

Ecological site F111XA021IN

Sandy Interdune

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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 in depressions on glacial till plains, land plains, on sandy parent material. It is located on the footslopes, toeslopes, and back slopes in an interdunal position. Drainage of the soils on this site ranges from very poorly to moderately well drained. The characteristic plant community for this site is an oak woodland that is dominated in the understory and canopy layers by oak species, mostly black and white oak. Pignut hickory, shagbark hickory, black cherry and sassafras are fairly common in the canopy level as well. Beneath the canopy, the understory is generally relatively dense as the wider spacing of the trees in a woodland allow for adequate sunlight to support a variety of species. Understory tree species include flowering dogwood and hop-hornbeam. The herbaceous portion of the understory contains many species that are more common in adjacent savannas and prairies like big bluestem, poverty oatgrass, and sedge species. Fire intensity and frequency was the principle driver for this site, with low intensity ground fires every (4-17) years being common. An increase in the fire return interval leads to a higher tree density and the concurrent increase in shade decreased the amount and diversity of species in the understory. This allows for shade tolerant species such as sugar maple and the invasive Asian honeysuckles to get established. Left unchecked these can come to dominant the site. Since settlement, most of this site has been converted to agriculture with the majority being row crop agriculture. The most common practice involves grain rotations between corn and soybeans.

Associated sites

R111XA022IN	Sand Dune Site is located on a dune landscape position; soils are well to somewhat excessively drained
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Similar sites

F111XA015IN	Dry Outwash Upland Soil parent material is outwash; soils are well or excessively drained
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Table 1. Dominant plant species

Tree	(1) <i>Quercus velutina</i> (2) <i>Quercus alba</i>
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Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This ecosite is found in unspecified landscape in MLRA 111A: Indiana and Ohio Till Plain, Central Part. This site is classified as an upland site located in depressions on outwash plains, lake plains, and developed on sandy material. Drainage is characterized somewhat poorly to moderate well drained.

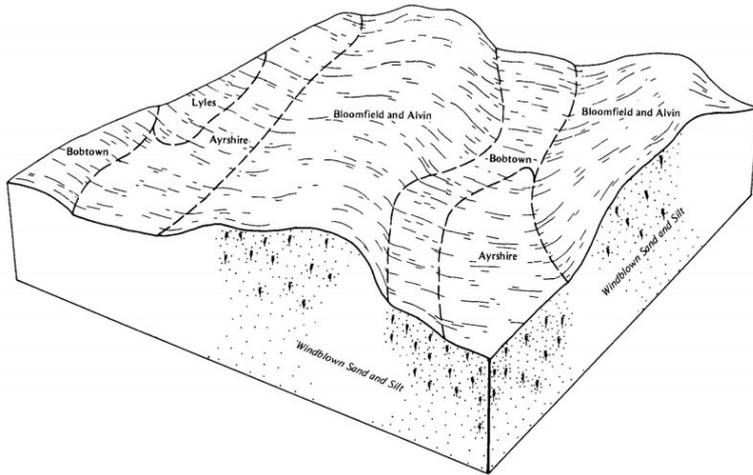


Figure 1. Block diagram showing soils on the landscape.

Table 2. Representative physiographic features

Landforms	(1) Depression (2) Interdune
Flooding frequency	None
Ponding duration	Very brief (4 to 48 hours)
Ponding frequency	None to frequent
Elevation	351–1,250 ft
Slope	0–3%
Ponding depth	0–7 in
Water table depth	2–60 in
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)	143-165 days
Freeze-free period (characteristic range)	173-198 days
Precipitation total (characteristic range)	40-44 in
Frost-free period (actual range)	139-174 days
Freeze-free period (actual range)	171-201 days

Precipitation total (actual range)	39-46 in
Frost-free period (average)	155 days
Freeze-free period (average)	186 days
Precipitation total (average)	42 in

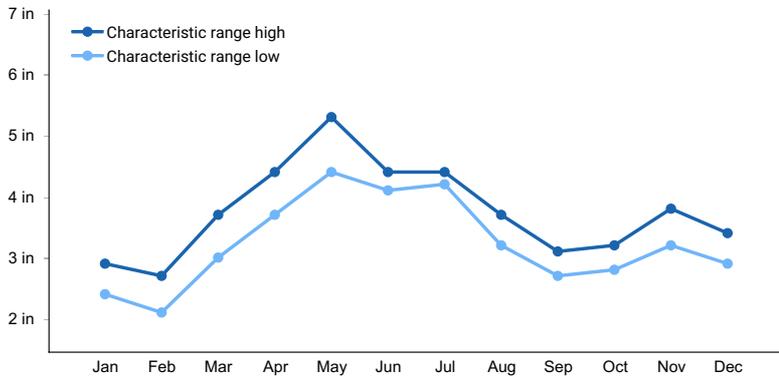


Figure 2. Monthly precipitation range

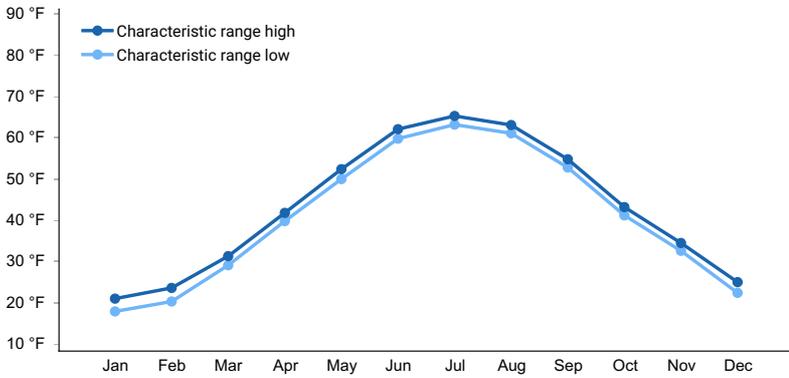


Figure 3. Monthly minimum temperature range

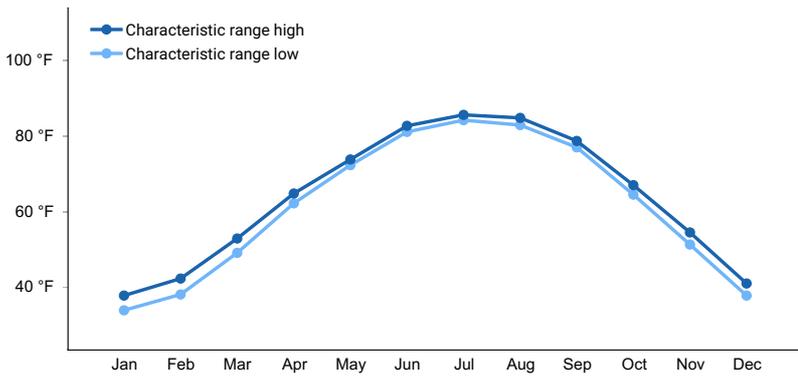


Figure 4. Monthly maximum temperature range

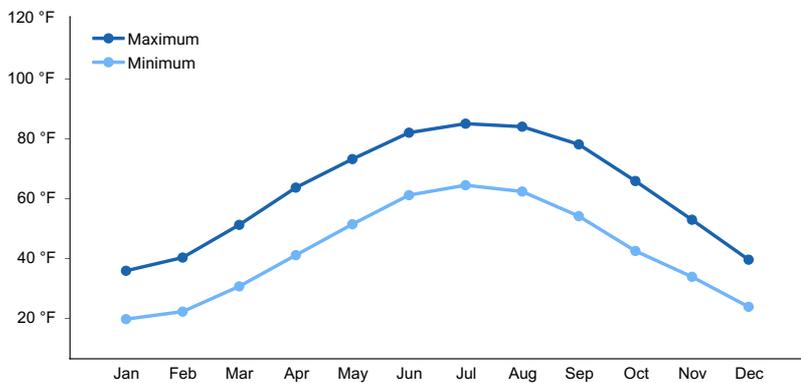


Figure 5. Monthly average minimum and maximum temperature

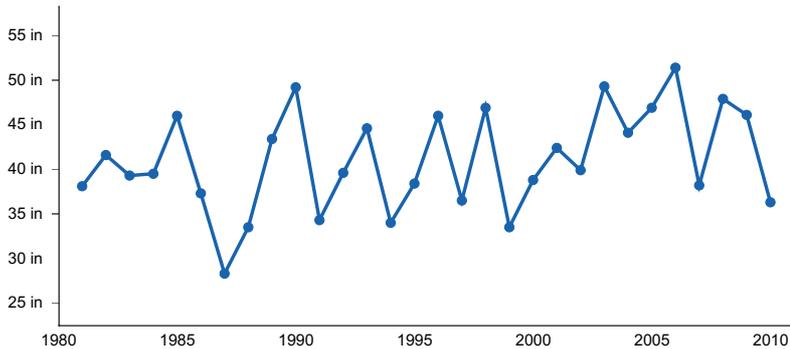


Figure 6. Annual precipitation pattern

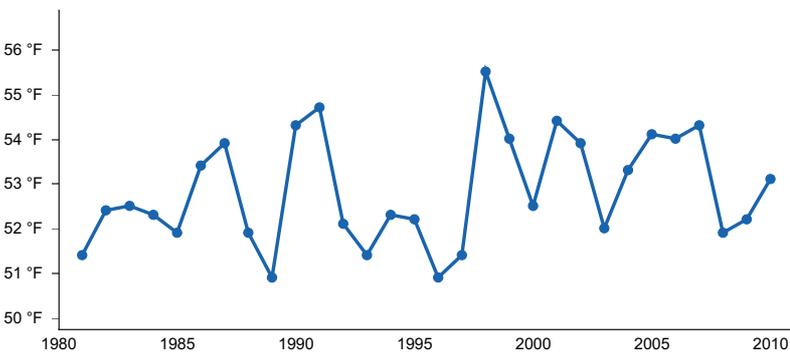


Figure 7. Annual average temperature pattern

Climate stations used

- (1) SHELBYVILLE SEWAGE PLT [USC00127999], Shelbyville, IN
- (2) COLUMBUS [USC00121747], Columbus, IN
- (3) SEYMOUR 2 N [USC00127935], Seymour, IN
- (4) KOKOMO 3 WSW [USC00124662], Russiaville, IN
- (5) INDIANAPOLIS EAGLE CREEK AP [USW00053842], Indianapolis, IN
- (6) GREENVILLE WTP [USC00333375], Greenville, OH
- (7) COLUMBUS OHIO STATE UNIV AP [USW00004804], Dublin, OH
- (8) CHILLICOTHE MOUND CITY [USC00331528], Chillicothe, OH

Influencing water features

This ecological site is not influenced by wetland or riparian water features.

Soil features

The soil series associated with this site are: Lyles, Bobtown, Ayrshire, Aquents. They are very deep, very poorly drained to moderately well drained, and moderately slow to rapid permeable soils, with very acidic to neutral soil

reaction, that formed in Drift, Eolian deposits, Eolian sands, and Outwash.

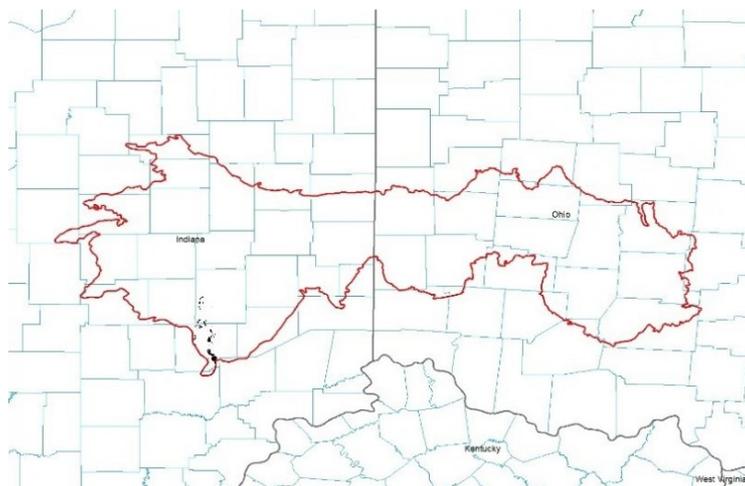


Figure 8. Mapunit location in the MLRA.

Table 4. Representative soil features

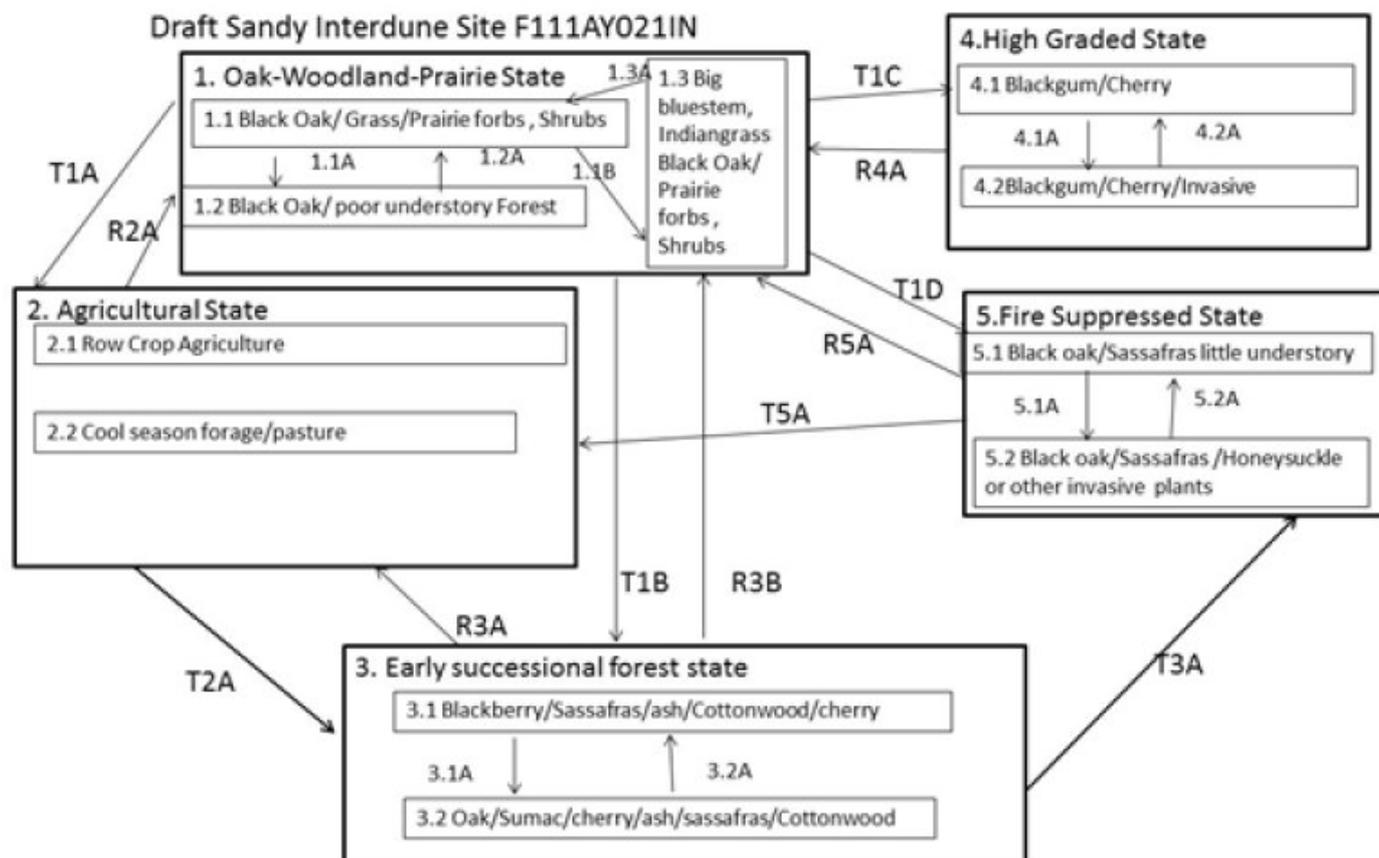
Parent material	(1) Eolian deposits (2) Eolian sands (3) Outwash
Surface texture	(1) Fine sandy loam (2) Loamy fine sand
Family particle size	(1) Loamy
Drainage class	Poorly drained to moderately well drained
Permeability class	Moderately slow to rapid
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	4.1–6.9 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	5–6.6
Subsurface fragment volume <=3" (Depth not specified)	0–1%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The historic plant community of the Sandy Interdune ecological site is an oak woodland. This site is characterized as being a mostly woody species dominated site adjacent to prairies and savannas and formed part of the continuum between prairie and forest. Fire intensity and frequency was the principle driver for this site, with low intensity ground fires every (4-17) years being common. Longer fire return intervals would lead the site to being a forest type. Canopy cover would range from 21-60% for the reference state community. Since settlement, most of

this site has been converted to agriculture with the majority being row crop agriculture. The most common practice involves grain rotations between corn and soybeans.

State and transition model



Refer to narrative in the Plant Community Section for detailed descriptions of these transitions/pathways. **1.1A/1.3A/T1D** No management & no fire **1.1B**-Fire; **1.2A** Timber stand improvement (TSI); **T1A /R3A/T3A** Clearing, Site Prep & Seeding; **T1B** – Clear-cut & Succession; **T1C** Selective Harvest/no TSI. **R2A**- Planting & TSI; **T2A**– Abandonment/poor mgt; **R3B**- Long term succession & TSI measures; **3.1A** – Succession & planting oak if absent; **3.2A** Cutting or disturbance; **T3A/T4B** - Fire Suppression; **R4A** – TSI & Planting; **R5A** Prescribed harvest & fire

Figure 9. F111AY021IN Sandy Interdune State and Transition M

Sandy Interdune Site, F111AY021IN
Diagram Legend

T1A	Woody species removal, site preparation, and planting of agricultural crop.
T1B	Clear cut of all trees and succession.
T1C	Selective harvest of marketable trees; no TSI
T1D	No woody species management; no fire.
T2A	Planting of desired species; TSI measures
T2B	No or poor management of tree species
T3A	Long term succession; TSI measures
T3B	Woody species removal, site preparation, and planting of agricultural crop.
T3C	Fire suppression
T4A	Planting of desired species; TSI measures

Figure 10. Legend

T5A	Prescribed tree harvest; fire
T5B	Woody species removal, site preparation, and planting of agricultural crop.
1.1A	No management; no fire
1.2A	TSI measures
3.1A	Succession and planting of oaks if needed
3.2A	Cutting or disturbance that removes overstory trees
4.1A	Succession; no management
4.2A	Cutting or disturbance that removes overstory trees; invasive species management
5.1A	No invasive species management; succession
5.2A	Chemical/mechanical removal of invasive species

Figure 11. Legend

State 1 Oak Woodland-Prairie State

This is the reference or diagnostic plant community for this site. In reference condition, this site was an oak woodland with the understory comprised largely of herbaceous prairie species. Fire intensity and frequency was the major disturbance factor for the maintenance of this site. Fires occurred about every 20 years. Tree canopy cover ranged from 21-60% and tree height maxed out at about 80ft. Black oak was the most dominant tree, but white oak, hickory species, and black cherry were also present. Removal of fire or the lengthening of the return interval would move this site toward state 5, a forested state. Tree harvest management would move this site to either state 3 or 4.

Community 1.1 black oak/prairie herbaceous species woodland

This community phase was an oak woodland with the understory comprised largely of herbaceous prairie species. Fire intensity and frequency was the major disturbance factor for the maintenance of this site. Fires occurred about every 20 years. Tree canopy cover ranged from 21-60% and tree height maxed out at about 80ft. Black oak was the most dominant tree, but white oak, hickory species, and black cherry were also present.

Community 1.2 black oak/poor understory

This community phase was an oak woodland but at the higher limits for tree canopy cover. The lack of fire and increase in shade have reduced the diversity and abundance of the understory.

Community 1.3

prairie/black oak woodland

This community phase was an oak woodland but at the lower limits for tree canopy cover. The short time since the last fire or more frequent fires or timber stand improvement have this phase closely resembling that of an oak savanna. Prairie grass species such as big bluestem and Indiangrass become more prominent and abundant.

Pathway P1.1A

Community 1.1 to 1.2

no management; no fire

Pathway P1.1B

Community 1.1 to 1.3

management for prairie species

Pathway P1.2A

Community 1.2 to 1.1

TSI measures

Pathway P1.3A

Community 1.3 to 1.1

increase in woody species

State 2

Agriculture

This site has largely been converted to agricultural use. Roughly 75% 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 2.1

Row Crop Agriculture

This phase is characterized by row crop agriculture of small grains, primarily corn, soybeans, and occasionally wheat. Seeding and management could transition this phase to phase 2.

Community 2.2

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. Tillage, seeding and management could transition this phase to phase 1.

Pathway P2.1A

Community 2.1 to 2.2

Establishment and management of forage pasture species.

Pathway P2.2A

Community 2.2 to 2.1

Establishment and maintenance of row crops

State 3

Early Successional Forest State

This state consists of early colonizing trees, shrubs, and herbaceous plants. This is the result of clear-cutting the reference state and succession with little to no management. The woodland and prairie phases of the reference community are lost in large part due to the lack of fire as disturbance. Long term succession and timber stand improvement measures can move this site back towards the reference state. Continued fire suppression will move this towards a forest state (#5).

Community 3.1

blackberry/sassfras/ash

This phase is characterized by early colonizing woody species, mostly shrubs and small trees. This is a result of clear cutting and succession without the use of fire. Species such as blackberry, sassafras, and ash become the dominant species. Some of the prairie herbaceous species will be present in the understory for a time, but will be eventually outcompeted.

Community 3.2

oak/sumac/cherry/ash

This phase is characterized by early colonizing woody species, but larger species start to dominate the canopy. Oak can become present again, if planted or less likely through natural distribution. Nearly all the herbaceous prairie species have disappeared from the understory and have been replaced by more shade tolerant woody species.

Pathway P3.1A

Community 3.1 to 3.2

Succession; planting of oaks if needed.

Pathway P3.2A

Community 3.2 to 3.1

Tree cutting or any other type of disturbance to remove some of the upper canopy trees.

State 4

High Graded State

This state is a forested state with increased tree cover (61-80%) over the reference state and the loss of most of the prairie species in the understory. The canopy tree species become dominated by less-marketable tree species that are fire intolerant. This is due to selective harvest without follow up timber stand improvement practices and lack of fire. Timber stand improvement, planting of desired tree species, and fire can restore this to the reference state.

Community 4.1

blackgum/cherry

This phase is characterized by two classes of trees. Those that have little market value as timber, such as black gum and those that are often small in numbers or size in the reference state like black cherry. The understory is still largely composed of prairie herbaceous species.

Community 4.2

blackgum/cherry/invasive species

This phase is characterized by two classes of trees. Those that have little market value as timber, such as black gum and those that are often small in numbers or size in the reference state like black cherry. The absence of disturbance or management have allowed this to develop into a forest phase with a canopy greater than 80% cover. Lack of management has the understory dominated by invasive shade tolerant species such as Asian bush honeysuckle and Callery pear

Pathway 4.1A

Community 4.1 to 4.2

No management, especially invasive species management

Pathway 4.2A

Community 4.2 to 4.1

Invasive species management. Cut and spray of non-native bush honeysuckle.

State 5

Fire Suppressed State

This state is an oak forest (81-100% canopy) state dominated by black oaks, with an increase in the amount of white oaks, hickories, and given enough time more mesophytic species like sugar maple present in the canopy. Nearly all the prairie herbaceous species are gone from the understory and replaced by more shade loving, fire intolerant woody species. Sassafras becomes common in the understory. With little to no management, the understory will often be invaded by and taken over by invasive honeysuckle species.

Dominant plant species

- black oak (*Quercus velutina*), tree

Community 5.1

black oak/sassafras/sparse understory

This phase is an oak forest (81-100% canopy cover) dominated by black oaks. Sassafras and other more shade tolerant woody species become more abundant in the understory.

Community 5.2

black oak/sassafras/invaded understory

This phase is an oak forest (81-100% canopy cover) dominated by black oaks. Sassafras and other more shade tolerant woody species become more abundant in the understory. Lack of management allows the understory to become dominated by non-native invasive species such as the many species of bush honeysuckle and Callery pear.

Pathway 5.1A

Community 5.1 to 5.2

Succession in the absence of fire or tree species management.

Pathway 5.2A

Community 5.2 to 5.1

Invasive species management

Transition T1A

State 1 to 2

Woody species removal, site preparation, and planting of agricultural crop.

Transition T1B

State 1 to 3

Clear cut of all trees and succession.

Transition T1C

State 1 to 4

selective harvest of marketable trees; no TSI.

Transition T1D

State 1 to 5

no woody species management; increase in woody species; fire

Restoration pathway R2A

State 2 to 1

planting of desired species; TSI measures

Transition T2B

State 2 to 3

no or poor management of tree species

Restoration pathway R3A

State 3 to 1

long term succession and management input

Transition T3B

State 3 to 2

Woody species removal, site prep, and planting of ag crop.

Restoration pathway R4A

State 4 to 1

planting of desired species; TSI measures

Restoration pathway R5A

State 5 to 1

Prescribed tree harvest; fire; timber stand improvement; weed control, brush control.

Transition T5B

State 5 to 2

Woody species removal, site preparation, and planting of agricultural crop.

Additional community tables

Inventory data references

Site concept developed through expert opinion and review of the literature.

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	04/25/2024
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:**
