Ecological site R110XY015IL
Wet Sand Prairie

Last updated: 4/22/2020
Accessed: 05/19/2024

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

National Vegetation Classification – Plant Associations: Spartina pectinata – Carex spp. – Calamagrostis canadensis Sand Wet Meadow (CEGL005178) (Nature Serve 2018)

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

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

Ecological site concept

Wet Sand Prairies are located within the green areas on the map. They occur on outwash plains. The soils are Mollisols and Alfisols that are poorly drained and very deep, formed in outwash.

The historic pre-European settlement vegetation on this ecological site was dominated by herbaceous vegetation adapted to saturated soil conditions. Prairie cordgrass (Spartina pectinata Bosc ex Link) and eastern marsh fern (Thelypteris palustris Schott) are the dominant species on the site, but bluejoint (Calamagrostis canadensisL.) and various sedges are present as well. A species characteristic of an undisturbed plant community associated with this ecological site includes groovestem Indian plantain (Arnoglossum plantagineaum 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

R110XY014IL	**Moist Sand Prairie** Eolian deposits and outwash that has a high-water table within 15-18 inches including Bonfield, Hoopeston, Ridgeville, Watseka, and Wesley soils

Similar sites

R110XY008IL	**Wet Glacial Drift Upland Prairie** Wet Glacial Drift Upland Prairies have a similar vegetation type, but the parent material is loess or other silty or loamy material, loamy outwash, glacial till, lacustrine deposits, or colluvium that is shallow to a high-water table

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Spartina pectinata* (2) *Thelypteris palustris*

Physiographic features

Wet Sand Prairies occur on outwash plains. They are situated on elevations ranging from approximately 361 to 1020 feet ASL. The site does not experience flooding, but rather allows for groundwater recharge due to low hydraulic gradients

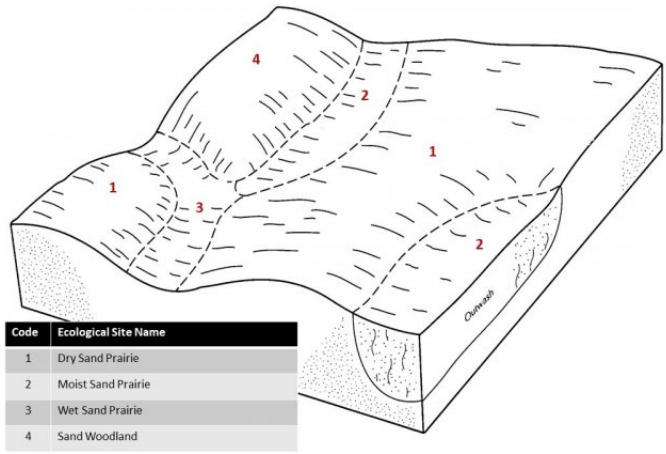


Figure 1. Representative block diagram of Wet Sand Prairie and associated ecological sites.

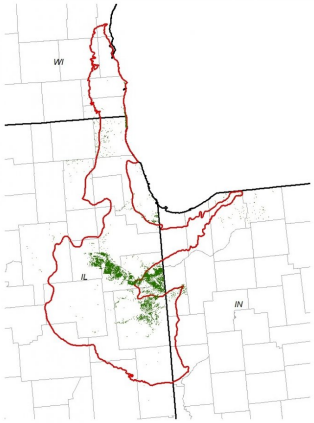


Figure 2.

Table 2. Representative physiographic features

Slope shape across	(1) Linear (2) Concave
Slope shape up-down	(1) Linear (2) Concave
Landforms	(1) Outwash plain
Runoff class	Negligible to low
Ponding duration	Brief (2 to 7 days)
Ponding frequency	None to frequent
Elevation	Not specified
Slope	0–2%
Ponding depth	0–30 cm
Water table depth	0–30 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 178 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 38 inches, which includes rainfall plus the water equivalent from snowfall (Table 3). The average annual low and high temperatures are 40.4 and 59.7°F, respectively.

Table 3. Representative climatic features

Frost-free period (characteristic range)	135-145 days
Freeze-free period (characteristic range)	174-182 days
Precipitation total (characteristic range)	940-991 mm
Frost-free period (actual range)	134-148 days
Freeze-free period (actual range)	173-188 days
Precipitation total (actual range)	940-991 mm
Frost-free period (average)	140 days
Freeze-free period (average)	178 days
Precipitation total (average)	965 mm

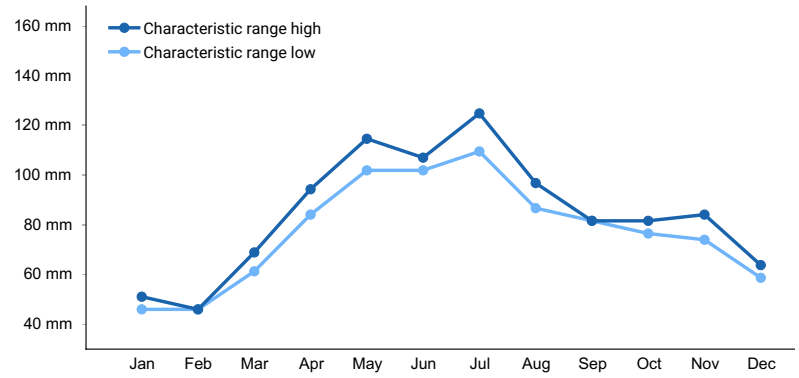


Figure 3. Monthly precipitation range

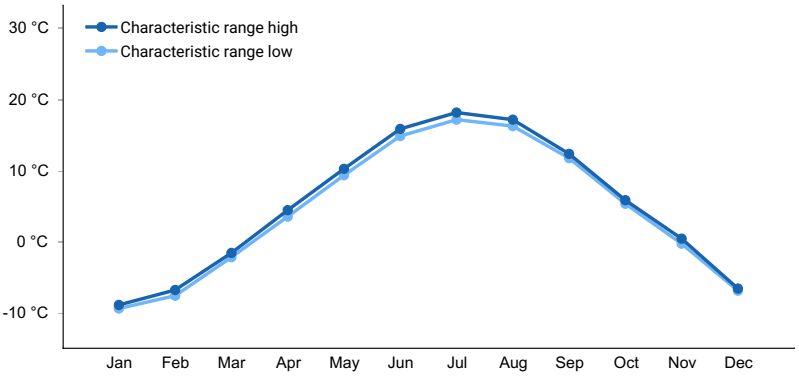


Figure 4. Monthly minimum temperature range

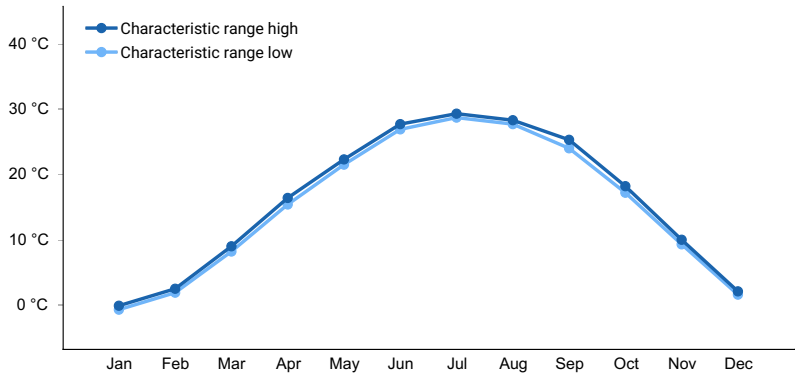


Figure 5. Monthly maximum temperature range

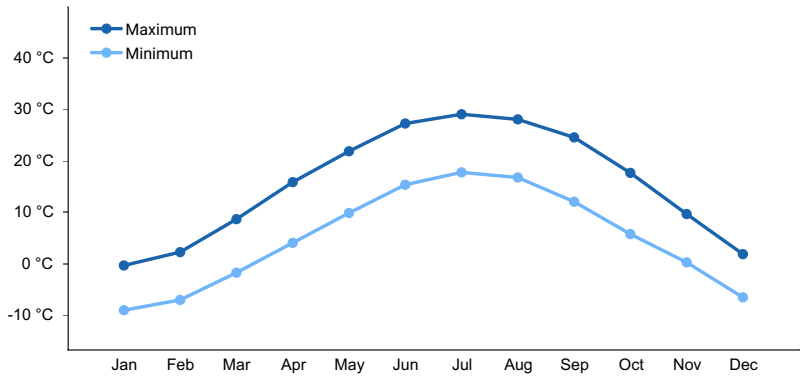


Figure 6. Monthly average minimum and maximum temperature

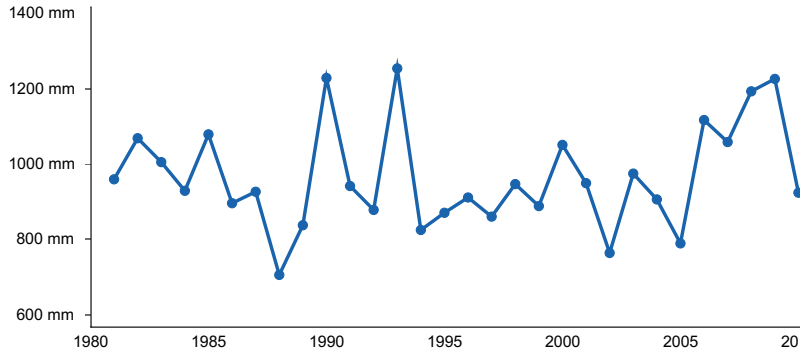


Figure 7. Annual precipitation pattern

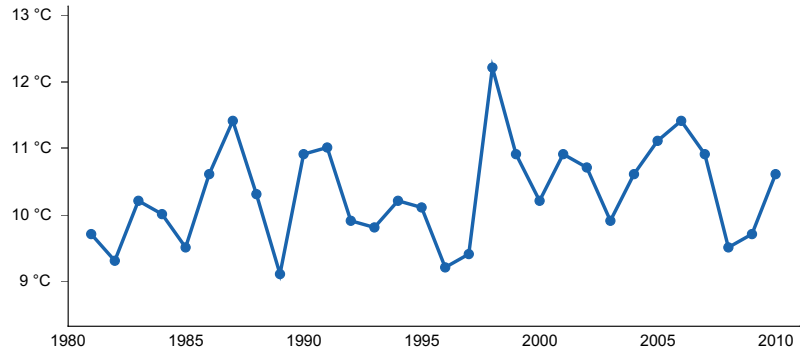


Figure 8. Annual average temperature pattern

Climate stations used

- (1) WATSEKA 2 NW [USC00119021], Watseka, IL
- (2) KANKAKEE WASTEWATER [USC00114603], Kankakee, IL
- (3) MORRIS 1 NW [USC00115825], Morris, IL
- (4) LAKE VILLA 2NE [USC00114837], Antioch, IL

Influencing water features

Wet Sand 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 Sand 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).

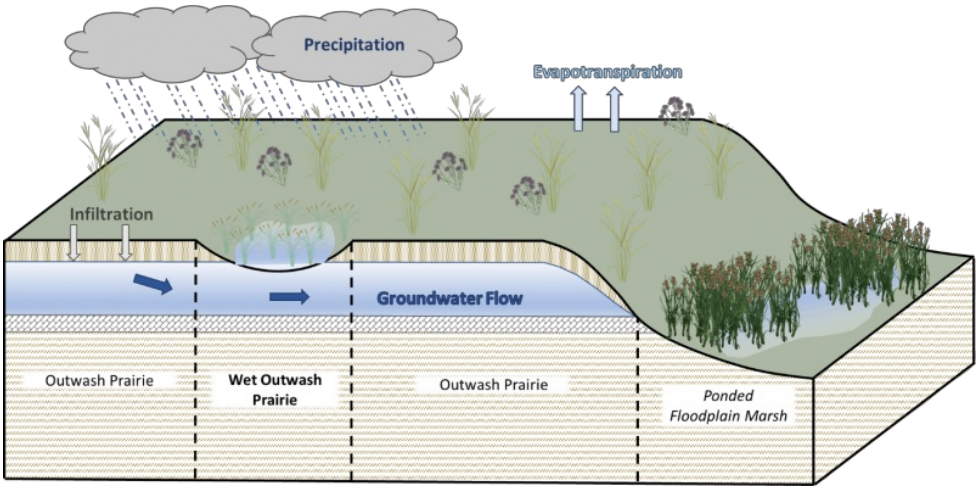


Figure 9. Hydrologic cycling in Wet Sand Prairie ecological site.

Soil features

Soils of Wet Sand Prairies are in the Mollisols and Alfisols orders, further classified as Typic Argiaquolls, Typic Endoaquolls, and Typic Endoaqualfs with very slow infiltration and negligible to low runoff potential. The soil series associated with this site includes Fieldon, Gilford, Granby, Granby variant, Hooppole, and Mussey. The parent material is outwash 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).

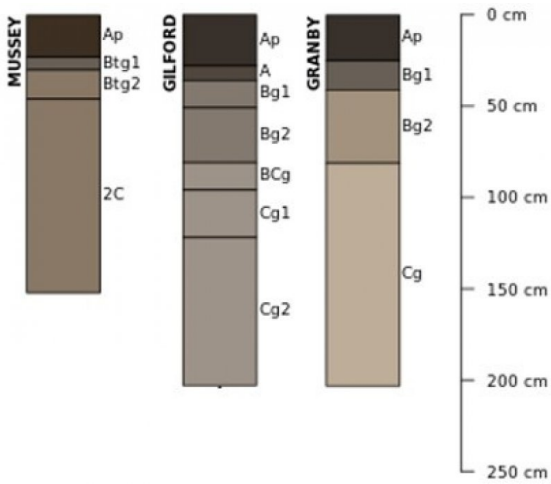


Figure 10. Profile sketches of soil series associated with Wet Sand Prairie.

Table 4. Representative soil features

Parent material	(1) Outwash
Family particle size	(1) Fine-loamy (2) Fine-loamy over sandy or sandy-skeletal (3) Coarse-loamy (4) Sandy
Drainage class	Poorly drained
Permeability class	Moderately slow to moderate
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)	7.62–20.32 cm
Calcium carbonate equivalent (Depth not specified)	0–40%
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)	0–16%
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. Wet Sand Prairies form an aspect of this vegetative continuum. This ecological site occurs on outwash plains on poorly drained soils. Species characteristic of this ecological site consist of hydrophytic herbaceous vegetation.

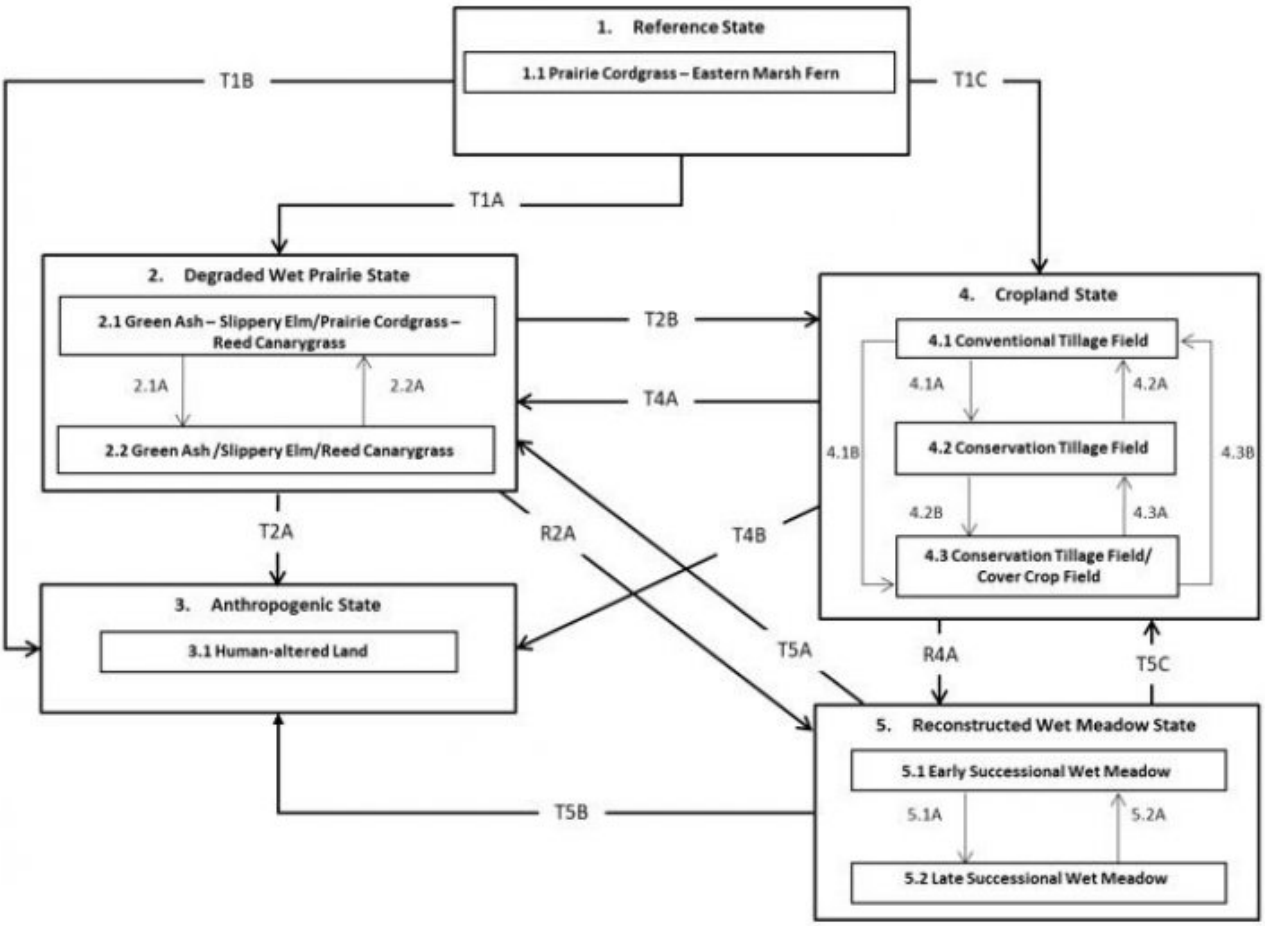
Fire is a critical disturbance factor that maintains Wet Sand Prairies. Fire intensity typically consisted of periodic, low-intensity surface fires occurring every 2 to 5 years (LANDFIRE 2009). Ignition sources included summertime lightning strikes from convective storms and bimodal, human ignitions 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 in conjunction with occasional ponding 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 Sand 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

R110XY015IL Wet Sand Prairie



Code	Process
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 one community phase within the reference state is 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 phase, but do contribute to overall species composition, diversity, cover, and productivity.

Community 1.1
Prairie Cordgrass - Eastern Marsh Fern

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). Prairie cordgrass, bluejoint, and various sedges are the dominant monocots on the site. Characteristic forbs can include eastern marsh fern, common boneset (*Eupatorium perfoliatum* L.), Virginia iris (*Iris virginica* L.), northern bugleweed (*Lycopus uniflorus* Michx.), and hemlock waterparsnip (*Sium suave* Walter) (White and Madany 1978; Bowles and Jones 2004; NatureServe 2018). Replacement fires every 2 to 5 years characterize the fire regime, maintaining this reference plant community (LANDFIRE 2009).

Dominant plant species

- prairie cordgrass (*Spartina pectinata*), grass
- eastern marsh fern (*Thelypteris palustris*), other herbaceous

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 - Slippery Elm/Prairie Cordgrass - 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.), slippery elm (*Ulmus rubra* Muhl.) – 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*), shrub
- slippery elm (*Ulmus rubra*), shrub
- prairie cordgrass (*Spartina pectinata*), grass
- reed canarygrass (*Phalaris arundinacea*), grass

Community 2.2
Green Ash/Slippery Elm/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
- slippery elm (*Ulmus rubra*), shrub
- 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 Limestone 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 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, 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

Installation of drain tiles, 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 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.

Other references

Angel, J. No date. Climate of Illinois Narrative. Illinois State Water Survey, Prairie Research Institute, University of Illinois at Urbana-Champaign. Available at https://www.isws.illinois.edu/statecli/General/Illinois-climate-narrative.htm. Accessed 8 November 2018.

Barrett, S.W. 1980. Indians and fire. Western Wildlands Spring: 17-20.

Bowles, M. and M. Jones. 2004. The prairie-wetland vegetation continuum in the Chicago region of northeastern Illinois. Proceedings of the 19th North American Prairie Conferences 64: 23-35.

Brudvig, L.A., C.M. Mabry, J.R. Miller, and T.A. Walker. 2007. Evaluation of central North American prairie management based on species diversity, life form, and individual species metrics. Conservation Biology 21:864-874.

Changes in Hydric Soils Database Selection Criteria. 77 Federal Register 12234 (29 February 2012), pp. 12234-12235.

Cleland, D.T., J.A. Freeouf, J.E. Keys, G.J. Nowacki, C. Carpenter, and W.H. McNab. 2007. Ecological Subregions: Sections and Subsections of the Coterminous United States. USDA Forest Service, General Technical Report WO-76. Washington, DC. 92 pps.

Federal Geographic Data Committee. 2013. Classification of Wetlands and Deepwater Habitats of the United States. FGDC-STD-004-2013. Second Edition. Wetlands Subcommittee, Federal geographic Data Committee and U.S. Fish and Wildlife Service, Washington, D.C. 90 pps.

Kardol, P. and D.A. Wardle. 2010. How understanding aboveground-belowground linkages can assist restoration ecology. Trends in Ecology and Evolution 25: 670-679.

LANDFIRE. 2009. Biophysical Setting 4914880 Eastern Great Plains Wet Meadow-Marsh-Prairie System. In: LANDFIRE National Vegetation Dynamics Models. USDA Forest Service and US Department of Interior. Washington, DC.

Leake, J., D. Johnson, D. Donnelly, G. Muckle, L. Boddy, and D. Read. 2004. Networks of power and influence: the role of mycorrhizal mycelium in controlling plant communities and agroecosystem functioning. Canadian Journal of Botany 82: 1016-1045.

Martin, L.M. and B.J. Wilsey. 2006. Assessing grassland restoration success: relative roles of seed additions and native ungulate activities. Journal of Applied Ecology 43: 1098-1110.

Martin, L.M. and B.J. Wilsey. 2012. Assembly history alters alpha and beta diversity, exotic-native proportions and functioning of restored prairie plant communities. Journal of Applied Ecology 49: 1436-1445.

NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1 NatureServe, Arlington, VA. Available at http://explorer.natureserve.org. (Accessed 15 January 2020).

Peel, M.C., B.L. Finlayson, and T.A. McMahon. 2007. Updated world map of the Köppen-Geiger climate classification. Hydrology and Earth System Sciences 11: 1633-1644.

Pyne, S.J., P.L. Andrews, and R.D. Laven. 1996. Introduction to Wildland Fire, Second Edition. John Wiley and Sons, Inc. New York, New York. 808 pps.

Schwegman, J.E., G.B. Fell, M. Hutchinson, G. Paulson, W.M. Shepherd, and J. White. 1973. Comprehensive Plan for the Illinois Nature Preserves System, Part 2 The Natural Divisions of Illinois. Illinois Nature Preserves Commission, Rockford, IL. 32 pps.

Smith, R.D., A. Ammann, C. Bartoldus, and M.M. Brinson. 1995. An Approach for Assessing Wetland Functions Using Hydrogeomorphic Classification, Reference Wetlands, and Functional Indices. U.S. Army Corps of Engineers, Waterways Experiment Station, Wetlands Research Program Technical Report WRP-DE-9. 78 pps.

Society for Ecological Restoration [SER]. Science & Policy Working Group. 2002. The SER Primer on Ecological Restoration. Available at: http://www.ser.org/. (Accessed 28 February 2017).

Taft, J.B., G.S. Wilhelm, D.M. Ladd, and L.A. Masters. 1997. Floristic Quality Assessment for vegetation in Illinois, a method for assessing vegetation integrity. Erigenia 15: 3-95.

Taft, J.B., R.C. Anderson, L.R. Iverson, and W.C. Handel. 2009. Chapter 4: Vegetation ecology and change in terrestrial ecosystems. In: C.A. Taylor, J.B. Taft, and C.E. Warwick (eds.). Canaries in the Catbird Seat: The Past, Present, and Future of Biological Resources in a Changing Environment. Illinois Natural Heritage Survey Special Publication 30, Prairie Research Institute, University of Illinois at Urbana-Champaign. 306 pps.

Tomer, M.D., D.W. Meek, and L.A. Kramer. 2005. Agricultural practices influence flow regimes of headwater

streams in western Iowa. Journal of Environmental Quality 34:1547-1558.

U.S. Army Corps of Engineers [USACE]. 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0). U.S. Army Corps of Engineers, Wetlands Regulatory Assistance Program, U.S. Army Engineer Research and Development Center, Vicksburg, MS. 141 pps.

United States Department of Agriculture – Natural Resource Conservation Service (USDA-NRCS). 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. 682 pps.

United States Department of Agriculture – Natural Resource Conservation Service (USDA-NRCS). 2008. Hydrogeomorphic Wetland Classification: An Overview and Modification to Better Meet the Needs of the Natural Resources Conservation Service. Technical Note No. 190-8-76. Washington, D.C. 8 pps.

U.S. Environmental Protection Agency [EPA]. 2013. Level III and Level IV Ecoregions of the Continental United States. Corvallis, OR, U.S. EPA, National Health and Environmental Effects Research Laboratory, map scale 1:3,000,000. Available at http://www.epa.gov/eco-research/level-iii-andiv-ecoregions-continental-united-states. (Accessed 1 March 2017).

White, J. and M.H. Madany. 1978. Classification of natural communities in Illinois. In: J. White. Illinois Natural Areas Inventory Technical Report. Illinois Natural Areas Inventory, Department of Landscape Architecture, University of Illinois at Urbana/Champaign. 426 pps.

Williams, D.A., L.L. Jackson, and D.D. Smith. 2007. Effects of frequent mowing on survival and persistence of forbs seeded into a species-poor grassland. Restoration Ecology 15: 24-33.

Wilsey, B.J. 2008. Productivity and subordinate species response to dominant grass species and seed source during restoration. Restoration Ecology 18: 628-637.

Wisconsin Department of Natural Resources [WDNR]. 2015. The Ecological Landscapes of Wisconsin: An Assessment of Ecological Resources and a Guide to Planning Sustainable Management. Wisconsin Department of Natural Resources, PUB-SS-1131 2015, Madison, WI. 293 pps.

Contributors

Lisa Kluesner
Kristine Ryan
Sarah Smith
Tiffany Justus

Approval

Chris Tecklenburg, 4/22/2020

Acknowledgments

This project could not have been completed without the dedication and commitment from a variety of staff members. Team members supported the project by serving on the technical team, assisting with the development of state and community phases of the state-and-transition model, providing peer review and technical editing, and conducting quality control and quality assurance reviews.

List of primary contributors and reviewers.
Organization Name Title Location
Natural Resources Conservation Service Ron Collman State Soil Scientist Champaign, IL
Tonie Endres Senior Regional Soil Scientist Indianapolis, IN
Tiffany Justus Soil Scientist Aurora, IL
Lisa Kluesner Ecological Site Specialist Waverly, IA
Rick Neilson State Soil Scientist Indianapolis, IN

Jason Nemecek State Soil Scientist Madison, WI
Kevin Norwood Soil Survey Regional Director Indianapolis, IN
Kristine Ryan MLRA Soil Survey Leader Aurora, IL
Stanley Sipp Resource Inventory Specialist Champaign, IL
Sarah Smith Soil Scientist Aurora, IL
Chris Tecklenberg Acting Regional Ecological Site Specialist Hutchinson, KS

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	05/19/2024
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:**