

Ecological site F108XB003IL

Shale Woodland

Last updated: 11/05/2024
Accessed: 08/17/2026

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): 108X—Illinois and Iowa Deep Loess and Drift

The Illinois and Iowa Deep Loess and Drift, East-Central Part (MLRA 108B) includes the Rock River Hill Country, Grand Prairie, and Western Forest-Prairie physiographic divisions (Schewman et al. 1973). It falls entirely in one state (Illinois), encompassing approximately 7,450 square miles (Figure 1). The elevation ranges from approximately 985 feet above sea level (ASL) in the northern and western parts to 660 feet ASL in south and west. Local relief is mainly 3 to 10 feet on the broad, upland flats and about 160 feet along the major streams and dissected drainageways. Wisconsin-aged loess forms a moderately thin to thick layer across the entire area with Illinoian glacial drift below. Bedrock lies beneath the glacial material with Pennsylvania shales, siltstones, and limestones in the south and west and Ordovician and Silurian limestone in the extreme north. This bedrock can be exposed on bluffs along the major rivers (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. Moisture continued to increase in the southernmost region 5,000 years ago, resulting in an increase of forested systems (Taft et al. 2009). 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), Central Till Plains-Oak Hickory Section (223G), Central Dissected Till Plains (251C), and Central Till Plains and Grand Prairies (251D) Sections; Rock River Old Drift Country (222Kh), Effingham Plain (222Ga), Mississippi River and Illinois Alluvial Plains (251 Cf), East Mississippi River Hills (251Ci), Galesburg Dissected Till Plain (251Cj), Carlinville Dissected Till Plain (251Ck), Green River Lowland (251Da), Western Grand Prairie (251Db), Northern Grand Prairie (251Dc), Southern Grand Prairie (251De), and Springfield Plains (251Df) Subsections (Cleland et al. 2007) U.S. EPA Level IV Ecoregion: Illinois/Indiana Prairies (54a), Sand Area (54d), Rock River Hills (54g), and Western Dissected Illinoian Till Plain (72i) (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 marilandica* – (*Juniperus virginiana*)/*Schizachyrium scoparium* – *Danthonia spicata* Wooded Grassland (CEGL002428) (Nature Serve 2018) Biophysical Settings: North-Central Dry Oak Forest and Woodland (BpS 4913110) (LANDFIRE 2009) Illinois Natural Areas Inventory: Dry barren, Dry-mesic barren (White and Madany 1978)

Ecological site concept

Shale Woodlands are located within the blue areas on the map (Figure 1). They occur on uplands in fire-protected landscapes. The soils are Alfisols that are somewhat poorly-drained and deep, formed in loess over residuum weathered from shale. The historic pre-European settlement vegetation on this ecological site was dominated by an open oak canopy and sparse herbaceous layer. Blackjack oak (*Quercus marilandica* Münchh.) is the dominant species on the site, and little bluestem (*Schizachyrium scoparium* (Michx.) Nash.) and poverty oatgrass (*Danthonia spicata* (L.) P. Beauv. ex Roem. & Schult.) are the dominant grasses. The moderately deep 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

F108XB007IL	Loess Upland Forest Deep loess parent material including Middletown soils
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Similar sites

F108XB004IL	Sandstone Woodland Sandstone Woodlands are in a similar landscape position, but the soils are moderately deep to sandstone residuum
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Table 1. Dominant plant species

Tree	(1) <i>Quercus marilandica</i>
Shrub	Not specified
Herbaceous	(1) <i>Schizachyrium scoparium</i> (2) <i>Danthonia spicata</i>

Physiographic features

Shale Woodlands occur on flats and knolls on ground moraines in fire-protected landscapes. They are situated on elevations ranging from approximately 680 to 1020 feet. The site does not experience flooding, but rather generates runoff to downslope, adjacent ecological sites (Table 1).

Figure 1. Figure 1. Location of Shale Woodland ecological site within MLRA 108B.

Table 2. Representative physiographic features

Slope shape across	(1) Convex
Slope shape up-down	(1) Convex
Landforms	(1) Upland > Ground moraine
Runoff class	Low to medium
Flooding frequency	None
Ponding frequency	None
Elevation	210 – 310 m

Slope	0 – 10 %
Water table depth	20 – 60 cm
Aspect	Aspect is not a significant factor

Climatic features

The Illinois and Iowa Deep Loess and Drift, East-Central Part falls into the hot-summer humid continental climate (Dfa) and the humid subtropical continental climate (Cfa) 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 108B 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 157 days, while the frost-free period is about 128 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 approximately 38 inches, which includes rainfall plus the water equivalent from snowfall (Table 3). The average annual low and high temperatures are 40 and 62°F, respectively.

Climate data and analyses are derived from 30-year averages gathered from one National Oceanic and Atmospheric Administration (NOAA) weather stations contained within the range of this ecological site (Table 4).

Table 3 Representative climatic features

Frost-free period (characteristic range)	130 days
Freeze-free period (characteristic range)	160 days
Precipitation total (characteristic range)	970 mm
Frost-free period (actual range)	130 days
Freeze-free period (actual range)	160 days
Precipitation total (actual range)	970 mm
Frost-free period (average)	130 days
Freeze-free period (average)	160 days
Precipitation total (average)	970 mm

- (1) PRINCEVILLE 2W [USC00117004], Princeville, IL

Influencing water features

Shale Woodlands are not influenced by wetland or riparian water features. Precipitation is the main source of water for this ecological site. Infiltration is moderate to very slow (Hydrologic Groups B and D), and surface runoff is low to medium. Surface runoff contributes some water to downslope ecological sites (Figure 4).

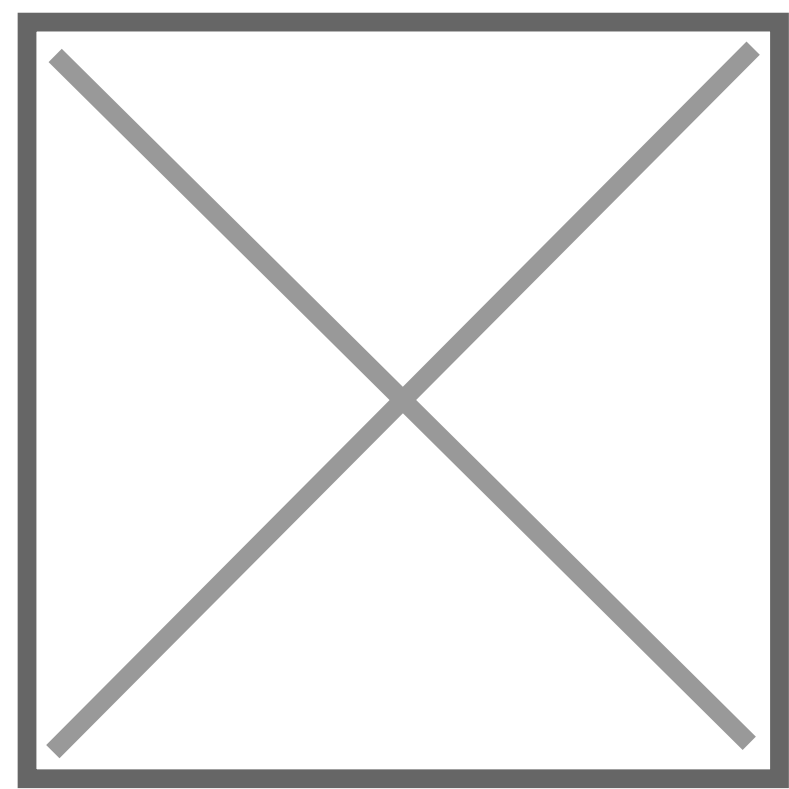


Figure 8. Figure 4. Hydrologic cycling in Shale Woodland ecological site.

Soil features

Soils of Shale Woodlands are in the Alfisols orders, further classified as Vertic Epiaqualfs with very slow to moderate infiltration and low to medium runoff potential. The soil series associated with this site includes Osceola. The parent material is loess over residuum weathered from shale. The soils are somewhat poorly-drained and deep. Soil pH classes are strongly acid to slightly alkaline. A paralithic contact is notes as a rooting restriction for the soils of this ecological site (Table 5).

Table 4. Representative soil features

Parent material	(1) Loess – shale and siltstone
Surface texture	(1) Silt loam
Family particle size	(1) Fine
Drainage class	Somewhat poorly drained
Permeability class	Moderately slow to moderate

Depth to restrictive layer	100 – 150 cm
Soil depth	100 – 150 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (Depth not specified)	20 – 20.07 cm
Soil reaction (1:1 water) (Depth not specified)	5.6 – 7.3
Subsurface fragment volume <=3" (Depth not specified)	Not specified
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. The heterogeneous topography of the area results in variable microclimates and fuel matrices that in support prairies, savannas, and forests. Shale Woodlands form an aspect of this vegetative continuum. This ecological site occurs on uplands on somewhat poorly-drained soils. Species characteristic of this ecological site consist of a scrubby, open oak canopy and sparse herbaceous vegetation.

Fire is a critical factor that maintains Shale 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 somewhat poorly-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. 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, Shale Woodlands have likely been extirpated from the landscape having been converted to forage or cropland. 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 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 7. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 2.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 9. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 10. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 11. Community 3.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 12. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 13. 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 have been developed 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.

Other references

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Contributors

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Approval

Acknowledgments

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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	01/30/2023
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:
