USDA Natural Resources
Conservation Service

Ecological site R110XY007IL
Moist Glacial Drift Upland Prairie

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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: Central Tallgrass Prairie (CES205.683) (NatureServe 2018)

National Vegetation Classification – Plant Associations: Andropogon gerardii – Sorghastrum nutans – (Sporobolus heterolepis) – Liatris spp. – Ratibida pinnata Grassland (CEGL002203); Andropogon gerardii – Panicum virgatum – Helianthus grosseserratus Wet Meadow (CEGL002024) (Nature Serve 2018)

Biophysical Settings: Central Tallgrass Prairie (BpS 4914210) (LANDFIRE 2009)

Illinois Natural Areas Inventory: Mesic prairie; Wet-mesic prairie (White and Madany 1978)

Wisconsin Natural Communities: Mesic prairie; Wet-mesic prairie (WDNR 2015)

Ecological site concept

Moist Glacial Drift Upland Prairies are located within the green areas on the map. They occur on uplands. The soils are Mollisols that are somewhat poorly to moderately well drained and very deep, formed in loess, glacial till, or outwash.

The historic pre-European settlement vegetation on this ecological site was dominated by tallgrass herbaceous species. Big bluestem (Andropogon gerardii Vitman) and Indiangrass (Sorghastrum nutans (L.) Nash) are the dominant species on the site. Other grasses present may include prairie dropseed (Sporobolus heterolepis (A. Gray) A. Gray), switchgrass (Panicum virgatum L.), and bluejoint (Calamagrostis canadensis L.). Species typical of an undisturbed plant community associated with this ecological site include longbract wild indigo (Baptisia bracteata Muhl. ex Elliott var. leucophaea (Nutt.) Kartesz & Gandhi), button eryngo (Eryngium yuccifolium Michx.), and white prairie clover (Dalea candida Michx. ex Willd.) (Taft et al. 1997; White & Madany 1978). Fire is the primary disturbance factor that maintains this site, while herbivory and drought are secondary factors (LANDFIRE 2009).

Associated sites

R110XY006IL	**Dry Glacial Drift Upland Prairie** Loess and outwash with no water table within 6 feet including Cresent, Jasper, Lorenzo, Saylesville variant, Warsaw, Waupecan, Wea, and Wyanet soils
R110XY008IL	**Wet Glacial Drift Upland Prairie** Loess, loamy outwash, glacial till, lacustrine deposits, and colluvium that have a seasonal high-water table within 12 inches including Ashkum, Bryce, Drummer, Dunham, Elpaso, Matherton, Milford, Monee, Montgomery, Pella, Reddick, Rowe, Selma, Selmass, Westland, and Will soils

Similar sites

R110XY014IL	**Moist Sand Prairie** Moist Sand Prairies are a similar vegetation type, but the parent material is outwash

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Andropogon gerardii* (2) *Sorghastrum nutans*

Physiographic features

Moist Glacial Drift Upland Prairies occur on uplands. They are situated on elevations ranging from approximately 470 to 1279 feet ASL. The site does not experience flooding but rather generates runoff to adjacent, downslope ecological sites.

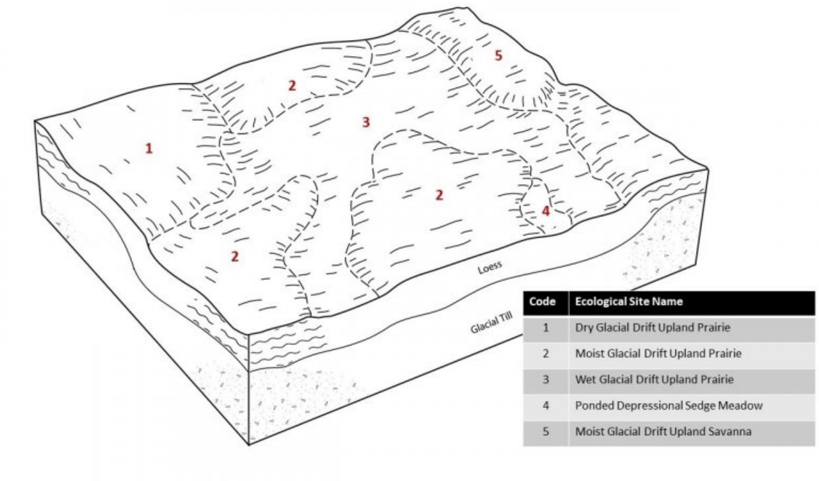


Figure 1. Representative block diagram of Moist Glacial Drift Upland Prairie and associated ecological sites.

Figure 2.

Table 2. Representative physiographic features

Slope shape across	(1) Convex
Slope shape up-down	(1) Convex
Landforms	(1) Upland
Runoff class	Low to very high
Elevation	143–390 m
Slope	0–10%
Water table depth	30–183 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 172 days, while the frost-free period is about 140 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 34.3 and 38.9°F, respectively.

Table 3. Representative climatic features

Frost-free period (characteristic range)	132-146 days
Freeze-free period (characteristic range)	159-180 days
Precipitation total (characteristic range)	914-940 mm
Frost-free period (actual range)	132-152 days
Freeze-free period (actual range)	154-191 days
Precipitation total (actual range)	889-965 mm
Frost-free period (average)	140 days
Freeze-free period (average)	172 days
Precipitation total (average)	940 mm

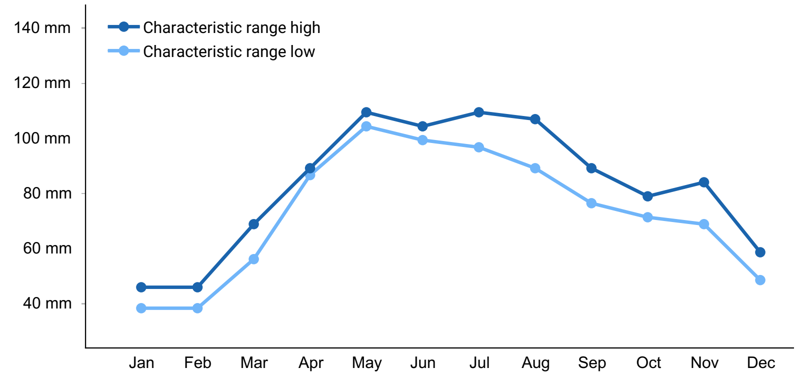


Figure 3. Monthly precipitation range

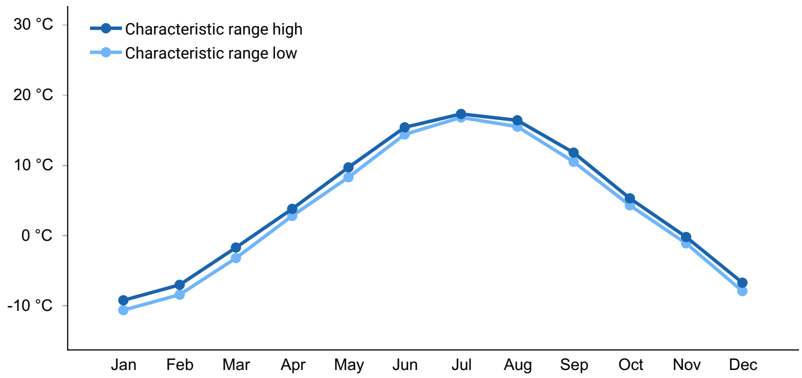


Figure 4. Monthly minimum temperature range

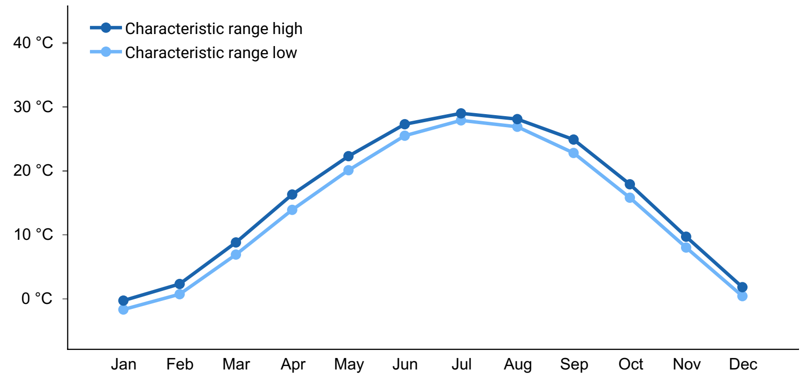


Figure 5. Monthly maximum temperature range

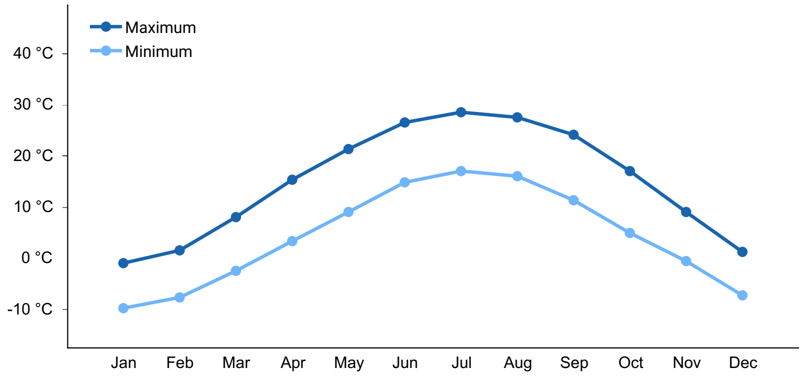


Figure 6. Monthly average minimum and maximum temperature

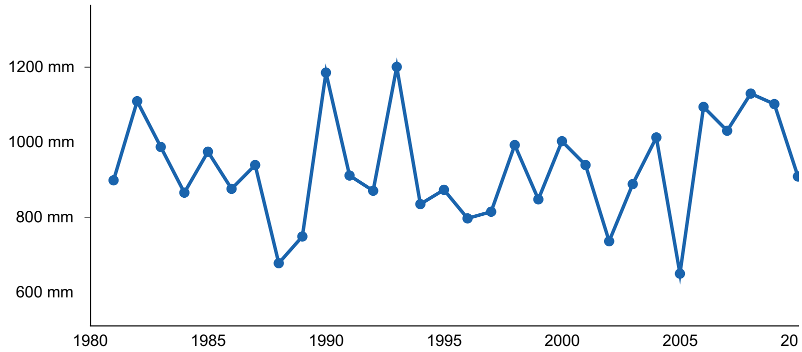


Figure 7. Annual precipitation pattern

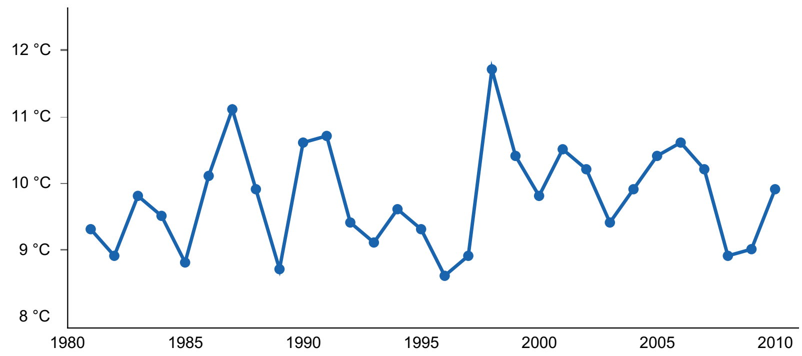


Figure 8. Annual average temperature pattern

Climate stations used

- (1) PAXTON 2 WSW [USC00116663], Paxton, IL
- (2) DWIGHT [USC00112500], Dwight, IL
- (3) JOLIET BRANDON RD DAM [USC00114530], Joliet, IL

- (4) MUNDELEIN 4WSW [USC00115961], Lake Zurich, IL
- (5) UNION GROVE [USC00478723], Union Grove, WI

Influencing water features

Moist Glacial Drift Upland Prairies are not influenced by wetland or riparian water features. Precipitation is the main source of water for this ecological site. Infiltration is slow (Hydrologic Group C), and surface runoff is low to very high. Surface runoff contributes some water to downslope ecological sites.

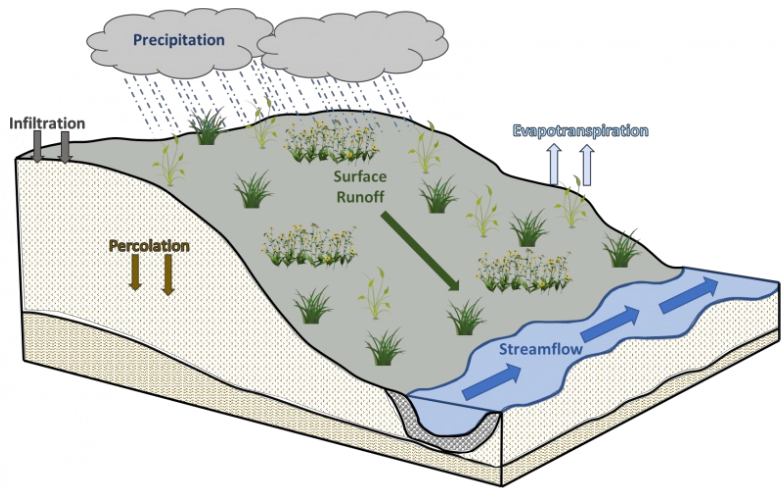


Figure 9. Hydrologic cycling in Moist Glacial Drift Upland Prairie ecological site.

Soil features

Soils of Moist Glacial Drift Upland Prairies are in the Mollisols order, further classified as Aquic Argiudolls, Oxyaquic Argiudolls, and Pachic Argiudolls with slow infiltration and low to very high runoff potential. The soil series associated with this site includes Andres, Barrington, Chenoa, Clare, Clarence, Crane, Darroch, Darroch variant, Elliott, Fabius, Grundelein, Kane, La Hogue, Martinton, Mokena, Mona, Mundelein, Odell, Papineau, Parr, Penfield, Raub, Rooks, Rutland, Swygert, Symerton, Troxel, Varna, Waupecan, and Wenona. The parent material is loess or other silty or loamy material, loamy outwash, or glacial till and the soils are somewhat poorly to moderately well drained and very deep with a seasonal water table. Soil pH classes are strongly acid to moderately alkaline. No rooting restrictions are noted for the soils of this ecological site.

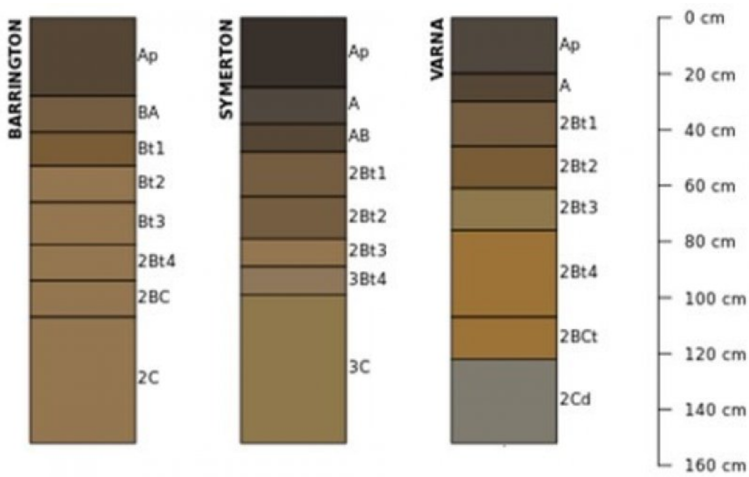


Figure 10. Profile sketches of soil series associated with Moist Glacial Drift Upland Prairie.

Table 4. Representative soil features

Parent material	(1) Loess (2) Outwash (3) Till
Family particle size	(1) Fine (2) Fine-silty (3) Fine-loamy over clayey
Drainage class	Somewhat poorly drained to moderately well drained
Permeability class	Moderately slow
Depth to restrictive layer	203 cm
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	2.54–22.86 cm
Calcium carbonate equivalent (Depth not specified)	0–55%
Electrical conductivity (Depth not specified)	0–2 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	5.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–15%
Subsurface fragment volume >3" (Depth not specified)	0–3%

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.

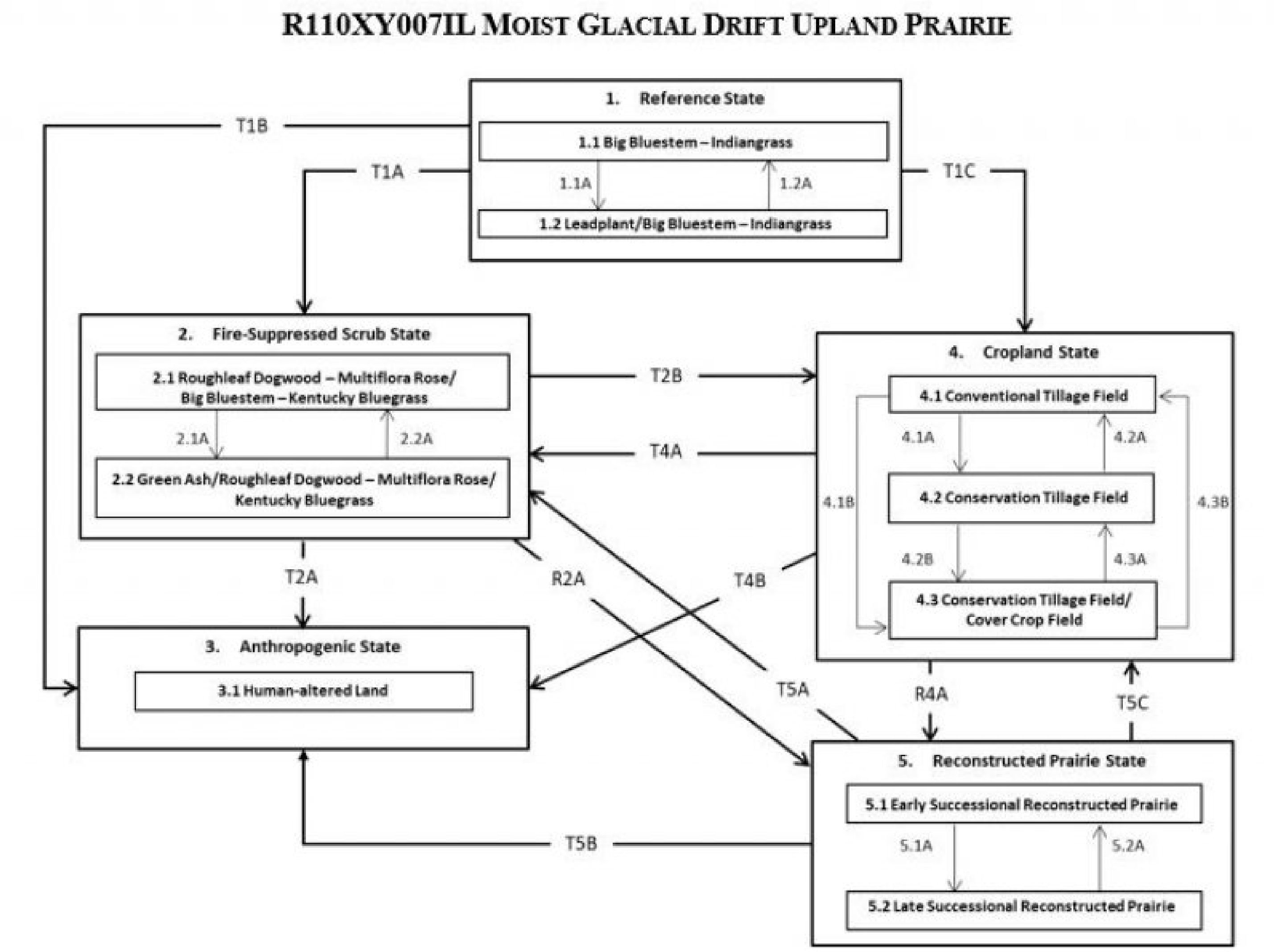
The MLRA lies within the tallgrass prairie ecosystem of the Midwest, but a variety of environmental and edaphic factors resulted in landscape that historically supported prairies, savannas, forests, and various wetlands. Moist Glacial Drift Upland Prairies form an aspect of this vegetative continuum. This ecological site occurs on uplands on somewhat poorly to moderately well drained soils. Species characteristic of this ecological site consist of herbaceous vegetation.

Fire is a critical disturbance factor that maintains Moist Glacial Drift Upland 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 somewhat poorly to moderately well 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, Moist Glacial Drift Upland Prairies are limited in their extent, having been type-converted to agricultural production land or other human-modified landscapes. Remnants that do exist show evidence of indirect anthropogenic influences from fire suppression and non-native species invasion. 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



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 mid- to tallgrass prairie community, dominated by herbaceous vegetation. The two community phases within the reference state are dependent on fire. The intensity and frequency alter species composition, cover, and extent, while regular fire intervals keep woody species from dominating. Drought and herbivory have more localized impacts in the reference phases, but do contribute to overall species composition, diversity, cover, and productivity.

Community 1.1
Big Bluestem - Indiangrass

Sites in this reference community phase are dominated by a mix of tallgrasses and various forbs. Vegetative cover is continuous (95 to 100 percent) and plants can reach heights up to 6 feet tall (LANDFIRE 2009; NatureServe 2018). Big bluestem and Indiangrass are the dominant warm-season grasses present on the site. Other grasses present can include prairie dropseed, switchgrass, and bluejoint. Characteristic forbs may include pride of Ohio (*Dodecatheon meadia* L.), prairie blazing star (*Liatris pycnostachya* Michx.), hoary puccoon (*Lithospermum canescens* (Michx.) Lehm.), and prairie rosinweed (*Silphium terebinthinaceum* Jacq.) (White and Madany 1978). Fire with low intensity will maintain this community phase, but a few years without fire allows the community to mature, shifting to phase 1.2 (LANDFIRE 2009).

Dominant plant species

- big bluestem (*Andropogon gerardii*), grass
- Indiangrass (*Sorghastrum nutans*), grass

Community 1.2
Leadplant/Big Bluestem - Indiangrass

This reference community phase represents a successional shift following an extended fire return interval. The lack of fire allows limited, low woody shrubs – such as leadplant (*Amorpha canescens* Pursh) – to develop in the prairie community. Perennial, warm-season grasses and a diversity of forbs continue to be dominant components on the site. A hot, replacement fire every 1 to 3 years will reduce the shrub cover, shifting the site back to community phase 1.1 (LANDFIRE 2009).

Dominant plant species

- leadplant (*Amorpha canescens*), shrub
- big bluestem (*Andropogon gerardii*), grass
- Indiangrass (*Sorghastrum nutans*), grass

Pathway 1.1A
Community 1.1 to 1.2

Natural succession as a result of a brief fire-free period.

Pathway 1.2A
Community 1.2 to 1.1

Hot, replacement fire every 1 to 3 years.

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 and sparse trees (LANDFIRE 2009). Proximity to lands that have been altered provide opportunities for non-native invasive species to readily colonize this state, thereby reducing the native biodiversity and changing the vegetative community.

Community 2.1
Roughleaf Dogwood - Multiflora Rose/Big Bluestem - Kentucky Bluegrass

This community phase represents the early stages of fire-suppression. In as little as six fire-free years, the prairie is disrupted and succeeded by woody shrubs. Native species – e.g., roughleaf dogwood (*Cornus drummondii* C.A. Mey) and black raspberry (*Rubus occidentalis* L.) – and non-native species – e.g., multiflora rose (*Rosa multiflora* Thunb.) – can form dense thickets with cover reaching up to 30 percent and plant heights as tall as 9 feet

(LANDFIRE 2009). Some native prairie plants will persist, but non-native herbaceous species tolerant of shading encroach on the site.

Dominant plant species

- roughleaf dogwood (*Cornus drummondii*), shrub
- multiflora rose (*Rosa multiflora*), shrub
- big bluestem (*Andropogon gerardii*), grass
- Kentucky bluegrass (*Poa pratensis*), grass

Community 2.2
Green Ash/Roughleaf Dogwood - Multiflora Rose/Kentucky Bluegrass

Sites falling into this community phase have a well-established shrub layer, and scattered trees begin to develop in the continued absence of fire. The shrub canopy can be diverse, including both native and non-native species. Roughleaf dogwood, black raspberry, and eastern poison ivy (*Toxicodendron radicans* (L.) Kuntze) are common natives, and multiflora rose is a frequently invading non-native. Green ash (*Fraxinus pennsylvanica* Marshall), common hackberry (*Celtis occidentalis* L.), and elms (Ulmus L.) may be some encroaching native trees. The non-native white mulberry (*Morus alba* L.) may also be encountered.

Dominant plant species

- green ash (*Fraxinus pennsylvanica*), tree
- roughleaf dogwood (*Cornus drummondii*), shrub
- multiflora rose (*Rosa multiflora*), shrub
- Kentucky bluegrass (*Poa pratensis*), grass

Pathway 2.1A
Community 2.1 to 2.2

Continued fire suppression in excess of 20 years.

Pathway 2.2A
Community 2.2 to 2.1

Single large disturbance event such as selective removal of woody species.

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 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 tallgrass 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 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 Reconstructed 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., big bluestem, Indiangrass, switchgrass, prairie rosinweed). 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 a majority 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 Reconstructed 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 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 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.

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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	05/04/2024
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):**

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:**