

Ecological site R111XA010IN

Till Ridge Prairie

Last updated: 4/17/2020
Accessed: 05/08/2024

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 Ohic (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 Unglaciaded 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 till parent materials located in a swell (convex) landscape position. It is located on summits, shoulders and backslopes on relatively shallow slopes up to an average maximum of 6%. The soil surface color is dark(3/2 Munsell or darker) extends beyond 10 inches. The soils of the site are taxonomically mollisols and are somewhat poorly to moderately well drained.

The characteristic vegetation of this site is that of a prairie dominated by tall-grass prairie species, principally big bluestem and switchgrass. Secondary grass species on the site include Indiangrass, little bluestem, and porcupine grass. Complementary forb species include tick-trefoil, milkweed species, black-eyed susan, and purple coneflower. Trees were present in small numbers and were patchily dispersed on the site. Those that did occur were fire tolerant species, mostly oaks, and were often found in only a grub form as the top was repeatedly killed by fire. This is a fire dependent system with an average return interval of less than 5 years, which maintained the dominance of herbaceous species. Due to the productiveness of the mollisols in which this site is found on, the majority of this site has been converted for agricultural production. Areas that have not been converted to agricultural use are now mostly in a woodland state as the fire cycle has been altered and in most cases completely eliminated.

Associated sites

F111XA006IN	Till Depression Site is located in a depression (concave) landscape position; soil surface is lighter than 3/2 Munsell; soils are alfisols.
F111XA007IN	Till Depression Flatwood Site is located in a depression (concave) landscape position; site is generally lower on the landscape; historic vegetation is a flatwood.
F111XA008IN	Wet Till Ridge Soil surface is lighter than 3/2 Munsell; soils are poorly to somewhat poorly drained; soils are not mollisols.
F111XA009IN	Till Ridge Soil surface is lighter than 3/2 Munsell; soils are poorly to somewhat poorly drained; soils are not mollisols.

Similar sites

R111XA002IN	Limnic Muck Soil parent material is organic; site exhibits a higher amount of ponding and flooding.
R111XA017IN	Dry Outwash Mollisol Soil parent is derived from outwash; soils are moderately well to excessively drained.
R111XA016IN	Outwash Mollisol Soil parent is derived from outwash; soils are very poorly to somewhat poorly well drained.
R111XA001IN	Mineral Muck Soil parent material is organic; site exhibits a higher amount of ponding and flooding

Table 1. Dominant plant species

Tree	(1) <i>Andropogon gerardii</i> (2) <i>Panicum virgatum</i>
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.
list of unique landform positions: Foothlope, Summit

list of unique landforms: flat, ground moraine, hillslope, moraine, rise, till plain

Conservation Tree and Shrub Group: 1D- Soils in this CTSG have a restrictive layer at less than 40 inches 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 frequency ranges from rare to none. The available water capacity is at least 3 inches in the rooting zone. 6K- Soils in this CTSG have a relative value (RV) for calcium carbonate equivalent of >5% but less than 15% or a pH (RV) >7.8 within 20 inches of the surface and are moderately well to well drained with a root restrictive zone (bedrock or fragipan) at 20-40 inches. Flooding frequency ranges from none to rare. The depth to a water table during the growing season is at least 1.5 feet. The available water capacity is 6 inches or less. Sodium adsorption rates are less than 1.

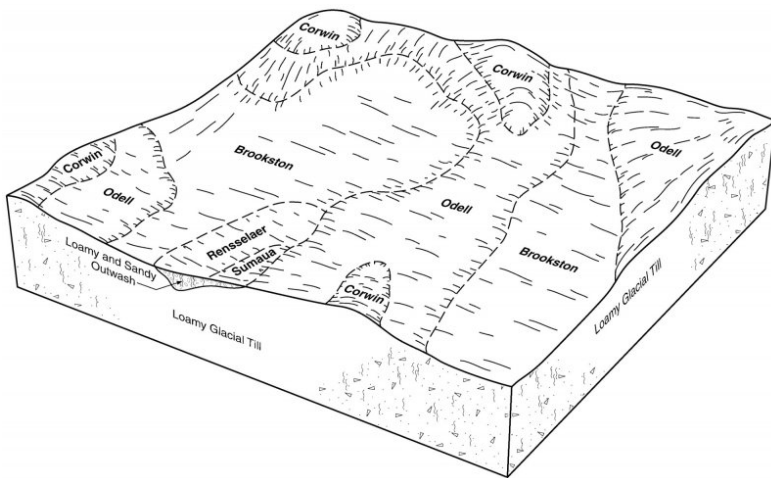


Figure 1. Block diagram showing soil series on the landscape.

Table 2. Representative physiographic features

Landforms	(1) Till plain (2) Ground moraine (3) Rise
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Flooding frequency	None
Ponding frequency	None
Elevation	183–305 m
Slope	0–6%
Ponding depth	0 cm
Water table depth	15–145 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)	142-156 days
Freeze-free period (characteristic range)	172-186 days
Precipitation total (characteristic range)	1,016-1,092 mm
Frost-free period (actual range)	138-163 days
Freeze-free period (actual range)	167-197 days
Precipitation total (actual range)	991-1,118 mm
Frost-free period (average)	149 days
Freeze-free period (average)	181 days
Precipitation total (average)	1,041 mm

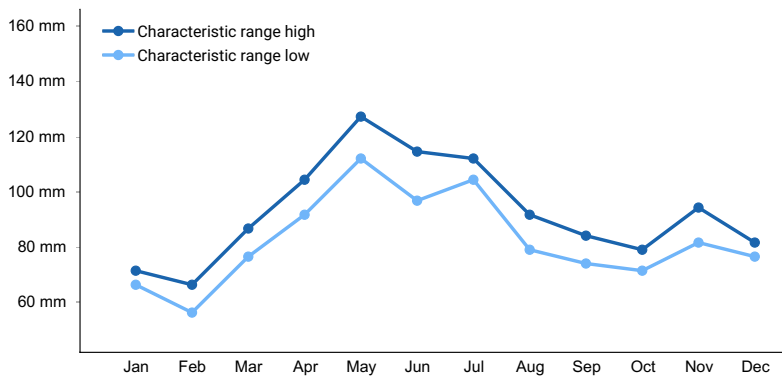


Figure 2. Monthly precipitation range

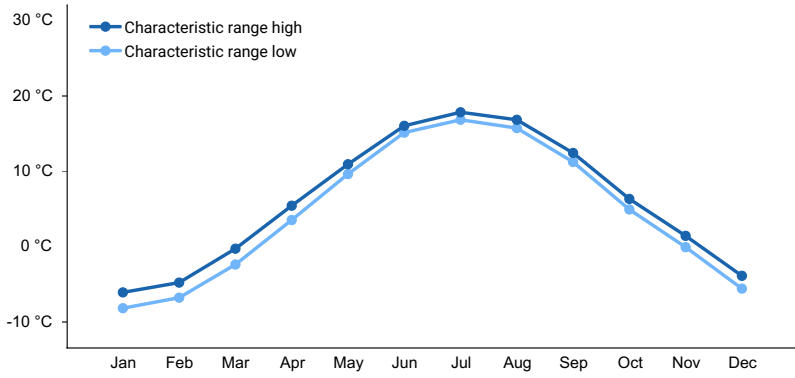


Figure 3. Monthly minimum temperature range

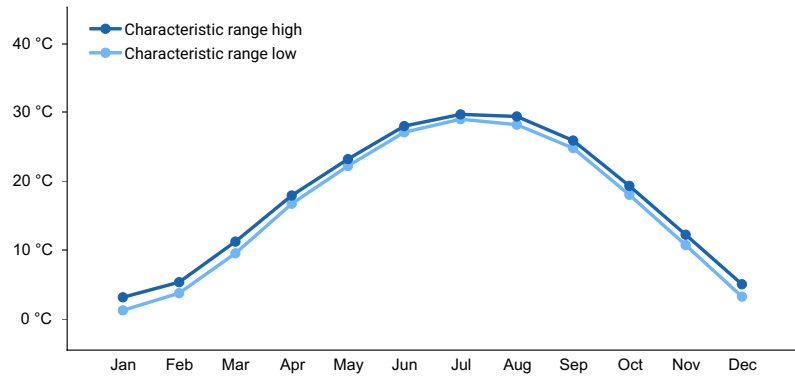


Figure 4. Monthly maximum temperature range

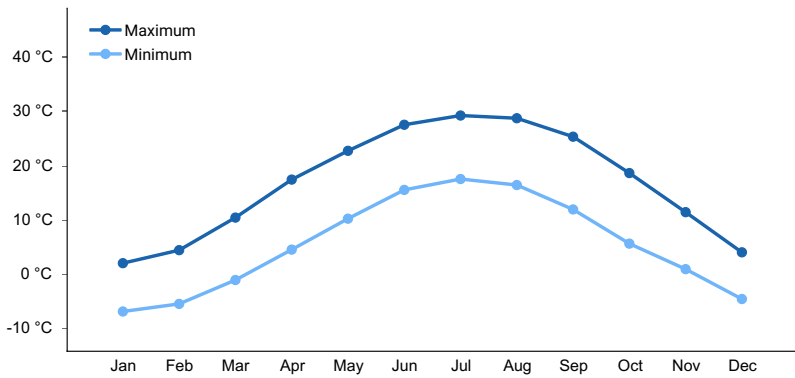


Figure 5. Monthly average minimum and maximum temperature

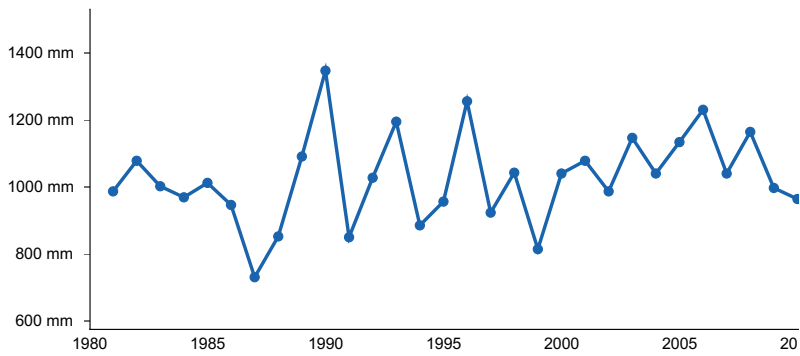


Figure 6. Annual precipitation pattern

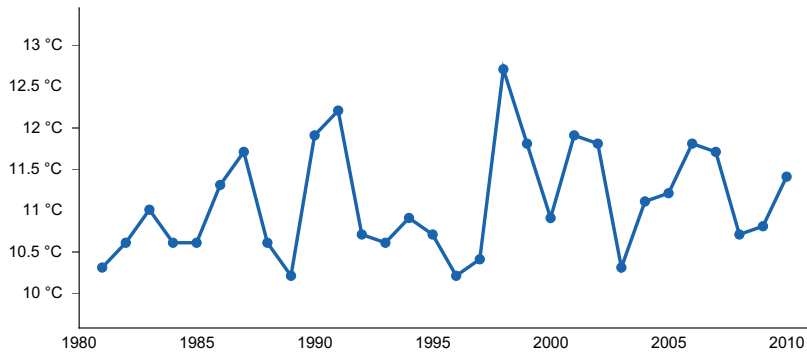


Figure 7. Annual average temperature pattern

Climate stations used

- (1) SIDNEY 1 S [USC00337693], Sidney, OH
- (2) FRANKLIN [USC00332928], Franklin, OH
- (3) CIRCLEVILLE [USC00331592], Circleville, OH
- (4) KOKOMO 3 WSW [USC00124662], Russiaville, IN
- (5) WHITESTOWN [USC00129557], Whitestown, IN
- (6) COLUMBUS [USC00121747], Columbus, IN
- (7) CAMBRIDGE CITY 3 N [USC00121229], Cambridge City, IN
- (8) DAYTON INTL AP [USW00093815], Tipp City, OH
- (9) COLUMBUS OHIO STATE UNIV AP [USW00004804], Dublin, OH
- (10) CHILLICOTHE MOUND CITY [USC00331528], Chillicothe, 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: Raub, Odell, Dana, Corwin. They are very deep, somewhat poorly drained to moderately well drained, and very slow to moderate permeable soils, with moderately acidic to slightly alkaline soil reaction, that formed in till.

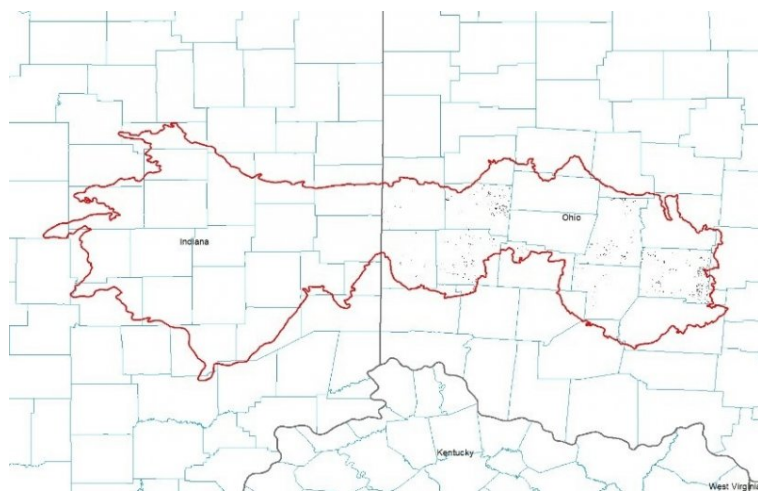


Figure 8. Location of mapunits within the MLRA

Table 4. Representative soil features

Parent material	(1) Till
Surface texture	(1) Silt loam (2) Sandy clay loam

Family particle size	(1) Loamy
Drainage class	Somewhat poorly drained to moderately well drained
Permeability class	Very slow to moderate
Soil depth	69–140 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	13.72–20.32 cm
Calcium carbonate equivalent (0-101.6cm)	0–20%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5.8–8.2
Subsurface fragment volume <=3" (Depth not specified)	1–7%
Subsurface fragment volume >3" (Depth not specified)	1–4%

Ecological dynamics

The historic plant community of the Till Ridge Prairie ecological site is a till mesic prairie. This site is characterized by the dominance of tall prairie grass species, particularly big bluestem, Indiangrass, and prairie dropseed. This site was maintained by frequent fires, often with a return interval of no more than 5 years. Much less frequently, insect and small mammal herbivory would impact local composition and dominance of the species. The herbaceous cover on the site was high, often times 70-100%.

Since settlement, the majority of this site has been converted to agricultural use with the majority being in row crop agriculture. This was accomplished via improved drainage by ditches and field tile along with tillage.

State and transition model

Till Ridge Prairie, R111AY010IN

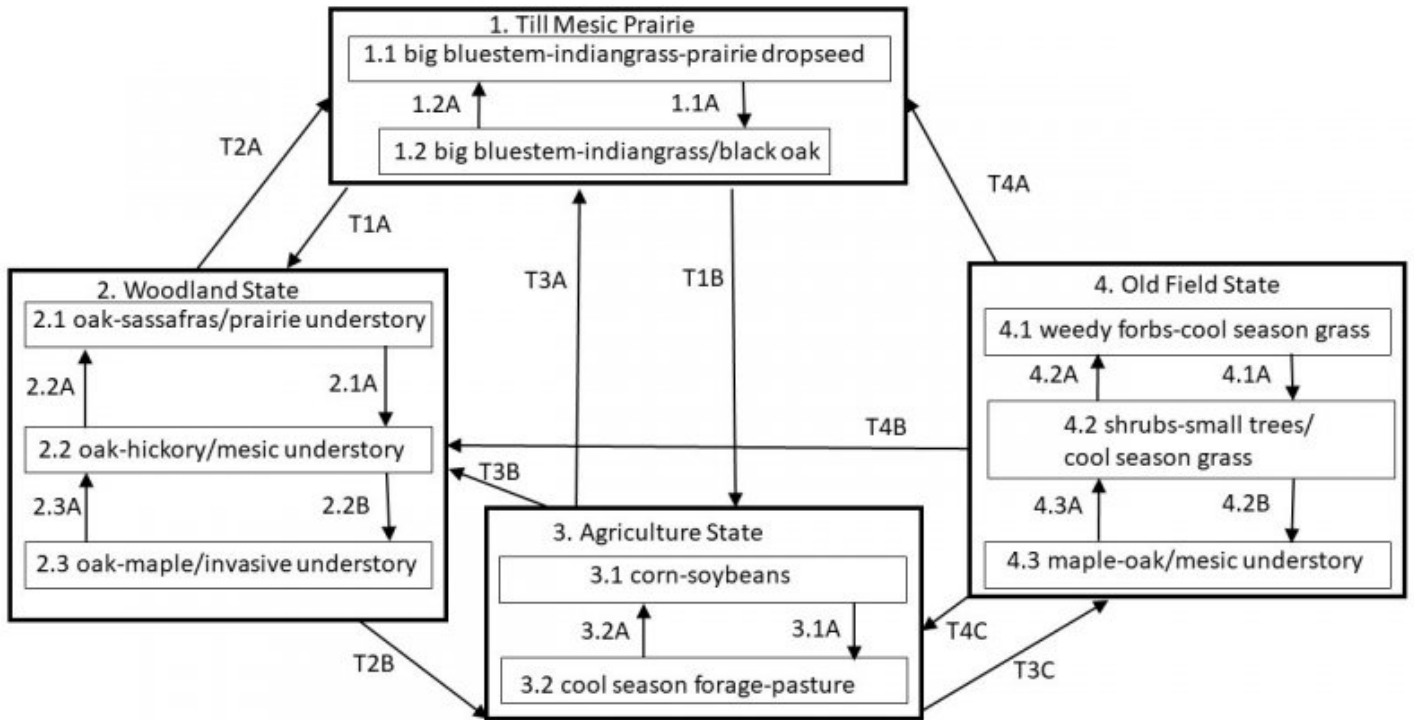


Figure 9. STM

Till Ridge Prairie, R111AY010IN

Diagram Legend

T1A	No fire, no woody species management
T1B	Drainage, site preparation, planting, management
T2A	Tree removal, planting, fire
T2B	Clear trees, drainage, site preparation, planting, management
T3A	Remove drainage, seeding, fire
T3B	Planting, forestry practices, no fire
T3C	No management
T4A	Remove woody species, remove drainage, seeding, fire
T4B	Forestry practices to include timber stand improvement, no fire
T4C	Clear woody species, planting, agricultural management

Figure 10. Legend1

1.1A	No management, no fire
1.2A	Fire
2.1A	No management, no fire
2.2A	Prescribed tree cutting
2.2B	Invasion, no management
2.3A	Timber stand improvement, mechanical/chemical control of invasive species
3.1A	Pasture/forage planting and maintenance
3.2A	Tillage/no-till planting and management of row crops.
4.1A	Succession with no management
4.2A	Disturbance to remove some or all of the woody vegetation

Figure 11. Legend2

4.2 B	Succession with no management
4.3A	Disturbance to remove some of the woody vegetation

Figure 12. Legend3

**State 1
Till Mesic Prairie**

This is the reference or diagnostic plant community for this site. In reference conditions, this site was dominated by prairie grass species. Dominant species include big bluestem, Indiangrass, and prairie dropseed. Fire was the main disturbance agent that maintained this site and occurred quite frequently, often with a return interval of 5 years or shorter. The removal of fire from the system and/or lack of woody species management would move this site toward state 2. Drainage and tillage of the site allows the site to be converted to cropland (state 3).

Dominant plant species

- big bluestem (*Andropogon gerardii*), grass
- Indiangrass (*Sorghastrum nutans*), grass
- prairie dropseed (*Sporobolus heterolepis*), grass

Community 1.1

big bluestem/Indiangrass/prairie dropseed

This phase is characterized by frequent fire events (1-5 years) that maintain herbaceous species dominance. Dominant species include big bluestem, Indiangrass, and prairie dropseed. Secondary species are little bluestem, porcupine grass, and switchgrass.

Dominant plant species

- big bluestem (*Andropogon gerardii*), grass
- Indiangrass (*Sorghastrum nutans*), grass
- prairie dropseed (*Sporobolus heterolepis*), grass

Community 1.2

big bluestem/Indiangrass/black oaks

This phase is characterized by a longer fire return interval (5-20 years) than phase 1. Big bluestem, Indiangrass, and prairie dropseed remain the dominant species, but the production is less as the thatch builds up. Likewise, fire has allowed for trees, mostly black oak, to get established or to grow from existing grubs.

Dominant plant species

- black oak (*Quercus velutina*), tree
- big bluestem (*Andropogon gerardii*), grass
- prairie dropseed (*Sporobolus heterolepis*), grass
- Indiangrass (*Sorghastrum nutans*), grass

Pathway P1.1A

Community 1.1 to 1.2

no management, no fire

Pathway P1.2A

Community 1.2 to 1.1

Reduction in woody species due to shorter fire interval.

State 2

Woodland State

Absence of fire or lack of woody species management will move this site to a woodland state dominated by oak species, specifically black oak and white oak. The understory would contain many of the prairie species until the canopy closed. Woody understory species would include sassafras.

Dominant plant species

- black oak (*Quercus velutina*), tree
- white oak (*Quercus alba*), tree
- sassafras (*Sassafras albidum*), shrub

Community 2.1

oak/sassafras/prairie understory

This phase is characterized by the absence of fire. Trees, particularly oak species, have become the dominant growth form on the site. The understory still contains some prairie herbaceous species at the lower tree canopy levels, but they all disappear at the higher levels.

Dominant plant species

- oak (*Quercus*), tree
- sassafras (*Sassafras albidum*), tree

Community 2.2 oak/hickory/mesic forest understory

This phase is characterized by the absence of fire. Trees remain the dominant growth form. Hickory trees become present in the canopy. The understory is occupied mostly by mesic species.

Dominant plant species

- oak (*Quercus*), tree
- hybrid hickory (*Carya*), tree

Community 2.3 oak/maple/invasive understory

This phase is characterized by the absence of fire. Trees remain the dominant growth form. More shade tolerant species, particularly sugar maple, become common in the canopy. The understory has been invaded by non-native invasive species, particularly species of Asian bush honeysuckle.

Dominant plant species

- sugar maple (*Acer saccharum*), tree
- oak (*Quercus*), tree
- Amur honeysuckle (*Lonicera maackii*), shrub

Pathway P2.1A Community 2.1 to 2.2

No management; no fire.

Pathway P2.2A Community 2.2 to 2.1

Prescribed tree cutting.

Pathway 2.2B Community 2.2 to 2.3

invasion, no management

Pathway P2.3A Community 2.3 to 2.2

Timber stand improvement activities, weed / brush treatments

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 5% 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 P3.1A Community 3.1 to 3.2

Establishment and maintenance of pasture/forage species.

Pathway P3.2A Community 3.2 to 3.1

Establishment and maintenance of row crop agriculture

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 Maple/Oak/mesic understory

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

Dominant plant species

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

Pathway P4.1A Community 4.1 to 4.2

Succession with no management

Pathway P4.2A
Community 4.2 to 4.1

Disturbance to remove some of the woody vegetation

Pathway P4.2B
Community 4.2 to 4.3

Succession with no management.

Pathway P4.3A
Community 4.3 to 4.2

Disturbance to remove some of the woody vegetation

Transition T1A
State 1 to 2

No woody species management and/or no fire moves the site to the woodland state

Transition T1B
State 1 to 3

Installation of drainage via either a ditch, field tile, or both followed by tillage and seeding move the site to the agriculture state. Regular agricultural practices maintain the site.

Restoration pathway R2A
State 2 to 1

Remove all trees and woody vegetation, seeding, and fire restores the site to the reference state.

Transition T2B
State 2 to 3

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

Restoration pathway R3A
State 3 to 1

Site preparation, removal of drainage (if needed), seeding, and regular application of fire.

Transition T3B
State 3 to 2

Forestry planting/practice, no fire applied.

Transition T3C
State 3 to 4

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

Restoration pathway R4A

State 4 to 1

Remove woody species and drainage system, seed appropriate species and regular application of fire moves the site back to the reference state.

Transition T4B

State 4 to 2

Forestry practices, to include tree planting and timber stand improvement practices, and no fire will move the site to the woodland state.

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

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	05/08/2024
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:**

17. **Perennial plant reproductive capability:**
