Ecological site R110XY029IL
Wet Floodplain Sedge Meadow

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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: North-Central Interior Wet Meadow-Shrub Swamp (CES202.701) (NatureServe 2018)

National Vegetation Classification – Plant Associations: Carex stricta – Carex spp. Wet Meadow (CEGL002258) (Nature Serve 2018)

Biophysical Settings: Eastern Great Plains Wet Meadow-Marsh-Prairie System (4214880) (LANDFIRE 2009)

Illinois Natural Areas Inventory: Sedge meadow (White and Madany 1978)

Wisconsin Natural Communities: Sedge meadow (WDNR 2015)

Ecological site concept

Wet Floodplain Sedge Meadows are located within the green areas on the map. They occur on river valleys in floodplains. The soils are Mollisols that are very poorly to poorly drained and very deep, formed in alluvium.

The historic pre-European settlement vegetation on this ecological site was dominated by hydrophytic herbaceous vegetation. Upright sedge (Carex stricta Lam.) and bluejoint (Calamagrostis canadensis L.) are the dominant species on the site. Other monocots that may occur include water sedge (Carex aquatilis Wahlenb.), woolly sedge (Carex pellita Muhl. ex Willd.), and hairy sedge (Carex lacustris Willd.). Species typical of an undisturbed plant community associated with this ecological site may include Bebb's sedge (Carex bebbii Olney ex Fernald) and bog willowherb (Epilobium leptophyllum Raf.) (Taft et al. 1997). Flooding and periodic fire are the primary disturbance factors that maintain this site, while drought is a secondary factor (LANDFIRE 2009; NatureServe 2018).

Associated sites

F110XY028IL	**Silty-Loamy Floodplain Forest** Somewhat poorly to well drained alluvium including Allison, Dorchester, Du Page, Lawson, Lawson variant, Ross, and Tice soils
R110XY008IL	**Wet Glacial Drift Upland Prairie** Loess or other silty or loamy material, loamy outwash, glacial till, lacustrine deposits, or colluvium that is shallow to a high-water table including Ashkum, Bryce, Drummer, Dunham, Elpaso, Matherton, Milford, Monee, Montgomery, Pella, Reddick, Rowe, Selma, Selmass, Westland, and Will soils

Similar sites

R110XY024IL	**Ponded Depressional Sedge Meadow** Ponded Depressional Sedge Meadows have a similar vegetation type but occur on uplands and are not subject to flooding

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Carex stricta* (2) *Calamagrostis canadensis*

Physiographic features

Wet Floodplain Sedge Meadows occur on river valleys on floodplains. They are situated on elevations ranging from approximately 341 to 1299 feet ASL. The site experiences rare to frequent flooding that can last up to seven days at a time.

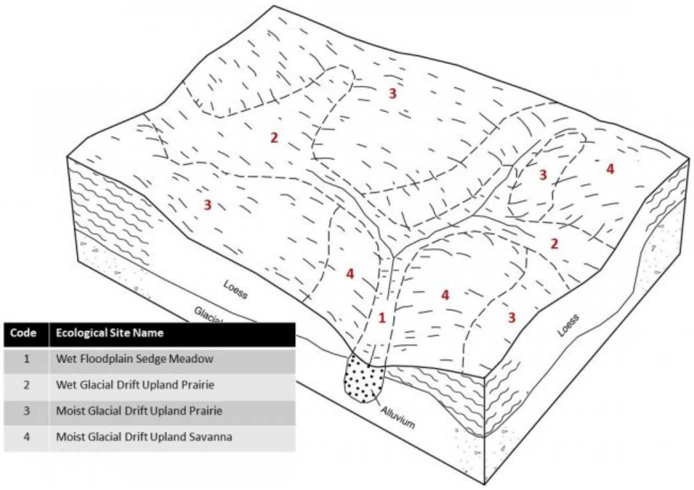


Figure 1. Representative block diagram of Wet Floodplain Sedge Meadow and associated ecological sites.

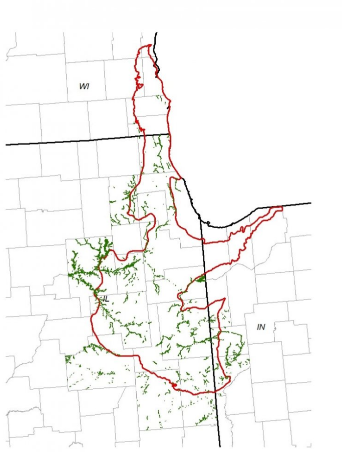


Figure 2.

Table 2. Representative physiographic features

Slope shape across	(1) Linear
Slope shape up-down	(1) Linear
Landforms	(1) River valley > Flood plain
Runoff class	Negligible to high
Flooding duration	Brief (2 to 7 days) to long (7 to 30 days)
Flooding frequency	Rare to frequent
Slope	0–2%
Water table depth	0–15 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 169 days, while the frost-free period is about 142 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 40.3 and 59.9°F, respectively.

Table 3. Representative climatic features

Frost-free period (characteristic range)	134-150 days
Freeze-free period (characteristic range)	155-179 days
Precipitation total (characteristic range)	914-965 mm
Frost-free period (actual range)	131-152 days
Freeze-free period (actual range)	154-182 days
Precipitation total (actual range)	889-991 mm
Frost-free period (average)	142 days
Freeze-free period (average)	169 days
Precipitation total (average)	940 mm

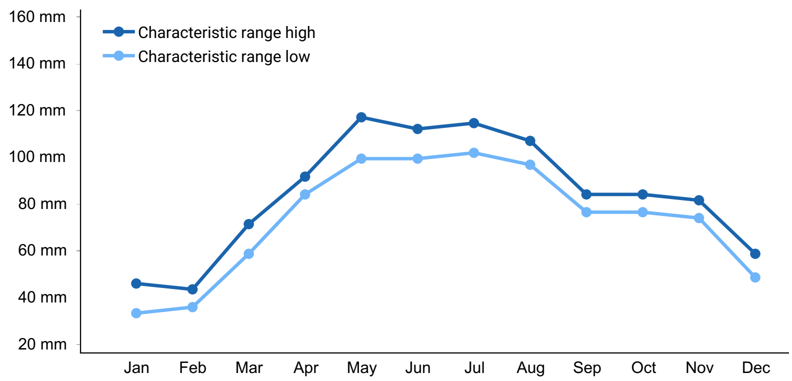


Figure 3. Monthly precipitation range

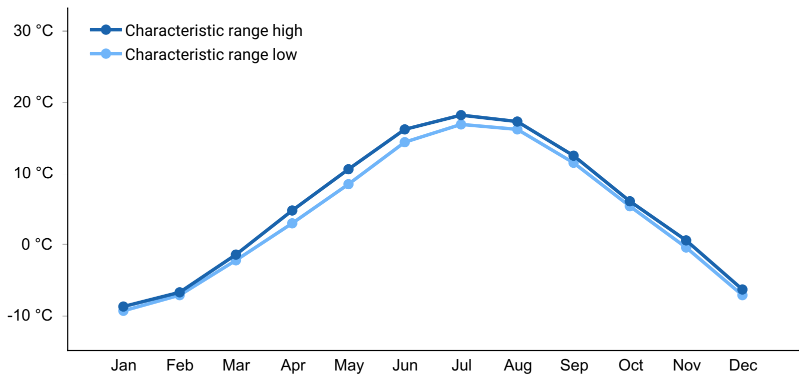


Figure 4. Monthly minimum temperature range

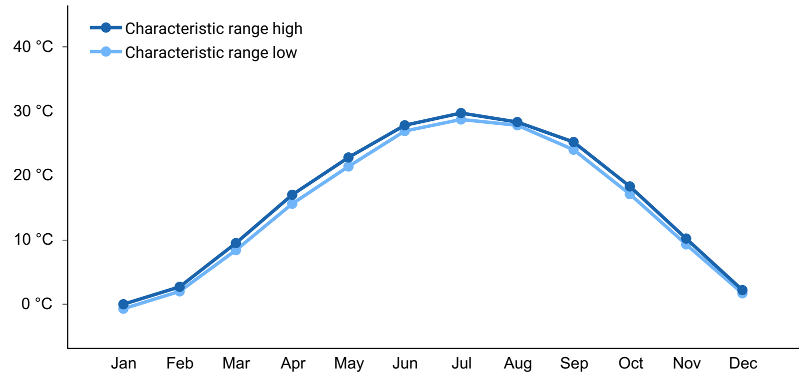


Figure 5. Monthly maximum temperature range

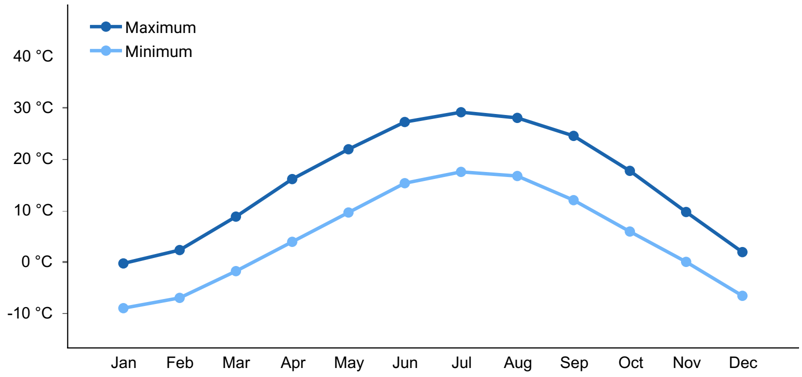


Figure 6. Monthly average minimum and maximum temperature

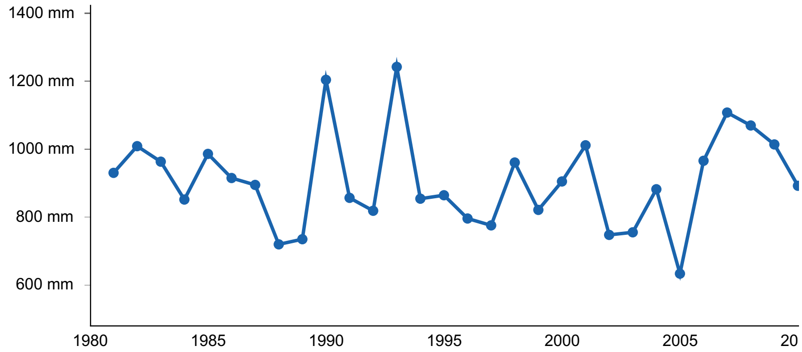


Figure 7. Annual precipitation pattern

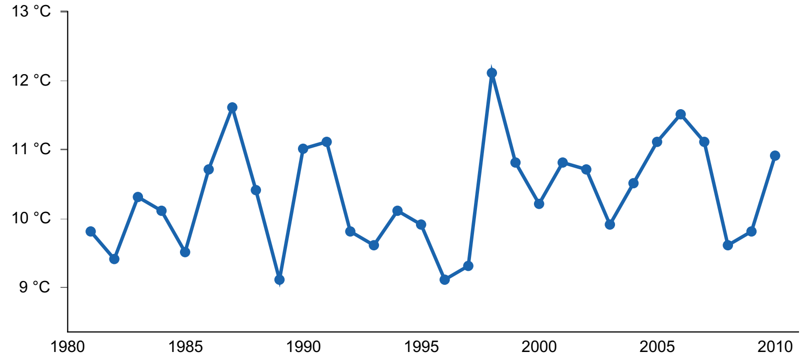


Figure 8. Annual average temperature pattern

Climate stations used

- (1) HOOPESTON 1NE [USC00114198], Hoopeston, IL
- (2) PONTIAC [USC00116910], Pontiac, IL
- (3) MORRIS 1 NW [USC00115825], Morris, IL

- (4) WEST CHICAGO DUPAGE AP [USW00094892], Saint Charles, IL
- (5) KENOSHA RGNL AP [USW00004845], Kenosha, WI

Influencing water features

Wet Floodplain Sedge Meadows are classified as a RIVERINE: bottomland, flooded, herbaceous wetland under the Hydrogeomorphic (HGM) classification system (Smith et al. 1995; USDA-NRCS 2008) and as a Palustrine, Persistent Emergent, Seasonally Flooded Wetland under the National Wetlands Inventory (FGDC 2013). Overbank flow from the stream and subsurface hydraulic connections are the main sources of water for this ecological site, but additional sources can include overland flow from adjacent uplands and precipitation (Smith et al. 1995). Infiltration is very slow (Hydrologic Group D) for undrained soils, and surface runoff is low to high.

Wetland description

Primary wetland hydrology indicators for an intact Wet Floodplain Sedge Meadow may include: A1 Surface water, A2 High water table, A3 Saturation, and B10 Drainage patterns. Secondary wetland hydrology indicators may include: C2: Dry-season water table, D5 FAC-neutral test (USACE 2010).

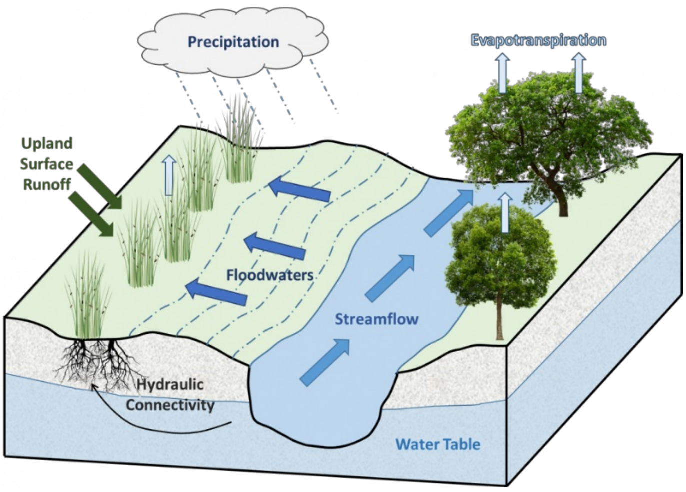


Figure 9. Hydrologic cycling in Wet Floodplain Sedge Meadow ecological site.

Soil features

Soils of Wet Floodplain Sedge Meadows are in the Mollisols order, further classified as Cumulic Endoaquolls, Cumulic Vertic Endoaquolls, Fluvaquentic Endoaquolls, and Vertic Endoaquolls with very slow infiltration and negligible to high runoff potential. The soil series associated with this site includes Ambraw, Comfrey, Millington, Sawmill, Sawmill variant, Titus and Zook The parent material is alluvium, and the soils are very poorly to 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).

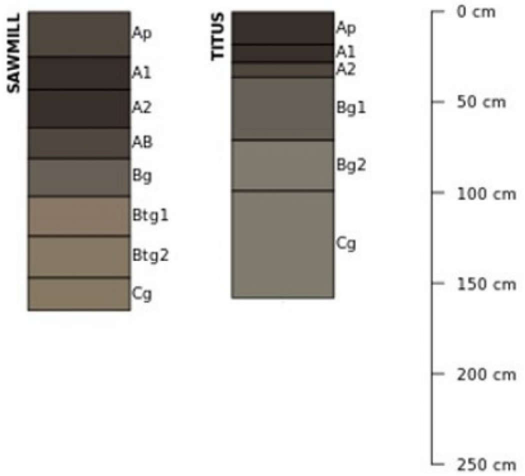


Figure 10. Profile sketches of soil series associated with Wet Floodplain Sedge Meadow.

Table 4. Representative soil features

Parent material	(1) Alluvium
Family particle size	(1) Fine (2) Fine-silty (3) Fine-loamy
Drainage class	Very poorly drained to poorly drained
Permeability class	Very slow to 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)	15.24–22.86 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)	1–14%
Subsurface fragment volume >3" (Depth not specified)	1–3%

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

Floodplain Sedge Meadows form an aspect of this vegetative continuum. This ecological site occurs on floodplains on very poorly and poorly drained soils. Species characteristic of this ecological site consist of hydrophytic herbaceous vegetation.

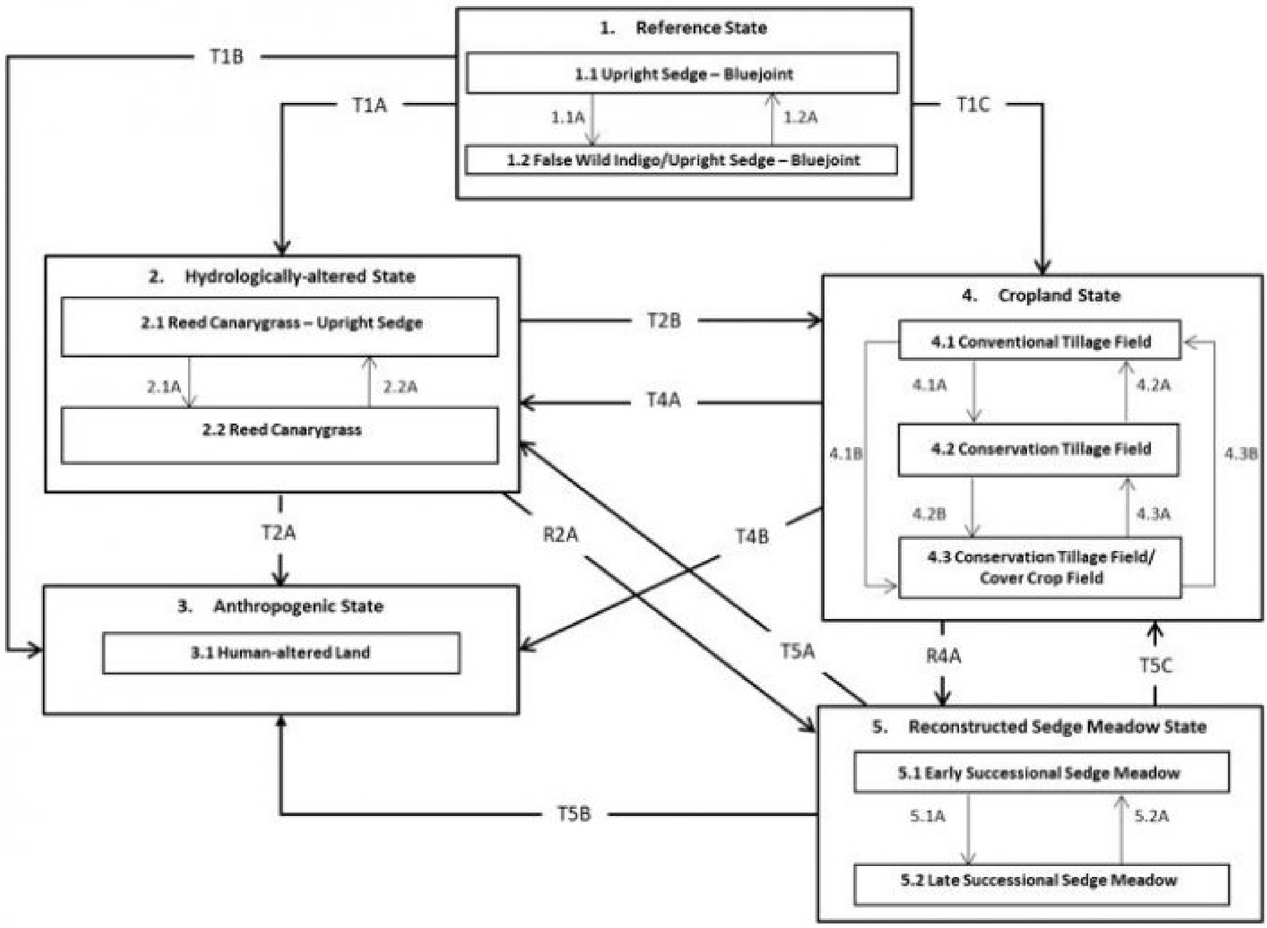
Flooding and fire are the most important ecosystem drivers for maintaining this ecological site. The frequency and duration of flooding affect species composition, cover, and vegetative production due to alternating aerobic and anaerobic surface substrate conditions. Replacement fires likely occurred on a regular rotation interval and helped to reduce the accumulation of peat. The combination of fire and saturated soil conditions prevented the establishment of shrubs for any significant amount of time.

Drought has also played a role in shaping this ecological site. The periodic episodes of reduced soil moisture in conjunction with the very poorly to poorly-drained soils have favored the proliferation of plant species tolerant of such conditions. Drought can slow the growth of plants and result in dieback of certain species. When coupled with fire, periods of drought can eliminate or greatly reduce the occurrence of woody vegetation, substantially altering the extent of shrubs and trees (Pyne et al. 1996).

Today, Wet Floodplain Sedge Meadows have been greatly reduced as the land has mostly been converted to agricultural production with corn (*Zea mays* L.) and soybeans (*Glycine max* (L.) Merr.) being the dominant crops. Some areas may have been converted to other human-modified landscapes. A return to the historic plant community is likely not possible due to significant hydrologic and water quality changes in the watershed, but long-term conservation agriculture or habitat reconstruction efforts can help to restore some natural diversity and ecological functioning. 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

R110XY029IL WET FLOODPLAIN SEDGE MEADOW



Code	Process
1.1A	Extended fire return interval
1.2A	Hot, replacement fire
T1A, T4A, T5A	Changes to natural hydroperiod and/or land abandonment
2.1A	Increasing changes to hydrology and increasing sedimentation
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 sedge meadow community, dominated by hydrophytic, herbaceous vegetation. The two community phases within the reference state are dependent on flooding and periodic fire. The frequency and duration of flooding alter species composition, cover, and extent, while periodic fires prevent 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

Upright Sedge - Bluejoint

Sites in this reference community phase are dominated by hydrophytic herbaceous vegetation. Vegetative cover is generally continuous and dense with plants reaching heights between 1.5 and 5 feet tall (NatureServe 2015). Upright sedge and bluejoint are dominant species, but other monocots are present and can include water sedge, hairy sedge, and woolly sedge. Common forbs include swamp milkweed (*Asclepias incarnata* L.), American water horehound (*Lycopus americanus* Muhl. ex W.P.C. Barton), and Canada goldenrod (*Solidago canadensis* L.) (NatureServe 2018). Seasonal flooding maintains the wetland plant community, while periodic fires maintain the herbaceous dominance. However, an extended fire return interval allows some wetland shrubs to establish shifting the community to phase 1.2.

Dominant plant species

- bluejoint (*Calamagrostis canadensis*), grass
- upright sedge (*Carex stricta*), other herbaceous

Community 1.2
False Indigo Bush/Upright Sedge - Bluejoint

This reference community phase represents natural succession as a result of an extended fire return interval. Shrubs, such as false indigo bush (*Amorpha fruticosa* L.) and white meadowsweet (*Spiraea alba* Du Roi), can form a scattered canopy across the sedge meadow. The prolonged absence of fire will maintain this state, but a replacement fire will shift the community back to phase 1.1.

Dominant plant species

- false indigo bush (*Amorpha fruticosa*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- upright sedge (*Carex stricta*), other herbaceous

Pathway 1.1A
Community 1.1 to 1.2

Extended fire return interval.

Pathway 1.2A
Community 1.2 to 1.1

Replacement fire.

State 2
Hydrologically-Altered State

Hydrology is the most important determinant of wetlands and wetland processes. Hydrology modifies and determines the physiochemical environment (i.e., sediments, soil chemistry, water chemistry) which in turn directly affects the vegetation, animals, and microbes (Mitsch and Gosselink 2007). Human activities on landscape hydrology have greatly altered Wet Floodplain Sedge Meadows. Alterations such as agricultural tile draining and conversion to cropland on adjacent lands have changed the natural hydroperiod, increased the rate of sedimentation, and intensified nutrient pollution (Werner and Zedler 2003; Mitsch and Gosselink 2007).

Community 2.1
Reed Canarygrass - Upright Sedge

This community phase represents the early changes to the natural wetland hydroperiod, sedimentation, and nutrient runoff. Sedimentation results in a reduction of soil organic matter and high dry bulk density. It also leads to a homogenization of the local microtopography, reducing the surface area and associated species diversity (Green and Galatowitsch 2002; Werner and Zedler 2002). Native sedges continue to form a component of the herbaceous layer, but the highly invasive reed canarygrass (*Phalaris arundinacea* L.) co-dominates.

Dominant plant species

- reed canarygrass (*Phalaris arundinacea*), grass
- upright sedge (*Carex stricta*), other herbaceous

Community 2.2
Reed Canarygrass

Sites falling into this community phase have experienced significant sedimentation and are dominated by a monoculture of reed canarygrass (NatureServe 2015). Reed canarygrass stands can significantly alter the physiochemical environment as well as the biotic communities, making the site only suitable to reed canarygrass. These monotypic stands create a positive feedback loop that perpetuates increasing sedimentation, altered hydrology, and dominance by this non-native species, especially in sites affected by nutrient enrichment from agricultural runoff (Vitousek 1995; Bernard and Lauve 1995; Green and Galatowitsch 2002; Werner and Zedler 2002; Kercher et al. 2007; Waggy 2010).

Dominant plant species

- reed canarygrass (*Phalaris arundinacea*), grass

Pathway 2.1A
Community 2.1 to 2.2

Continuing alterations to the natural hydrology and increasing sedimentation.

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 Sedge Meadow State

Sedge meadow habitats provide multiple ecosystem services including flood abatement, water quality improvement, and biodiversity support. However, many sedge 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 Floodplain Sedge Meadows 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 Sedge Meadow

This community phase represents the early community assembly from sedge meadow reconstruction and is highly dependent on seed viability, hydroperiod, soil organic matter content, and site preparation. Successful establishment of sedges can be maximized by using seed collected during the same growing season, 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 (Budelsky and Galatowitsch 1999; van der Valk et al. 1999; Mitsch and Gosselink 2007; Hall and Zedler 2010). In addition, suppression and removal of non-native species is essential for reducing competition (Perry and Galatowitsch 2003).

Community 5.2
Late Successional Sedge 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

Direct and indirect alterations to the landscape hydrology from human-induced land development transition the site to the hydrologically-altered 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 the site to the cropland state (4).

Restoration pathway R2A
State 2 to 5

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

Transition T4A
State 4 to 2

Land abandonment transitions the site to the hydrologically-altered 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, tree planting, invasive species control, and seeding native species transition this site to the reconstructed sedge meadow state (5).

Transition T5A
State 5 to 2

Fire suppression and removal of active management transitions this site to the hydrologically-altered 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	05/18/2024
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):**

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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:**
