

# Ecological site R111XA017IN

## Dry Outwash Mollisol

Last updated: 4/17/2020  
Accessed: 05/06/2024

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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.

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 outwash and colluvium parent materials in soils that are well drained or drier. The soil surface color is relatively dark (3/2 Munsell or darker) and extends past 10 inches making the soils of this site taxonomically mollisols.

The characteristic vegetation of this site is of a tall grass prairie. The dominant grass species are big bluestem and little bluestem. Other species common on the site included side oats grama, needlegrass, and numerous aster and blazingstar species. Fire frequency, and to a lesser extent intensity, was the primary disturbance mechanism that led to the site being dominated by grass species historically. The accumulation of dried plant material allowed this site to carry fire well once started, whether that be by lightning strikes or fires set by Native Americans. Fires occurred every 5 years or sooner on this site. Longer intervals allowed for increased tree growth from oak ‘grubs’ primarily of black oak, but bur oaks and white oaks could also be present. Reduction or in most cases elimination of fire as converted most of the site that is still in natural vegetation to that of a woodland or forest dominated primarily by oak and hickory species. Grazing by ungulates had an effect on the productions and species diversity of this site, but the magnitude of the impact was less than that for prairies farther west. Since settlement, most of the site is being used for agriculture, primarily corn and soybean rotations.

## Associated sites

F111XA015IN	<b>Dry Outwash Upland</b> Site is generally located on similar landscape positions; soil surface color is lighter than 3/2 Munsell; soils are not mollisols
R111XA016IN	<b>Outwash Mollisol</b> Site is located on lower landscape positions; soils are very poorly to somewhat poorly drained.

F111XA014IN	<b>Outwash Upland</b> Site is located on lower landscape positions; soil surface color is lighter than 3/2 Munsell; soils are not mollisols
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### Similar sites

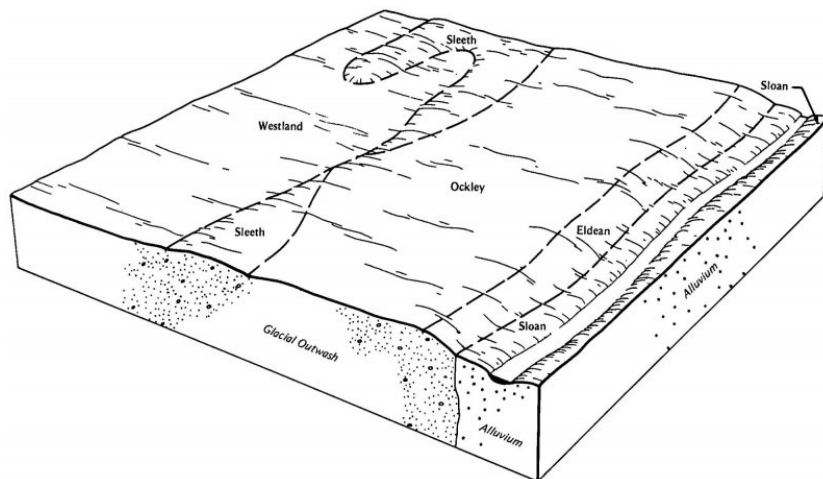
R111XA001IN	<b>Mineral Muck</b> Soil parent material is organic; soils are histosols; site generally lower on the landscape
R111XA010IN	<b>Till Ridge Prairie</b> Soil parent material is glacial till; site is located on a swell (convex) landscape position.
R111XA002IN	<b>Limnic Muck</b> Soil parent material is organic; soils are histosols; underlying material is limnic (coprogenous earth); site generally lower on the landscape
R111XA016IN	<b>Outwash Mollisol</b> Site is located on lower landscape positions; 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>Schizachyrium</i>

### Physiographic features

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



**Figure 1. Block diagram showing soils on the landscape.**

**Table 2. Representative physiographic features**

Landforms	(1) Outwash terrace (2) Terrace (3) Outwash plain
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	None to occasional
Ponding frequency	None
Elevation	122–381 m
Slope	0–50%

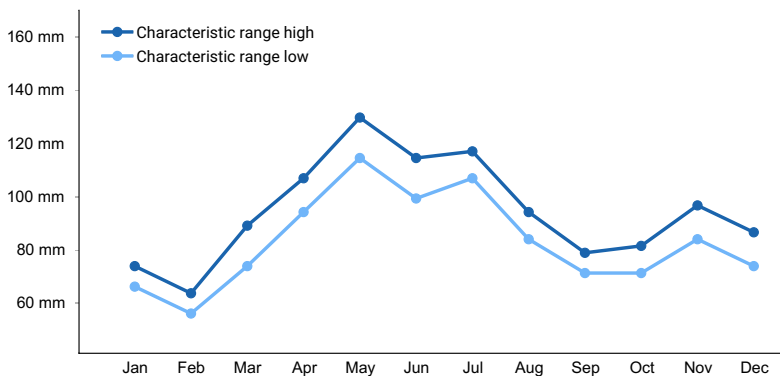
Ponding depth	0 cm
Water table depth	69–137 cm
Aspect	W, NW, N, NE, E, SE, S, SW

## Climatic features

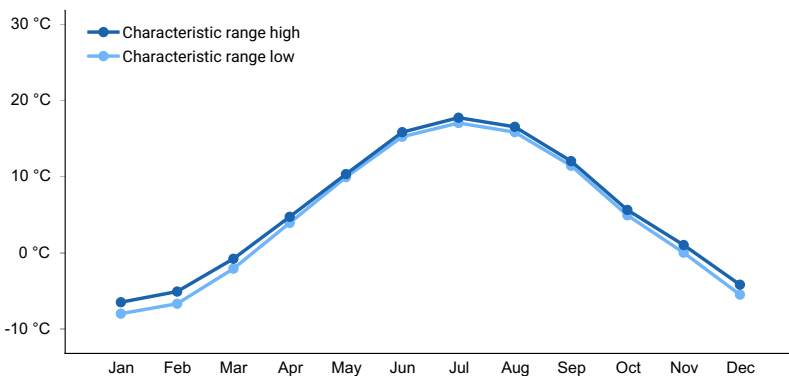
The average annual precipitation in this area is 36 to 43 inches (915 to 1,090 millimeters). Most of the rainfall occurs as convective thunderstorms during the growing season. About half or more of the precipitation occurs during the freeze-free period. Snowfall is common in winter. The average annual temperature is 49 to 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)	142-148 days
Freeze-free period (characteristic range)	174-185 days
Precipitation total (characteristic range)	1,016-1,118 mm
Frost-free period (actual range)	141-162 days
Freeze-free period (actual range)	171-191 days
Precipitation total (actual range)	1,016-1,143 mm
Frost-free period (average)	148 days
Freeze-free period (average)	179 days
Precipitation total (average)	1,067 mm



**Figure 2. Monthly precipitation range**



**Figure 3. Monthly minimum temperature range**

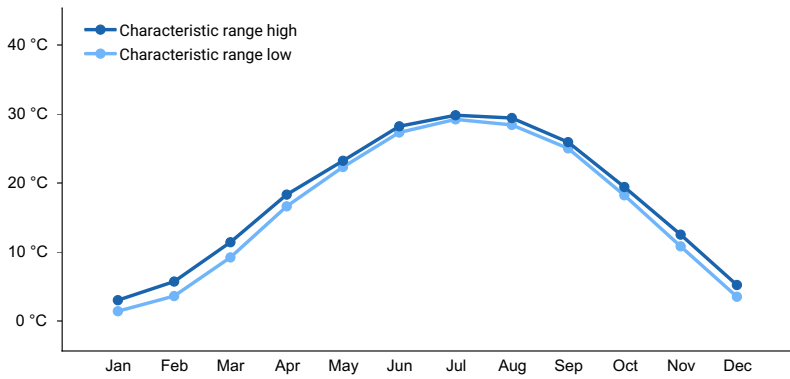


Figure 4. Monthly maximum temperature range

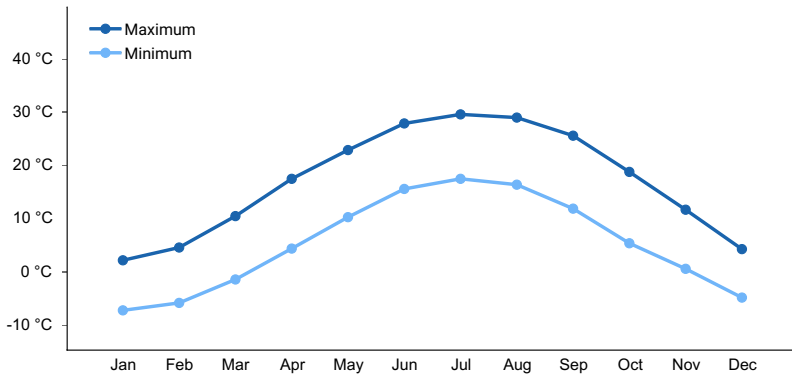


Figure 5. Monthly average minimum and maximum temperature

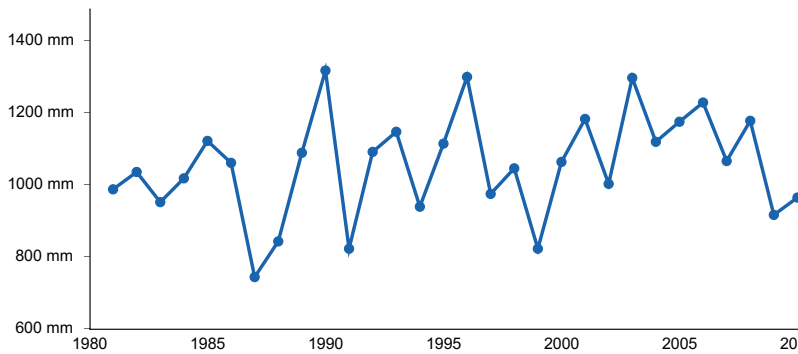


Figure 6. Annual precipitation pattern

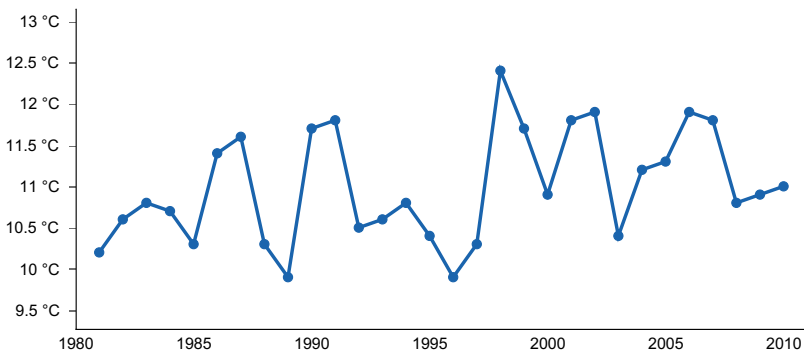


Figure 7. Annual average temperature pattern

### Climate stations used

- (1) URBANA WWTP [USC00338552], Urbana, OH
- (2) COLUMBUS [USC00121747], Columbus, IN
- (3) RICHMOND WTR WKS [USC00127370], Richmond, IN

- (4) COLUMBUS VLY CROSSING [USC00331783], Columbus, OH
- (5) KOKOMO 3 WSW [USC00124662], Russiaville, IN
- (6) SIDNEY 1 S [USC00337693], Sidney, OH
- (7) CHILLICOTHE MOUND CITY [USC00331528], Chillicothe, OH
- (8) FRANKLIN WWTP [USC00123091], Franklin, 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: Wea, Waupecan, Warsaw, Tippecanoe, Rodman, Plattville, Nineveh, Lorenzo, Lickcreek, Eldean, Donnelsville. They are deep to very deep, moderately well drained to excessively drained, and moderately slow to very rapid permeable soils, with moderately acidic to moderately alkaline soil reaction, that formed in Alluvium, Colluvium, Drift, and Outwash.

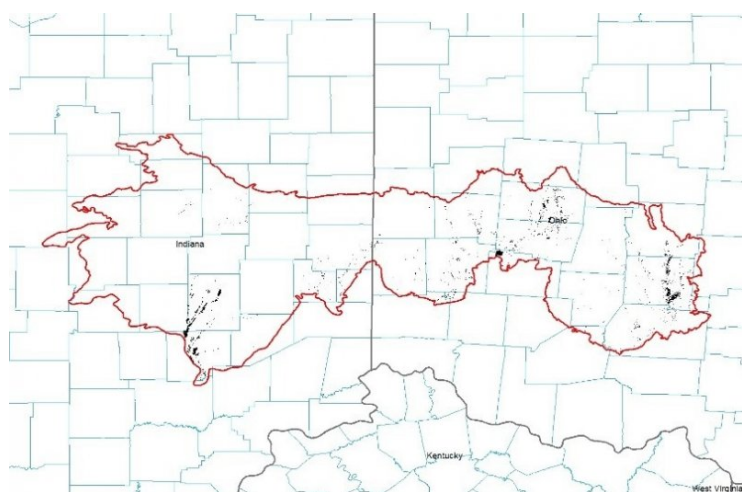


Figure 8. mapunit location within the MLRA

Table 4. Representative soil features

Parent material	(1) Outwash–limestone (2) Colluvium (3) Drift (4) Alluvium
Surface texture	(1) Very gravelly sandy loam (2) Gravelly loamy sand (3) Channery loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to excessively drained
Permeability class	Very slow to very rapid
Soil depth	15–147 cm
Surface fragment cover <=3"	0–3%
Surface fragment cover >3"	1–3%
Available water capacity (0-101.6cm)	4.32–20.57 cm
Calcium carbonate equivalent (0-101.6cm)	0–40%
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)	1–38%
Subsurface fragment volume >3" (Depth not specified)	1–30%

## Ecological dynamics

The historic plant community of the Dry Outwash Mollisol ecological site is a tallgrass prairie. This site is characterized by the dominance of tall prairie grass species, particularly big bluestem, little bluestem, and Indiangrass. 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.

## State and transition model

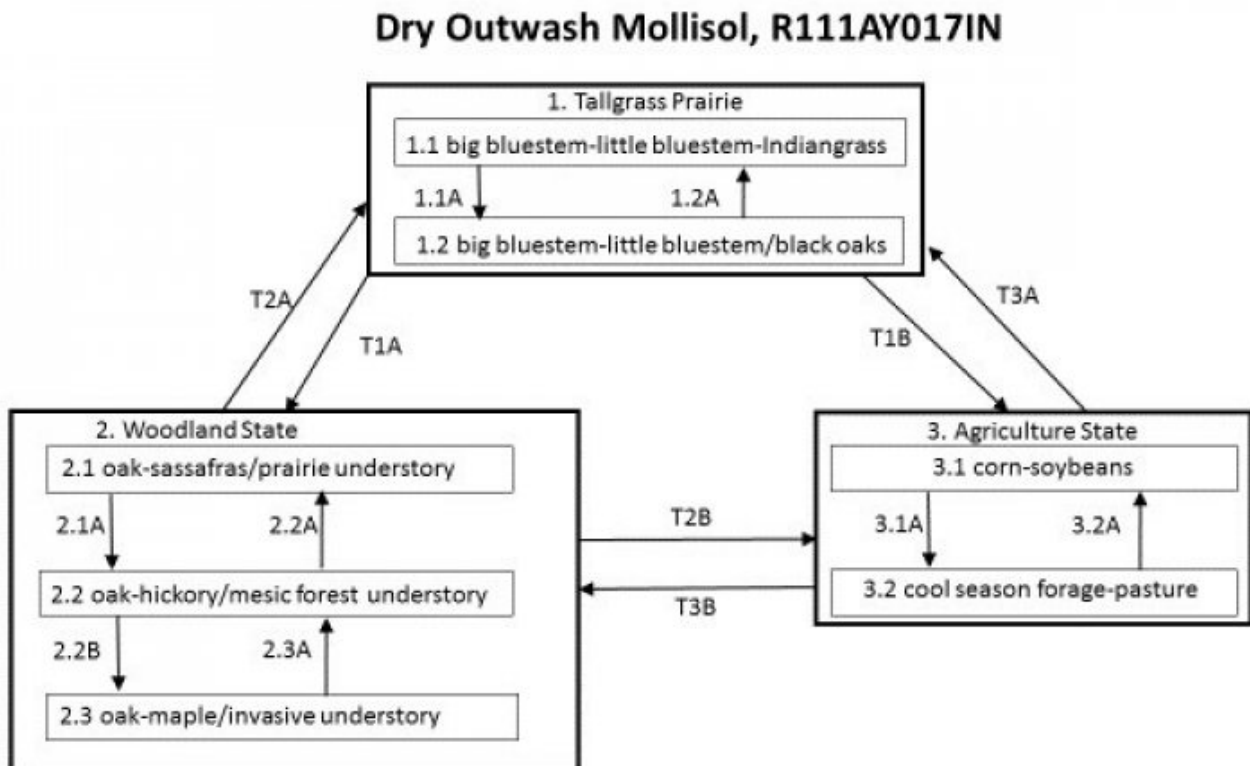


Figure 9. STM

## Dry Outwash Mollisol, R111AY017IN Diagram Legend

T1A	No woody species management, no fire
T1B	Site preparation, planting, management
T2A	Tree removal, planting, fire
T2B	Remove woody species, site preparation, planting, management
T3A	Site preparation, planting, management
T3B	Planting, timber practices, no fire
1.1A	Succession, no fire
1.2A	Fire or disturbance to remove some of the woody canopy level
2.1A	No woody species management, no fire
2.2A	Selective tree harvest, timber stand improvement
2.2B	Establishment, no invasive species management
2.3A	Chemical/mechanical treatment of invasive species, timber stand improvement
3.1A	Pasture/forage planting and maintenance
3.2A	Tillage/no-till planting and management of row crops.

Figure 10. Legend

### State 1 Tallgrass 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, little bluestem, and Indiangrass. 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. Tillage of the site allows the site to be converted to cropland (state 3).

#### Dominant plant species

- big bluestem (*Andropogon gerardii*), grass
- little bluestem (*Schizachyrium scoparium*), grass
- Indiangrass (*Sorghastrum nutans*), grass

### Community 1.1 big bluestem/little bluestem/Indiangrass

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

#### Dominant plant species

- big bluestem (*Andropogon gerardii*), grass
- little bluestem (*Schizachyrium scoparium*), grass
- Indiangrass (*Sorghastrum nutans*), 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, little bluestem, and Indiangrass, 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**

Fire return intervals longer than 5 years or no wood species management will move this phase towards phase 1.2.

### **Pathway P1.2A**

#### **Community 1.2 to 1.1**

Woody species management or fire return intervals shorter than 5 years will move this phase towards community phase 1.1.

## **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*), 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 and no fire.

### **Pathway P2.2A Community 2.2 to 2.1**

Prescribed timber harvest and timber stand improvement practices.

### **Pathway P2.2B Community 2.2 to 2.3**

Invasion of non-native invasive species in the understory and no invasive species management.

### **Pathway P2.3A Community 2.3 to 2.2**

Chemical or mechanical treatment of woody invasive species leads the site back to community phase 2.2.

## **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**

Pasture/forage planting and maintenance.

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

Tillage / no-till planting and management of row crops

## **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**

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, 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.

### **Restoration pathway T3B**

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

Forestry planting/practice, no fire applied.

## **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)	TYLER STAGGS
Contact for lead author	
Date	05/06/2024
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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