

Ecological site R111XA016IN

Outwash Mollisol

Last updated: 4/17/2020
Accessed: 05/20/2024

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 outwash and colluvium parent materials in soils that are very poorly, poorly, or somewhat poorly drained. The soils surface color is dark (3/2 Munsell or darker) and extends beyond 10 inches, making them taxonomically mollisols. This site is found on flat portions (slope 0-2%) on outwash plains and terraces. Flooding is frequent on this site and can last for up to 30 days. Similarly, ponding of water to a depth of 15 inches occurs frequently for a range of duration between 2 and 30 days.

The characteristic vegetation of this site is of a depressional, tall-grass prairie that is dominated by prairie cordgrass, big bluestem, and a variety of sedge species. The combination of accumulation of organic material and seasonal changes in water which led to an increased probability of fire limited the encroachment of woody species. Fires occurred on this site every 5 years or less with the ignitions being a mix of lightning strikes those set by Native Americans. During the dormant season, these fires were less frequent and of lower intensity and size than those that occurred during the growing season. 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. 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.

Currently, most of this site is in agricultural production, with the majority being used to raise corn and soybeans after the installation of drainage.

Associated sites

F111XA014IN	Outwash Upland Site is located on similar landscape positions; soil surface color is lighter than 3/2 Munsell; soils are not mollisols.
F111XA015IN	Dry Outwash Upland Site is generally located on higher landscape positions; soil surface color is lighter than 3/2 Munsell; soils are not mollisols.
R111XA017IN	Dry Outwash Mollisol Site is generally located on higher landscape positions; soils are moderately well to excessively drained.

Similar sites

R111XA010IN	Till Ridge Prairie Soil parent material is glacial till; site is located on a swell (convex) landscape position
R111XA017IN	Dry Outwash Mollisol Site is generally located on higher landscape positions; soils are moderately well to excessively drained.
R111XA002IN	Limnic Muck Soil parent material is organic; soils are histosols; underlying material is limnic (coprogenous earth); site generally lower on the landscape
R111XA001IN	Mineral Muck Soil parent material is organic; soils are histosols; site generally lower on the landscape.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Spartina pectinata</i> (2) <i>Andropogon gerardii</i>

Physiographic features

This ecosite is found in outwash plain, till plain in MLRA 111A: Indiana and Ohio Till Plain, Central Part.

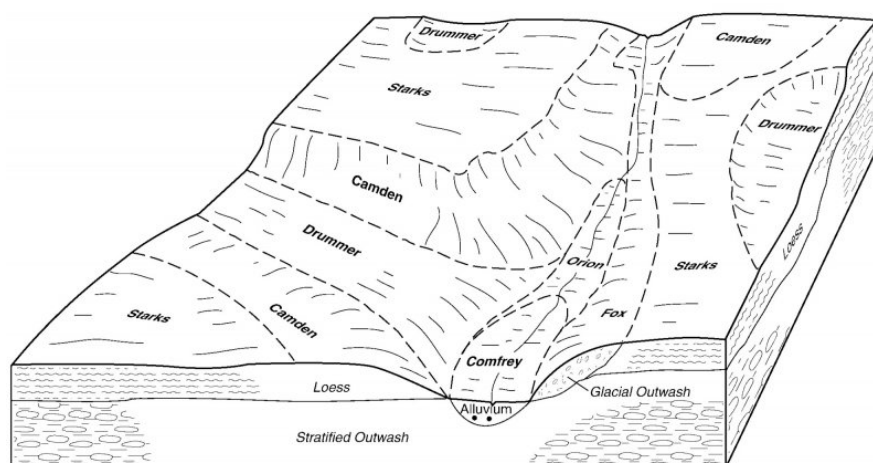


Figure 1. Block diagram showing soils on the landscape.

Table 2. Representative physiographic features

Landforms	(1) Outwash plain (2) Outwash terrace (3) Swale
Flooding duration	Extremely brief (0.1 to 4 hours) to long (7 to 30 days)
Flooding frequency	None to frequent
Ponding duration	Brief (2 to 7 days) to very long (more than 30 days)
Ponding frequency	None to frequent
Elevation	107–381 m
Slope	0–2%
Ponding depth	0–38 cm
Water table depth	0–152 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)	145-156 days
Freeze-free period (characteristic range)	173-194 days
Precipitation total (characteristic range)	1,041-1,067 mm
Frost-free period (actual range)	141-173 days
Freeze-free period (actual range)	171-201 days
Precipitation total (actual range)	991-1,118 mm
Frost-free period (average)	152 days
Freeze-free period (average)	183 days
Precipitation total (average)	1,041 mm

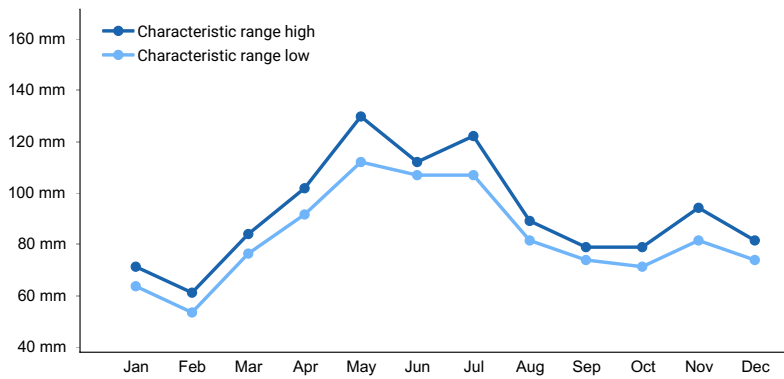


Figure 2. Monthly precipitation range

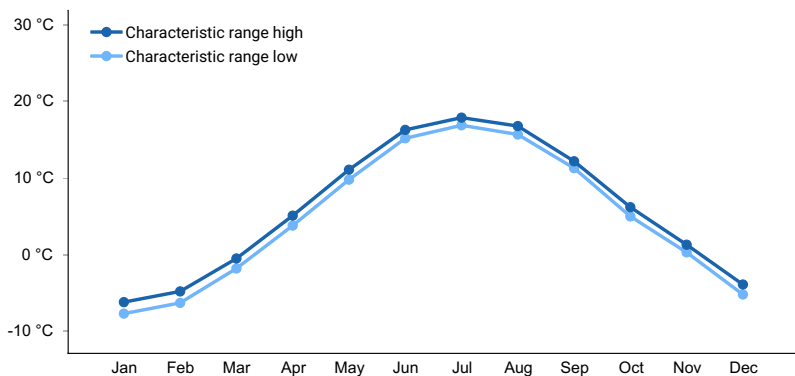


Figure 3. Monthly minimum temperature range

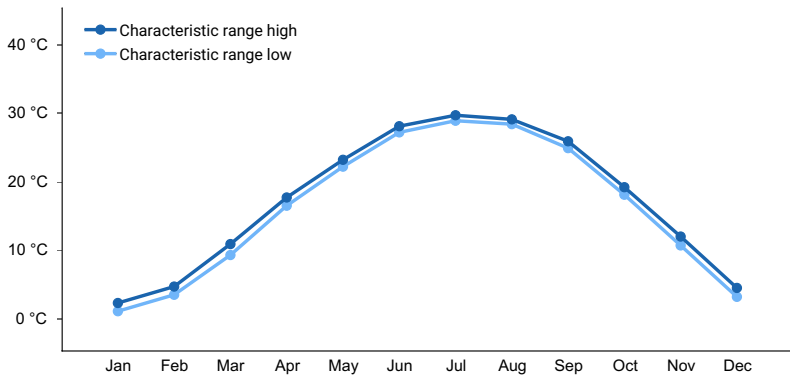


Figure 4. Monthly maximum temperature range

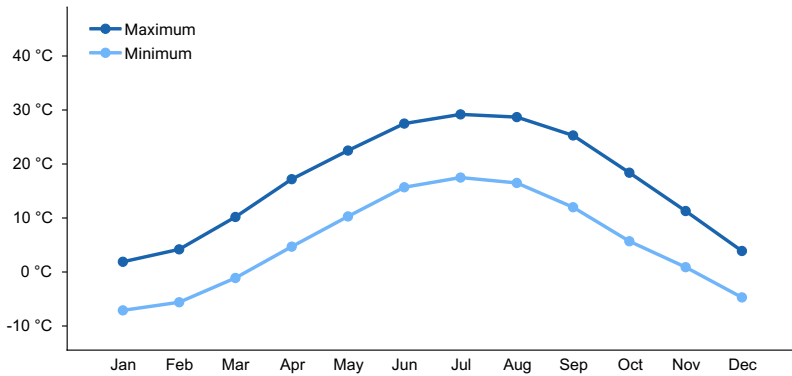


Figure 5. Monthly average minimum and maximum temperature

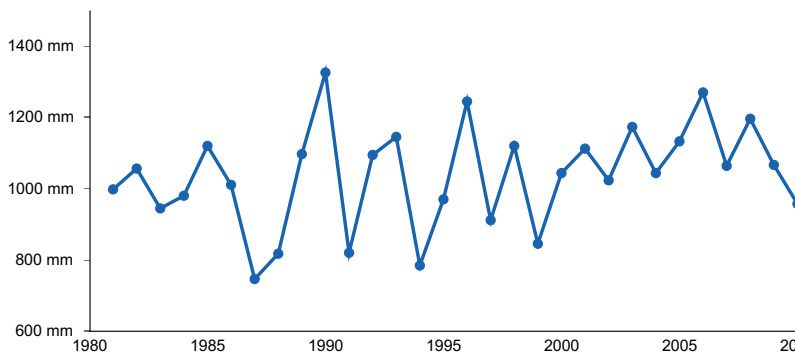


Figure 6. Annual precipitation pattern

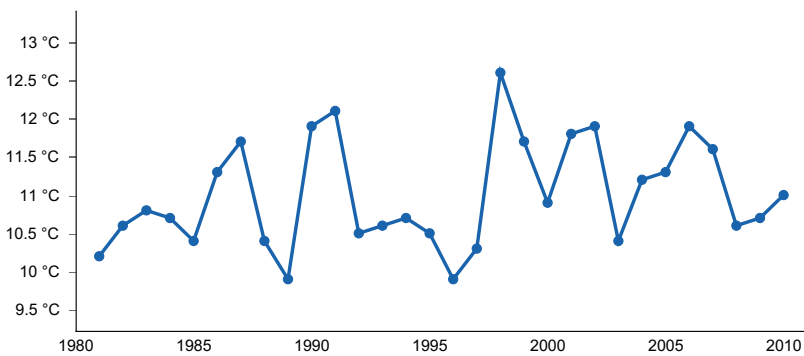


Figure 7. Annual average temperature pattern

Climate stations used

- (1) ELWOOD [USC00122638], Elwood, IN
- (2) NEW CASTLE 3 SW [USC00126164], New Castle, IN
- (3) SHELBYVILLE SEWAGE PLT [USC00127999], Shelbyville, IN

- (4) URBANA WWTP [USC00338552], Urbana, OH
- (5) INDIANAPOLIS EAGLE CREEK AP [USW00053842], Indianapolis, IN
- (6) KOKOMO 3 WSW [USC00124662], Russiaville, IN
- (7) COLUMBUS [USC00121747], Columbus, IN
- (8) RICHMOND WTR WKS [USC00127370], Richmond, IN
- (9) SPRINGFIELD NEW WWKS [USC00337935], Springfield, OH
- (10) COLUMBUS OHIO STATE UNIV AP [USW00004804], Dublin, OH
- (11) CHILLICOTHE MOUND CITY [USC00331528], Chillicothe, OH

Influencing water features

This ecological site is a depressional wetland that receives water from precipitation, ground water discharge, and from the surrounding uplands. A distinguishing characteristic of this site is the seasonal abundance (winter/spring) and lack of abundance (late summer) of water on the site creating annual wet and dry periods. Flooding can be frequent with a long (7 to 30 days) duration. Ponding frequently occurs to a maximum average depth of 15 inches with a duration from brief (2 to 7 days) and very long (> 30 days).

The hydrogeographic model classification for this site is DEPRESSIONAL: Outwash Plain, Mucky; herbaceous. This site has a Cowardin Classification of PEM1Cn; it is a persistent herbaceous vegetation palustrine site that is seasonally flooded/ponded on a mineral soil.

Soil features

The soil series associated with this site are: Westland, Sebewa, Rensselaer, Pella, Millgrove, Mahalassville, Lippincott, Kane, Dunham, Drummer, Crane. They are moderately deep to very deep, very poorly drained to somewhat poorly drained, and moderately slow to very rapid permeable soils, with slightly acidic to neutral soil reaction, that formed in Glaciofluvial deposits, Glaciolacustrine deposits, and Outwash.

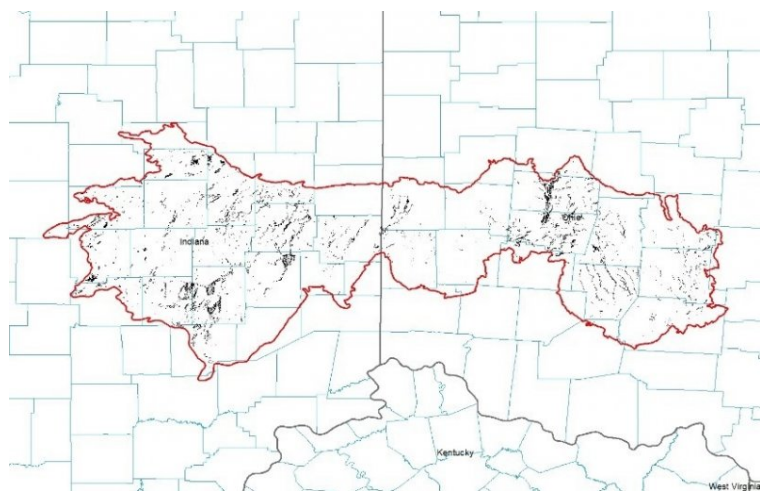


Figure 8. Mapunit location within the MLRA.

Table 4. Representative soil features

Parent material	(1) Outwash–limestone
Surface texture	(1) Mucky clay loam (2) Silt loam (3) Silty clay loam
Family particle size	(1) Loamy
Drainage class	Very poorly drained to somewhat poorly drained
Permeability class	Slow to very rapid
Soil depth	81–140 cm
Surface fragment cover <=3"	0%

Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	11.43–21.59 cm
Calcium carbonate equivalent (0-101.6cm)	0–30%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	4.8–8.3
Subsurface fragment volume <=3" (Depth not specified)	0–32%
Subsurface fragment volume >3" (Depth not specified)	0–20%

Ecological dynamics

The historic plant community of the Outwash Mollisol ecological site is a wet prairie. This site is dominated by tall-grass prairie species that often reach 3-8 feet in height, particularly prairie cordgrass and big bluestem. Fluctuation of the amount of water on the site varies greatly, even over the course of a single year, which make the site prone to wildfires. The fluctuating water table, amount of organic material and cover, and fires maintain the herbaceous dominance of the site to the exclusion of trees. Suppression of or absence of fire, will over time allow the site to be converted to a woodland after the invasion of trees from nearby sources. Drainage and tillage have led to the majority of this site being converted to agriculture.

State and transition model

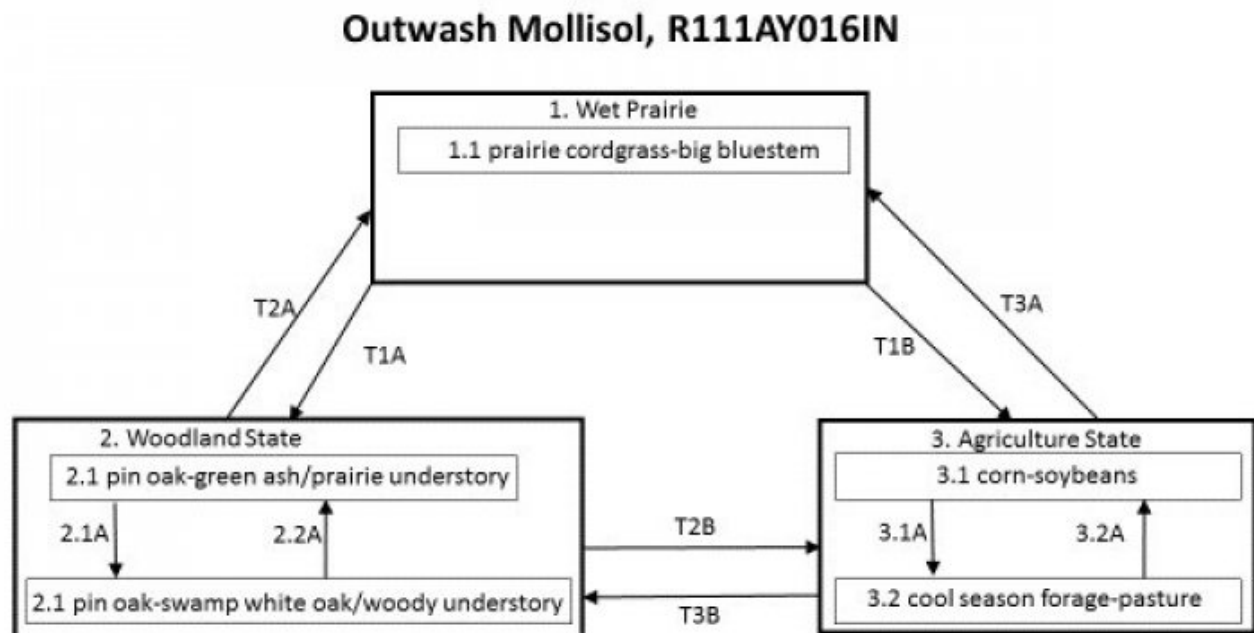


Figure 9. STM

Outwash Mollisol, R111AY016IN

Diagram Legend

T1A	No woody species management, no fire
T1B	Drainage, site preparation, planting, management
T2A	Tree removal, fire
T2B	Remove woody species, drainage, site preparation, planting, management
T3A	Remove drainage, planting, fire
T3B	Remove drainage, planting, no fire
2.1A	Succession, no fire
2.2A	Selective tree harvest
3.1A	Pasture/forage planting and maintenance
3.2A	Tillage/no-till planting and management of row crops.

Figure 10. Legend

State 1

Wet prairie

This is the reference or diagnostic plant community for this site. In reference condition, this site was dominated by tall prairie grass, principally big bluestem, prairie cordgrass, and switchgrass. Secondary forb species include dense blazing star and Virginia mountainmint as two of the more abundant. Herbaceous species dominance was maintained by a, mostly annual, wet and dry cycle and fire. Absence of fire allows the state to transition to the woodland state.

Dominant plant species

- big bluestem (*Andropogon gerardii*), grass
- prairie cordgrass (*Spartina pectinata*), grass
- switchgrass (*Panicum virgatum*), grass
- blazing star (*Liatris*), other herbaceous
- Virginia mountainmint (*Pycnanthemum virginianum*), other herbaceous

Community 1.1

prairie cordgrass/big bluestem

This phase is characterized by dominance of tall-prairie grasses. Periodic wet and dry soil periods along with fire maintain this phase. Absence of fire allows for woody species to invade and given enough time become dominant.

Dominant plant species

- big bluestem (*Andropogon gerardii*), grass
- prairie cordgrass (*Spartina pectinata*), grass
- switchgrass (*Panicum virgatum*), grass
- blazing star (*Liatris*), other herbaceous
- Virginia mountainmint (*Pycnanthemum virginianum*), other herbaceous

State 2

Woodland State

Absence of fire or lack of woody species management will move this site to a woodland state. The understory would contain many of the prairie species until the canopy closed.

Dominant plant species

- pin oak (*Quercus palustris*), tree
- swamp white oak (*Quercus bicolor*), tree
- prairie cordgrass (*Spartina pectinata*), grass
- big bluestem (*Andropogon gerardii*), grass

Community 2.1

pin oak/green ash/understory

This phase is characterized by the absence of fire. Trees 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

- pin oak (*Quercus palustris*), tree
- green ash (*Fraxinus pennsylvanica*), tree

Community 2.2

pin oak/swamp white oak/woody understory

This phase is characterized by the absence of fire. Trees remain the dominant growth form. Swamp white oak becomes present in the canopy. The understory is occupied mostly by woody species.

Dominant plant species

- pin oak (*Quercus palustris*), tree
- swamp white oak (*Quercus bicolor*), tree

Pathway CP 2.1-2.2

Community 2.1 to 2.1

No management and no fire.

Pathway P2.1A

Community 2.1 to 2.2

Succession, no fire.

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 (<90%) of the historic acres are now in row crop agricultural use. Most common is a corn and soybean rotation of various types.

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 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 fire or woody species management of any type.

Transition T1B

State 1 to 3

Install soil drainage, tillage and regular agricultural practices.

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

Remove drainage, site preparation, planting, and regular application of fire.

Transition T3B

State 3 to 2

Remove drainage, plant trees, implement forestry practices that do not include fire.

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	04/17/2020
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:**
-