

Ecological site R111XD020IN Wet Outwash Mollisol

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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 Crawfordsville, 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 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. Ponding 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

| | |
|-------------|--|
| R111XD019IN | Outwash Integrate Located on adjacent landscapes; soil surface color is 3/2 Munsell or darker and extends to 10 inches or less. |
| R111XD021IN | Dry Outwash Mollisol Located on adjacent landscapes; soil surface color is 3/2 Munsell or darker and extends greater than 10 inches; soils are moderately well to excessively drained. |
| F111XD017IN | Outwash Upland Located on adjacent landscapes; soils surface is 3/2 Munsell or lighter; soils are somewhat poorly to moderately well drained. |
| F111XD018IN | Dry Outwash Upland Located on adjacent landscapes; soils surface is 3/2 Munsell or lighter; soils are well to excessively drained. |

Similar sites

| | |
|-------------|--|
| R111XD001IN | Shallow Muck Located on organic parent material that extends to less than 51 inches |
| R111XD007IN | Till Depression Prairie Located on glacial till parent material and a concave landscape position; soils are 3/2 Munsell or darker to deeper than 10 inches and well drained. |
| R111XD012IN | Till Ridge Prairie Located on glacial till parent material and a convex landscape position; soils are 3/2 Munsell or darker to deeper than 10 inches |
| R111XD026IN | Sand Dune Prairie Located on sandy parent material on a dune landscape position; soils are 3/2 Munsell or darker and the color extends deeper than 10 inches |

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, plains, till plain in MLRA 111D: Indiana and Ohio Till Plain, Western Part.

list of unique landform positions: Backslope, Footslope, Summit, Toeslope

Soils in this site are clayey, poorly drained or very poorly drained, and at least moderately deep. They have a seasonal high water table from 0-.5 feet during the growing season. Flooding frequency ranges from none to rare. Available water capacity is greater than 3 inches. Sodium adsorption rates are less than 1.

Table 2. Representative physiographic features

| | |
|--------------------|---|
| Landforms | (1) Outwash terrace (2) Outwash plain (3) Terrace |
| Flooding frequency | None |
| Ponding duration | Brief (2 to 7 days) to long (7 to 30 days) |

| | |
|-------------------|------------------------------------|
| Ponding frequency | None to frequent |
| Elevation | 107–351 m |
| Slope | 0–2% |
| Ponding depth | 0–76 cm |
| Water table depth | 0–137 cm |
| Aspect | Aspect is not a significant factor |

Climatic features

The average annual precipitation in this area is 36 to 43 inches (915 to 1,090 millimeters). Most of the rainfall occurs as convective thunderstorms during the growing season. About half or more of the precipitation occurs during the freeze-free period. Snowfall is common in winter. The average annual temperature is 49 to 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) | 134-142 days |
| Freeze-free period (characteristic range) | 168-183 days |
| Precipitation total (characteristic range) | 991 mm |
| Frost-free period (actual range) | 133-148 days |
| Freeze-free period (actual range) | 167-187 days |
| Precipitation total (actual range) | 991 mm |
| Frost-free period (average) | 139 days |
| Freeze-free period (average) | 176 days |
| Precipitation total (average) | 991 mm |

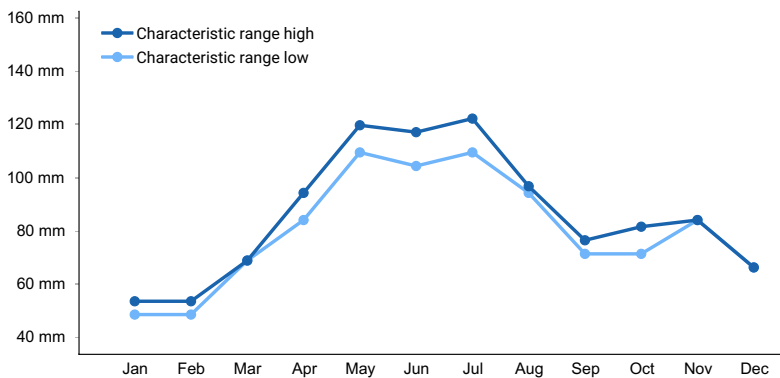


Figure 1. Monthly precipitation range

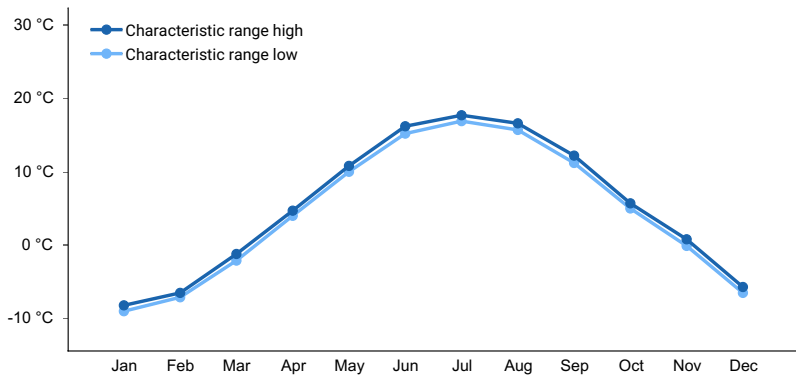


Figure 2. Monthly minimum temperature range

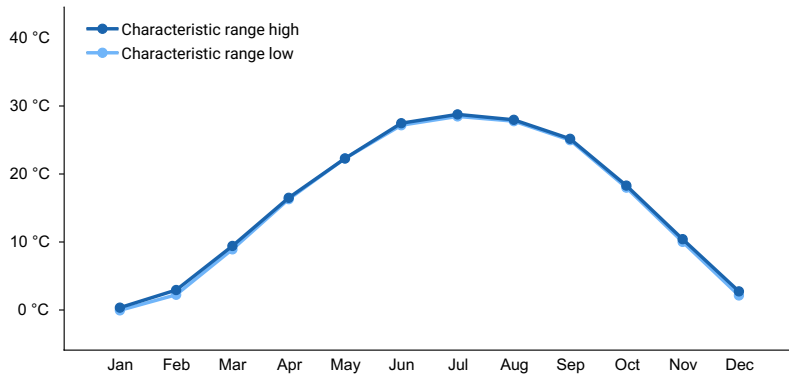


Figure 3. Monthly maximum temperature range

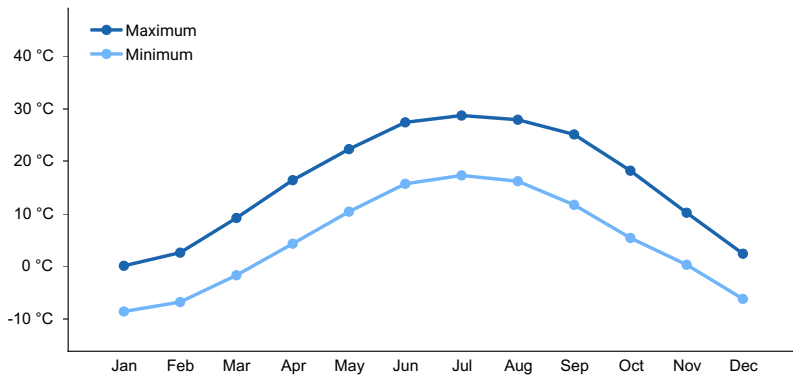


Figure 4. Monthly average minimum and maximum temperature

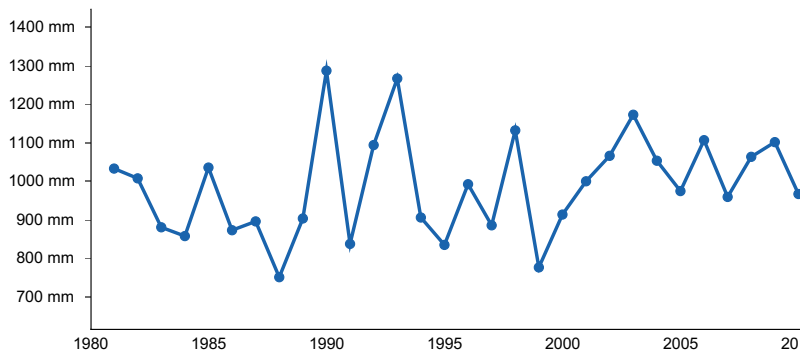


Figure 5. Annual precipitation pattern

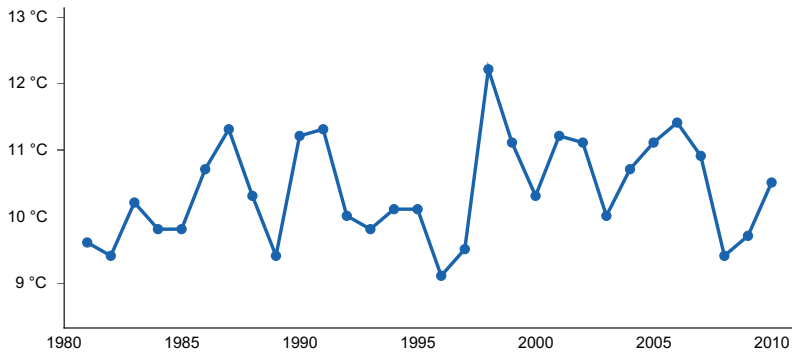


Figure 6. Annual average temperature pattern

Climate stations used

- (1) ATTICA 2E [USC00120331], Attica, IN
- (2) LAFAYETTE 8 S [USC00124715], Lafayette, IN
- (3) YOUNG AMERICA [USC00129905], Kokomo, IN
- (4) BOSWELL 4WNW [USC00120858], Fowler, IN

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. The water table depth can vary from 0 to 54 inches. Ponding frequently occurs to a maximum average depth of 30 inches with a duration from brief (2 to 7 days) to long (7 to 30 days).

The hydrogeographic model classification for this site is DEPRESSIONAL: Outwash Plain; 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, Peotone, Millgrove, Mahalassville, Mahalaland, Lafayette, Harpster, Gilford, Gilboa, Free, Dunham, Drummer, Darroch, Crane, Brenton, Andres. They are very deep, very poorly drained to somewhat poorly drained, and slow to very rapid permeable soils, with slightly acidic to neutral soil reaction, that formed in Drift, Outwash.

Table 4. Representative soil features

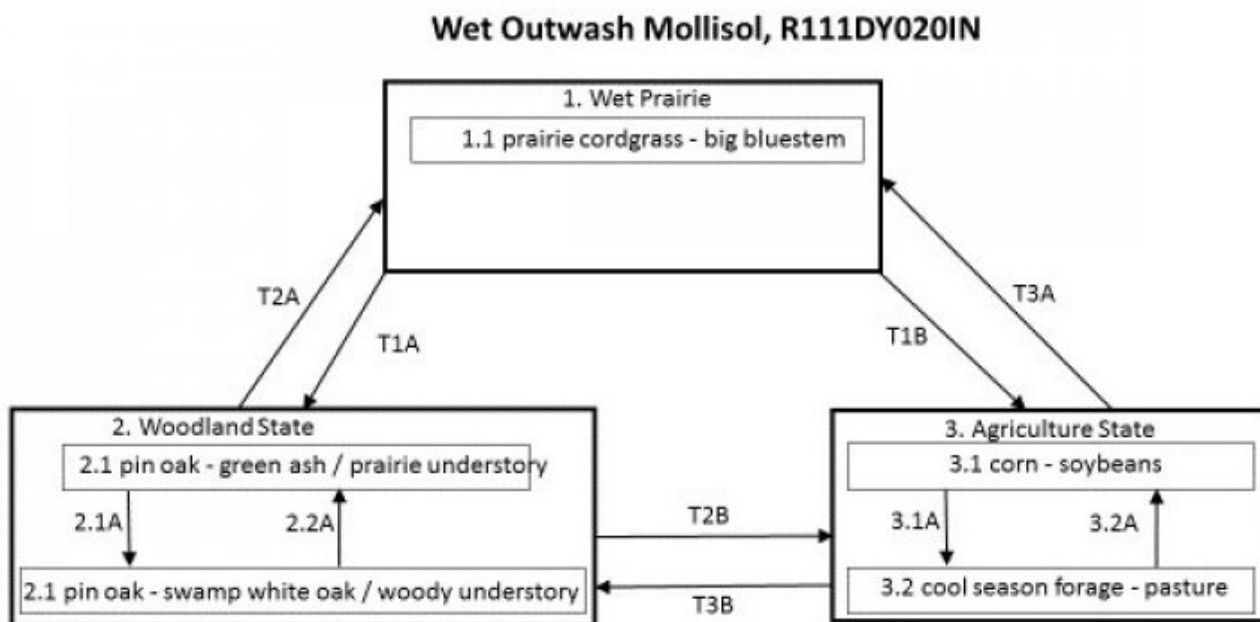
| | |
|--------------------------------------|--|
| Parent material | (1) Outwash–sandstone and siltstone (2) Drift |
| Surface texture | (1) Loam (2) Silt loam (3) Silty clay loam |
| Family particle size | (1) Loamy |
| Drainage class | Very poorly drained to somewhat poorly drained |
| Permeability class | Slow to very rapid |
| Soil depth | 81–183 cm |
| Surface fragment cover <=3" | 0–2% |
| Surface fragment cover >3" | 0% |
| Available water capacity (0-101.6cm) | 13.21–21.84 cm |

| | |
|---|------------|
| Calcium carbonate equivalent (0-101.6cm) | 0–15% |
| Electrical conductivity (0-101.6cm) | 0 mmhos/cm |
| Sodium adsorption ratio (0-101.6cm) | 0 |
| Soil reaction (1:1 water) (0-101.6cm) | 6.1–7.6 |
| Subsurface fragment volume <=3" (Depth not specified) | 0–16% |
| Subsurface fragment volume >3" (Depth not specified) | 0–6% |

Ecological dynamics

The historic plant community of the Wet 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



Wet Outwash Mollisol, R111DY020IN

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. |

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.

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.

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.

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 but disappear at the higher levels.

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.

Pathway CP 2.1-2.2
Community 2.1 to 2.1

No management and no fire.

Pathway CP2.1-2.2
Community 2.1 to 2.2

Succession, no fire

Pathway CP2.2 -2.1
Community 2.2 to 2.1

Selective 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 CP 3.1-3.2
Community 3.1 to 3.2

Establishment of pasture/forage species.

Pathway CP 3.2-3.1
Community 3.2 to 3.1

Establishment of row crops.

Transition T 1-2
State 1 to 2

No fire or woody species management of any type.

Transition T 1-3
State 1 to 3

Install soil drainage, tillage and regular agricultural practices.

Restoration pathway R 2-1

State 2 to 1

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

Transition T 2-3

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 R 3-1

State 3 to 1

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

Restoration pathway R 3-2

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 work.

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 | 05/07/2024 |
| 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:**
-