

Ecological site R111XD012IN Till Ridge Prairie

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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 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

F111XD009IN	Wet Till Ridge Located on an adjacent landscape position; soils surface color is lighter than 3/2 Munsell; soils are poorly to somewhat poorly drained
F111XD010IN	Till Ridge Located on an adjacent landscape position; soils surface color is lighter than 3/2 Munsell; soils are moderately well to well drained.
R111XD011IN	Mollic Till Ridge Located on an adjacent landscape position; dark soil surface color extends less than 10 inches

Similar sites

R111XD026IN	Sand Dune Prairie Located on sand parent material; site is located on a dune landscape position.
R111XD021IN	Dry Outwash Mollisol Located on outwash parent material; soils are moderately well to excessively drained.
R111XD007IN	Till Depression Prairie Located on a concave landscape position; soils are well drained.
R111XD001IN	Shallow Muck Located on organic parent material and extends to less than 51 inches
R111XD020IN	Wet Outwash Mollisol Located on outwash parent material; soils are very poorly to somewhat poorly drained.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Andropogon gerardii</i> (2) <i>Panicum virgatum</i>

Physiographic features

This ecosite is found till landscapes in MLRA 111D: Indiana and Ohio Till Plain, Western Part on swells or convex slopes.

Table 2. Representative physiographic features

Landforms	(1) Till plain (2) End moraine (3) Ground moraine
Flooding frequency	None
Ponding frequency	None
Elevation	144–305 m
Slope	0–6%
Ponding depth	0 cm
Water table depth	30–145 cm
Aspect	W, NW, N, NE, E, SE, S, SW

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)	133-151 days
Freeze-free period (characteristic range)	175-183 days
Precipitation total (characteristic range)	1,016-1,092 mm
Frost-free period (actual range)	132-158 days
Freeze-free period (actual range)	171-187 days
Precipitation total (actual range)	991-1,118 mm
Frost-free period (average)	143 days
Freeze-free period (average)	179 days
Precipitation total (average)	1,067 mm

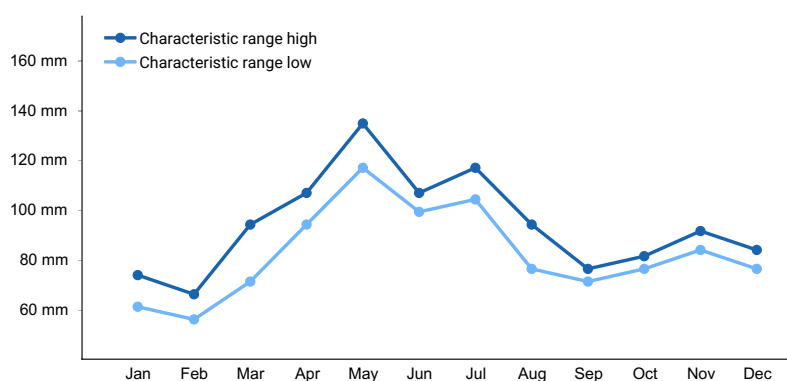


Figure 1. Monthly precipitation range

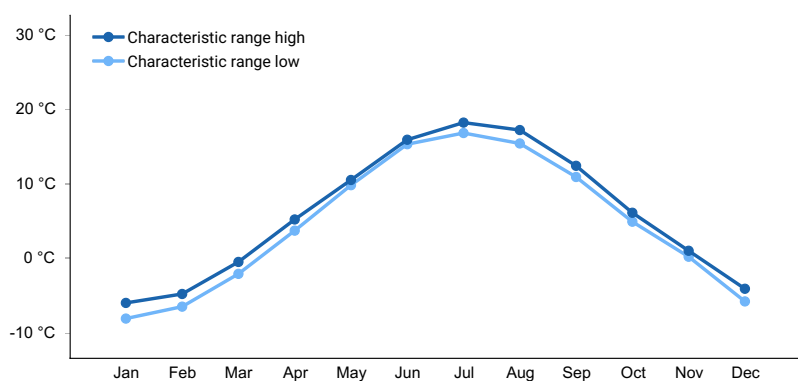


Figure 2. Monthly minimum temperature range

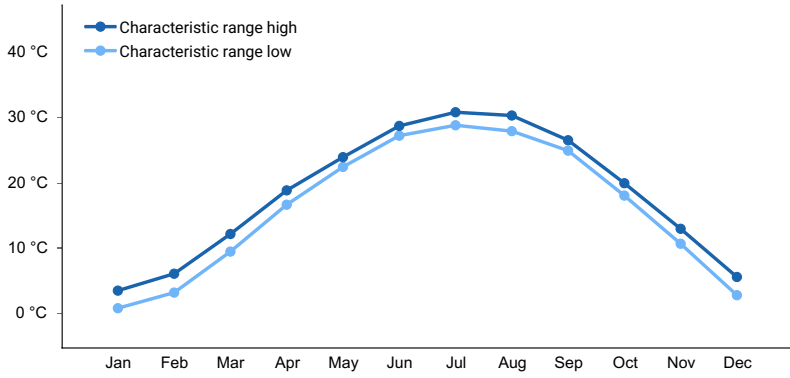


Figure 3. Monthly maximum temperature range

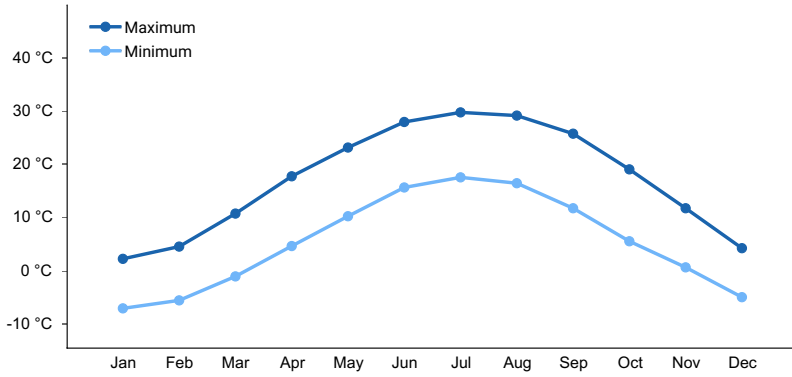


Figure 4. Monthly average minimum and maximum temperature

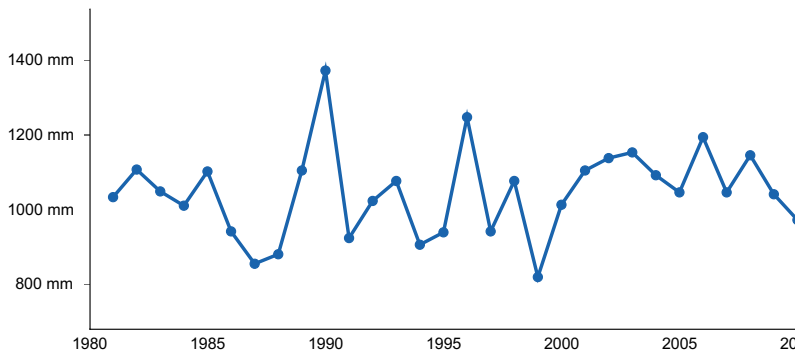


Figure 5. Annual precipitation pattern

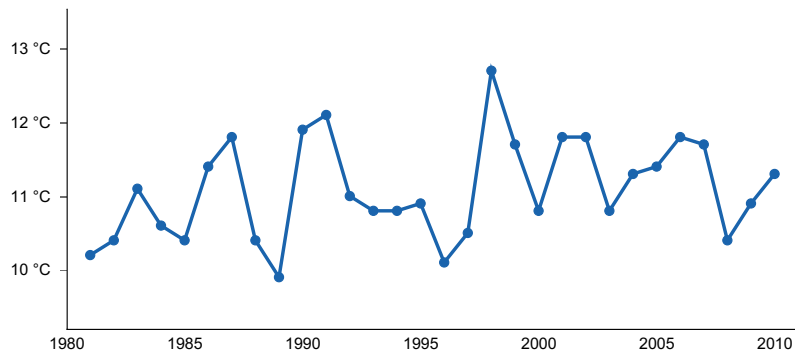


Figure 6. Annual average temperature pattern

Climate stations used

- (1) TERRE HAUTE INDIANA ST [USC00128723], Terre Haute, IN
- (2) WABASH [USC00129138], Wabash, IN
- (3) HAMILTON BUTLER CO RGNL AP [USW00053855], Fairfield, OH

- (4) WILMINGTON 3 N [USC00339219], Wilmington, OH
- (5) FAIRFIELD [USC00332651], Hamilton, OH
- (6) BOSWELL 4WNW [USC00120858], Fowler, IN
- (7) FRANKFORT DISPOSAL PLT [USC00123082], Frankfort, IN
- (8) FRANKLIN [USC00332928], Franklin, 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: Williamsport, Varna, Symerton, Raub, Parr, Odell, Elliott, Dana, Corwin. They are very deep, somewhat poorly drained to moderately well drained, and very slow to moderate permeable soils, with strongly acidic to slightly alkaline soil reaction, that formed in Loess, Outwash, Till from limestone.

Table 4. Representative soil features

Parent material	(1) Till–limestone
Surface texture	(1) Silt loam (2) Silty clay loam
Family particle size	(1) Loamy
Drainage class	Somewhat poorly drained to moderately well drained
Permeability class	Very slow to moderate
Soil depth	74–152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	13.21–20.57 cm
Calcium carbonate equivalent (0-101.6cm)	0–25%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5.8–7.9
Subsurface fragment volume <=3" (Depth not specified)	1–14%
Subsurface fragment volume >3" (Depth not specified)	0–3%

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

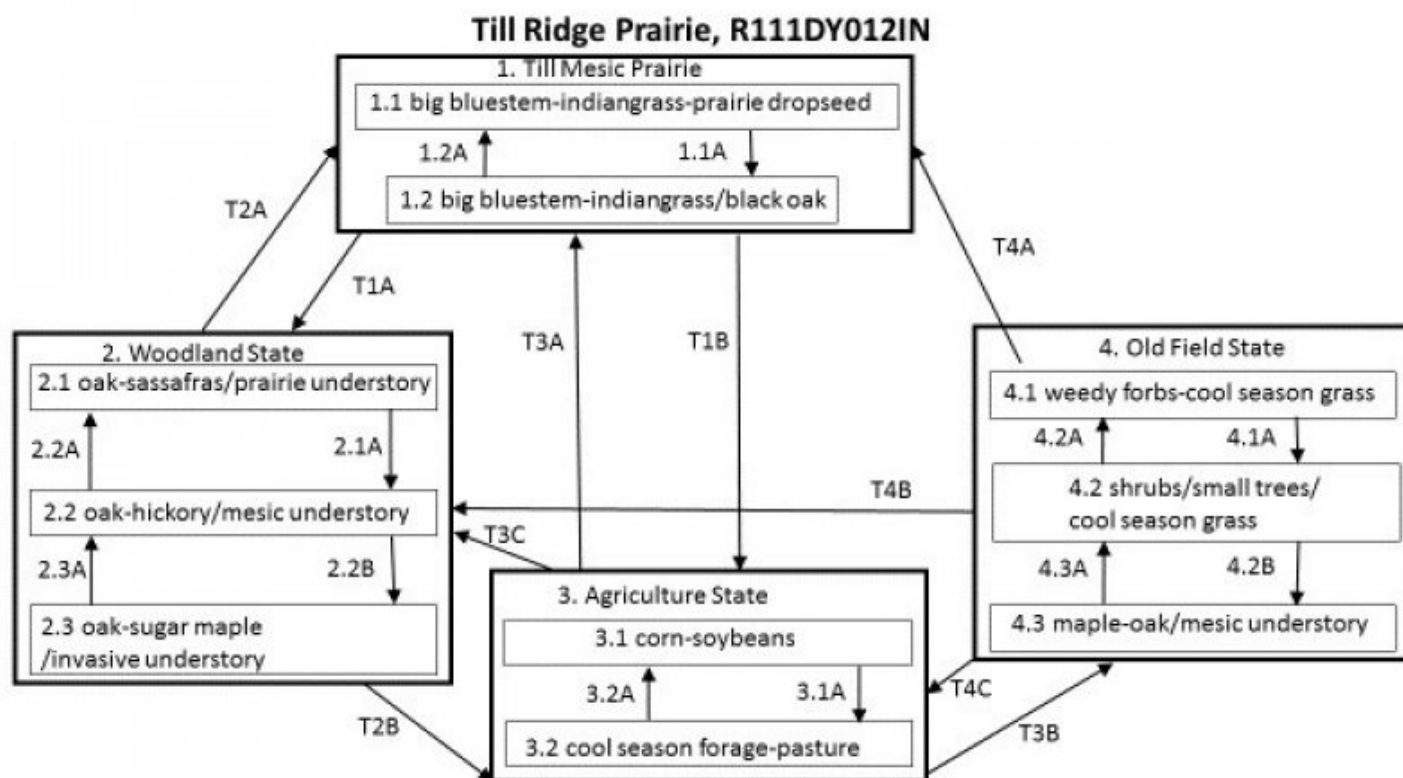


Figure 7. R111D012IN

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	No management
T3C	Planting, forestry practices, no fire
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

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

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

**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
- 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**

managed fire regime

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

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

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

- oak (*Quercus*), tree
- maple (*Acer*), 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 fire and tree removal

Pathway P2.2B Community 2.2 to 2.3

Invasion of non-native species

Pathway P2.3A Community 2.3 to 2.2

treatment of invasive 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 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 forage/pasture species

Pathway P3.2A Community 3.2 to 3.1

Establishment 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.

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.

Pathway P4.1A Community 4.1 to 4.2

succession

Pathway P4.2A Community 4.2 to 4.1

Disturbance to remove woody species

Pathway P4.2B

Community 4.2 to 4.3

succession/ no management

Pathway P4.3A

Community 4.3 to 4.2

disturbance to remove trees

Transition T 1A

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 T3C

State 3 to 2

Forestry planting/practice, no fire applied.

Transition T3B

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 limited field reconnaissance.

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	05/08/2024
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:**
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17. **Perennial plant reproductive capability:**
-