

Ecological site R110XY004IL

Sandstone Prairie

Last updated: 4/22/2020
Accessed: 09/16/2026

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: Central Tallgrass Prairie (CES205.683) (NatureServe 2018) National Vegetation Classification – Plant Associations: Schizachyrium scoparium – Sorghastrum nutans – Andropogon ternarius – Coreopsis grandiflora Sandstone – Sandstone Grassland (CEGL002212) (Nature Serve 2018) Biophysical Settings: Central Tallgrass Prairie (BpS 4914210) (LANDFIRE 2009) Illinois Natural Areas Inventory: (None) (White and Madany 1978)

Ecological site concept

Sandstone Prairies are located within the green areas on the map. They occur on bedrock-controlled uplands. The soils are Mollisols that are well to somewhat excessively drained and shallow, formed in drift over sandstone. The historic pre-European settlement vegetation on this ecological site was dominated by herbaceous vegetation. Little bluestem (*Schizachyrium scoparium* (Michx.) Nash) and switchgrass (*Panicum virgatum* L.) are the dominant and characteristic species on the site, respectively. Other grasses present on the site may include Indiangrass (*Sorghastrum nutans* (L.) Nash), big bluestem (*Andropogon gerardii* Vitman), and prairie dropseed (*Sporobolus heterolepis* (A. Gray) A. Gray) (NatureServe 2018). Abundant forbs are intermixed throughout the prairie. Fire is the primary disturbance factor that maintains this site, while herbivory and drought are secondary factors (LANDFIRE 2009).

Associated sites

F110XY005IL	Sandstone Woodland Soils that are shallow to sandstone bedrock on fire-protected landscapes including High Gap and Shadeland soils
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Similar sites

R110XY001IL	Dry Limestone Prairie Dry Limestone Prairies have a similar vegetation type but site is shallow to sandstone bedrock
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Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Schizachyrium scoparium</i> (2) <i>Panicum virgatum</i>

Physiographic features

Sandstone Prairies 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.

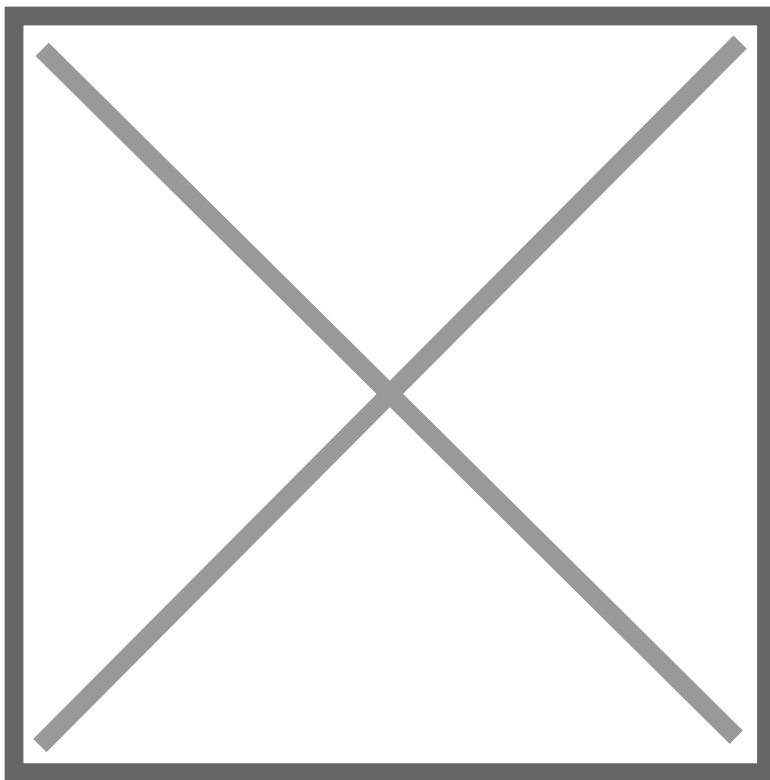


Figure 1.

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	200 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 182 days, while the frost-free period is about 148 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 39.8 and 60°F, respectively.

Table 3 Representative climatic features

Frost-free period (characteristic range)	150-150 days
Freeze-free period (characteristic range)	180-190 days
Precipitation total (characteristic range)	910-970 mm
Frost-free period (actual range)	150-150 days
Freeze-free period (actual range)	180-190 days
Precipitation total (actual range)	910-970 mm
Frost-free period (average)	150 days

Freeze-free period (average)	180 days
Precipitation total (average)	940 mm

- (1) MARSEILLES LOCK [USC00115372], Marseilles, IL
- (2) OTTAWA 5SW [USC00116526], Ottawa, IL

Influencing water features

Sandstone Prairies 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 moderate (Hydrologic Groups B and D), and surface runoff is low. Surface runoff contributes some water to downslope ecological sites.

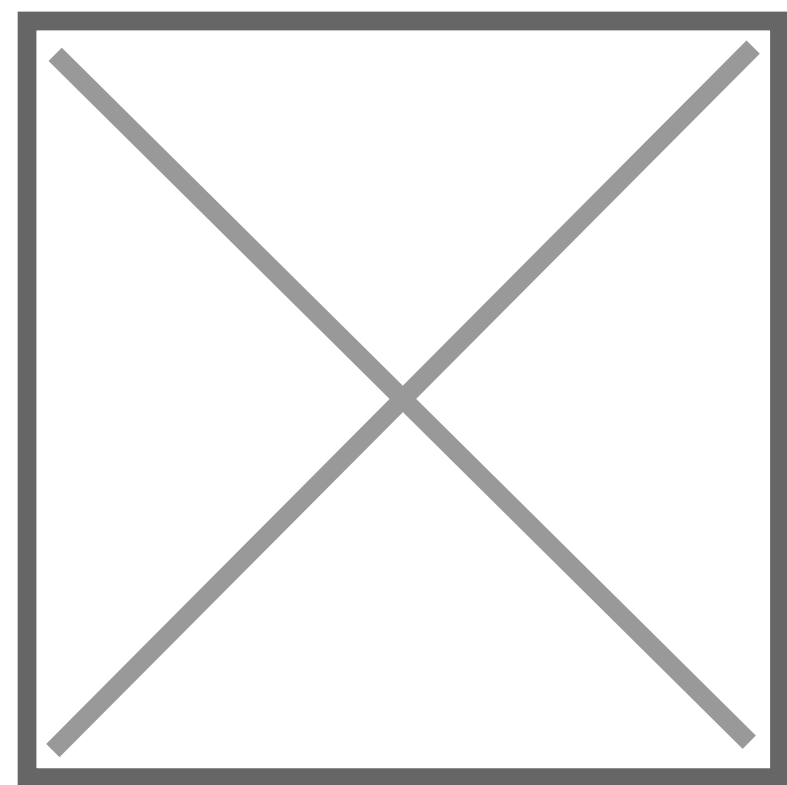


Figure 8. Hydrologic cycling in Sandstone Prairie ecological site.

Soil features

Soils of Sandstone Prairies are in the Mollisols order, further classified as Lithic Argiudolls and Typic Argiudolls with very slow to moderate infiltration and low runoff potential. The soil series associated with this site includes Channahon and Hesch. The parent material is drift over sandstone, and the soils are well to somewhat excessively drained and shallow. Soil pH classes are strongly acid to neutral. A shallow depth to bedrock is noted as a rooting restriction for the soils of this ecological site.

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

Table 4. Representative soil features

Parent material	(1) Drift
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Family particle size	(1) Coarse-loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Slow
Depth to restrictive layer	40 – 80 cm
Soil depth	40 – 80 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (Depth not specified)	5.08 – 12.7 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)	5.1 – 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 Prairies form an aspect of this vegetative continuum. This ecological site occurs on bedrock-controlled uplands on well to somewhat excessively drained soils. Species characteristic of this ecological site consist of herbaceous vegetation.

Fire is a critical disturbance factor that maintains Sandstone Prairies. Fire intensity typically consisted of periodic, low-intensity surface fires occurring every 1 to 3 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, driving large game, improving grazing and browsing habitat, agricultural clearing, and enhancing vital ethnobotanical plants (Barrett 1980).

Drought and herbivory by native ungulates have also played a role in shaping this ecological site. The periodic episodes of reduced soil moisture in conjunction with the well to somewhat excessively drained 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. Bison (*Bos bison*) grazing, while present, served a more limited role in community composition and structure than lands further west. Prairie elk (*Cervus elaphus*) and white-tailed deer (*Odocoileus virginianus*) likely contributed to woody species reduction but are also considered to be of a lesser impact compared to the west (LANDFIRE 2009). When coupled with fire, periods of drought and herbivory can further delay the establishment of woody vegetation (Pyne et al. 1996).

Today, Sandstone Prairies may be extirpated, having been type-converted to agricultural production land or other human-modified landscapes. A return to the historic plant community may not be possible following extensive land modification, but long-term conservation agriculture or prairie 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 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 7. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 9. Community 3.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 10. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 11. Community 4.2 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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Contributors

Lisa Kluesner
Kristine Ryan
Sarah Smith
Tiffany Justus

Approval

Chris Tecklenburg, 4/22/2020

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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	09/16/2026
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:
