USDA Natural Resources Conservation Service

Ecological site F111XA014IN
Outwash Upland

Last updated: 4/17/2020
Accessed: 04/30/2024

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.

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.

111A – Indiana and Ohio Till Plain, Central Part. This area is in the Till Plains Section of the Central Lowland Province of the Interior Plains. It is dominated by broad, nearly level ground moraines that are broken in some areas by kames, outwash plains, and stream valleys along the leading edge of the moraines. Narrow, shallow valleys commonly are along the few large streams in the area. Elevation ranges from 680 to 1,250 feet (205 to 380 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 plains.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Wabash (0512), 46 percent; Great Miami (0508), 30 percent; Scioto (0506), 22 percent; and the Middle Ohio (0509), 2 percent. The major rivers in the area include the East and West Forks of the White River and the Whitewater River in Indiana and the Great Miami, Stillwater, Big Darby, Scioto, and Big Walnut Rivers in Ohio.

Surface deposits in this area include glacial deposits of till, lacustrine sediments, and outwash from Wisconsin and older glacial periods. A moderately thick mantle of loess covers much of the area. Most of this MLRA is underlain by Silurian and Devonian limestone and dolostone. Also, some areas of Late Ordovician shale and limestone are in the western part of the MLRA (USDA, 2006).

Classification relationships

Major Land Resource Area (USDA-Natural Resources Conservation Service, 2006)
USFS Ecological Regions (USDA, 2007):
Sections – Southern Unglaciated Allegheny Plateau (221E), Central Till Plains, Beech Maple (222H), Interior Low Plateau-Transition Hills (223B), Interior Low Plateau-Bluegrass (223F)
Subsections - Lower Scioto River Plateau (221Eg), Bluffton Till Plains (222Ha), Miami-Scioto Plain-Tipton Till Plain

(222Hb), Little Miami Old Drift Plain (222Hc), Mad River Interlobate Plains (222Hd), Darby Plains (222He), Brown County Hills (223Ba), Northern Bluegrass (223Fd), Muscatatuck Flats and Valleys (223Fe), Scottsburg Lowlands (223Ff)
NatureServe Systems anticipated (NatureServe, 2011): Agriculture - Cultivated Crops and Irrigated Agriculture, Agriculture - Pasture/Hay, Allegheny-Cumberland Dry Oak Forest and Woodland, Appalachian (Hemlock)-Northern Hardwood Forest, Central Appalachian Pine-Oak Rocky 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 Floodplain, North-Central Interior Freshwater Marsh, North-Central Interior Oak Savanna, North-Central Interior Wet Flatwoods, North-Central Interior Wet Meadow-Shrub Swamp, North-Central Oak Barrens, Northeastern Interior Dry-Mesic Oak 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, Southern Ridge and Valley / Cumberland Dry Calcareous Forest, Successional Shrub/Scrub
LANDFIRE Biophysical Settings anticipated (USGS, 2010): Allegheny-Cumberland Dry Oak Forest and Woodland, Appalachian (Hemlock-) Northern Hardwood Forest, 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, 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 Oak Savanna, North-Central Interior Wet Flatwoods, 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

F111XA013IN	**Loess Upland** Soil parent material is loess; site is lower on the landscape.
F111XA015IN	**Dry Outwash Upland** Soils are well to excessively drained.
R111XA016IN	**Outwash Mollisol** Site is located on similar landscape positions; soils surface is 3/2 Munsell or darker; soils are mollisols.
R111XA017IN	**Dry Outwash Mollisol** Site is located on higher landscape positions; soils surface is 3/2 Munsell or darker; soils are mollisols; soils are generally coarser textured

Similar sites

F111XA015IN	**Dry Outwash Upland** Soils are well to excessively drained

Table 1. Dominant plant species

Tree	(1) *Quercus alba* (2) *Carya ovata*

Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This ecosite is found in unspecified landscape in MLRA 111A: Indiana and Ohio Till Plain, Central Part.

Soils in this CTSG have a gravel layer at 20-40 inches from the surface and are 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 freqency ranges from rare to none. The available water capacity is at least 3 inches in the rooting zone.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 freqency ranges from rare to none. The available water capacity is at least 3 inches in the rooting zone.

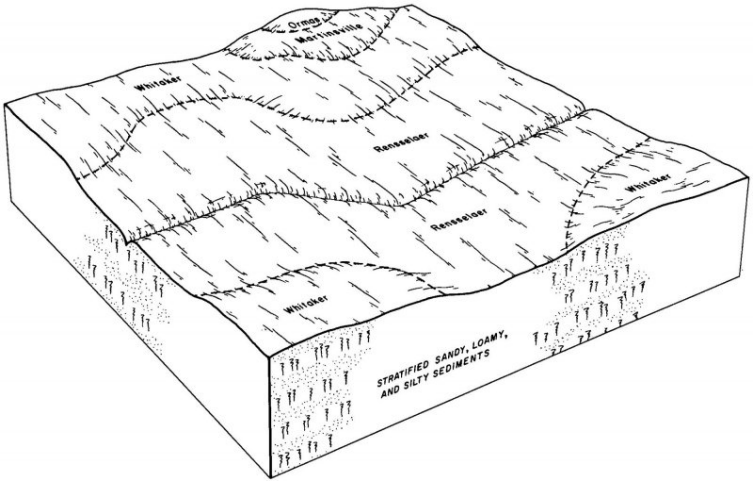

Figure 1. block diagram showing soils on the landscape

Table 2. Representative physiographic features

Landforms	(1) Outwash plain (2) Outwash terrace
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to very rare
Ponding frequency	None
Elevation	107–381 m
Slope	0–6%
Ponding depth	0 cm
Water table depth	15–137 cm
Aspect	Aspect is not a significant factor

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 53 degrees F (9 to 12 degrees C). The freeze-free period averages about 195 days and ranges from 175 to 215 days.

Table 3. Representative climatic features

Frost-free period (characteristic range)	138-158 days

Freeze-free period (characteristic range)	175-193 days
Precipitation total (characteristic range)	1,041-1,092 mm
Frost-free period (actual range)	108-166 days
Freeze-free period (actual range)	171-194 days
Precipitation total (actual range)	991-1,118 mm
Frost-free period (average)	145 days
Freeze-free period (average)	183 days
Precipitation total (average)	1,067 mm

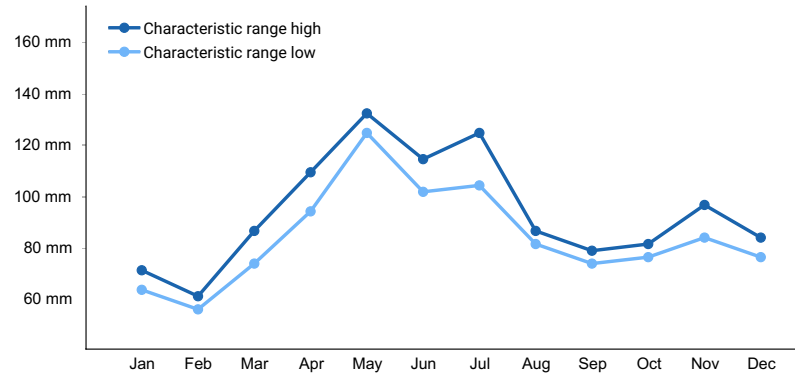

Figure 2. Monthly precipitation range

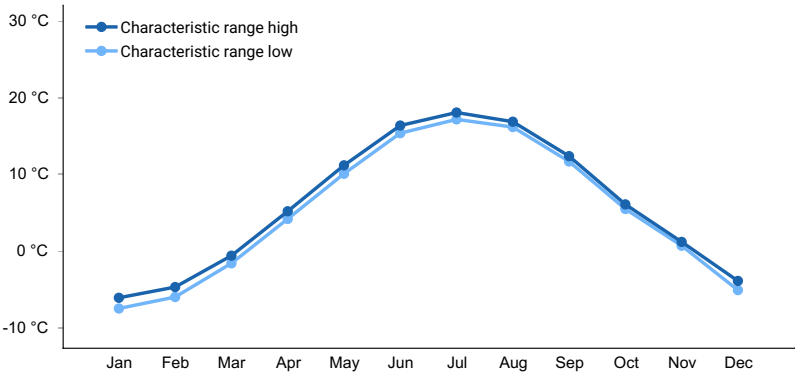

Figure 3. Monthly minimum temperature range

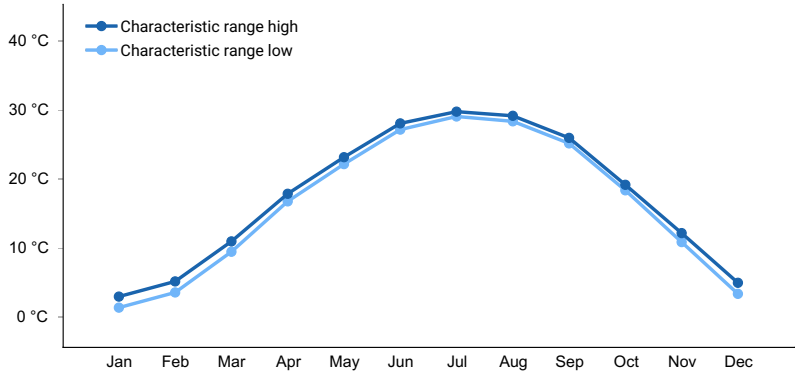

Figure 4. Monthly maximum temperature range

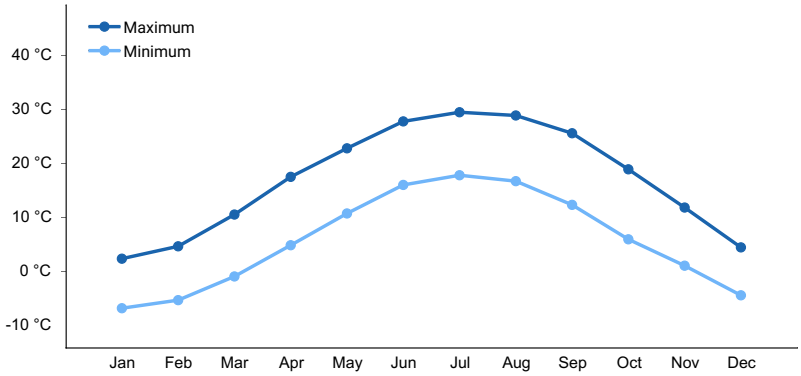

Figure 5. Monthly average minimum and maximum temperature

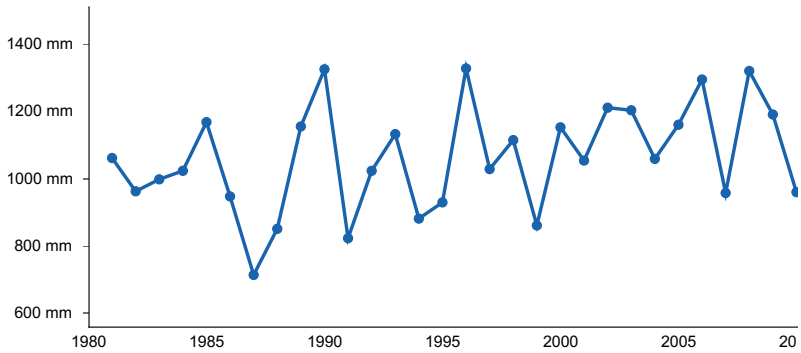

Figure 6. Annual precipitation pattern

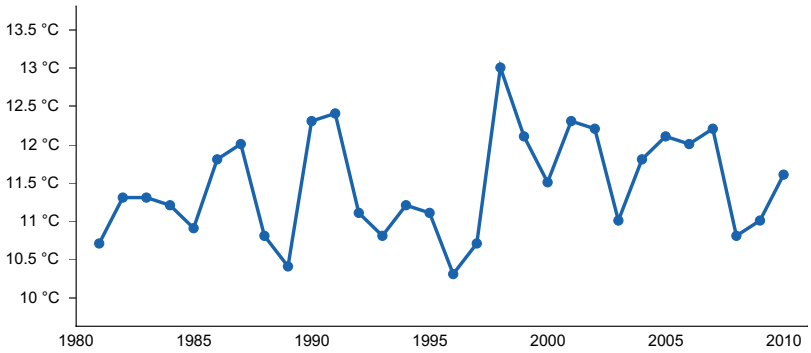

Figure 7. Annual average temperature pattern

Climate stations used

- (1) COLUMBUS [USC00121747], Columbus, IN
- (2) JAMESTOWN 2 E [USC00124356], Lizton, IN
- (3) CIRCLEVILLE [USC00331592], Circleville, OH
- (4) URBANA WWTP [USC00338552], Urbana, OH
- (5) SHELBYVILLE SEWAGE PLT [USC00127999], Shelbyville, IN

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, Savona, Roby, Rainsboro, Libre, Ionia, Homer, Haney, Fitchville, Digby. They are moderately deep to very deep, somewhat poorly drained to moderately well drained, and slow to very rapid permeable soils, with very strongly acidic to neutral soil reaction, that formed in Alluvium, Glaciofluvial deposits, Glaciolacustrine deposits, Loess, Outwash, Residuum, Till from Limestone, Siltstone.

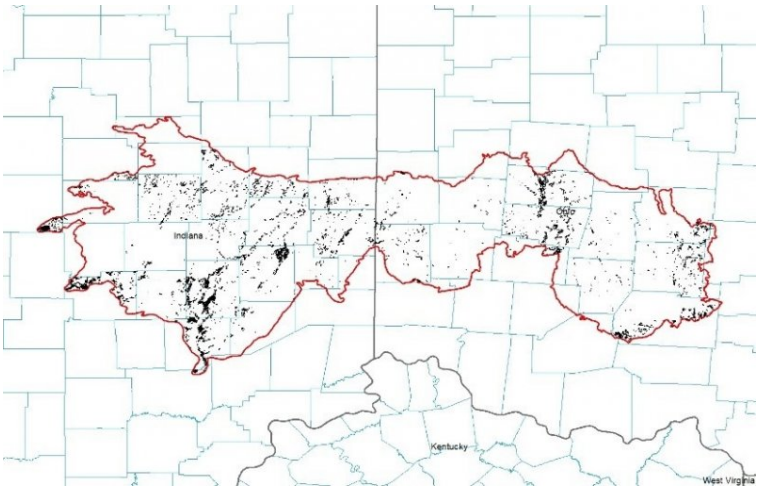

Figure 8. Location of mapunits within the MLRA

Table 4. Representative soil features

Parent material	(1) Outwash–limestone (2) Glaciofluvial deposits–siltstone
Surface texture	(1) Loam (2) Sandy loam (3) Silt loam
Family particle size	(1) Loamy
Drainage class	Somewhat poorly drained to moderately well drained
Permeability class	Slow to very rapid
Soil depth	69–178 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	13.72–21.08 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5.3–7.6
Subsurface fragment volume <=3" (Depth not specified)	0–31%
Subsurface fragment volume >3" (Depth not specified)	0–6%

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 bine used to grow corn and soybeans.

State and transition model

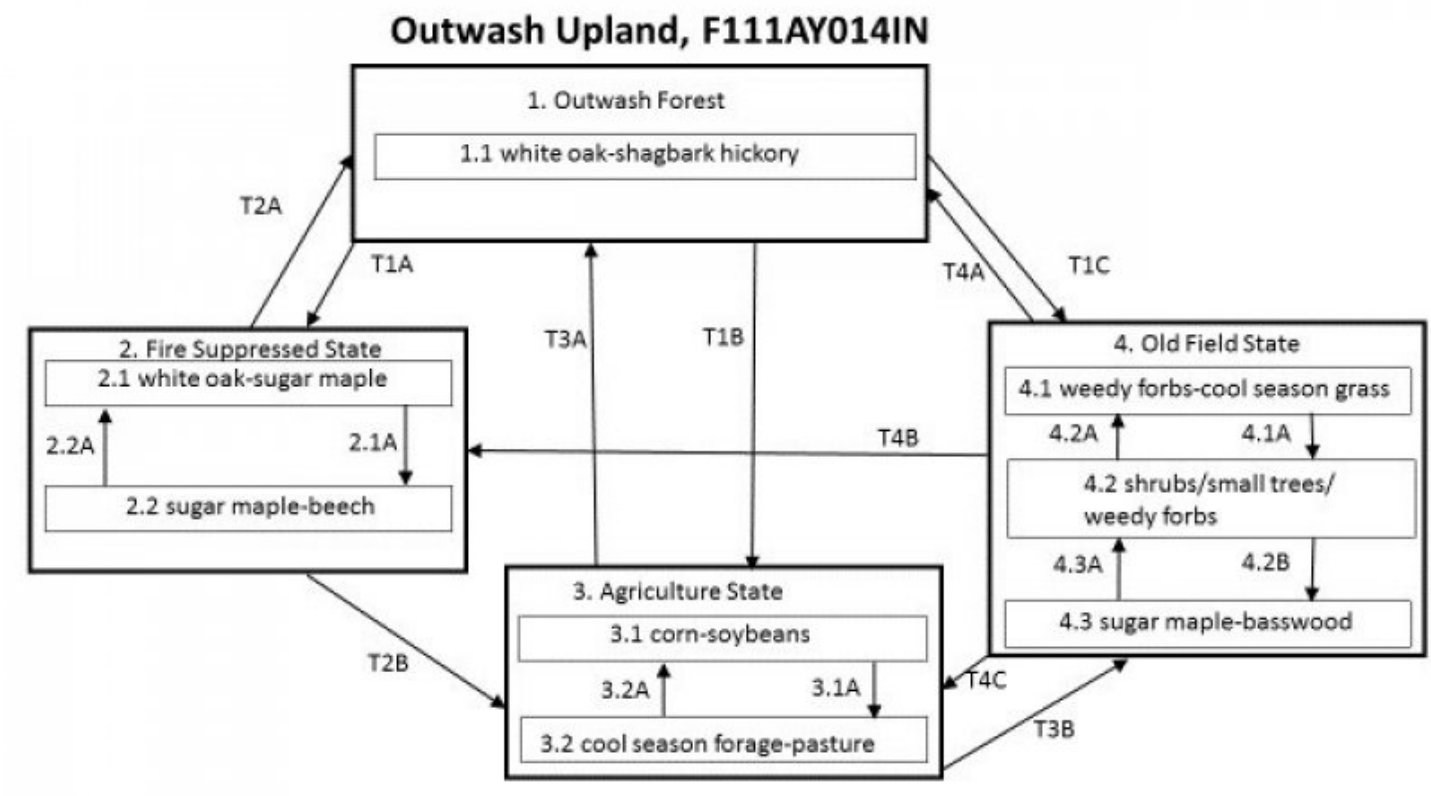

Figure 9. STM

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 are mesophytic forest. Restoration involves selective tree harvest and the use of fire.

Dominant plant species

- white oak (*Quercus alba*), tree
- shagbark hickory (*Carya ovata*), tree
- rose (*Rosa*), shrub
- Pennsylvania sedge (*Carex pensylvanica*), grass
- big bluestem (*Andropogon gerardii*), grass

Community 1.1
white oak/shagbark hickory

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

Dominant plant species

- white oak (*Quercus alba*), tree
- shagbark hickory (*Carya ovata*), tree

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

- sugar maple (*Acer saccharum*), tree
- American beech (*Fagus grandifolia*), 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

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

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.

Dominant plant species

- sugar maple (*Acer saccharum*), tree
- American beech (*Fagus grandifolia*), tree

Pathway P2.1A
Community 2.1 to 2.1

No management

Pathway P2.1A
Community 2.1 to 2.2

no management

Pathway P2.2A
Community 2.2 to 2.1

Selective tree harvest

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 P3.1A
Community 3.1 to 3.2

pasture/forage planting and management

Pathway P3.2A
Community 3.2 to 3.1

tillage and management 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.

Dominant plant species

- fescue (*Festuca*), grass

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.

Dominant plant species

- sugar maple (*Acer saccharum*), tree
- American basswood (*Tilia americana*), tree

Pathway CP 4.1-4.2

Community 4.1 to 4.1

Succession with no management.

Pathway P4.1A
Community 4.1 to 4.2

succession no management

Pathway P4.2A
Community 4.2 to 4.1

Disturbance that removes woody species

Pathway CP 4.2-4.3
Community 4.2 to 4.2

Succession with no management.

Pathway P4.2B
Community 4.2 to 4.3

succession

Pathway P4.3A
Community 4.3 to 4.2

Disturbance that removes trees

Transition T1A
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 T1B
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 T1C
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 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, drainage installed, the site prepared, tillage and planting the of the agricultural crop.

Restoration pathway R3A
State 3 to 1

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

Transition T3B
State 3 to 4

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

Restoration pathway R4A
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 T4B
State 4 to 2

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

Transition T4C
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 reconnaissance.

Other references

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Contributors

Tyler Staggs

Approval

Chris Tecklenburg, 4/17/2020

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)	
Contact for lead author	
Date	04/30/2024
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:**
