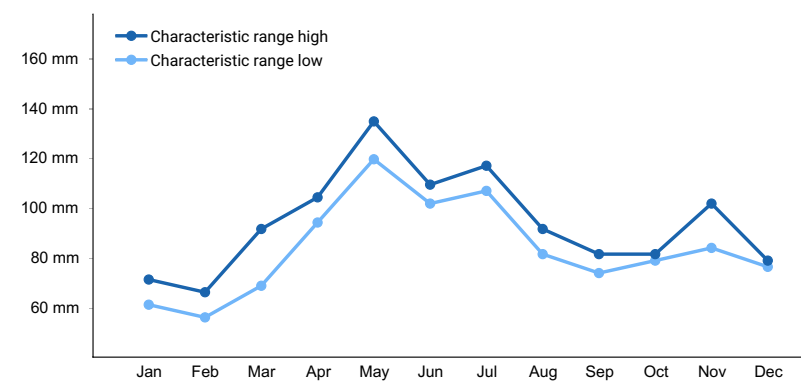


Figure 1. Monthly precipitation range

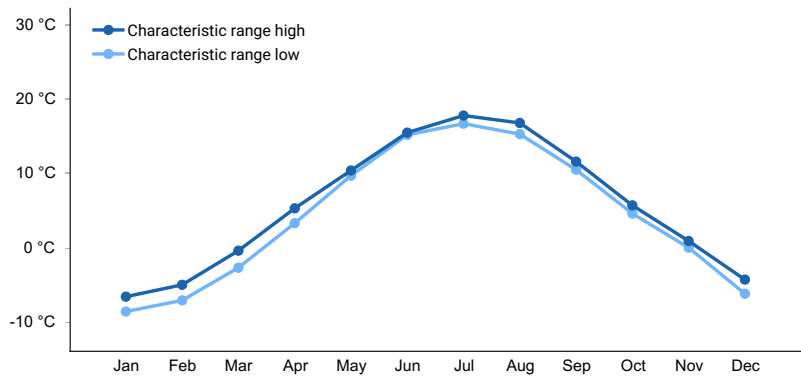


Figure 2. Monthly minimum temperature range

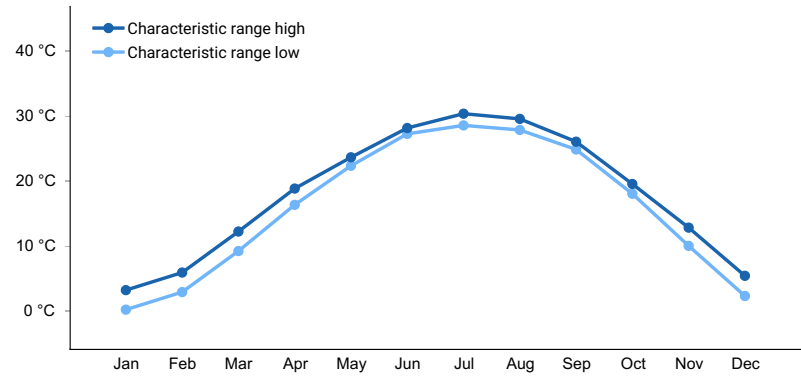
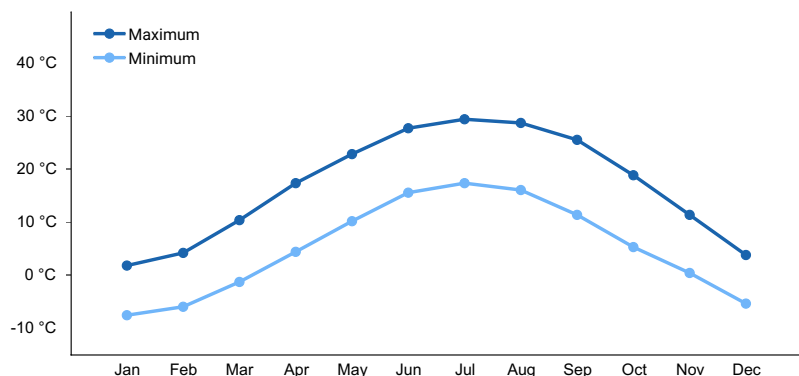
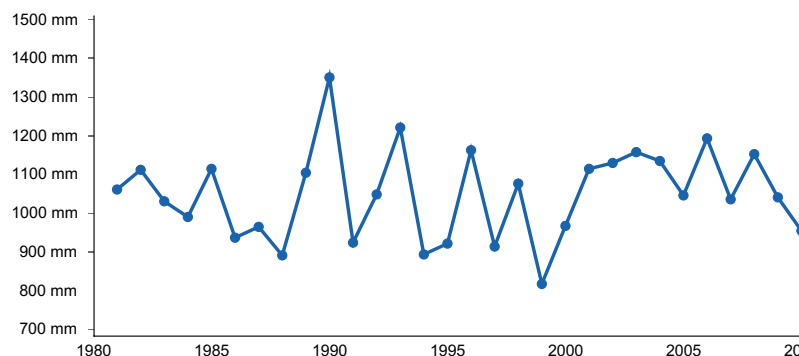


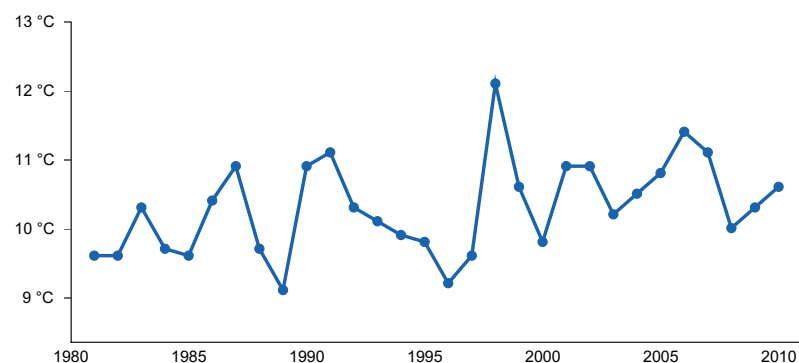
Figure 3. Monthly maximum temperature range



**Figure 4. Monthly average minimum and maximum temperature**



**Figure 5. Annual precipitation pattern**



**Figure 6. Annual average temperature pattern**

## Climate stations used

- (1) CRAWFORDSVILLE 6 SE [USC00121873], Crawfordsville, IN
- (2) WABASH [USC00129138], Wabash, IN
- (3) TERRE HAUTE INDIANA ST [USC00128723], Terre Haute, IN
- (4) BOSWELL 4WNW [USC00120858], Fowler, IN
- (5) HAMILTON BUTLER CO RGNL AP [USW00053855], Fairfield, OH
- (6) WILMINGTON 3 N [USC00339219], Wilmington, 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: Whitaker, Waynetown, Thackery, Taggart, Starks, Sleeth, Shadeland, Markland, Libre, Kendall, Homer, Fitchville. They are moderately deep to very deep, somewhat poorly drained to moderately well drained, and slow to very rapid permeable soils, with strongly acidic to neutral soil reaction, that formed in Outwash.

**Table 4. Representative soil features**

Parent material	(1) Outwash–sandstone and shale (2) Glaciofluvial deposits–siltstone
Surface texture	(1) Loam (2) Silt loam (3) Silty clay loam
Family particle size	(1) Loamy
Drainage class	Somewhat poorly drained to moderately well drained
Permeability class	Slow to very rapid
Soil depth	76–191 cm
Surface fragment cover ≤3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	11.94–20.83 cm
Calcium carbonate equivalent (0-101.6cm)	0–13%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5.5–7.2
Subsurface fragment volume ≤3" (Depth not specified)	0–20%
Subsurface fragment volume >3" (Depth not specified)	0–5%

## Ecological dynamics

The historic plant community of the Overflow ecological site is an outwash forest. The forest canopy is dominated by white oak and shagbark hickory with high level of canopy cover. The site was maintained by periodic surface fires that occurred every 25-65 years. Once this fire return interval exceeded 40 years, less fire tolerant species such as sugar maple and beech would invade the understory. Continued absence of fire would lead to their dominance in the canopy to the exclusion of the oaks and hickories. Since settlement, most of the site has been converted to agricultural use with the majority bined used to grow corn and soybeans.

## State and transition model

## Outwash Upland, F111DY017IN

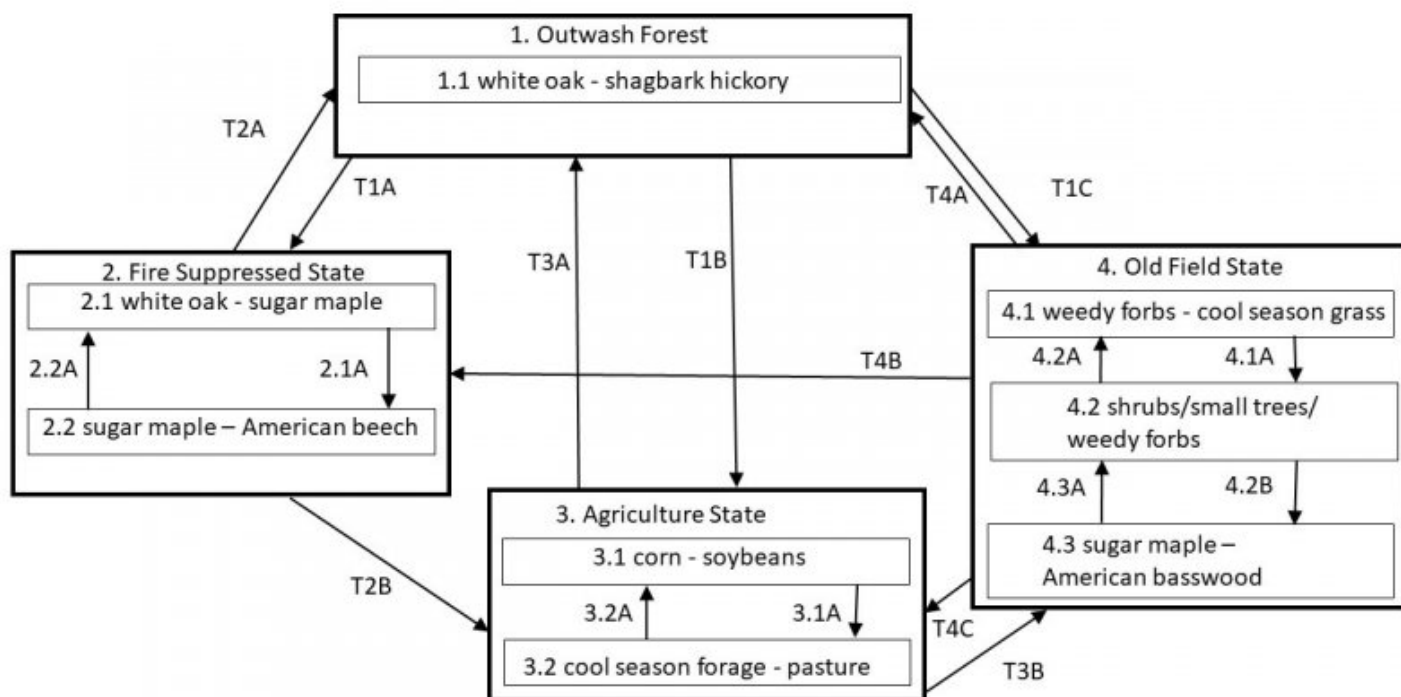


Figure 7. STM

## Outwash Upland, F111DY017IN

### Diagram Legend

T1A	No management, no fire
T1B	Drainage, site preparation, planting, management
T1C	Complete tree removal, no subsequent management or fire
T2A	Prescribed tree thinning, timber stand improvement, fire
T2B	Clear trees, drainage, site preparation, planting, management
T3A	Remove drainage, tree planting, timber stand improvement, fire
T3B	No management or fire
T4A	Tree planting, timber stand improvement, fire
T4B	No management over a long time, no fire
T4C	Woody specie removal, tillage, agricultural practices

Figure 8. Legend1

2.1A	No management
2.2A	Selective tree harvest
3.1A	Pasture/forage planting and management
3.2A	Tillage, management of row crops
4.1A	Succession, no management
4.2A	Disturbance that removes woody species
4.2B	Succession, no management
4.3A	Disturbance that removes trees

Figure 9. Legend2

## State 1 Outwash Forest

This is the reference or diagnostic plant community for this site. In reference conditions, this forested site was dominated by white oak and shagbark hickory in the canopy. Secondary species included black oak, black cherry, shellbark hickory, and pignut hickory. 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. The absence of fire will shift this state towards a mesophytic forest. Restoration involves selective tree harvest and the use of fire.

### Community 1.1 white oak/shagbark hickory

This phase is characterized by being an oak-hickory forest with the dominant species being white oak and shagbark hickory. The competitive advantage of these species is maintained by fire every 24-40 years.

## 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.

### 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.

### Community 2.2 sugar maple/beech

This state is characterized by a longer than normal fire return interval (150+ years) or the absence of fire. Sugar maple and beech are the dominant species in the canopy.



**Pathway CP 2.1-2.2**  
**Community 2.1 to 2.1**

No management

**Pathway CP2.1**  
**Community 2.1 to 2.2**

No management.

**Pathway CP2.2**  
**Community 2.2 to 2.1**

Management for desired species

**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 2% 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 3.1**

Planting of cool season pasture/forage species and management.

**Pathway P3.1**  
**Community 3.1 to 3.2**

Establishment of forage / pasture species

**Pathway P3.2**  
**Community 3.2 to 3.1**

Establishment of row crops

**State 4**  
**Old Field State**

Abandoned agricultural lands move into the old field state. This state is dominated at the outset by cool season grasses, mostly fescue, and weedy, opportunistic forbs. Absent management or fire, the site will progress to a shrub dominated phase then to that of a mesic forest.

### **Community 4.1**

#### **weedy forbs/cool season grass**

This phase is characterized by the absence of any management after being used for agriculture. Weedy forbs and non-native cool season grasses dominate.

### **Community 4.2**

#### **shrubs/small trees/cool season grass**

Continued absence of management allows the site to become dominated by woody species. Shrubs and smaller, colonizing species, trees dominate the site. The same herbaceous component as found in phase 4.1 is present, just at a reduced amount.

### **Community 4.3**

#### **sugar maple/basswood**

Continued absence of management allows for the site to develop into a mixed mesic forest. Sugar maple and basswood are the two most dominate tree species in the canopy.

### **Pathway CP 4.1-4.2**

#### **Community 4.1 to 4.1**

Succession with no management.

### **Pathway P4.1**

#### **Community 4.1 to 4.2**

Succession, no management

### **Pathway P4.1 -4.3**

#### **Community 4.1 to 4.3**

Increase in tree species

### **Pathway P4.2**

#### **Community 4.2 to 4.1**

Shrub removal

### **Pathway CP 4.2-4.3**

#### **Community 4.2 to 4.2**

Succession with no management.

### **Pathway P 4.3-4.2**

#### **Community 4.3 to 4.1**

Disturbance, of any type, that removes some or all of the trees.

### **Transition T 1-2**

#### **State 1 to 2**

No management that selects for certain tree species, in this case white oak and shagbark hickory. No fire for 40-100 years.

### **Transition T 1-3**

### **State 1 to 3**

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

### **Transition T 1-4**

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

Removal of the trees with no management afterwards to include the lack of fire. This moves the site to the Old Field State (4).

### **Restoration pathway R 2-1**

#### **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 T 2-3**

#### **State 2 to 3**

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

### **Restoration pathway R 3-1**

#### **State 3 to 1**

Remove drainage, tree planting, timber stand improvement and application of fire.

### **Transition T 3-4**

#### **State 3 to 4**

No management. Agricultural practices abandoned and succession allowed to take place

### **Restoration pathway R 4-1**

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

Timber stand improvement, to include tree removal. Planting of desired tree species, especially white oak and shagbark hickory, if not present. The periodic application of surface fires.

### **Transition T 4-2**

#### **State 4 to 2**

No management over a long time frame (100+ years) in the absence of fire.

### **Restoration pathway R 4-3**

#### **State 4 to 3**

Clear the woody species from the site, tillage, and plant the agricultural crop will move the site to state 3. Regular agricultural practices will maintain the site in that state.

## **Additional community tables**

## **Inventory data references**

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

## **Other references**

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## Contributors

Tyler Staggs

## 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	05/18/2024
Approved by	Chris Tecklenburg
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:**

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17. **Perennial plant reproductive capability:**

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