Ecological site R110XY001IL
Dry Limestone Prairie

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Accessed: 04/27/2024

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): 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 – Clinopodium askansanum Limestone Grassland (CEGL005179) (Nature Serve 2018)

Biophysical Settings: Central Tallgrass Prairie (BpS 4214210) (LANDFIRE 2009)

Illinois Natural Areas Inventory: Dry-mesic dolomite prairie (White and Madany 1978)

Ecological site concept

Dry Limestone 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 loamy drift over limestone or dolostone.

The historic pre-European settlement vegetation on this ecological site was dominated by mid- and tallgrass prairie vegetation. Little bluestem (Schizachyrium scoparium (Michx.) Nash) and Indiangrass (Sorghastrum nutans (L.) Nash) are the dominant species on the site. Other grasses and grass-likes present can include porcupinegrass (Hesperostipa spartea (Trin.) Barkworth), big bluestem (Andropogon gerardii Vitman), and Mead's sedge (Carex meadii Dewey) (White and Madany 1978; NatureServe 2018). Forbs typical of an undisturbed plant community associated with this ecological site can include leafy prairie clover (Dalea foliosa (A. Gray) Barneby), Atlantic camas (Camassia scilloides (Raf.) Cory), pale purple coneflower (Echinacea pallida (Nutt.) Nutt.), and pale purple clover (Dalea purpurea Vent.) (Taft et al. 1997; Taft et al. 2009). Fire is the primary disturbance factor that maintains this site, while herbivory and drought are secondary factors (LANDFIRE 2009).

Associated sites

R110XY002IL	**Wet Limestone Prairie** Loamy drift over limestone or dolostone that is shallow to a high-water table including Calamine, Faxon, Joliet, Millsdale, Romeo, and Tallmadege soils

Similar sites

R110XY006IL	**Dry Glacial Drift Upland Prairie** Dry Glacial Drift Upland Prairies support a similar vegetation type but the site is not shallow to bedrock

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Schizachyrium scoparium* (2) *Sorghastrum nutans*

Physiographic features

Dry Limestone Prairies occur on bedrock-controlled uplands. They are situated on elevations ranging from approximately 512 to 1020 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 (2) Convex
Landforms	(1) Upland
Runoff class	Low to very high
Elevation	512–1,020 ft
Slope	0–30%
Water table depth	80 in
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 188 days, while the frost-free period is about 149 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 38 inches, which includes rainfall plus the water equivalent from snowfall (Table 3). The average annual low and high temperatures are 40.8 and 60.1°F, respectively.

Table 3. Representative climatic features

Frost-free period (characteristic range)	145-152 days
Freeze-free period (characteristic range)	182-196 days
Precipitation total (characteristic range)	37-38 in
Frost-free period (actual range)	143-154 days
Freeze-free period (actual range)	176-196 days
Precipitation total (actual range)	37-39 in
Frost-free period (average)	149 days
Freeze-free period (average)	188 days
Precipitation total (average)	38 in

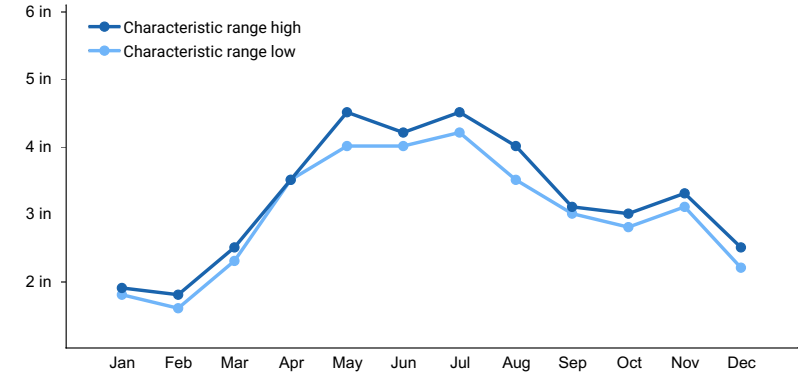


Figure 2. Monthly precipitation range

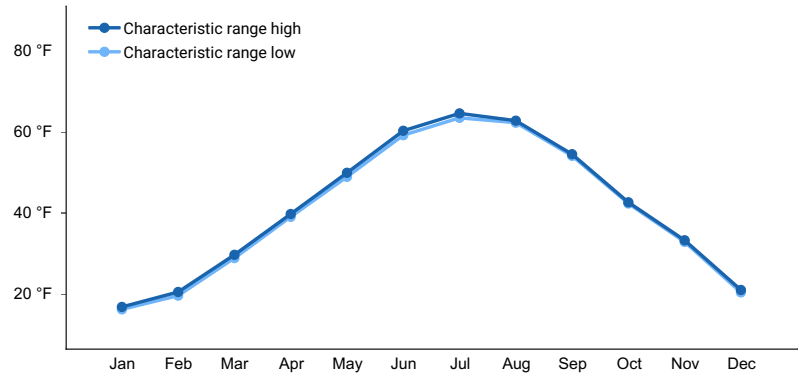


Figure 3. Monthly minimum temperature range

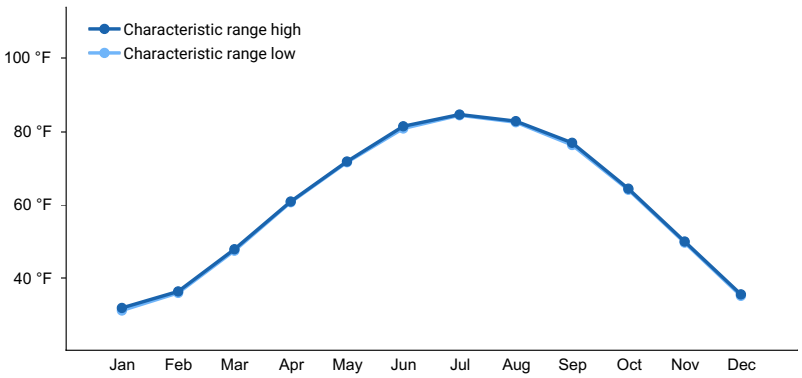


Figure 4. Monthly maximum temperature range

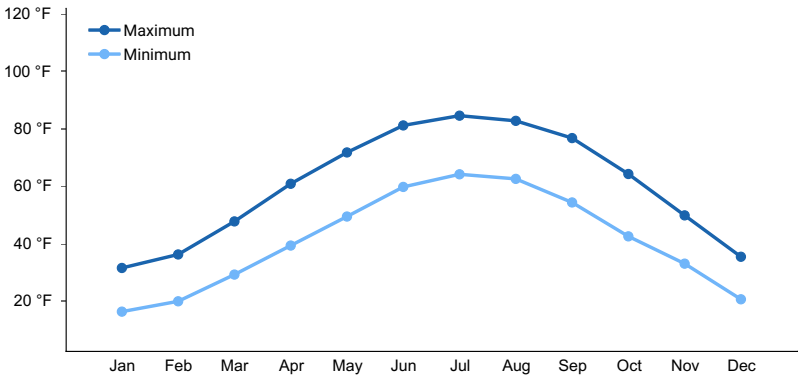


Figure 5. Monthly average minimum and maximum temperature

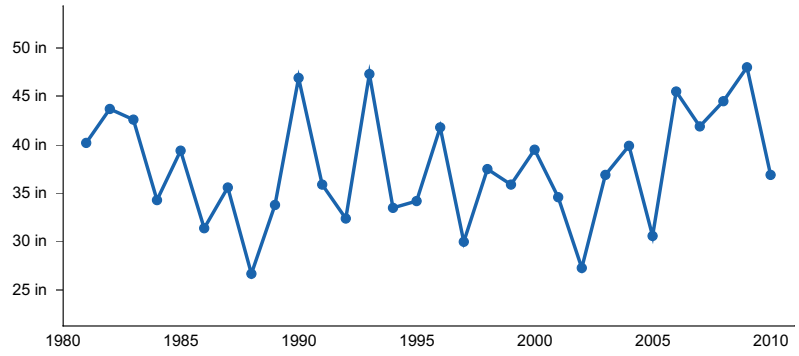


Figure 6. Annual precipitation pattern

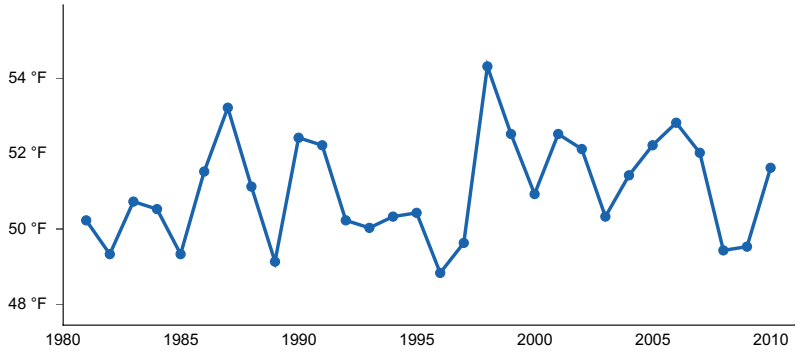


Figure 7. Annual average temperature pattern

Climate stations used

- (1) KANKAKEE WASTEWATER [USC00114603], Kankakee, IL
- (2) JOLIET BRANDON RD DAM [USC00114530], Joliet, IL
- (3) CHANNAHON DRESDEN ISL DAM [USC00111420], Morris, IL

Influencing water features

Dry Limestone 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 slow (Hydrologic Groups C and D), and surface runoff is low to very high. Surface runoff contributes some water to downslope ecological sites.

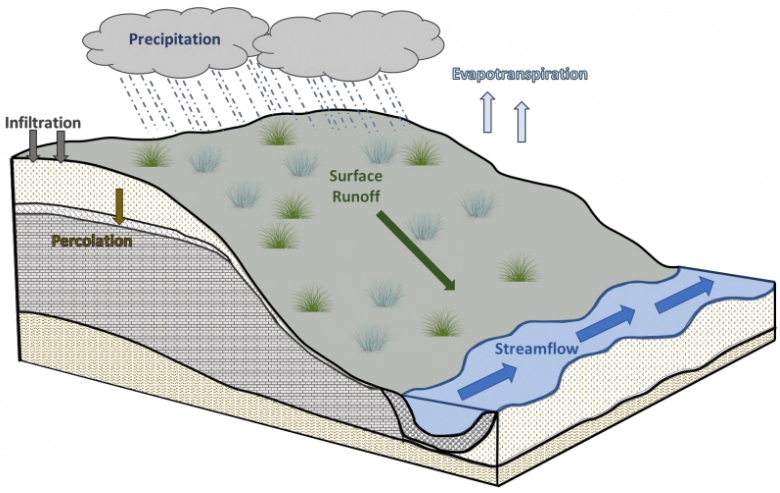


Figure 8. Hydrologic cycling in Dry Limestone Prairie ecological site.

Soil features

Soils of Dry Limestone Prairies are in the Mollisols order, further classified as Lithic Argiudolls, Typic Argiudolls, and

Lithic Hapludolls with very slow to slow infiltration and low to very high runoff potential. The soil series associated with this site includes Channahon, Elizabeth, Plattville, and Rockton. The parent material is loamy drift over limestone or dolostone, and the soils are well to somewhat excessively drained and shallow. Soil pH classes are moderately acid to moderately alkaline. A shallow depth to bedrock is noted as a rooting restriction for the soils of this ecological site.

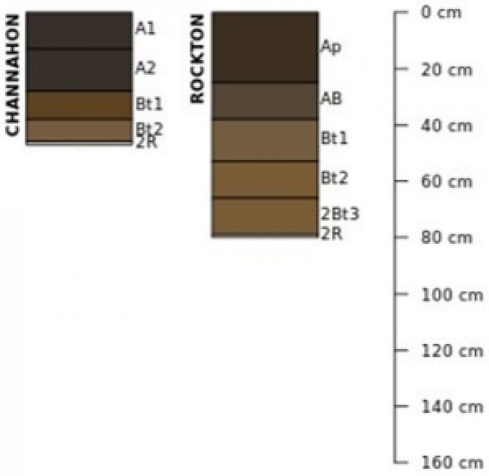


Figure 9. Profile sketches of soil series associated with Dry Limestone Prairie.

Table 4. Representative soil features

Parent material	(1) Drift
Family particle size	(1) Fine-loamy (2) Loamy (3) Loamy-skeletal
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderately slow
Depth to restrictive layer	16–35 in
Soil depth	16–35 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	2–6 in
Calcium carbonate equivalent (Depth not specified)	0–40%
Electrical conductivity (Depth not specified)	0 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	5.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	2–8%
Subsurface fragment volume >3" (Depth not specified)	1–40%

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. Dry Limestone 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 mid- and tallgrass herbaceous vegetation.

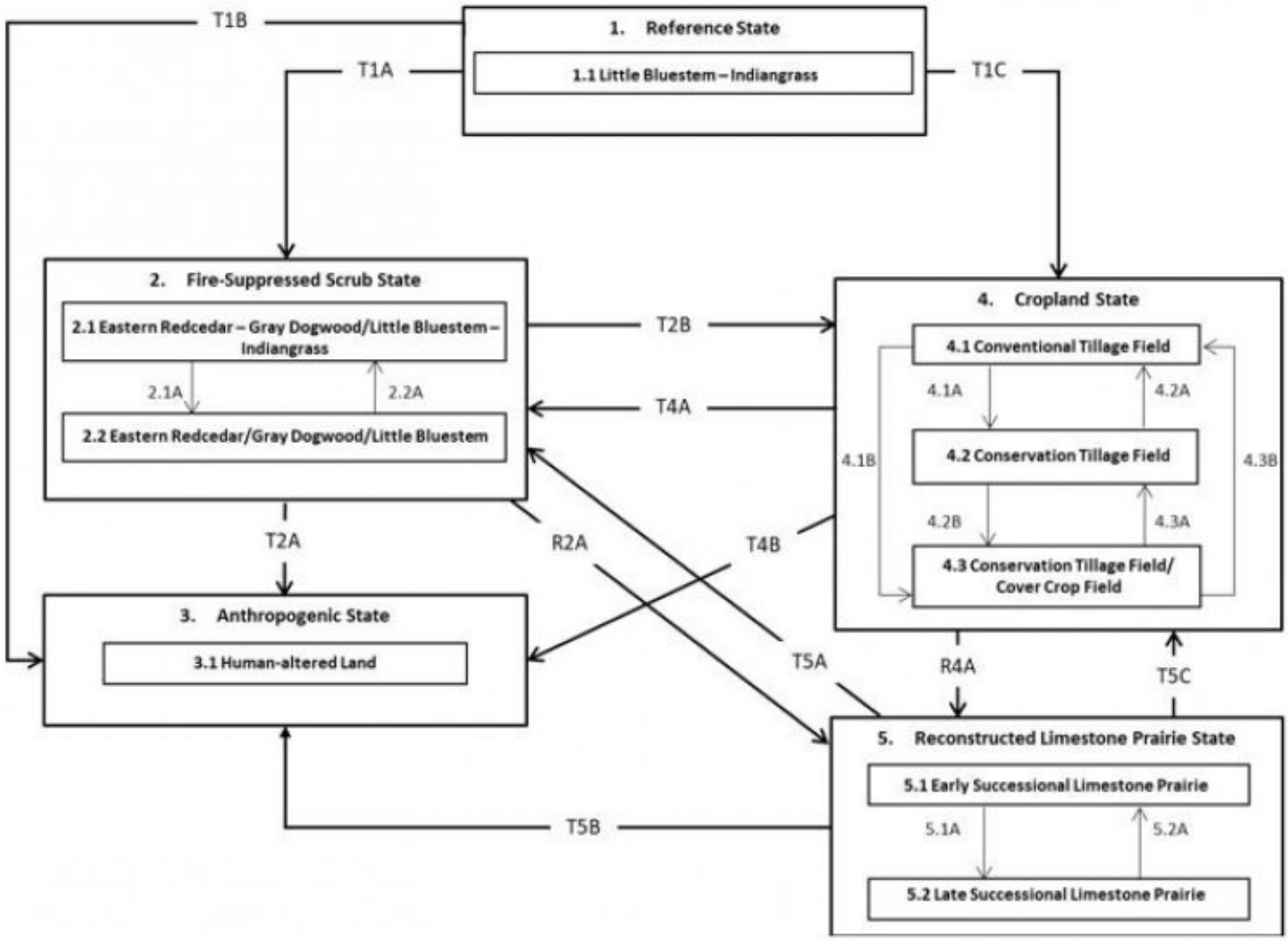
Fire is a critical disturbance factor that maintains Dry Limestone Prairies. Fire intensity typically consisted of periodic, low-intensity surface fires occurring every 1 to 3 years (LANDFIRE 2009). Ignition sources included summertime lightning strikes from convective storms and bimodal, human ignitions 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, Dry Limestone Prairies are limited in their extent, having been type-converted to agricultural production land or other human-modified landscapes. Some remnants that remain show evidence of indirect anthropogenic influences from long-term fire suppression. A return to the historic plant community may not always 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

R110XY001IL Dry Limestone Prairie



Code	Process
1.1A	Natural succession as a result of a brief fire free period
1.2A	Hot, replacement fire every 1 to 3 years
T1A, T4A, T5A	Long-term fire suppression and/or land abandonment
2.1A	Continued fire suppression in excess of 20 years
2.2A	Single large disturbance event
T1B, T2A, T4B, T5B	Vegetation removal and human alterations/transportation of soils
T1C, T2B, T5C	Agricultural conversion via tillage, seeding, and non-selective herbicide
4.1A	Less tillage, residue management
4.1B	Less tillage, residue management, and implementation of cover cropping
4.2B	Implementation of cover cropping
4.2A, 4.3B	Intensive tillage, remove residue, and reinitiate monoculture row cropping
4.3A	Remove cover cropping
R2A, R4A	Site preparation, non-native species control, and native seeding
5.1A	Invasive species control and implementation of disturbance regimes
5.2A	Drought or improper timing/use of management actions

State 1
Reference State

The reference plant community is categorized as a prairie community, dominated by herbaceous vegetation. The one community phase within the reference state is dependent on fire. The intensity and frequency alter species composition, cover, and extent. Drought and herbivory have more localized impacts in the reference state, but do contribute to overall species composition, diversity, cover, and productivity.

Community 1.1
Little Bluestem - Indiangrass

Sites in this reference community phase are dominated by a mix of grass and forbs. Vegetative cover is continuous (95 to 100 percent), and plants can reach heights between 3 and 6 feet tall (LANDFIRE 2009). Little bluestem, Indiangrass, porcupinegrass, big bluestem, and Mead's sedge are common monocots present on the site. Characteristic forbs can include butterfly milkweed (*Asclepias tuberosa* L.), pride of Ohio (*Dodecatheon meadia* L.), hoary puccoon (*Lithospermum canescens* (Michx.) Lehm.), and limestone calamint (*Clinopodium arkansanum* (Nutt.) House) (NatureServe 2018).

Dominant plant species

- little bluestem (*Schizachyrium scoparium*), grass
- Indiangrass (*Sorghastrum nutans*), grass

State 2
Fire-Suppressed Scrub State

Long-term fire suppression can transition the reference prairie community into a woody-invaded shrub-prairie state. This state is evidenced by a well-developed shrub layer with an overstory of eastern redcedar (*Juniperus virginiana* L.) (LANDFIRE 2009). The establishment of woody species reduces the historic biodiversity thereby changing the vegetative community.

Community 2.1
Eastern Redcedar - Gray Dogwood/Little Bluestem - Indiangrass

This community phase represents the early stages of fire-suppression. In as little as six fire-free years, the prairie can become disrupted by woody shrubs (LANDFIRE 2009; NatureServe 2018). Native species, such as eastern red cedar and gray dogwood (*Cornus racemosa* Lam.), can form dense thickets with cover reaching up to 30 percent and plant heights as tall as 9 feet (LANDFIRE 2009). While the herbaceous layer is still present, diversity is reduced as some prairie plants become shaded out from the encroaching shrubs.

Dominant plant species

- eastern redcedar (*Juniperus virginiana*), tree
- gray dogwood (*Cornus racemosa*), tree
- little bluestem (*Schizachyrium scoparium*), grass
- Indiangrass (*Sorghastrum nutans*), grass

Community 2.2
Eastern Redcedar/Gray Dogwood/Little Bluestem

Site falling into this community phase have a well-established shrub layer, and eastern redcedars mature into small trees in the continued absence of fire. Herbaceous diversity continues to decline, and cover is reduced as grasses and forbs are replaced by woody species.

Dominant plant species

- eastern redcedar (*Juniperus virginiana*), tree
- gray dogwood (*Cornus racemosa*), tree
- little bluestem (*Schizachyrium scoparium*), grass

Pathway 2.1A
Community 2.1 to 2.2

Continued fire suppression more than 20 years.

Pathway 2.2A

Community 2.2 to 2.1

A single, large disturbance event.

State 3
Anthropogenic State

The anthropogenic state occurs when the reference state is cleared and developed for human use and inhabitation, such as for commercial and housing developments, landfills, parks, golf courses, cemeteries, earthen spoils, etc. The native vegetation has been removed and soils have either been altered in place (e.g. cemeteries) or transported from one location to another (e.g. housing developments). Most of the soils in this state have 50 to 100 cm of overburden on top of the natural soil. This natural material can be determined by observing a buried surface horizon or the unaltered subsoil, till, or lacustrine parent materials. This state is generally considered permanent.

Community 3.1
Human-altered land

Sites in this community phase have had the native plant community removed and soils heavily re-worked in support of human development projects.

State 4
Cropland State

The continuous use of tillage, row-crop planting, and chemicals (i.e., herbicides, fertilizers, etc.) has effectively eliminated the reference community and many of its natural ecological functions in favor of crop production. Corn and soybeans are the dominant crops for the site, and common wheat (*Triticum aestivum* L.) and alfalfa (*Medicago sativa* L.) may be rotated periodically. These areas are likely to remain in crop production for the foreseeable future.

Community 4.1
Conventional Tillage Field

Sites in this community phase typically consist of monoculture row-cropping maintained by conventional tillage practices. They are cropped in either continuous corn or corn-soybean rotations. The frequent use of deep tillage, low crop diversity, and bare soil conditions during the non-growing season negatively impacts soil health. Under these practices, soil aggregation is reduced or destroyed, soil organic matter is reduced, erosion and runoff are increased, and infiltration is decreased, which can ultimately lead to undesirable changes in the hydrology of the watershed (Tomer et al. 2005).

Community 4.2
Conservation Tillage Field

This community phase is characterized by rotational crop production that utilizes various conservation tillage methods to promote soil health and reduce erosion. Conservation tillage methods include strip-till, ridge-till, vertical-till, or no-till planting systems. Strip-till keeps seedbed preparation to narrow bands less than one-third the width of the row where crop residue and soil consolidation are left undisturbed in-between seedbed areas. Strip-till planting may be completed in the fall and nutrient application either occurs simultaneously or at the time of planting. Ridge-till uses specialized equipment to create ridges in the seedbed and vegetative residue is left on the surface in between the ridges. Weeds are controlled with herbicides and/or cultivation, seedbed ridges are rebuilt during cultivation, and soils are left undisturbed from harvest to planting. Vertical-till systems employ machinery that lightly tills the soil and cuts up crop residue, mixing some of the residue into the top few inches of the soil while leaving a large portion on the surface. No-till management is the most conservative, disturbing soils only at the time of planting and fertilizer application. Compared to conventional tillage systems, conservation tillage methods can improve soil ecosystem function by reducing soil erosion, increasing organic matter and water availability, improving water quality, and reducing soil compaction.

Community 4.3
Conservation Tillage Field/Alternative Crop Field

This community phase applies conservation tillage methods as described above as well as adds cover crop practices. Cover crops typically include nitrogen-fixing species (e.g., legumes), small grains (e.g., rye, wheat, oats), or forage covers (e.g., turnips, radishes, rapeseed). The addition of cover crops not only adds plant diversity but also promotes soil health by reducing soil erosion, limiting nitrogen leaching, suppressing weeds, increasing soil organic matter, and improving the overall soil ecosystem. In the case of small grain cover crops, surface cover and water infiltration are increased, while forage covers can be used to graze livestock or support local wildlife. Of the three community phases for this state, this phase promotes the greatest soil sustainability and improves ecological functioning within a cropland system.

Pathway 4.1A
Community 4.1 to 4.2

Tillage operations are greatly reduced, crop rotation occurs on a regular interval, and crop residue remains on the soil surface.

Pathway 4.1B
Community 4.1 to 4.3

Tillage operations are greatly reduced or eliminated, crop rotation occurs on a regular interval, crop residue remains on the soil surface, and cover crops are planted following crop harvest.

Pathway 4.2A
Community 4.2 to 4.1

Intensive tillage is utilized, and monoculture row-cropping is established.

Pathway 4.2B
Community 4.2 to 4.3

Cover crops are implemented to minimize soil erosion.

Pathway 4.3B
Community 4.3 to 4.1

Intensive tillage is utilized, cover crop practices are abandoned, monoculture row-cropping is established, and crop rotation is reduced or eliminated.

Pathway 4.3A
Community 4.3 to 4.2

Cover crop practices are abandoned.

State 5
Reconstructed Limestone Prairie State

Prairie reconstructions have become an important tool for repairing natural ecological functions and providing habitat protection for numerous grassland dependent species. Because the historic plant and soil biota communities of the prairie were highly diverse with complex interrelationships, historic prairie replication cannot be guaranteed on landscapes that have been so extensively manipulated for extended timeframes (Kardol and Wardle 2010; Fierer et al. 2013). Therefore, ecological restoration should aim to aid the recovery of degraded, damaged, or destroyed ecosystems. A successful restoration will have the ability to structurally and functionally sustain itself, demonstrate resilience to the natural ranges of stress and disturbance, and create and maintain positive biotic and abiotic interactions (SER 2002). The reconstructed limestone prairie state is the result of a long-term commitment involving a multi-step, adaptive management process. Diverse, species-rich seed mixes are important to utilize as they allow the site to undergo successional stages that exhibit changing composition and dominance over time (Smith et al. 2010). On-going management via prescribed fire and/or light grazing can help the site progress from an early successional community dominated by annuals and some weeds to a later seral stage composed of native,

perennial grasses, forbs, and a few shrubs. Establishing a prescribed fire regimen that mimics natural disturbance patterns can increase native species cover and diversity while reducing cover of non-native forbs and grasses. Light grazing alone can help promote species richness, while grazing accompanied with fire can control the encroachment of woody vegetation (Brudvig et al. 2007).

Community 5.1
Early Successional Limestone Prairie

This community phase represents the early community assembly from prairie reconstruction and is highly dependent on the seed mix utilized and the timing and priority of planting operations. The seed mix should look to include a diverse mix of cool-season and warm-season annual and perennial grasses and forbs typical of the reference state (e.g., little bluestem, Indiangrass, porcupinegrass, pale purple coneflower, hoary puccoon). Cool-season annuals can help provide litter that promotes cool, moist soil conditions to the benefit of the other species in the seed mix. The first season following site preparation and seeding will typically result in annuals and other volunteer species forming much of the vegetative cover. Control of non-native species, particularly perennial species, is crucial at this point to ensure they do not establish before the native vegetation (Martin and Wilsey 2012). After the first season, native warm-season grasses should begin to become more prominent on the landscape.

Community 5.2
Late Successional Limestone Prairie

Appropriately timed disturbance regimes (e.g., prescribed fire) applied to the early successional community phase can help increase the beta diversity, pushing the site into a late successional community phase over time. While prairie communities are dominated by grasses, these species can suppress forb establishment and reduce overall diversity and ecological function (Martin and Wilsey 2006; Williams et al. 2007). Reducing accumulated plant litter from perennial bunchgrasses allows more nutrients and light to become available for forb recruitment, allowing greater ecosystem complexity (Wilsey 2008).

Pathway 5.1A
Community 5.1 to 5.2

Selective herbicides are used to control non-native species, and prescribed fire and/or light grazing helps to increase the native species diversity and control woody vegetation.

Pathway 5.2A
Community 5.2 to 5.1

Reconstruction experiences a decrease in native species diversity from drought or improper timing of management actions (e.g. reduced fire frequency, use of non-selective herbicides).

Transition T1A
State 1 to 2

Long-term fire suppression transitions the site to the fire-suppressed scrub state (2).

Transition T1B
State 1 to 3

Vegetation removal and human alterations/transportation of soils transitions the site to the anthropogenic state (3).

Transition T1C
State 1 to 4

Tillage, seeding of agricultural crops, and non-selective herbicide transition the site to the cropland state (4).

Transition T2A
State 2 to 3

Vegetation removal and human alterations/transportation of soils transitions the site to the anthropogenic state (3).

Transition T2B
State 2 to 4

Tillage, seeding of agricultural crops, and non-selective herbicide transition this site to the cropland state (4).

Restoration pathway R2A
State 2 to 5

Site preparation, invasive species control, and seeding native species transition this site to the reconstructed limestone prairie state (5).

Transition T4A
State 4 to 2

Land abandonment transitions the site to the fire-suppressed scrub state (2).

Transition T4B
State 4 to 3

Vegetation removal and human alterations/transportation of soils transitions the site to the anthropogenic state (3).

Restoration pathway R4A
State 4 to 5

Site preparation, invasive species control, and seeding native species transition this site to the reconstructed limestone prairie state (5).

Transition T5A
State 5 to 2

Land abandonment transitions the site to the fire-suppressed scrub state (2).

Transition T5B
State 5 to 3

Vegetation removal and human alterations/transportation of soils transitions the site to the anthropogenic state (3).

Transition T5C
State 5 to 4

Tillage, seeding of agricultural crops, and non-selective herbicide transition this site to the cropland state (4).

Additional community tables

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.

Other references

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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	04/27/2024
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):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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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):**

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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):**

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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:**