USDA Natural Resources Conservation Service

# Ecological site R110XY020IL
# Ponded Organic Acidic Peatland

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Accessed: 05/04/2024

## 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: Laurentian-Acadian Alkaline Conifer-Hardwood Swamp (CES201.575) (NatureServe 2018)

National Vegetation Classification – Plant Associations: Larix laricina – Thuja occidentalis Swamp Forest (CEGL002455) (Nature Serve 2018)

Biophysical Settings: Laurentian-Acadian Swamp Systems (BpS 6314810) (LANDFIRE 2009)

Illinois Natural Areas Inventory: Graminoid bog, Low shrub bog, Forested bog (White and Madany 1978)

Wisconsin Natural Communities: Southern tamarack swamp, Poor fen (WDNR 2015)

## Ecological site concept

Ponded Organic Acidic Peatlands are located within the green areas on the map. They occur on depressions of lake plains or outwash plains. The soils are Histosols that are very poorly drained and very deep, formed in organic material.

The historic pre-European settlement vegetation on this ecological site was dominated by hydrophytic woody and herbaceous species and mosses. Tamarack (Larix laricina (Du Roi) K. Koch) is the canopy dominant with several common canopy associates including red maple (Acer rubrum L.), black ash (Fraxinus nigra Marshall), green ash (Fraxinus pennsylvanica Marshall), and paper birch (Betula papyrifera Marshall). Shrubs can be well developed and dense with species such as, bog birch (Betula pumila L.), cranberry (Vaccinium macrocarpon Aiton), poison sumac (Toxocodendron vernix (L.) Kuntze) and redosier dogwood (Cornus sericea L. ssp. sericea). Sphagnum (Sphagnum L.) mosses can form a dense understory layer that support a unique community of acidophilic species (White and Madany 1978; WDNR 2015). Common winterberry (Ilex verticillate (L.) A. Gray) is a highly conservative species of the site that is indicative of an undisturbed plant community (White and Madany 1978; Taft et al. 1997). Water level fluctuations are the primary disturbance factor that maintain the site, while drought, occasional fire, and windthrow are secondary disturbances (LANDFIRE 2009; WDNR 2015).

## Associated sites

| | |
|---|---|
| R110XY008IL | **Wet Glacial Drift Upland Prairie**<br>Loess or other silty or loamy material, loamy outwash, glacial till, lacustrine deposits, and colluvium that are 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

| | |
|---|---|
| R110XY021IL | **Ponded Organic Alkaline Peatland**<br>Ponded Organic Alkaline Peatland is a SLOPE wetland |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | (1) *Larix laricina*<br>(2) *Acer rubrum* |
| Shrub | (1) *Betula pumila*<br>(2) *Vaccinium macrocarpon* |
| Herbaceous | (1) *Sphagnum* |

## Physiographic features

Ponded Organic Acidic Peatlands occur on depressions of lake plains or outwash plains. They are situated on elevations ranging from approximately 512 to 1401 feet ASL. The site does not experience flooding, but rather is continuously saturated to ponded from groundwater seepage

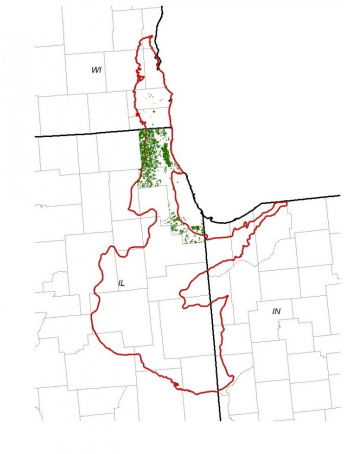



**Figure 1.**

**Table 2. Representative physiographic features**

| | |
|---|---|
| Slope shape across | (1) Concave |
| Slope shape up-down | (1) Concave |
| Landforms | (1) Lake plain<br>(2) Outwash plain |
| Runoff class | Negligible |
| Ponding duration | Brief (2 to 7 days) to very long (more than 30 days) |
| Ponding frequency | Frequent |
| Elevation | 156–427 m |
| Slope | 0–2% |
| Ponding depth | 0–30 cm |
| 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 168 days, while the frost-free period is about 134 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 38.0 and 58.5°F, respectively.

**Table 3. Representative climatic features**

| | |
|---|---|
| Frost-free period (characteristic range) | 129-140 days |
| Freeze-free period (characteristic range) | 153-182 days |
| Precipitation total (characteristic range) | 914-991 mm |
| Frost-free period (actual range) | 125-142 days |
| Freeze-free period (actual range) | 152-184 days |
| Precipitation total (actual range) | 889-1,041 mm |
| Frost-free period (average) | 134 days |
| Freeze-free period (average) | 168 days |
| Precipitation total (average) | 965 mm |

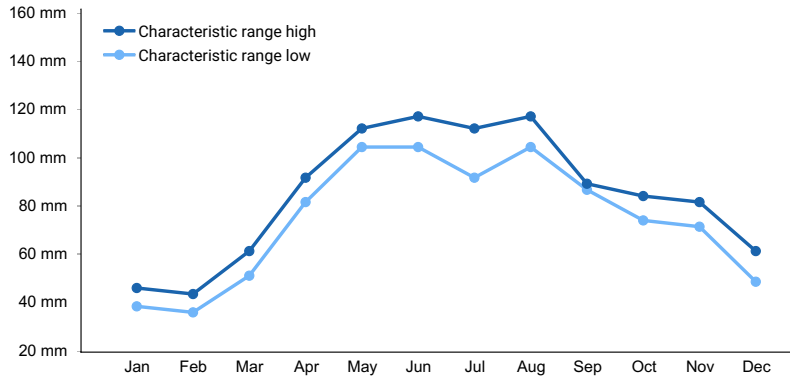



**Figure 2. Monthly precipitation range**

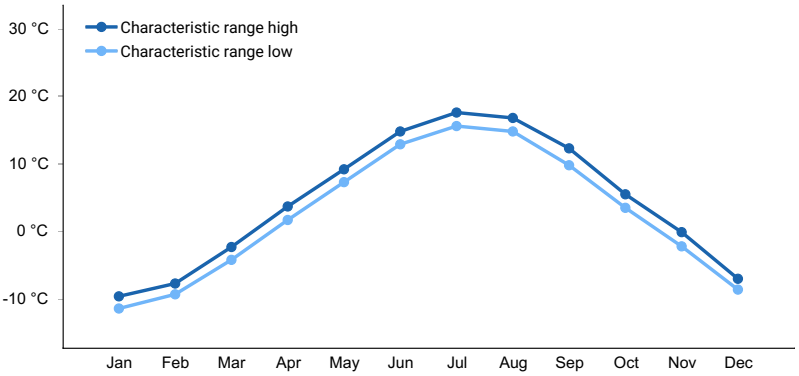



**Figure 3. Monthly minimum temperature range**

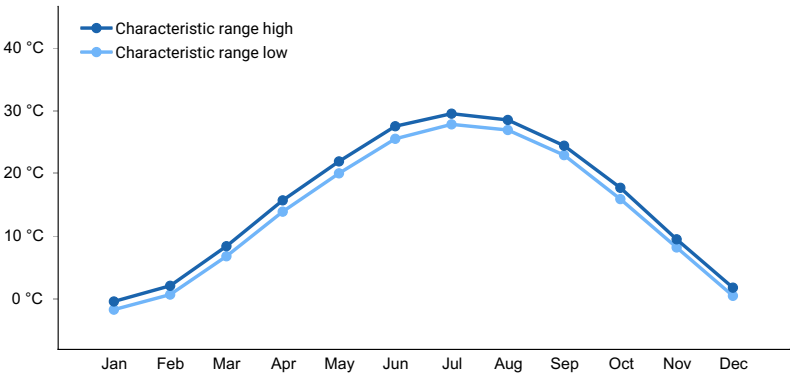



**Figure 4. Monthly maximum temperature range**

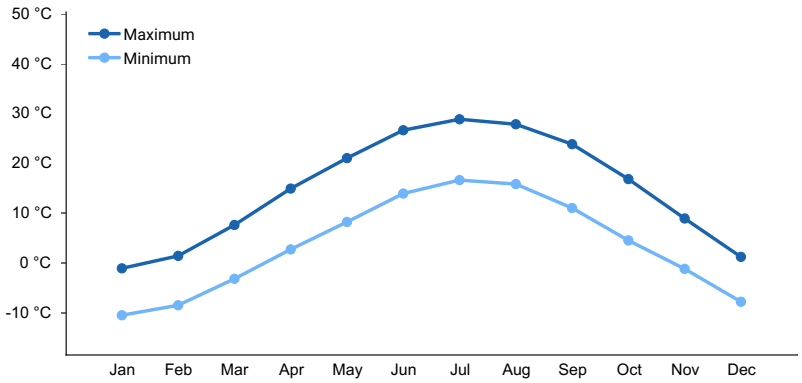



**Figure 5. Monthly average minimum and maximum temperature**

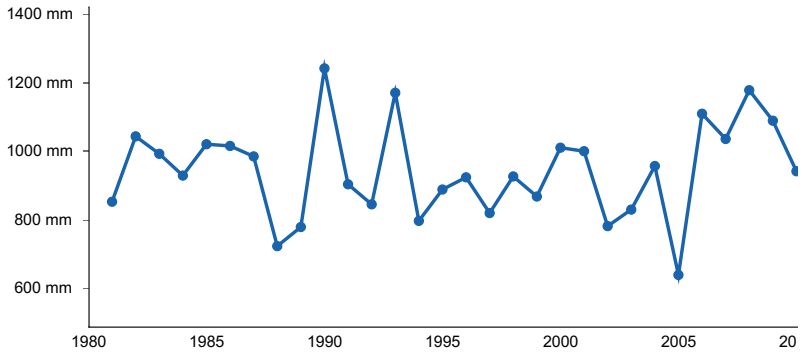



**Figure 6. Annual precipitation pattern**

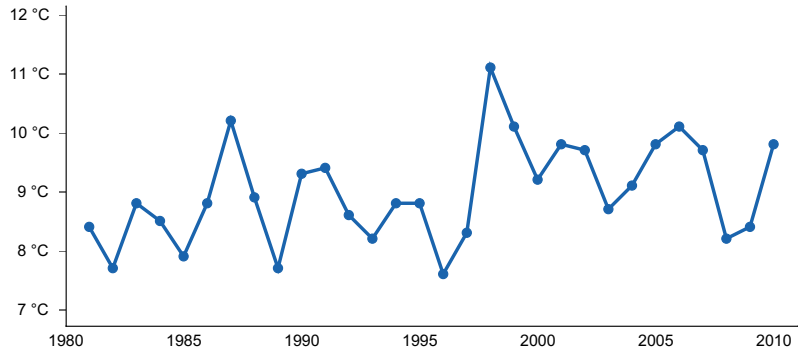



**Figure 7. Annual average temperature pattern**

## Climate stations used

- (1) PARK FOREST [USC00116616], Chicago Heights, IL
- (2) STREAMWOOD [USC00118324], Streamwood, IL
- (3) ANTIOCH [USC00110203], Antioch, IL
- (4) UNION GROVE [USC00478723], Union Grove, WI

## Influencing water features

Ponded Organic Acidic Peatlands are classified as an ORGANIC SOIL FLATS: depressional, groundwater influenced, discharge wetland under the Hydrogeomorphic (HGM) classification system (Smith et al. 1995; USDA-NRCS 2008) and as a Palustrine, Moss/Scrub-Shrub/Forested, Continuously Saturated wetland under the National Wetlands Inventory (FGDC 2013). Groundwater discharge is the main source of water for this ecological site (Smith et al. 1995). Infiltration is very slow (Hydrologic Group D) for undrained soils, and surface runoff is negligible.

## Wetland description

Primary wetland hydrology indicators for an intact Ponded Organic Acidic Peatland 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).

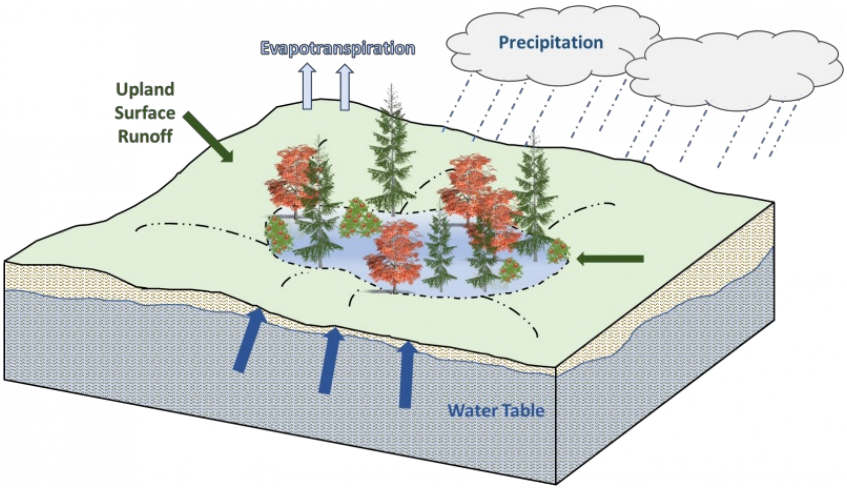



**Figure 8. Hydrologic cycling in Ponded Organic Acidic Peatland ecological site.**

## Soil features

Soils of Ponded Organic Acidic Peatlands are in the Histosols orders, further classified as Limnic Haplosaprists and Typic Haplosaprists with very slow infiltration and impermeable to slow runoff potential. The soil series associated with this site includes Houghton and Muskego. The parent material is organic material, and the soils are very 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 1 of the hydric soils list (77 FR 12234).

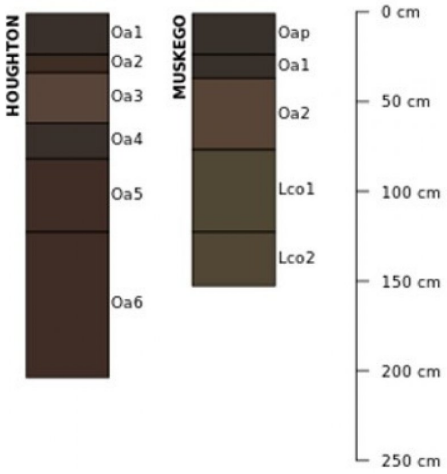



**Figure 9. Profile sketches of soil series associated with Ponded Organic Acidic Peatland.**

**Table 4. Representative soil features**

| | |
|---|---|
| Parent material | (1) Organic material |
| Drainage class | Very poorly drained |
| Permeability class | 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) | 33.02–40.64 cm |
| Calcium carbonate equivalent (Depth not specified) | 0–60% |
| Electrical conductivity (Depth not specified) | 0 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) | 1–2% |
| Subsurface fragment volume >3" (Depth not specified) | 0% |

## 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.

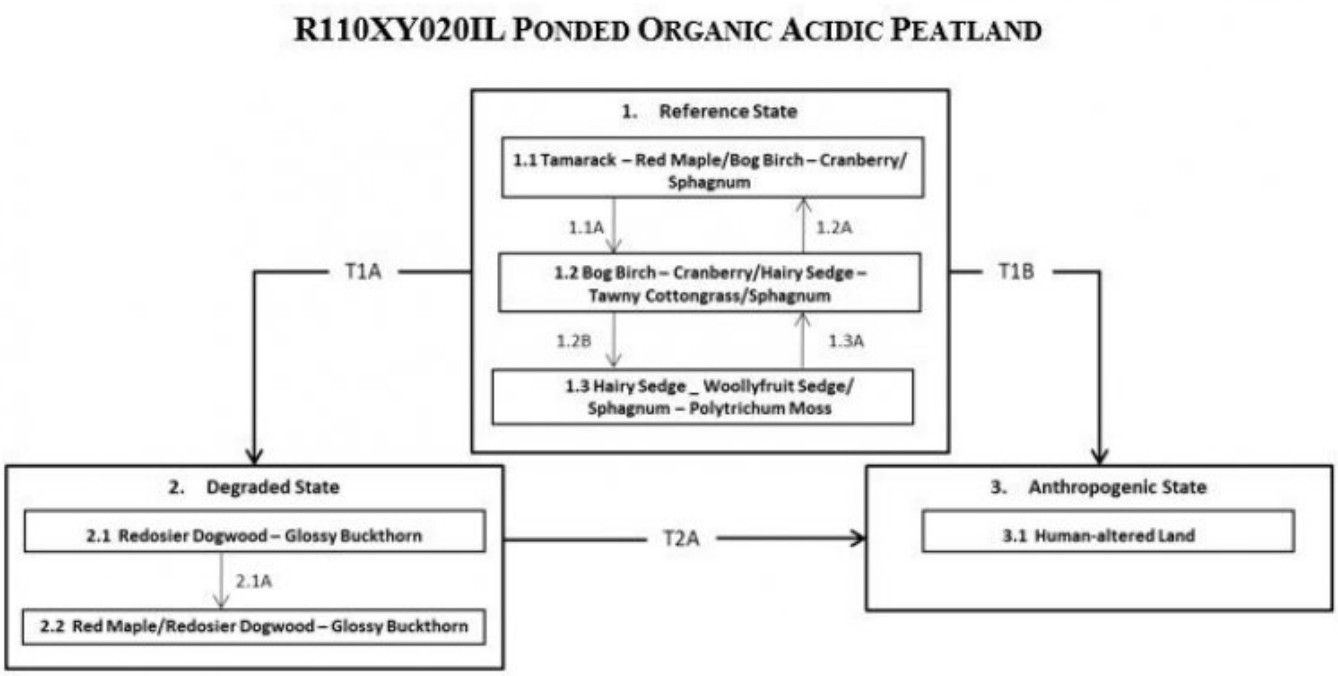
The MLRA lies within the tallgrass prairie ecosystem of the Midwest, but a variety of environmental and edaphic factors resulted in landscape that historically supported prairies, savannas, forests, and various wetlands. Ponded Organic Acidic Peatlands form an aspect of this vegetative continuum. This ecological site occurs on depressions of lake plains and outwash plains on very poorly drained, acidic organic soils. Species characteristic of this ecological site consist of hydrophytic woody and herbaceous vegetation and mosses.

Ponded Organic Acidic Peatlands are dependent on consistent groundwater discharge. Water levels naturally fluctuate across spatiotemporal scales, giving rise to various successional phases (LANDFIRE 2009; WDNR 2015). Early successional phases begin as moss-dominated floating bogs. As herbaceous material accumulates, the community shifts to a low bog. The advancing development in the microtopography – acidic hummocks and small, wet depressions – gives rise to the late successional forested bog phase (White and Madany 1978).

Drought, fire, and windthrow have also played a role in shaping this ecological site. The periodic episodes of reduced soil moisture in conjunction with the very poorly-drained soils have favored the proliferation of plant species tolerant of such conditions. Drought can also slow the growth of plants and result in dieback of certain species. Occasional fires reduced plant litter and aided in preventing declines in species richness. Windthrow, coupled with drought and fire would greatly reduce the tree canopy (LANDFIRE 2009; WDNR 2015).

Today, Ponded Organic Acidic Peatlands have been greatly reduced in abundance and diversity. In the early 20th century, sites were cleared, drained, and converted to muck farms. The resulting changes to the soils left them prone to wind erosion and oxidation, making them unsuitable for agriculture. Sites that have not been directly altered show evidence of indirect anthropogenic influences from hydrologic alterations, sedimentation, pollution and invasive species. Restoration of these sites back to the historic conditions may be improbable (WDNR 2015). The state-and-transition model that follows provides a detailed description of each state, community phase, pathway, and transition. This model is based on available experimental research, field observations, literature reviews, professional consensus, and interpretations.

## State and transition model




| Code | Process |
|---|---|
| 1.1A | Large disturbance event that reduces or removes the tree canopy |
| 1.2A, 1.3A | Natural succession |
| 1.2B | Disturbance event that sets back the successional status |
| T1A | Changes to hydrology, long-term fire suppression, pollution, invasive species |
| 2.1A | Continued lack of disturbance events |
| T1B, T2A | Vegetation removal and human alterations/transportation of soils |

## State 1
## Reference State

The reference plant community is categorized as a bog community, dominated by hydrophytic woody and herbaceous vegetation and mosses. The three community phases within the reference state are dependent on consistent groundwater discharge. The fluctuations in discharge alter species composition, cover, and extent. Drought, occasional fires, and windthrow have more localized impacts in the reference phases, but do contribute to overall species composition, diversity, cover, and productivity.

## Community 1.1
## Tamarack - Red Maple/Bog Birch - Cranberry/Sphagnum

Sites in this reference community phase are dominated by hydrophytic woody vegetation and mosses. Tamarack is the dominant tree species with a patchy to high canopy of even-aged plants. Red maple, black ash, green ash, and paper birch are common canopy associates. A variety of shrubs can be present among the canopy gaps including bog birch, cranberry, redosier dogwood, and poison sumac. The herbaceous layer may be limited, but, if present, may include mostly sedges, such as hairy sedge (*Carex lacustris* Willd.) and woollyfruit sedge (*Carex lasiocarpa* Ehrh.) (White and Madany 1978; WDNR 2015).

### Dominant plant species

- tamarack (*Larix laricina*), tree
- red maple (*Acer rubrum*), tree
- bog birch (*Betula pumila*), shrub
- cranberry (*Vaccinium macrocarpon*), shrub
- sphagnum (*Sphagnum*), other herbaceous

### Community 1.2
### Bog Birch - Cranberry/Hairy Sedge - Tawny Cottongrass/Sphagnum

This reference community phase represents a mid-seral low to tall shrub bog community. A variety of shrubs are present, and the herbaceous and moss strata are well-developed. Sedges, along with fringed brome (*Bromus ciliatus* L.), bluejoint (*Calamagrostis canadensis* L.), and fowl mannagrass (*Glyceria striata* (Lam.) Hitchc.) are characteristic graminoids. Forbs can include tawny cottongrass (*Eriophorum virginicum* L.), yellow marsh marigold (*Caltha palustris* L.), skunk cabbage (*Symplocarpus foetidus* (L.) Salisb. Ex W.P.C. Barton), and water arum (*Calla palustris* L.) (White and Madany 1978; WDNR 2015).

#### Dominant plant species

- bog birch (*Betula pumila*), shrub
- cranberry (*Vaccinium macrocarpon*), shrub
- hairy sedge (*Carex lacustris*), other herbaceous
- tawny cottongrass (*Eriophorum virginicum*), other herbaceous
- sphagnum (*Sphagnum*), other herbaceous

### Community 1.3
### Hairy Sedge - Woollyfruit Sedge/Sphagnum - Polytrichum Moss

This reference community phase represents an early seral floating graminoid bog. Mosses co-dominate with a variety of sedges. Acidophilic and insectivorous species are characteristic of this phase and may include roundleaf sundew (*Drosera rotundifolia* L.), buckbean (*Menyanthes trifoliata* L.), and purple pitcherplant (*Sarracenia purpurea* L.) (White and Madany 1978).

#### Dominant plant species

- hairy sedge (*Carex lacustris*), other herbaceous
- woollyfruit sedge (*Carex lasiocarpa*), other herbaceous
- sphagnum (*Sphagnum*), other herbaceous
- polytrichum moss (*Polytrichum*), other herbaceous

### Pathway 1.1A
### Community 1.1 to 1.2

Large disturbance event that reduces or removes the tree canopy.

### Pathway 1.2A
### Community 1.2 to 1.1

Natural succession resulting in lower ponded water conditions and lack of natural disturbances.

### Pathway 1.2B
### Community 1.2 to 1.3

Disturbance event that sets back the natural succession.

### Pathway 1.3A
### Community 1.3 to 1.2

Natural succession resulting in lower ponded water conditions and lack of natural disturbances.

### State 2
### Degraded State

The expansion of ruderal and non-native woody species into Ponded Organic Acidic Peatlands can arise due to a complex interaction of fire suppression, hydrological alterations, and edge effects. Subsurface water reduction from

agricultural tiling, ditching, or off-site development in conjunction with the removal of periodic fires result in significant changes to the reference plant community. In addition, edge effects can arise from indirect land management practices (e.g., cropping, herbicide drift, sedimentation, groundwater pollution) on directly adjacent sites that facilitates invasive species spread (WDNR 2015).

### Community 2.1
### Redosier Dogwood - Glossy Buckthorn

This community phase represents the initial changes to the natural community following hydroperiod alterations, fire suppression, and adjacent land management actions. Tall shrubs form a nearly impenetrable thicket with species such as redosier dogwood, poison sumac, and speckled alder (*Alnus incana* (L.) Moench ssp. rugosa (Du Roi) R.T. Clausen). Non-native invasive shrubs also encroach, including glossy buckthorn (*Frangula alnus* Mill.) (WDNR 2015).

#### Dominant plant species

- redosier dogwood (*Cornus sericea*), shrub
- glossy buckthorn (*Frangula alnus*), shrub

### Community 2.2
### Red Maple/Redosier Dogwood - Glossy Buckthorn

Sites falling into this community phase represent the natural succession as a result of continuing changes to the hydroperiod and adjacent lands. Red maple along with elms and ashes not only dominate the canopy, but also the subcanopy and sapling layers. Redosier dogwood and glossy buckthorn continue to form a nearly continuous shrub layer, allowing little to no light for any potential tamarack seedlings that may have been present.

#### Dominant plant species

- red maple (*Acer rubrum*), tree
- redosier dogwood (*Cornus sericea*), shrub
- glossy buckthorn (*Frangula alnus*), shrub

### Pathway 2.1A
### Community 2.1 to 2.2

Natural succession as a result of continuing landscape changes.

## 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.

### Transition T1A
### State 1 to 2

Changes to hydrology, long-term fire suppression, pollution, and invasive species transition the site to the degraded

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 T2A
### State 2 to 3

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

## Additional community tables

### Inventory data references

No field plots were available for this site. A review of the scientific literature and professional experience were used to approximate the plant communities for this provisional ecological site. Information for the state-and-transition model was obtained from the same sources. All community phases are considered provisional based on these plots and the sources identified in this ecological site description.

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## Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

| | |
|---|---|
| Author(s)/participant(s) | |
| Contact for lead author | |
| Date | 05/04/2024 |
| Approved by | Chris Tecklenburg |
| Approval date | |
| Composition (Indicators 10 and 12) based on | Annual Production |

## Indicators

1. **Number and extent of rills:**

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

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

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

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

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

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

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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

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

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

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth ( in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**