

# Ecological site R110XY008IL

## Wet 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 Wisconsin 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: Eastern Great Plains Wet Meadow, Prairie and Marsh (CES205.687) (NatureServe 2018)

National Vegetation Classification – Plant Associations: *Spartina pectinata* – *Carex* spp. – *Calamagrostis canadensis* – *Lythrum alatum* – (*Oxypolis rigidior*) Wet Meadow (CEGL002224) (Nature Serve 2018)

Biophysical Settings: Eastern Great Plains Wet Meadow-Prairie-Marsh System (BpS 4914880) (LANDFIRE 2009)

Illinois Natural Areas Inventory: Wet Prairie (White and Madany 1978)

## Ecological site concept

Wet Glacial Drift Upland Prairies are located within the green areas on the map. They occur on uplands. The soils are Mollisols and Alfisols that are poorly-drained and very deep, formed in loess or other silty or loamy material, loamy outwash, glacial till, lacustrine deposits, or colluvium.

The historic pre-European settlement vegetation on this ecological site was dominated by herbaceous vegetation adapted to saturated soil conditions. Bluejoint (*Calamagrostis canadensis* L.) and prairie cordgrass (*Spartina pectinata* Bosc ex Link) are the dominant species on the site, but various sedges are present as well. A species characteristic of an undisturbed plant community associated with this ecological site includes groovestem Indian plantain (*Arnoglossum plantagineum* Raf.) (White and Madany 1978; Taft et al. 1997). Fire is the primary disturbance regime that maintains the structure of this ecological site, while saturated soil conditions and herbivory are secondary factors (LANDFIRE 2009).

## Associated sites

R110XY007IL	<p><b>Moist Glacial Drift Upland Prairie</b> Loess or other silty or loamy material, loamy outwash, or glacial till that has a high-water table within 12-72 inches including 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 Wenoa soils</p>
R110XY024IL	<p><b>Ponded Depressional Sedge Meadow</b> Organic material or loess or other silty or loamy material over outwash, till, or lacustrine deposits that are subject to ponding including Ashkum, Drummer, Dunham, Elpaso, Houghton, Lena, Muskego, Ogden, Pella, Peotone, Pewamo, Rantoul, Reddick, Selma, Streator, Thorp, and Will soils</p>

## Similar sites

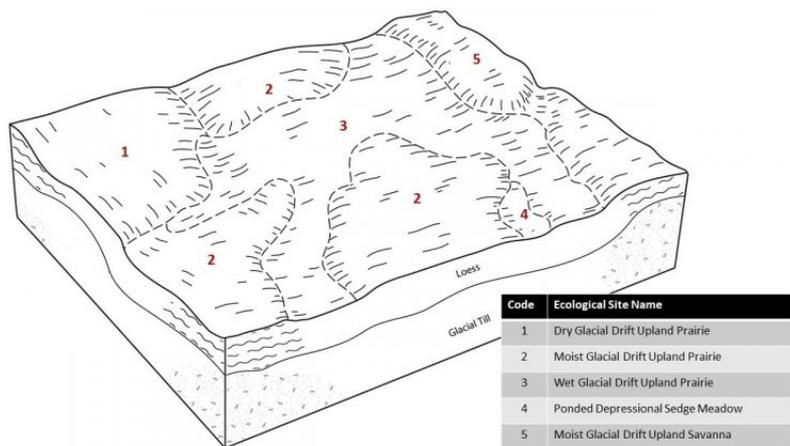
R110XY015IL	<p><b>Wet Sand Prairie</b> Wet Sand Prairies have a similar vegetation type, but the parent material is outwash that is shallow to a high-water table</p>
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Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Calamagrostis canadensis</i> (2) <i>Spartina pectinata</i>

## Physiographic features

Wet Glacial Drift Upland Prairies occur on uplands. They are situated on elevations ranging from approximately 470 to 1246 feet ASL. The site does not experience flooding, but rather allows for groundwater recharge due to low hydraulic gradients.



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



**Figure 2.**

**Table 2. Representative physiographic features**

Slope shape across	(1) Linear
Slope shape up-down	(1) Linear
Landforms	(1) Upland
Runoff class	Negligible to medium
Elevation	470–1,246 ft
Slope	0–2%
Water table depth	0–12 in
Aspect	Aspect is not a significant factor

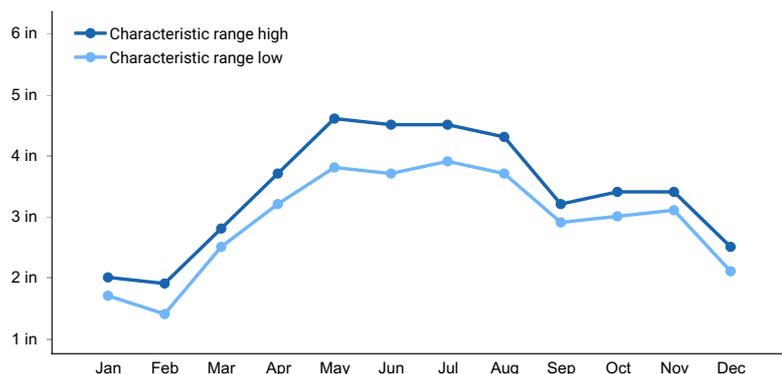
## Climatic features

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.).

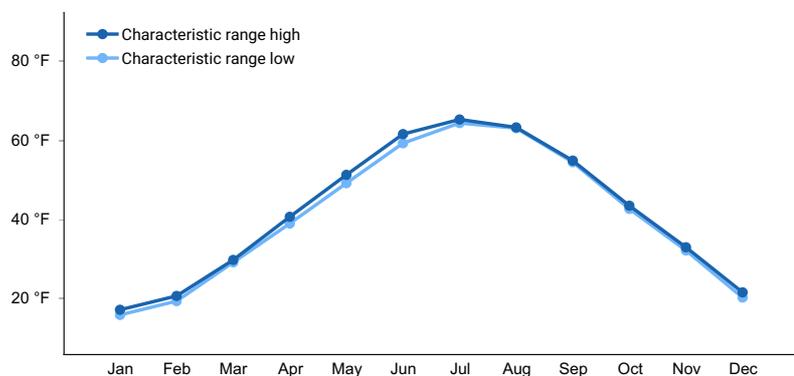
The soil temperature regime of MLRA 110 is classified as mesic, where the mean annual soil temperature is between 46 and 59°F (USDA-NRCS 2006). Temperature and precipitation occur along a north-south gradient, where temperature and precipitation increase the further south one travels. The average freeze-free period of this ecological site is about 183 days, while the frost-free period is about 147 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 41.2 and 60.0°F, respectively.

**Table 3. Representative climatic features**

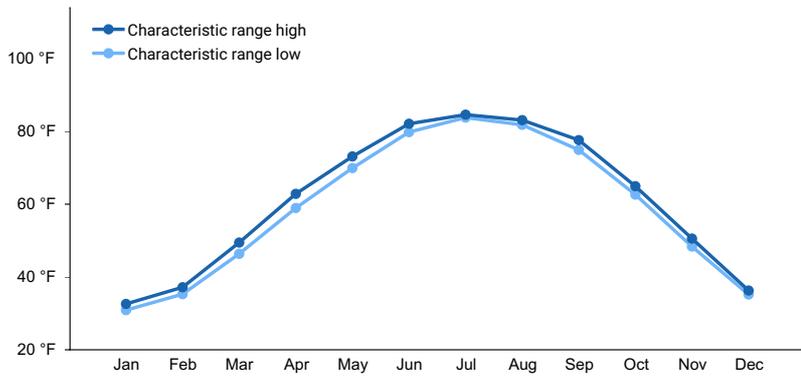
Frost-free period (characteristic range)	143-151 days
Freeze-free period (characteristic range)	179-186 days
Precipitation total (characteristic range)	35-40 in
Frost-free period (actual range)	142-153 days
Freeze-free period (actual range)	178-189 days
Precipitation total (actual range)	34-41 in
Frost-free period (average)	147 days
Freeze-free period (average)	183 days
Precipitation total (average)	38 in



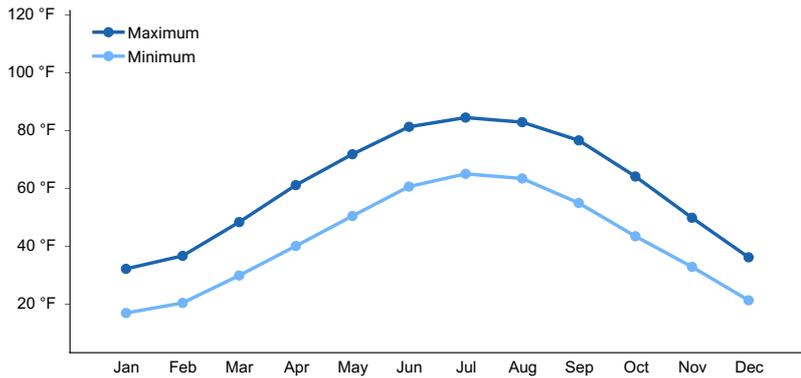
**Figure 3. Monthly precipitation range**



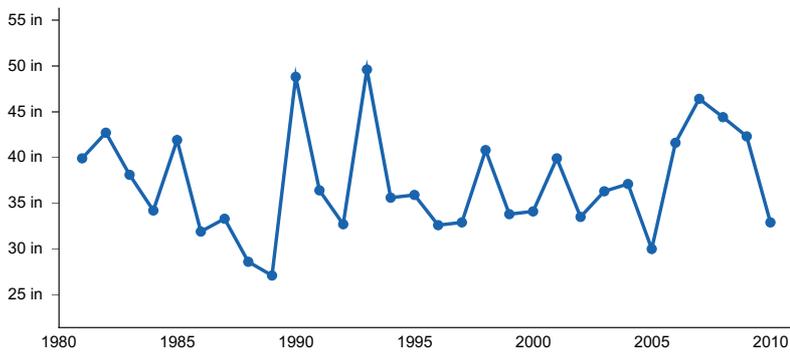
**Figure 4. Monthly minimum temperature range**



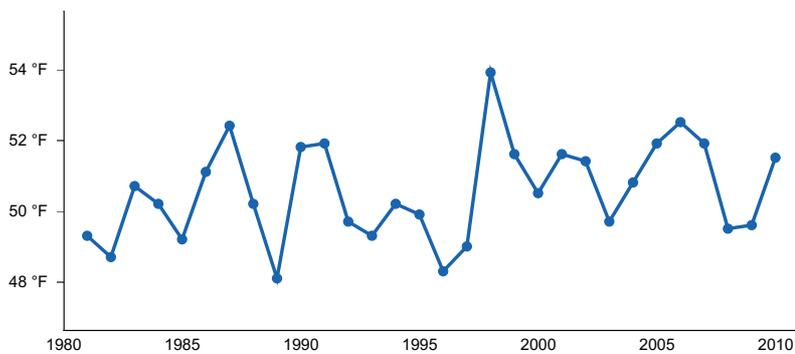
**Figure 5. Monthly maximum temperature range**



**Figure 6. Monthly average minimum and maximum temperature**



**Figure 7. Annual precipitation pattern**



**Figure 8. Annual average temperature pattern**

### Climate stations used

- (1) PARK FOREST [USC00116616], Chicago Heights, IL
- (2) CHICAGO PALWAUKEE AP [USW00004838], Wheeling, IL
- (3) PONTIAC [USC00116910], Pontiac, IL

- (4) HOOPESTON 1NE [USC00114198], Hoopeston, IL

## Influencing water features

Wet Glacial Drift Upland Prairies are classified as a MINERAL SOIL FLATS: saturated, recharge, herbaceous wetland under the Hydrogeomorphic (HGM) classification system (Smith et al. 1995; USDA-NRCS 2008) and as a Palustrine, Persistent Emergent, Seasonally Saturated wetland under the National Wetlands Inventory (FGDC 2013). Precipitation is the main source of water for this ecological site (Smith et al. 1995). Infiltration is very slow (Hydrologic Groups D) for undrained soils, and surface runoff is negligible.

## Wetland description

Primary wetland hydrology indicators for an intact Wet Glacial Drift Upland Prairie may include: A2 High water table and A3 Saturation. Secondary wetland hydrology indicators may include: C2 Dry-season water table and D5 FAC-neutral test (USACE 2010).

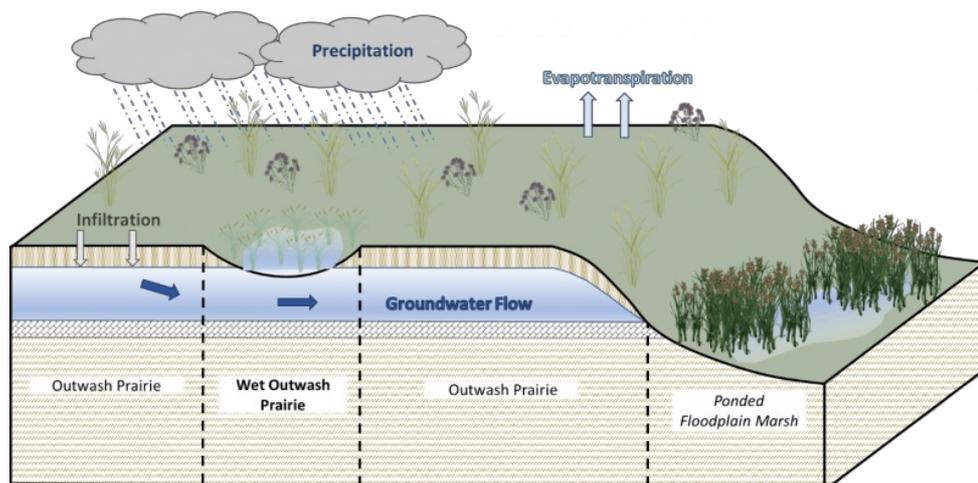


Figure 9. Hydrologic cycling in Wet Glacial Drift Upland Prairie ecological site.

## Soil features

Soils of Wet Glacial Drift Upland Prairies are in the Mollisols and Alfisols orders, further classified as Typic Argiaquolls, Vertic Argiaquolls, Typic Endoaquolls, Vertic Endoaquolls, Mollic Epiaqualfs, and Udollic Epiaqualfs with very slow infiltration and negligible to medium runoff potential. The soil series associated with this site includes Ashkum, Bryce, Drummer, Dunham, Elpaso, Matherton, Milford, Monee, Montgomery, Pella, Reddick, Rowe, Selma, Selmass, Westland, and Will. The parent material is loess or other silty or loamy material, loamy outwash, glacial till, lacustrine deposits, or colluvium, and the soils are poorly drained and very deep with seasonal high-water tables. Soil pH classes are strongly acid to moderately alkaline. No rooting restrictions are noted for the soils of this ecological site.

Some soil map units in this ecological site, if not drained, may meet the definition of hydric soils and are listed as meeting criteria 2 of the hydric soils list (77 FR 12234).

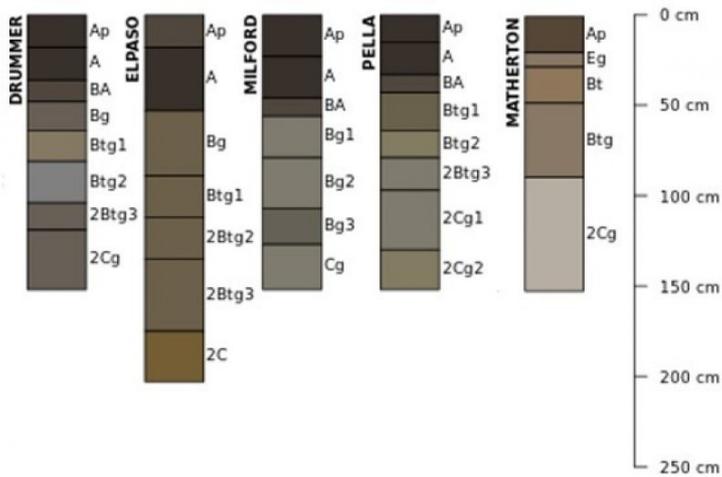


Figure 10. Profile sketches of soil series associated with Wet Glacial Drift Upland Prairie.

Table 4. Representative soil features

Parent material	(1) Loess (2) Outwash (3) Till (4) Lacustrine deposits (5) Colluvium
Family particle size	(1) Fine (2) Fine-silty (3) Fine-loamy
Drainage class	Poorly drained
Permeability class	Moderately slow
Depth to restrictive layer	80 in
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	4–11 in
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)	1–15%
Subsurface fragment volume >3" (Depth not specified)	1–4%

## 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. Wet Glacial Drift Upland Prairies form an aspect of this vegetative continuum. This ecological site occurs on uplands on poorly-drained soils. Species characteristic of this ecological site consist of hydrophytic herbaceous vegetation.

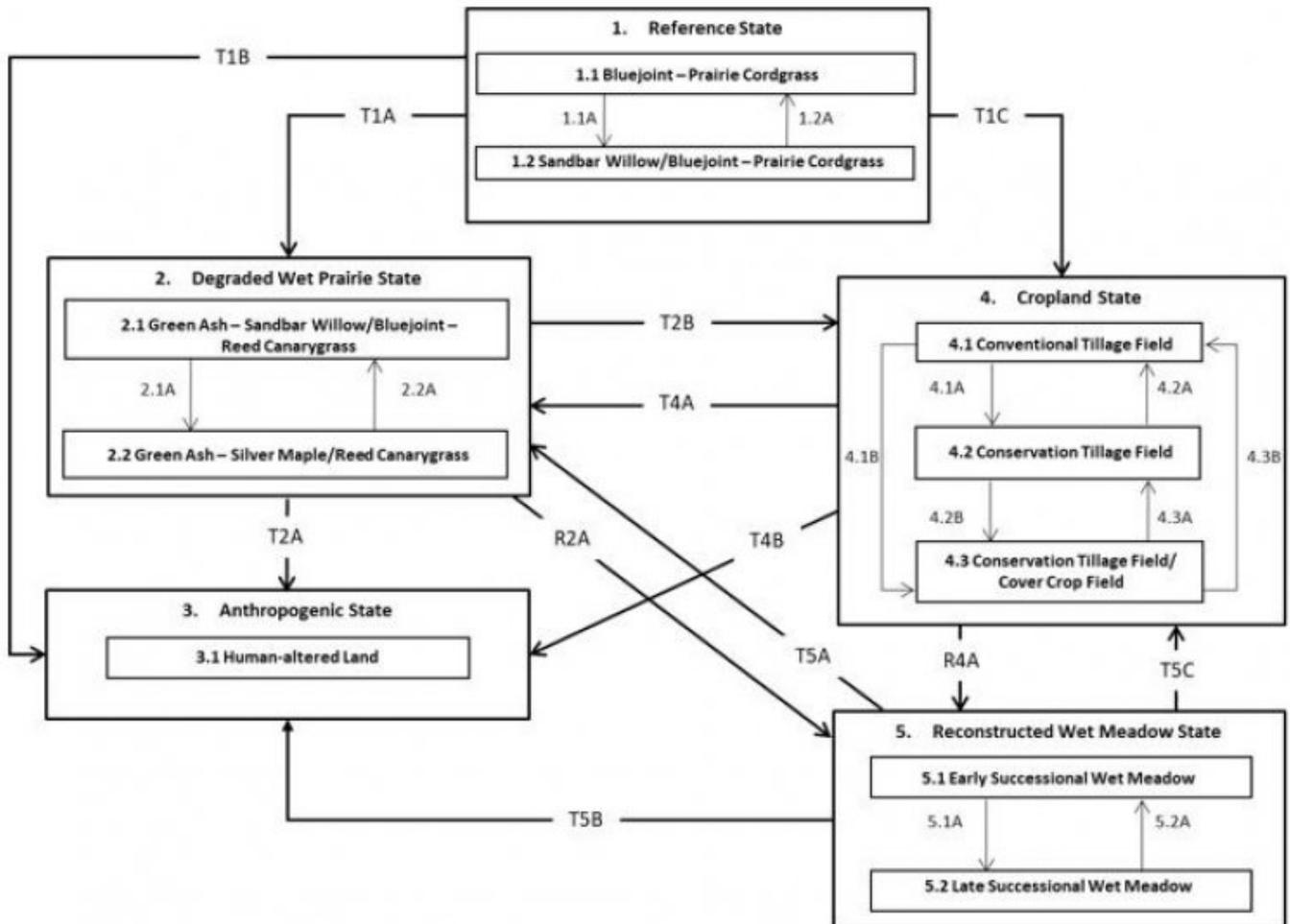
Fire is a critical disturbance factor that maintains Wet Glacial Drift Upland Prairies. Fire intensity typically consisted of periodic, low-intensity surface fires occurring every 2 to 5 years (LANDFIRE 2009). Ignition sources included summertime lightning strikes from convective storms and bimodal, 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).

Saturated soil conditions and herbivory by native ungulates have also played a role in shaping this ecological site. The high soil moisture conditions have favored the proliferation of plant species tolerant of such conditions. The high-water tables prevent many woody species from establishing, thus maintaining the prairie structure. Grazing also likely contributed to woody species reduction (LANDFIRE 2009). When coupled with fire, saturated soils and herbivory can further delay the establishment of woody vegetation (Pyne et al. 1996).

Today, Wet Glacial Drift Upland Prairies have been greatly reduced as most areas have been converted to agricultural production with corn (*Zea mays* L.) and soybeans (*Glycine max* (L.) Merr.) the dominant crops grown. Some areas may have been converted to other human-modified landscapes. Remnants that do exist show evidence of indirect anthropogenic influences from fire suppression, subsurface drainage, 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**

## R110XY008IL WET GLACIAL DRIFT UPLAND PRAIRIE



Code	Process
1.1A	Extended fire return interval
1.2A	Decreased fire return interval
T1A, T4A, T5A	Long-term fire suppression, hydrologic alterations, 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 wet tallgrass prairie community, dominated by hydrophytic herbaceous vegetation. The two community phases within the reference state are dependent on periodic fire. The intensity and frequency alter species composition, cover, and extent, while regular fire intervals keep woody species from dominating. Soil saturation and native mammal grazing have more localized impacts in the reference phases, but do contribute to overall species composition, diversity, cover, and productivity.

## Community 1.1

### Bluejoint - Prairie Cordgrass

Sites in this reference community phase are dominated by a mix of hydrophytic grasses, sedges, and forbs. Vegetative cover is continuous (95 to 100 percent) and plants can reach heights between 3 and 6 feet tall (NatureServe 2018). Bluejoint, prairie cordgrass, and various sedges are the dominant monocots on the site. Characteristic forbs can include common boneset (*Eupatorium perfoliatum* L.), Virginia iris (*Iris virginica* L.), American water horehound (*Lycopus americanus* Muhl. ex W.P.C. Barton), and hemlock waterparsnip (*Sium suave* Walter) (White and Madany 1978; NatureServe 2018). Replacement fires every 2 to 5 years characterize the fire regime, maintaining this reference plant community. An extended fire return interval will shift the community to phase 1.2 (LANDFIRE 2009).

#### Dominant plant species

- bluejoint (*Calamagrostis canadensis*), grass
- prairie cordgrass (*Spartina pectinata*), grass

## Community 1.2

### Sandbar Willow/Bluejoint - Prairie Cordgrass

This reference community phase represents a successional shift from an extended fire return interval. Grasses, sedges, and forbs are still prominent, but scattered shrubs – such as sandbar willow (*Salix interior* Rowlee) – begin to develop and mature (Bowles and Jones 2004). Low intensity fires will maintain this community phase, but a hot replacement fire will shift the site back to community phase 1.1 (LANDFIRE 2009).

#### Dominant plant species

- sandbar willow (*Salix interior*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- prairie cordgrass (*Spartina pectinata*), grass

## Pathway 1.1A

### Community 1.1 to 1.2

Natural succession due to an extended fire return interval.

## Pathway 1.2A

### Community 1.2 to 1.1

Hot replacement fire every 1 to 3 years.

## State 2

### Degraded Wet Prairie State

Long-term fire suppression and landscape hydrologic alterations can transition the reference wet tallgrass prairie community into a woody-invaded 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

### Green Ash - Sandbar Willow/Bluejoint - Reed Canarygrass

This community phase represents the early stages of long-term fire-suppression. In as little as six fire-free years, the prairie can be disrupted and succeeded by woody shrubs. Native trees – e.g., green ash (*Fraxinus pennsylvanica* Marshall), silver maple (*Acer saccharinum* L.), elm (*Ulmus* L.) – and shrubs 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, including reed canarygrass (*Phalaris arundinacea* L.), smooth brome (*Bromus inermis* Leyss.), Kentucky bluegrass (*Poa pratensis* L.), and redtop (*Agrostis gigantea*

Roth) can begin to encroach from adjacent, disturbed sites.

### **Dominant plant species**

- green ash (*Fraxinus pennsylvanica*), tree
- sandbar willow (*Salix interior*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- reed canarygrass (*Phalaris arundinacea*), grass

## **Community 2.2**

### **Green Ash - Silver Maple/Reed Canarygrass**

Sites falling into this community phase have scattered trees beginning to mature in the continued absence of fire and reduced water table.

### **Dominant plant species**

- green ash (*Fraxinus pennsylvanica*), tree
- silver maple (*Acer saccharinum*), tree
- reed canarygrass (*Phalaris arundinacea*), 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 some 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, chemicals (i.e., herbicides, fertilizers, etc.), and subsurface tile drainage 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 Wet Meadow State**

Wet meadow habitats provide multiple ecosystem services including flood abatement, water quality improvement, and biodiversity support. However, many wet meadow communities have been stressed from watershed-scale changes in hydrology or eliminated as a result of type conversions to agricultural production, thereby significantly reducing these services (Zedler 2003). The extensive alterations of lands adjacent to Wet Glacial Drift Upland Prairies may not allow for restoration back to the historic reference condition. However, ecological reconstruction can aim to aid the recovery of degraded, damaged or destroyed functions. A successful reconstruction 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; Mitsch and Jørgensen 2004).

### **Community 5.1**

#### **Early Successional Wet Meadow**

This community phase represents the early community assembly from wet meadow reconstruction and is highly dependent on seed viability, hydroperiod, soil organic matter content, and site preparation. Successful establishment of native vegetation can be maximized by utilizing genotypes adapted to the environmental location, ensuring soil moisture is saturated at the time of seeding, and improving the water holding capacity and fertility of the soil (Mitsch and Gosselink 2007). In addition, suppression and removal of non-native species is essential for reducing competition (Perry and Galatowitsch 2003).

### **Community 5.2**

#### **Late Successional Wet Meadow**

Appropriately timed disturbance regimes (e.g., hydroperiod, prescribed fire) and nutrient management applied to the early successional community phase can help increase the species richness, pushing the site into a late successional community phase over time (Mitsch and Gosselink 2007).

### **Pathway 5.1A**

#### **Community 5.1 to 5.2**

Maintenance of proper hydrology and nutrient balances in line with a developed wetland management plan.

### **Pathway 5.2A**

#### **Community 5.2 to 5.1**

Reconstruction experiences a setback from extreme weather event or improper timing of management actions.

## **Transition T1A**

### **State 1 to 2**

Long-term fire suppression and hydrologic alterations transition the site to the degraded wet prairie 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**

Installation of drain tiles, 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**

Installation of drain tiles, 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 wet meadow state (5).

## **Transition T4A**

### **State 4 to 2**

Agricultural production abandoned and left fallow; natural succession by opportunistic species transition this site to the degraded wet prairie 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**

Hydroperiod restoration, site preparation, non-native species control and seeding native species transition this site to the reconstructed wet meadow state (5).

## **Transition T5A**

### **State 5 to 2**

Land is abandoned and left fallow; natural succession by opportunistic species transition this site to the degraded wet prairie 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**

Installation of drain tiles, seeding of agricultural crops, and non-selective herbicide transition the 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	04/20/2024
Approved by	Chris Tecklenburg
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

## Indicators

### 1. Number and extent of rills:

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2. **Presence of water flow patterns:**

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3. **Number and height of erosional pedestals or terracettes:**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

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5. **Number of gullies and erosion associated with gullies:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

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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:

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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):**

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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:**

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