LANDFIRE Biophysical Setting Model

Biophysical Setting: 6214110 Great Lakes Wet-Mesic Lakeplain Prairie

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 10/19/2007

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Vegetation Type
Wetlands/Riparian

General Model Sources
☑ Literature
☐ Local Data
☐ Expert Estimate

Dominant Species
SCHIZ4
ANGE
PAVI2
SONU2
PYVI
LISP
OLOH
PELA2

Map Zone
62

Model Zone
☐ Alaska
☐ California
☐ Great Basin
☑ Great Lakes
☐ Hawaii
☐ Northeast
☐ Northern Plains
☐ N-Cent.Rockies
☐ Pacific Northwest
☐ South Central
☐ Southeast
☐ S. Appalachians
☐ Southwest

Geographic Range

Lakeplain wet-mesic prairies occur along the glacial lakeplains of the Great Lakes, in southeastern WI, northeastern IL, northern IN, southern MI, and northwestern OH, as well as in southern Ontario, Canada. In MZ62, this BpS has potential occurrence in Subsection 222Ia on the Lake Erie lakeplain. Lakeplain prairie is concentrated in OH west of MZ62, occurring primarily in MZ52.

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 one to two meters 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 (OH 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

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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).

Disturbance Description

Many factors influence the development and maintenance of prairies on Michigan's lakeplain. Hubbard (1888) speculated that the extensive wet prairies of Wayne and Monroe counties 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 one to three meters 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 Michigan's lakeplain prairies, 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, 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.

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). As elsewhere in the state, it is quite likely that fires periodically resulted from this use, spreading to adjacent savanna and grassland. 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.

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

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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 regimes has allowed invasives species to invade lakeplain prairie remants. Significant invasive species found in lakeplain wet-mesic prairies include Phragmites australis, Phalaris arundiancea, Lythrum salicaria. Of nearly 160,000ac (64,000ha) of lakeplain prairie in MI circa 1800 less than 0.5% remain today (Comer et al. 1995a and b).

Native Uncharacteristic Conditions

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 over 15,000ac (40 to 6000ha) (Comer et al. 1995b).

Issues/Problems

Comments

Copied from model for MZ51 by Becky Schillo. Geographic range modified for MZ62. The text in the General Information Section of this model was copied from the Michigan Natural Features Inventory Abstract for Lakeplain Wet-Mesic Prairie by Dennis Albert and Michael Kost. See References section for complete citation and associated references.

Vegetation Classes

Class A **34 %**

Early Development 1 Open

Upper Layer Lifeform

- [x] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model

Description

Indicator Species and Canopy Position

TYLA
Low-Mid
CAREX
Lower
SPPE
Low-Mid
CACA4
Low-Mid

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	11 %	60 %
Height	Herb 0m	Herb >1.1m
Tree Size Class	None	

- [ ] Upper layer lifeform differs from dominant lifeform.

The canopy closure in this stage can range up to 100% but the maximum canopy closure was set at 60 to make this stage exclusive from stage B. In this stage there may be standing water at the soil surface for part of the year.

Emergent marsh/lakeplain wet-prairie class: This stage is domianted 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, Zizania aquatica.

This stage would occur with fluctuating Great Lakes water levels. When Great Lakes water levels rise, areas of

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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) flucations in Great Lakes water levels are stochastic events and occur without regular periodicity. In the absence of disturbance the class A would remain as class A.

Class B **33 %**

Early Development 2 Open

Upper Layer Lifeform

- [x] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model

Indicator Species and Canopy Position

SCHIZ4
Low-Mid
SONU2
Low-Mid
PYVI
Lower
LISP
Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	61 %	100 %
Height	Herb 0m	Herb 1.0m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Lakeplain wet-mesic prairie class. The stage ranges from 0-100yrs, but lakeplain wet-mesic prairie systems can persist on the landscape for longer than 100yrs as long as fire and hydrologic regimes remian unaltered. This stage is dominated by Schizachyrium scoparius, Sorghastrum nutans, Panicum virgatum, and Andropogon geradii with forbs such as Pycnanthemum virginianum, Solidago 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 limit the encroachment of woody vegetation. In addition to abiotic and edaphic factors, fire also maintains the system in this class. Replacement fire was modeled with a probability of occurring every seven years (.15). 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" at a probability of occurring every 40yrs (0.25). Again, this probability is an estimate and large-scale (interannual) flucations 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 transtion to a lakeplain oak savanna/ oak woodland (class C).

Class C **33 %**

Late Development 1 Closed

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [x] Tree

Fuel Model

Indicator Species and Canopy Position

QUBI
Low-Mid
QUPA2
Low-Mid
ULAM
Lower
FRQU
Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	31 %	90 %
Height	Tree 0m	Tree 25m
Tree Size Class	Large 21-33"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Lakeplain oak savanna/ oak woodland would include Quercus palustris, Q. bicolor, Ulmus americana, Fraxinus

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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, modeled at the probability of occurring every 150yrs (.007), would take the system back to the wet-mesic prairie stage represented by class B. 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.

Class D **0 %**

[Not Used] [Not Used]

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model

Indicator Species and Canopy Position

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	%	%
Height		
Tree Size Class		

☐ Upper layer lifeform differs from dominant lifeform.

Description

Class E **0 %**

[Not Used] [Not Used]

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model

Indicator Species and Canopy Position

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	%	%
Height		
Tree Size Class		

☐ Upper layer lifeform differs from dominant lifeform.

Description

Disturbances

Fire Regime Group:** **II**

Historical Fire Size (acres)

Avg 0
Min 0
Max 0

Sources of Fire Regime Data

☐ Literature
☐ Local Data
☑ Expert Estimate

Fire Intervals

	Avg FI	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	19.08			0.0524	100
Mixed					
Surface					
All Fires	19			0.05242	

Fire Intervals (FI):

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inverse of fire interval in years and is used in reference condition modeling. Percent of all fires is the percent of all fires in that severity class.

Additional Disturbances Modeled

☐ Insects/Disease ☐ Native Grazing ☐ Other (optional 1) Decline in Great Lakes Water Levels

☐ Wind/Weather/Stress ☐ Competition ☑ Other (optional 2) Rise in Great Lakes Water Levels

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