14110

Great Lakes Wet-Mesic Lakeplain Prairie

BpS Model/Description Version: Aug. 2020

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| None | None | None | None |
| None | None | None | None |

Vegetation Type

Mixed Upland and Wetland

Map Zones

49, 51, 52

Geographic Range

Lakeplain wet-mesic prairies occur along the glacial lakeplains of the Great Lakes, in southeastern Wisconsin, northeastern Illinois, northern Indiana, southern Michigan and northwestern Ohio, as well as in southern Ontario, Canada. In map zones 49 and 52, this Biophysical Setting was concentrated in the lakeplain portion of the Central Corn Belt Plains Level III Ecoregion (54), particularly in the Chicago Lake Plain and Chiwaukee Prairie Region Level IV Ecoregions (Woods et al. 1998, 2006).

Biophysical Site Description

Lakeplain wet-mesic prairie is most commonly associated with inland portions of Michigan’s lakeplains, but is also found along low beach ridges near the present Saginaw Bay shoreline. More specifically, lakeplain wet-mesic prairie occurs on several glacial features of the lakeplain, including level, sandy outwash, sandy lakeplains, and deposits of dune sand on silt or clay glacial lakeplains. The soils are sands, sandy loams, loams, or silty clays with poor to moderate water-retaining capacity. Lakeplain prairies most commonly occur on sand lakeplain with soils of medium to fine-textured sands that are slightly acid to moderately alkaline (pH6-8). The prairies, which experience seasonal flooding and typically include small pockets that remain wet throughout the year, are among the most diverse plant communities in Michigan, with as many as 200 plant species found within a single prairie remnant.

Vegetation Description

The dominant tallgrass prairie species of this community typically grow 1-2m high. Trees and shrubs are uncommon and bare ground is scarce. *Andropogon gerardii* (big bluestem), *Carex* (sedge) spp., *Panicum virgatum* (switch grass), *Schizachyrium scoparius* (little bluestem) and Sorghastrum nutans *(Indian grass) are the most abundant species. Solidago ohioensis (Ohio goldenrod*) is found in both fens and Great Lakes interdunal wetlands as well as this community. *Pycnanthemum virginianum* (common mountain mint) is common in this community but may also occur in woodlands. In addition to the species listed above, other diagnostic species include: *Pedicularis lanceolata* (swamp-betony), *Solidago riddellii* (Riddell’s goldenrod) and *Vernonia* (ironweed) spp. *Sorghastrum nutans, Liatris spicata* (marsh blazing star), *Aletris farinosa* (colic root) and *Coreopsis tripteris* (tall coreopsis) are good indicators of functioning lakeplain wet-mesic prairie.

Rare plants associated with lakeplain wet-mesic prairie include: *Agalinis gattingeri* (Gattinger’s gerardia), *Agalinis skinneriana* (Skinner’s gerardia), *Angelica venenosa* (hairy angelica), *Aristida longispica* (three-awned grass), *Asclepias hirtella* (tall green milkweed), *A. sullivantii* (Sullivant’s milkweed), *Astragalus neglectus* (Cooper’s milk-vetch), *Baptisia leucophaea* (creamy wild indigo), *Cacalia plantaginea* (prairie Indian-plantain), *Carex festucacea* (fescue sedge), *Conobea multifida* (conobea), *Cyperus flavescens* (yellow nut-grass), *Cypripedium candidum* (white lady’s-slipper), *Fimbristylis puberula* (chestnut sedge), *Hemicarpha micrantha* (dwarf-bulrush), *Hypericum gentianoides* (gentian-leaved St. John’s-wort), *Juncus biflorus* (two-flowered rush), *Juncus brachycarpus* (short-fruited rush), *Lechea minor* (least pinweed), *Ludwigia alternifolia* (seedbox), *Lycopodium appressum* (appressed bog clubmoss), *Panicum leibergii* (Leiberg’s panic-grass), *Platanthera ciliaris* (yellow fringed orchid), *Platanthera leucophaea* (prairie fringed orchid), *Polygala cruciata* (cross-leaved milkwort), *Pycnanthemum verticillatum* (whorled mountain-mint), *Rotala ramosior* (tooth-cup), *Scirpus clintonii* (Clinton’s bulrush), *Scleria pauciflora* (few-flowered nut-rush), *Scleria triglomerata* (tall nut-rush), *Tradescantia virginiana* (Virginia spiderwort) and *Triplasis purpurea* (sand grass).

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| SCHIZ4 | *Schizachyrium* | Little bluestem |
| ANGE | *Andropogon gerardii* | Big bluestem |
| PAVI2 | *Panicum virgatum* | Switchgrass |
| SONU2 | *Sorghastrum nutans* | Indiangrass |
| PYVI | *Pycnanthemum virginianum* | Virginia mountainmint |
| LISP | *Liatris spicata* | Dense blazing star |
| OLOH | *Oligoneuron ohioense* | Ohio goldenrod |
| PELA2 | *Pedicularis lanceolata* | Swamp lousewort |

Species names are from the NRCS PLANTS database. Check species codes at http://plants.usda.gov.

Disturbance Description

Many factors influence the development and maintenance of prairies on post-glacial lakeplain. Hubbard (1888) speculated that the extensive wet prairies of Wayne and Monroe Counties in Michigan were the result of beaver activity prior to their localized extirpation by the fur trade. His view was based on communications with Native Americans and the prevalence of abandoned beaver dams on the flat lakeplain landscape. Other important factors probably include both soil moisture regimes and periodic wildfires. The combination of 1-3m of highly permeable sand over clay sets up a characteristic hydrological regime with spring flooding followed by drought conditions during the growing season. This characteristic water level fluctuation is common to nearly all extant examples of lakeplain prairies in the region, and is possibly the most significant physical process in their establishment and maintenance (Minc 1995, Albert et al. 1996). Such extreme variation in the soil moisture regime prevents woody vegetation from becoming established (Hayes 1964, Roberts et al. 1977). In addition to the dramatic seasonal fluctuations in surface and ground water levels, Great Lakes water level cycles also produce fluctuations in the water table of these prairies. Wet prairies originally occupied the position on the landscape between emergent marsh and adjacent uplands. Based on the original surveyors’ notes from the Saginaw Bay shoreline in Michigan, the boundary between prairie and marsh was not static, but moved inland or lakeward across the landscape, depending on the stage of the Great Lakes water-level cycle. Lakeplain prairies isolated from the current Great Lakes shorelines, such as those in the Oak Openings region of Ohio, are not subject to direct flooding by Lake Erie. However, fluctuating hydrology remains a significant factor shaping temporal vegetative composition and structure.

The combination of accumulation of organic material within these wetlands and drought conditions during the growing season made lakeplain prairies prone to wildfires, which limited the encroachment of woody vegetation. However, it remains unclear whether lighting strikes or Native American activities had a more significant role in the maintenance of lakeplain prairie (Hayes 1964, Faber-Langendoen & Maycock 1987). It is clear, however, that Native Americans utilized dune ridges on the lakeplain for settlements and trails (Jones & Knapp 1972, Comer et al. 1995a). One indication of the significance of fire on the lakeplain is the fact that many of the historical oak savannas located along the beach ridges have become closed-canopy oak forests during the last century of fire suppression.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 24 | 100 |  |  |
| Moderate (Mixed) |  |  |  |  |
| Low (Surface) |  |  |  |  |
| All Fires | 24 | 100 |  |  |

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is the central tendency modeled. Percent of all fires is the percent of all fires modeled in that severity class. Minimum and Maximum FIs show the relative range of fire intervals as estimated by model contributors, if known.

Scale Description

Patch size characteristics for this community are variable. Circa 1800 patch sizes of lakeplain prairie mosaics (including wet, wet-mesic, and mesic sand prairies) in Michigan varied from <100ac to more than 15,000ac (40-6000ha) (Comer et al. 1995b).

Adjacency or Identification Concerns

Historically, these prairies occurred in complex mosaics with lakeplain oak openings, pin oak-swamp white oak sand flatwoods, and elm-ash-maple swamps, all typical of poorly drained lakeplain. At the base of old beach ridges, lakeplain wet-mesic prairie presently occurs as a transition zone between lakeplain wet-prairie and lakeplain mesic prairie (Comer et al. 1995a).

Lakeplain prairies have been lost and degraded via conversion to agriculture, residential and industrial development, alterations of ground water hydrology, and fire suppression. The construction of extensive drainage networks to promote agriculture and residential development has lowered the water table in most of the historical range of lakeplain prairies. That, and the suppression of natural and cultural fires has allowed the community to succeed to shrub and forest communities. Also, alteration of natural hydrologic and fire regimes has allowed invasives species to invade lakeplain prairie remnants. Significant invasive species found in lakeplain wet-mesic prairies include *Phragmites australis, Phalaris arundiancea,* and *Lythrum salicaria*. Of nearly 160,000ac (64,000ha) of lakeplain prairie in Michigan circa 1800, < 0.5% remain today (Comer et al. 1995a and b).

Issues or Problems

Native Uncharacteristic Conditions

Comments

Succession Classes

**Mapping Rules**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Upper Layer Lifeform** | **Height (m)** | **Canopy Cover (%)** | | | | | | | | | |
| **0-10** | **11-20** | **21-30** | **31-40** | **41 - 50** | **51-60** | **61-70** | **71-80** | **81-90** | **91-100** |
| Herb | 0-0.5 | A | A | A | A | A | A | B | B | B | B |
| Herb | 0.5-1.0 | A | A | A | A | A | A | B | B | B | B |
| Herb | >1.0 | A | A | A | A | A | A | B | B | B | B |
| Shrub | 0-0.5 | UN | UN | UN | C | C | C | C | C | C | UN |
| Shrub | 0.5-1.0 | UN | UN | UN | C | C | C | C | C | C | UN |
| Shrub | 1.0-3.0 | UN | UN | UN | C | C | C | C | C | C | UN |
| Shrub | >3.0 | UN | UN | UN | C | C | C | C | C | C | UN |
| Tree | 0-5 | UN | UN | UN | C | C | C | C | C | C | UN |
| Tree | 5-10 | UN | UN | UN | C | C | C | C | C | C | UN |
| Tree | 10-25 | UN | UN | UN | C | C | C | C | C | C | UN |
| Tree | 25-50 | UN | UN | UN | C | C | C | C | C | C | UN |
| Tree | >50 | UN | UN | UN | C | C | C | C | C | C | UN |

Succession class letters A-E are described in the Succession Class Description section. Some classes use a leafform distinction where a qualifier is added to the class letter: Brdl (broadleaf), Con (conifer), or Mix (mixed conifer and broadleaf). UN refers to uncharacteristic native or a combination of height and cover that would not be expected under the reference condition. NP refers to not possible or a combination of height and cover which is not physiologically possible for the species in the BpS.

**Description**

Class A 46 Early Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| TYLA | Typha latifolia | Broadleaf cattail | Low-Mid |
| CAREX | Carex | Sedge | Lower |
| SPPE | Spartina pectinata | Prairie cordgrass | Low-Mid |
| CACA4 | Calamagrostis canadensis | Bluejoint | Low-Mid |

Description

Emergent marsh/lakeplain wet-prairie class: This stage is dominated by species such as *Calamagrostis canadensis, Spartina pectinata, Juncus balticus, Carex stricta, Carex aquatilis, Carex pellita, Cladium mariscoides, Potentilla fruiticosa* and *Asclepias incarnata* (swamp milkweed). Wetter portions would contain *Alisma plantago-aquatica, Carex, Eleocharis, Glyceria borealis, Leersia, Lemna, Nuphar, Nymphaea, Polygonum, Pontederia cordata, Sagittaria, Scirpus, Sparganium, Spirodela, Typha, Wolffia*, and *Zizania aquatica*.

This stage would occur with fluctuating Great Lakes water levels. When Great Lakes water levels rise, areas of wet-mesic prairie (class B) near the Great Lakes would be inundated and species mix would shift to wet prairie and marsh species (class A). This probability is an estimate and large-scale (interannual) fluctuations in Great Lakes water levels are stochastic events and occur without regular periodicity. In the absence of disturbance class A would remain as class A.

*Maximum Tree Size Class*  
None

Class B 27 Early Development 2 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| SCHIZ4 | Schizachyrium | Little bluestem | Low-Mid |
| SONU2 | Sorghastrum nutans | Indiangrass | Low-Mid |
| PYVI | Pycnanthemum virginianum | Virginia mountainmint | Lower |
| LISP | Liatris spicata | Dense blazing star | Lower |

Description

Lakeplain wet-mesic prairie class. The stage can exist for decades, but lakeplain wet-mesic prairie systems can persist on the landscape for longer than 100yrs as long as fire and hydrologic regimes remain unaltered. This stage is dominated by *Schizachyrium scoparium, Sorghastrum nutans, Panicum virgatum*, and *Andropogon geradii* with forbs such as *Pycnanthemum virginianum, Solidgao ohioensis, Liatris spicata, Pedicularis lanceolata, Solidago riddellii, Vernonia* spp., and *Coreopsis tripteris*.

The poor to moderately drained soils of the lakeplain supports a moisture regime of spring flooding followed by summer drought. These edaphic factors maintain lakeplain prairie species and limits the encroachment of woody vegetation. In addition to abiotic and edaphic factors, fire also maintains the system in this class. Replacement fire was included, and the frequency of fires would have depended in large part on the concentration of Native Americans in the region.

For lakeplain wet-mesic prairies that occur near the Great Lakes, rises in Great Lakes water levels can send the system back to class A, a wet-prairie or marsh. This was modeled as "Optional 2". Again, this probability is an estimate and large-scale (interannual) fluctuations in Great Lakes water levels are stochastic events and occur with no regular periodicity.

With time and the absence of fires, trees and shrubs would establish and the system would transition to a lakeplain oak savanna/ oak woodland.

*Maximum Tree Size Class*  
None

Class C 27 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUBI | Quercus bicolor | Swamp white oak | Low-Mid |
| QUPA2 | Quercus palustris | Pin oak | Low-Mid |
| ULAM | Ulmus americana | American elm | Lower |
| FRQU | Fraxinus quadrangulata | Blue ash | Lower |

Description

Lakeplain oak savanna/oak woodland would include *Quercus palustris, Q. bicolor, Ulmus americana,* and *Fraxinus quadrangulata*. This stage would result when trees encroach and establish in areas of lakeplain wet-mesic prairie. This would occur when frequent prairie fires are absent. Infrequent replacement fires would take the system back to the wet-mesic prairie stage. It is assumed that an area capable of supporting lakeplain oak savanna/woodland is far enough inland to no longer be affected by changes in Great Lakes water levels.

*Maximum Tree Size Class*  
Large 21-33"DBH

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:OPN | 0 | Early2:OPN | 40 |
| Early2:OPN | 41 | Late1:CLS | 100 |
| Late1:CLS | 101 | Late1:CLS | 999 |

Probabilistic Transitions

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Disturbance Type** | **Disturbance occurs In** | **Moves vegetation to** | **Disturbance Probability** | **Return Interval (yrs)** | **Reset Age to New Class Start Age After Disturbance?** | **Years Since Last Disturbance** |
| Optional 2 | Early1:OPN | Early1:OPN | 0.025 | 40 | Yes | 0 |
| Optional 2 | Early2:OPN | Early1:OPN | 0.025 | 40 | Yes | 0 |
| Replacement Fire | Early2:OPN | Early2:OPN | 0.15 | 7 | No | 0 |
| Replacement Fire | Late1:CLS | Early2:OPN | 0.007 | 143 | Yes | 0 |

Optional Disturbances

Optional 1: Rise in Great Lakes Water Levels

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