

Ecological site F110XY005IL

Sandstone Woodland

Last updated: 4/22/2020
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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): 110X–Northern Illinois and Indiana Heavy Till Plain

The Northern Illinois and Indiana Heavy Till Plain (MLRA 110) encompasses the Northeastern Morainal, Grand Prairie, and Southern Lake Michigan Coastal landscapes (Schwegman et al. 1973, WDNR 2015). It spans three states – Illinois (79 percent), Indiana (10 percent), and Wisconsin (11 percent) – comprising about 7,535 square miles (Figure 1). The elevation is about 650 feet above sea level (ASL) and increases gradually from Lake Michigan south. Local relief varies from 10 to 25 feet. Silurian age fractured dolomite and limestone bedrock underlie the region. Glacial drift covers the surface area of the MLRA, and till, outwash, lacustrine deposits, loess or other silty material, and organic deposits are common (USDA-NRCS 2006). The vegetation in the MLRA has undergone drastic changes over time. At the end of the last glacial episode – the Wisconsinan glaciation – the evolution of vegetation began with the development of tundra habitats, followed by a phase of spruce and fir forests, and eventually spruce-pine forests. Not until approximately 9,000 years ago did the climate undergo a warming trend which prompted the development of deciduous forests dominated by oak and hickory. As the climate continued to warm and dry, prairies began to develop approximately 8,300 years ago. Another shift in climate that resulted in an increase in moisture prompted the emergence of savanna-like habitats from 8,000 to 5,000 years before present (Taft et al. 2009). Forests maintained footholds on steep valley sides, morainal ridges, and wet floodplains. Fire, droughts, and grazing by native mammals helped to maintain the prairies and savannas until the arrival of European settlers, and the forests were maintained by droughts, wind, lightning, and occasional fire (Taft et al. 2009; NatureServe 2018).

Classification relationships

USFS Subregions: Southwestern Great Lakes Morainal (222K) and Central Till Plains and Grand Prairies (251D) Sections; Kenosha-Lake Michigan Plain and Moraines (222Kg), Valparaiso Moraine (Kj), and Eastern Grand Prairie (251Dd) Subsections (Cleland et al. 2007) U.S. EPA Level IV Ecoregion: Kettle Moraines (53b), Illinois/Indiana Prairies (54a), and Valparaiso-Wheaton Morainal Complex (54f) (USEPA 2013) National Vegetation Classification – Ecological Systems: North-Central Interior Dry Oak Forest and Woodland (CES202.047) (NatureServe 2018) National Vegetation Classification – Plant Associations: *Quercus stellata* – *Quercus velutina*/*Schizachyrium scoparium* Woodland (CEGL005281) (Nature Serve 2018) Biophysical Settings: North-Central Dry Oak Forest and Woodland (BpS 4913110) (LANDFIRE 2009) Illinois Natural Areas Inventory: Dry-mesic barren (White and Madany 1978)

Ecological site concept

Sandstone Woodlands are located within the green areas on the map. They occur on bedrock-controlled uplands. The soils are Alfisols that are somewhat poorly to well drained and moderately deep, formed in a thin mantle of loess and underlying outwash over residuum weathered from sandstone. The historic pre-European settlement vegetation on this ecological site was dominated by an open oak canopy and sparse herbaceous layer. Black oak (*Quercus velutina* Lam.) is the dominant tree species on the site, and little bluestem (*Schizachyrium scoparium* (Michx.) Nash.) is the dominant grass. The moderately deep, acidic soils over bedrock result in a less productive plant community with smaller, stunted trees and an herbaceous layer that is generally less than 3 feet tall (White and Madany 1978). Fire is the primary disturbance that maintains this ecological site, and drought, storm damage, and periodic pest influences are secondary disturbances (LANDFIRE 2009).

Associated sites

R110XY004IL	Sandstone Prairie Sites with sandstone bedrock with 32 inches on fire-prone landscapes including Channahon and Hesch soils
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Similar sites

F110XY003IL	Limestone Woodland Limestone Woodlands have a similar vegetation type, but site is over limestone bedrock
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Table 1. Dominant plant species

Tree	(1) <i>Quercus velutina</i>
Shrub	Not specified
Herbaceous	(1) <i>Schizachyrium scoparium</i>

Physiographic features

Sandstone Woodlands occur on bedrock-controlled uplands. They are situated on elevations ranging from approximately 512 to 935 feet ASL. The site does not experience flooding but rather generates runoff to adjacent, downslope ecological sites.

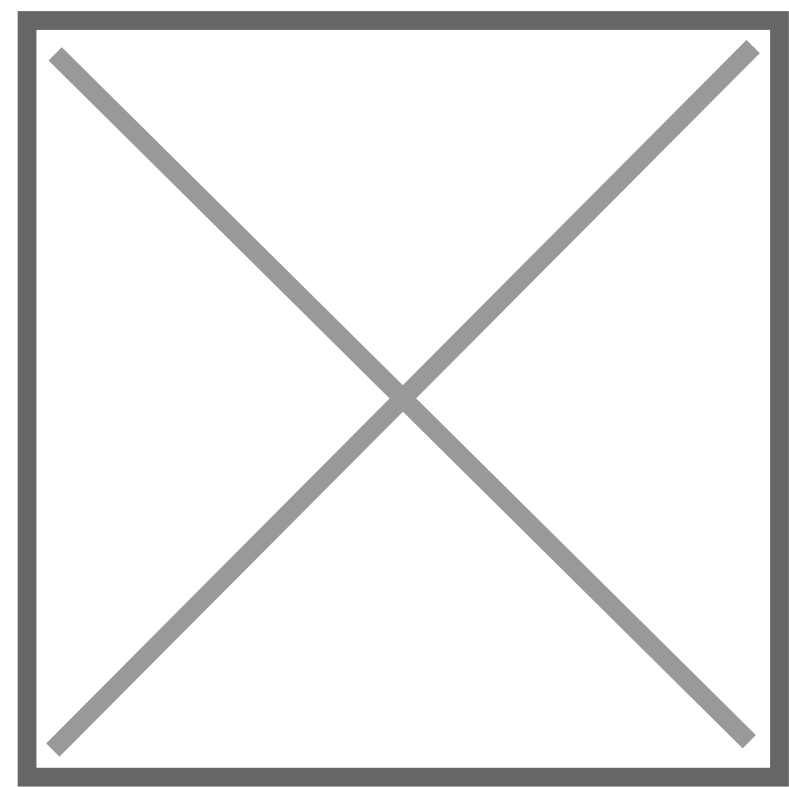


Figure 1.

Table 2. Representative physiographic features

Slope shape across	(1) Convex
Slope shape up-down	(1) Convex
Landforms	(1) Upland

Runoff class	Low
Elevation	160 – 290 m
Slope	0 – 10 %
Water table depth	40 – 130 cm
Aspect	Aspect is not a significant factor

Climatic features

The Northern Illinois and Indiana Heavy Till Plain falls into the hot-summer humid continental climate (Dfa) and warm-summer humid continental climate (Dfb) Köppen-Geiger climate classifications (Peel et al. 2007). The two main factors that drive the climate of the MLRA are latitude and weather systems. Latitude, and the subsequent reflection of solar input, determines air temperatures and seasonal variations. Solar energy varies across the seasons, with summer receiving three to four times as much energy as opposed to winter. Weather systems (air masses and cyclonic storms) are responsible for daily fluctuations of weather conditions. High-pressure systems are responsible for settled weather patterns where sun and clear skies dominate. In fall, winter, and spring, the polar jet stream is responsible for the creation and movement of low-pressure systems. The clouds, winds, and precipitation associated with a low-pressure system regularly follow high-pressure systems every few days (Angel n.d.).

The soil temperature regime of MLRA 110 is classified as mesic, where the mean annual soil temperature is between 46 and 59°F (USDA-NRCS 2006). Temperature and precipitation occur along a north-south gradient, where temperature and precipitation increase the further south one travels. The average freeze-free period of this ecological site is about 186 days, while the frost-free period is about 143 days (Table 2). The majority of the precipitation occurs as rainfall in the form of convective thunderstorms during the growing season. Average annual precipitation is 37 inches, which includes rainfall plus the water equivalent from snowfall (Table 3). The average annual low and high temperatures are 40.6 and 60.1°F, respectively.

Table 3 Representative climatic features

Frost-free period (characteristic range)	140-150 days
Freeze-free period (characteristic range)	180-190 days
Precipitation total (characteristic range)	940-970 mm
Frost-free period (actual range)	140-150 days
Freeze-free period (actual range)	180-200 days
Precipitation total (actual range)	940-970 mm
Frost-free period (average)	140 days
Freeze-free period (average)	190 days

Precipitation total (average)	940 mm
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- (1) MORRIS 1 NW [USC00115825], Morris, IL
- (2) CHANNAHON DRESDEN ISL DAM [USC00111420], Morris, IL

Influencing water features

Sandstone Woodlands are not influenced by wetland or riparian water features. Precipitation is the main source of water for this ecological site. Infiltration is very slow to slow (Hydrologic Groups C and D), and surface runoff is low. Surface runoff contributes some water to downslope ecological sites

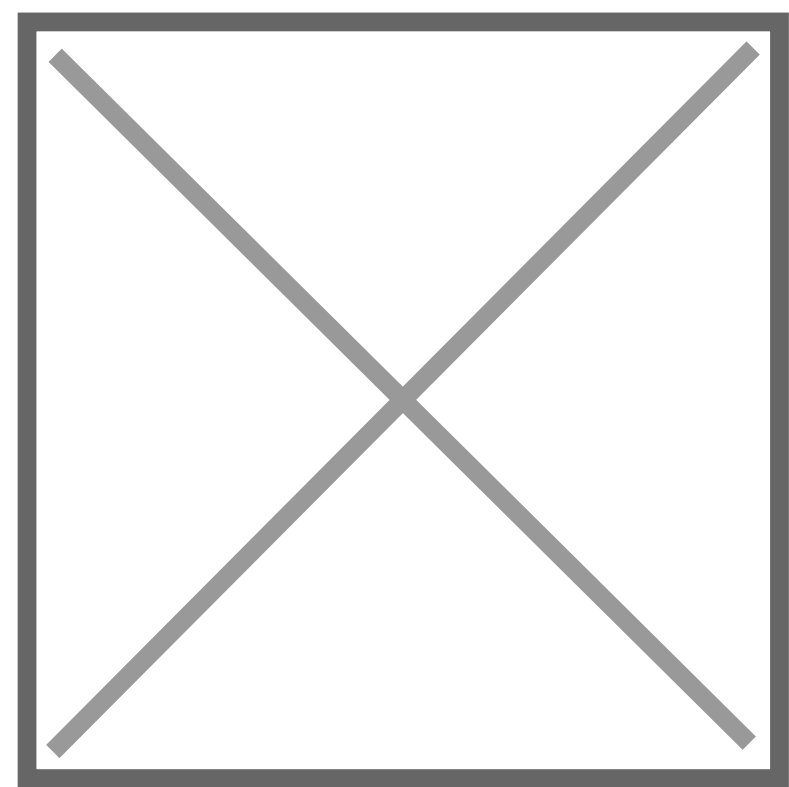


Figure 8. Hydrologic cycling in Sandstone Woodland ecological site.

Soil features

Soils of Sandstone Woodlands are in the Alfisols order, further classified as Aeric Endoaqualfs and Typic Hapludalfs with very slow to slow infiltration and low runoff potential. The soil series associated with this site includes High Gap and Shadeland. The parent material is a thin mantle of loss and underlying outwash over residuum weathered from sandstone, and the soils are somewhat poorly to well drained and moderately deep. Soil pH classes are very strongly acid to neutral. A paralithic contact is noted as a rooting restriction for the soils of this ecological site.

Figure 9. Profile sketches of soil series associated with Sandstone Woodland.

Table 4. Representative soil features

Parent material	(1) Residuum
Family particle size	(1) Fine-loamy

Drainage class	Somewhat poorly drained to well drained
Permeability class	Very slow
Depth to restrictive layer	90 cm
Soil depth	90 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (Depth not specified)	17.78 cm
Calcium carbonate equivalent (Depth not specified)	Not specified
Electrical conductivity (Depth not specified)	Not specified
Sodium adsorption ratio (Depth not specified)	Not specified
Soil reaction (1:1 water) (Depth not specified)	4.5 – 7.3
Subsurface fragment volume <=3" (Depth not specified)	10 %
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

The information in this Ecological Site Description, including the state-and-transition model (STM), was developed based on historical data, current field data, professional experience, and a review of the scientific literature. As a result, all possible scenarios or plant species may not be included. Key indicator plant species, disturbances, and ecological processes are described to inform land

management decisions.

The MLRA lies within the tallgrass prairie ecosystem of the Midwest, but a variety of environmental and edaphic factors resulted in landscape that historically supported prairies, savannas, forests, and various wetlands. Sandstone Woodlands form an aspect of this vegetative continuum. This ecological site occurs on uplands on somewhat poorly to well drained soils that are moderately deep to sandstone bedrock. Species characteristic of this ecological site consist of a scrubby, open oak canopy and sparse herbaceous vegetation.

Fire is a critical factor that maintains Sandstone Woodlands. Fire typically consisted of low-severity surface fires every 10 years (LANDFIRE 2009). Ignition sources included summertime lightning strikes from convective storms and bimodal, human ignitions during the spring and fall seasons. Native Americans regularly set fires to improve sight lines for hunting, drive large game, improve grazing and browsing habitat, agricultural clearing, and enhance vital ethnobotanical plants (Barrett 1980; LANDFIRE 2009).

Drought and storm damage have also played a role in shaping this ecological site. The periodic episodes of reduced soil moisture in conjunction with the acidic soils have favored the proliferation of plant species tolerant of such conditions. Drought can also slow the growth of plants and result in dieback of certain species. Damage to trees from storms and pest outbreaks can vary from minor, patchy effects of individual trees to stand effects that temporarily affect community structure and species richness and diversity (Irland 2000; Peterson 2000). When coupled with fire, periods of drought and catastrophic storm damage can greatly delay the establishment and maturation of woody vegetation (Pyne et al. 1996).

Today, Sandstone Woodlands have been reduced from their pre-settlement extent. Low to moderate slopes have been converted to cropland, while steeper slopes have been converted to forage land. Remnants that do exist have experienced long-term fire suppression and overbrowsing resulting in significant changes to the forest structure. A return to the historic plant community may not be possible following extensive land modification, but long-term conservation agriculture or forest reconstruction efforts can help to restore some biotic diversity and ecological function. The state-and-transition model that follows provides a detailed description of each state, community phase, pathway, and transition. This model is based on available experimental research, field observations, literature reviews, professional consensus, and interpretations.

State and transition model

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 7. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 9. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 10. Community 3.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 11. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 12. Community 4.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 13. Community 4.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 14. Community 5.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 15. Community 5.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Inventory data references

No field plots were available for this site. A review of the scientific literature and professional experience were used to approximate the plant communities for this provisional ecological site. Information for the state-and-transition model was obtained from the same sources. All community phases are considered provisional based on these plots and the sources identified in this ecological site description.

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Organization	Name	Title	Location
Natural Resources Conservation Service	Ron Collman	State Soil Scientist	Champaign, IL
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Sarah Smith	Soil Scientist	Aurora, IL	
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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	08/17/2026
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:

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:
