Ecological site R111XC001IN
Sand Dune

Accessed: 05/07/2024

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.

111C – Indiana and Ohio Till Plain, Northwestern Part. This MLRA is in the glaciated part of north-central Indiana and is dominated by glacial till plains broken in places by lake plains, outwash plains, and flood plains. Areas that parallel most of the major rivers and streams have deposits of sand.

Although it is an important agricultural region, MLRA 111C hosts a large proportion of Indiana’s biodiversity.

Classification relationships

Major Land Resource Area (MLRA)(USDA-Natural Resources Conservation Service, 2006)

USFS Ecological Regions (USDA, 2007):
Sections - Central Till Plains, Beech Maple (222H), South Central Great Lakes (222J), Central Till Plains and Grand Prairies (251D)

Subsections - Kalamazoo-Elkhart Moraines and Plains (222Jh), Steuben Interlobate Moraines (222Ji), Bluffton Till Plains (222Ha), Entrenched Valleys (222Hf), Miami-Scioto Plain-Tipton Till Plain (222Hb), Kankakee Sands (251Dg) and Eastern Grand Prairie (251Dd).

NatureServe Systems anticipated (NatureServe, 2011): Agriculture-Pasture/Hay, Agriculture-Cultivated Crops and Irrigated Agriculture, Central Interior Highlands calcareous Glade and Barrens, Central Interior Highlands Dry Acidic Glade & Barrens, Central Tallgrass Prairie, Harvested Forest-Grass Regeneration, Harvested Forest-Herbaceous Regeneration, Introduced Upland Vegetation – Treed, Laurentian-Acadian Alkaline Conifer-Hardwood Swamp, Laurentian-Acadian Northern Hardwoods Forest, Laurentian-Acadian Northern Pine-Oak Forest, Laurentian-Acadian Wet Meadow-Shrub Swamp, Laurentian Pine-Oak Barrens, Managed Tree Plantation, North-Central Interior and Appalachian Acidic Peatland, North-Central Interior Beech-Maple Forest, North-Central Interior Dry Oak

Forest & Woodland, North-Central Interior Dry-Mesic Oak Forest & Woodland, North-Central Interior Floodplain, North-Central Interior Freshwater Marsh, North-Central Interior Maple-Basswood Forest, North-Central Interior Oak Savanna, North-Central Interior Sand Gravel Tallgrass Prairie, North-Central Interior Wet Flatwoods, North-Central Interior Wet Meadow-Shrub Swamp, North-Central Oak Barrens, Ruderal Forest, Ruderal Upland-Old Field, South-Central Interior Large Floodplain.

LANDFIRE Biophysical Settings anticipated (USGS, 2010): North-Central Interior Oak Savanna, North-Central Interior Sand and Gravel Tallgrass Prairie, Central Interior and Appalachian Swamp Systems, North-Central Interior Dry-Mesic Oak Forest and Woodland, North-Central Interior Dry Oak Forest and Woodland, North-Central Interior Beech-Maple Forest, North Central Oak Barrens, Central Interior and Appalachian Floodplain Systems, Great Lakes Coastal Marsh Systems, Central Interior and Appalachian Shrub-Herbaceous wetland systems, North Central Wet Flatwoods, North-Central Interior Maple-Basswood Forest, Central Tallgrass Prairie, South-Central Interior Mesophytic Forest, Boreal White Spruce-Fire-Hardwood Forest-Inland, Great Lakes Pine Barrens, Great Lakes Wet-Mesic Lakeplain Prairie, Laurentian-Acadian Alkaline Conifer-Hardwood Swamp, Laurentian-Acadian Floodplain Systems, Laurentian-Acadian Shrub-Herbaceous Wetland Systems, Laurentian Pine-Oak Barrens, Northern Sugar Maple-Basswood Forest, Paleozoic Plateau Bluff and Talus.

Ecological site concept

This site is an upland site form on sandy, wind and water deposited, parent materials. It is located on the summits, shoulders, and steep back slopes of dune topography. There are 3 distinct states: 1. dry sand savanna (reference state), 2. black oak woodland, and 3 agriculture state. Fire frequency and intensity were the principle drivers between the first two states. Currently, over 80% of this site is in the agriculture state and mostly used for corn and soybean production.

Associated sites

F111XC003IN	**Sandy Interdune** In adjacent, downhill position being interdunal.
R111XC002IN	**Wet Sandy Interdune** In adjacent, downhill position being interdunal.

Similar sites

R111XC010IN	**Well Drained Overflow** Different soil parent material. Has greater amount of white oak.

Table 1. Dominant plant species

Tree	(1) *Quercus velutina*
Shrub	Not specified
Herbaceous	(1) *Schizachyrium scoparium* (2) *Hesperostipa spartea*

Physiographic features

This site is located in the 111C - Indiana and Ohio Till Plain, Northwestern Part Major Land Resource Area (MLRA). It is classified as an upland site. This site was formed from Aeolian sand deposits. It is located on the summits, shoulders, and backslopes with a slope greater than 7%.

Table 2. Representative physiographic features

Landforms	(1) Dune
Flooding frequency	None

Ponding frequency	None
Slope	1–32%
Ponding depth	0 cm
Aspect	E, W, NW

Climatic features

The climate is humid continental in nature typified by large season temperature differences, with warm to hot, humid summers and cold winters. Precipitation is relatively well distributed year-round.

The average first frost should occur around October 12 and the last freeze of the season should occur around April 25.

Table 3. Representative climatic features

Frost-free period (average)	160 days
Freeze-free period (average)	189 days
Precipitation total (average)	1,067 mm

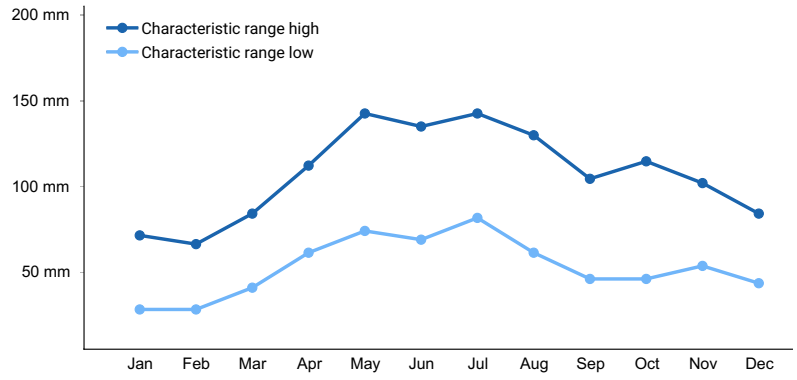


Figure 1. Monthly precipitation range

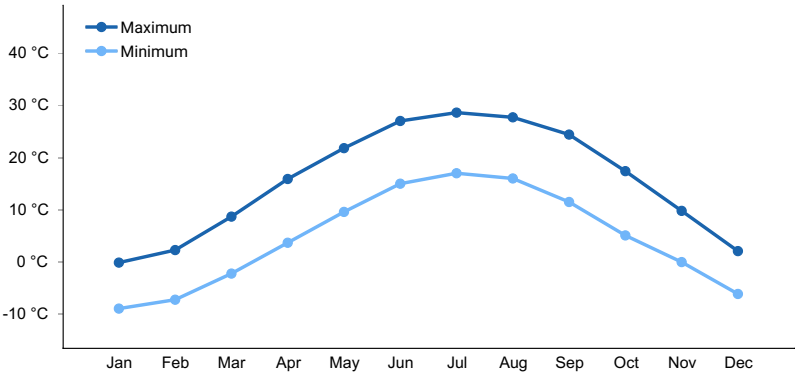


Figure 2. Monthly average minimum and maximum temperature

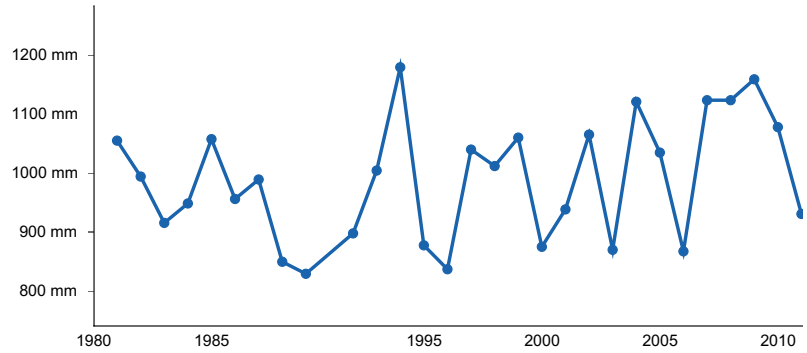


Figure 3. Annual precipitation pattern

Climate stations used

- (1) CHALMERS 5 W [USC00121417], Chalmers, IN
- (2) FRANCESVILLE [USC00123078], Francesville, IN
- (3) GOSHEN 3SW [USC00123418], Goshen, IN
- (4) PLYMOUTH [USC00126989], Plymouth, IN
- (5) RENSSELAER [USC00127298], Rensselaer, IN
- (6) WEST LAFAYETTE 6 NW [USC00129430], West Lafayette, IN
- (7) LAKEVILLE [USC00124782], Lakeville, IN
- (8) LOGANSPORT CICOTT ST [USC00125117], Logansport, IN
- (9) LAGRANGE 1 S [USC00124730], LaGrange, IN
- (10) WARSAW [USC00129240], Warsaw, IN
- (11) WINAMAC 2SSE [USC00129670], Winamac, IN

Influencing water features

This being an upland site, it is not influenced by water from a wetland or stream.

Soil features

In a representative profile for the Sand Dune ecological site, the soils of this site are a light grayish brown, with a thick layer of sandy material (to 60+ inches).

In should be noted that there may be inclusions of other soils and because of mapping scale are not divided out.

The three largest soils components in this site are Metea, Chelsea, and Oakville.

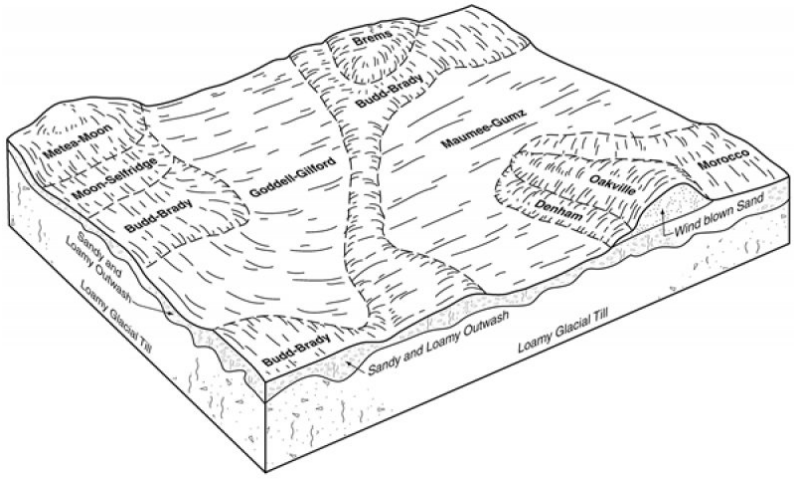


Figure 5. Sand Dune site block diagram

Table 4. Representative soil features

Parent material	(1) Eolian sands–sandstone
Surface texture	(1) Loamy fine sand (2) Fine sand
Family particle size	(1) Sandy
Drainage class	Moderately well drained to excessively drained
Permeability class	Rapid to very rapid
Soil depth	41–203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The historic plant community of the Sand Dune ecological site is a dry sand savanna. This site is characterized by the ebb and flow of the co-dominant tall grass prairie species and oak species, primarily black oak. This dynamic was driven by the fire frequency and intensity.

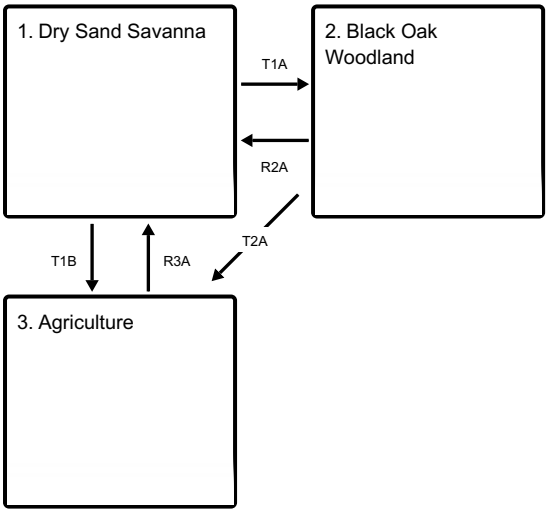
The canopy tree cover varied from about 5 to 60 percent and dominated by black oak. Other prominent tree species include white oak, black cherry, and hickory species. The ground layer is dominated by graminoids with the most common species being little bluestem, porcupine grass, and big bluestem.

Ground fires was the most common disturbance for this site. These frequent, but lower intensity fires, in conjunction with wind throw would maintain the function of the site. Replacement fires would have occurred roughly every 200 years.

Since settlement, the majority of this site (80%) has been converted to agricultural use with the majority being row crop agriculture. The most common practice involves grain rotations between corn and soybeans, with occasionally wheat being planted.

State and transition model

Ecosystem states



State 1 submodel, plant communities

1.1. little bluestem/black oak/porcupine grass	1.2. black oak/little bluestem

State 2 submodel, plant communities

2.1. black oak/shrub/few prairie species	2.2. black oak/white oak/ hickory

State 3 submodel, plant communities

3.1. Row Crop Agriculture	3.2. cool season forage/pasture

State 1
Dry Sand Savanna

This is the reference or diagnostic plant community for this site. In reference condition, this site was a co-dominance of prairie grass species and black oaks. Fire was the main disturbance agent that maintained the site. The more recent the fire the greater the dominance of grasses. Longer time between fire would sway dominance towards the black oak trees. The removal of fire from the system and lack of tree management would move the site toward the black oak woodland state. Restoration back to the reference state could be accomplished with timber harvest, seeding of appropriate species, and the application of fire. Plowing the prairie portions up,removing the trees, and preparation for seeding for would transition the site to the agriculture state. Cessation of tillage practices, seeding the proper species and the application of fire would allow the agriculture state to return to the reference state.

Community 1.1
little bluestem/black oak/porcupine grass

This phase is characterized by recent or frequently occurring ground fires that shift the co-dominance towards the herbaceous species. Longer fire return intervals will move this towards phase 2.

Community 1.2
black oak/little bluestem

This phase is characterized by protection from or longer time since the last fire. Trees and herbaceous species are co-dominant during this phase. More frequent/intense fire will shift this phase back to phase 1. Increased fire absence and no woody species management will move this site toward State 2, characterized by the marked increase in shrubs.

State 2
Black Oak Woodland

Absence of fire and/or lack of woody vegetation management will move this site to the black oak woodland state. This state is characterized by an increase in tree canopy (61-100%) concomitant with shrub species becoming the dominant growth form in the understory. Black oaks will still be the dominant tree species, but white oaks and

hickory become more dominant. Sub canopy and shrub species include the dogwood species, sassafras, and hazelnut species. Continued suppression of disturbance will lead to this site being a closed canopy oak-dominated forest at the higher end of the suggested canopy range. White oak eventually becomes the dominant tree species with black oak, shagbark hickory and black cherry also in the canopy.

Community 2.1
black oak/shrub/few prairie species

This phase is characterized by protection from or longer time since the last fire. Trees are the dominant growth form and shrubs are the secondary growth form. Timber cutting, more frequent/intense fire, and seeding will transition this phase back to State 1. Increased fire absence and no woody species management will move this site toward phase 2, characterized by shift in tree species.

Community 2.2
black oak/white oak/ hickory

This phase is characterized by near lack of fire. Trees are the dominant growth form. White oaks and hickory species become more common/prevalent in the canopy. Timber cutting, more frequent/intense fire, and seeding will transition this phase back to phase 1.

State 3
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 3.1
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 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. Tillage, seeding and management could transition this phase to phase 1.

Transition T1A
State 1 to 2

No fire, no woody species management

Transition T1B
State 1 to 3

Plowing, spraying, site prep, seeding.

Restoration pathway R2A
State 2 to 1

Timber cutting, seeding, fire.

Transition T2A
State 2 to 3

Tree clearing, site prep, tillage, spraying, seeding.

Restoration pathway R3A
State 3 to 1

Site prep, seeding, fire

Additional community tables

Inventory data references

Reconnaissance data includes 10 field days looking for reference community examples.

Other references

Bibliography
Betz, R. (1973). The prairies of Indiana. Proceedings of the Fifth Midwest Prairie Conference (pp. 34-31). Ames: Iowa State University.

Homoya, M. A., Abrell, D. B., Aldrich, J. R., & Post, T. W. (1985). The Natural Regions of Indiana. Indiana Academy of Science , 94, 245-269.

Kartesz, J. T. (2011). Density Gradient Map Samples Produced From BONAP's Floristic Synthesis. Retrieved 12 12, 2011, from Biota of North America Program: http://bonap.org/diversity/diversity/diversity.html

NatureServe. (2011). An online encyclopedia of life [web application]. NatureServe, Arlington, VA, USA [Online: www. natureserve. org/explorer] .

Soil Survey Staff. (2011). Soil Survey Geographic (SSURGO) Database. Retrieved 10 04, 2011, from Natural Resources Conservation Service, United States Department of Agriculture: http://soildatamart.nrcs.usda.gov

Transeau, E. (1935). The prairie peninsula. Ecology vol. 16 (3) , 423-437.

U.S. Census Bureau. (2011). Population Distribution and Change: 2000 to 2010. Retrieved 10 06, 2011, from http://www.census.gov/prod/cen2010/briefs/c2010br-01.pdf

USDA. (2007). Ecological Subregions: Sections and Subsections for the Conterminous United States. Washington, DC: USDA - Forest Service.

USDA. (2006). Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U. S. Department of Agriculture, Natural Resources Conservation Service. U. S. Department of Agriculture Handbook 296.

USGS. (2010). LANDFIRE Biophysical Settings. Retrieved from http://www.landfire.gov

Contributors

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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)	
Contact for lead author	
Date	
Approved by	
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:

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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:**
