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# Natural Features Inventory and Management Recommendations for Huron Meadows and Lake Erie Metroparks



**Prepared by:**

**Michael A. Kost, Joshua G. Cohen, Ryan P. O'Connor, and Helen D. Enander**

**Michigan Natural Features Inventory**

**P.O. Box 30444**

**Lansing, MI 48909-7944**

**For:**

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Cover photograph: Joshua Cohen, MNFI Ecologist, in a prairie fen with tamarack swamp in the background at Huron Meadows Metropark (Photo by Michael Kost).

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# INTRODUCTION

During the summer of 2004 Michigan Natural Features Inventory (MNFI) surveyed for exemplary natural communities and rare plants in two Huron-Clinton Metroparks, Huron Meadows and Lake Erie. In addition, surveys were conducted to evaluate management needs on lands considered to have good potential for supporting high-quality natural communities with active land management and restoration. This report summarizes the findings of MNFI's surveys and evaluations of Huron Meadows and Lake Erie Metroparks.

## Landscape Context

Regional landscape ecosystems of Michigan have been classified and mapped at three hierarchical levels (section, subsection, and sub-subsection) based on an integration of climate, physiography (topographic form and geologic parent material), soil, and natural vegetation (Albert 1995). The regional classification provides a framework for understanding broad patterns of natural community and species occurrences and natural disturbance regimes across the state, which is useful in integrated resource management and planning, as well as for biological conservation. The classification is hierarchically structured with three levels in a nested series, from broad landscape regions called sections, down to smaller subsections and sub-subsections.

All of the Huron-Clinton Metroparks occur within the Washtenaw Subsection (VI.1) of southern Lower Michigan (Figure 1) (Albert 1995). The Washtenaw Subsection contains three sub-subsections that differ from each other in their soils, glacial landforms, climate, and vegetation. Huron Meadows Metropark occurs within the Ann Arbor Moraines Sub-subsection (VI.1.2) and the Jackson Interlobate Sub-subsection (VI.1.3). Lake Erie Metropark occurs on the Maumee Lake Plain Sub-subsection (VI.1.1) (Albert 1995). The local landforms within the metroparks reflect those typical of their regional landscape ecosystems and respective sub-subsections.

## Huron Meadows Metropark

The Ann Arbor Moraines Sub-subsection (VI.1.2) is a long, narrow band of fine- and medium-textured end moraine and ground moraine bordered by flat lake plain on the east and sandy outwash, end moraine, and ice-contact features to the west. The Sub-subsection is characterized by rolling topography and loam- and sandy loam-textured soils. Fine-textured soils, primarily silt loams and clay loams, are more common on the eastern edge. In the 1800s, the loams and sandy

loams originally supported oak and oak-hickory forests. White oak appeared to be the most common species of the oak forest. Black oak was common on the drier ridge tops and red oak was most common on lower slopes. Beech and sugar maple were restricted to silt loams and clay loams. Windthrow was the prevailing disturbance within the forested moraines with fire occasionally spreading into the Sub-subsection from adjacent outwash plains. Oak savannas, dominated by white and black oak, occurred along the western edge of the Sub-subsection, where fires from Sub-subsection VI.1.3 were carried by westerly winds. Almost all of the ground moraines have been farmed, whereas the steeper moraines remain forested with oak forests. Most of the land was cleared for agriculture by the mid-nineteenth century.

The Jackson Interlobate Sub-subsection (VI.1.3) contains broad expanses of glacial outwash sands that surround sandy and gravelly end moraines and ground moraines (Albert 1995). The soils on the moraines are typically well drained or excessively well drained and in the 1800s supported drought-tolerant, fire-dependent natural communities such as oak barrens, oak savanna, oak forest, and hillside prairie. The outwash soils vary from excessively well-drained sands, which once supported oak barrens, oak forests, woodland prairies, and dry sand prairies, to poorly-drained organic deposits that supported a variety of open and forested wetland types.

Huron Meadows Metropark occurs along the Huron River in southeastern Livingston County and as noted, is located within both the Ann Arbor Moraines and the Jackson Interlobate. The southeastern portion of the park contains fine-textured glacial till (ground moraine) of rolling topography and falls within the Ann Arbor Moraines (Farrand and Bell 1982) (Figure 2). The remainder of the park falls within an outwash plain of the Jackson Interlobate. The outwash contains coarse-textured, well-drained sands in the flat to moderately sloping uplands and poorly-drained areas with organic deposits. The Huron River flows through a narrow, steep-sided glacial outwash channel (too small to be mapped by Farrand and Bell) that dissects fine-textured till plain in the central portion of the park. Floodwaters from the Huron River and groundwater seepage from the adjacent moraine support a diverse wetland complex along the narrow floodplain of the Huron River. Three lakes occur within the park; Maltby Lake in the northern portion of the park and two small unnamed lakes just north of the Huron River. Ore Lake occurs just west of the metropark and drains into the Huron River.

## Lake Erie Metropark

Lake Erie Metropark occurs at the confluence of the Detroit River and Lake Erie within the Maumee Lake Plain Sub-subsection (Figure 1). This Sub-subsection is comprised of a flat, clay lake plain, dissected by broad glacial drainage ways of sandy soil (Albert 1995). Beach ridges and small sand dunes are common feature within the glacial drainage ways of the Maumee Lake Plain. Clay soils of the lake plain are generally wet with low permeability and poor drainage. In the past, these poorly-drained soils supported broad expanses of lowland hardwood forest. In contrast, the soils on the upland beach ridges and dunes of the sandy glacial drainage ways are excessively drained and once supported extensive bur oak and white oak savannas. The sandy glacial drainage ways also supported vast wet prairies and marshes, which commonly occurred in depressions on poorly- to very, poorly-drained soils (Comer et al. 1993). Lake Erie Metropark occurs entirely on a broad, flat expanse of lacustrine clay and silt (Figure 3).

### Vegetation circa 1800

By interpreting the notes of the Michigan General Land Office surveyors (recorded from 1818-1856), MNFI ecologists were able to piece together a relatively accurate picture of the state's vegetation in the early 1800s (Comer et al. 1995). A digital map of vegetation encountered by the land surveyors during this period reveals that Huron Meadows Metropark was almost entirely occupied by fire-dependent community types such as oak barrens, oak-hickory forest, and wet prairie (Figure 4). Large blocks of oak barrens occurred on outwash plain in the northeastern portion of the park and in the southern part of the park, south of the Huron River. The mean diameter at breast height (dbh) of trees recorded by the surveyors within the oak barrens was 43 cm (17 inches) with a wide range of diameters observed (13 to 91 cm, or 5 to 36 inches). These barrens, dominated by widely-spaced white oak (*Quercus alba*) and black oak (*Quercus velutina*), likely contained pockets of dry sand prairie in areas with high fire frequency. Morainal features and portions of glacial outwash supported oak-hickory forest, which occurred in uplands that tended to burn less frequently. The Huron River, Ore Lake, Maltby Lake, and the associated wetlands functioned as fire breaks and these oak-hickory stands occurred adjacent to these features. In addition to white oak and black oak, red oak (*Quercus rubra*), hickories (*Carya* spp.), and basswood (*Tilia americana*) were important canopy trees in these dry-mesic southern forests. Average dbh for the oak-hickory forests was 43 cm (17 inches) with a range from 23 to 61 cm (9 to 24 inches).

A large block of wet prairie was noted by the surveyors along the Huron River in the western portion of the park. Because the original land surveyors did not differentiate among the many different types of open, grass- and sedge-dominated wetlands, this area designated as wet prairie on the circa 1800 vegetation map was likely to have also supported other types of open, fire-dependent wetlands such as wet-mesic prairie, prairie fen, and wet meadow. These wetland types once occupied over 856 acres (270 ha) along the Huron River. A large (137 acres or 56 ha) mixed conifer swamp also occurred on the outwash plain east of Ore Lake and north of the Huron River. Tamarack (*Larix laricina*) and northern white-cedar (*Thuja canadensis*) dominated this swamp complex. Recorded dbh for tamarack trees ranged between 15 to 25 cm (6 and 10 inches) with a mean dbh of 23 cm (9 inches). A small pocket of lowland hardwood forest occurred within the floodplain of the Huron River in the easternmost portion of the park.

The digital map of vegetation circa 1800 for Lake Erie Metropark depicts the park as supporting beech-sugar maple forest, wet prairie, and marsh (Figure 5). On the lake plain, the mesic forests typically contained a diverse mix of tree species and in some places, like Lake Erie Metropark, were dominated by species other than American beech (*Fagus grandifolia*) and sugar maple (*Acer saccharum*). A close look at the original notes of General Land Office surveyors reveals that the forests in the area now occupied by Lake Erie Metropark were predominately forested with white oak, black oak, hickories, and basswood. Additional canopy associates recorded by the surveyors included black ash (*Fraxinus nigra*), red maple (*Acer rubrum*), and American elm (*Ulmus americana*). Trees noted by the surveyors included basswood, American elm, red maple, black oak, and white oak. The presence of black oak and white oak, which are highly dependent on open conditions in their early development, indicates that in the past, some areas of the metropark likely supported fire-dependent, lakeplain prairie and lakeplain oak openings (an oak savanna ecosystem unique to lake plains of the Great Lakes) (see natural community abstracts, Albert and Kost 1998a and 1998b, and Cohen 2001a). In the southern portion of the metropark, wet prairie occurred along Campau Road, Point Mouillee Road, and in portions of the golf course. Marsh occupied the low areas along the shoreline and surrounded Cherry Island.

The surveyors noted several other significant findings within and nearby what is now Lake Erie Metropark. For example, the surveyors recorded the location of a corn field south of Cherry Island Road and east of River Road. Another farm field was noted

just north of the metropark between present day River Road and South Gibraltar Road, near Gibraltar Cemetery. Lastly, a “sulfur spring” was noted in the northern portion of the metropark near the northwestern corner of section 12.

### **Present Land Cover**

The 1995 Land Cover maps (Figures 6 and 7) were produced by overlaying circa 1980 National Wetlands Inventory data over the Southeast Michigan Council of Governments (SEMCOG) 1995 land cover data set. The accuracy of land cover types within each metropark was further enhanced through photo interpretation and ground truthing.

Comparisons between circa 1800 vegetation and present land cover reveal drastic changes across the landscape (Figures 4 - 9). The most drastic change for Huron Meadows is the loss of oak barrens, the most prevalent cover type circa 1800. Nearly all of the oak barrens at Huron Meadows (and in the remainder of the Midwest) have been converted to old field (e.g., abandoned agricultural fields), recreation areas (golf course, picnic areas, etc.), or have succeeded to closed-canopy oak forest in the absence of natural, periodic fires (Cohen 2001b). The conversion of oak barrens and oak savanna to closed-canopy oak forest was rapid, typically taking place within 30 years following the onset of fire suppression (Curtis 1959). The mature oak-hickory forest that now remains is highly fragmented, with many small, isolated blocks of forest surrounded by old fields, residential areas, and degraded forest. Exotic species have invaded all structural levels of the upland systems with the most severe incursions in the understory and in degraded oak barrens. Fire suppression of the fire-dependent wetland systems has resulted in a severe reduction of open wetlands along the Huron River with extensive shrub encroachment by the pervasive, exotic glossy buckthorn (*Rhamnus frangula*). The large block of swamp forest east of Ore Lake and north of the Huron River was described by the original land surveyors as

lowland conifer forest dominated by tamarack and cedar. This block of swamp forest has been converted to deciduous hardwood swamp. Cedar and tamarack were likely harvested for use in building and as fence posts. Later, tamarack was also harvested for use as wheel spokes by the early automotive industry. The conversion of tamarack-dominated wetlands to other wetland types has also been facilitated by periodic outbreaks of the larch sawfly and fire suppression (Kost 2001a).

At a larger scale, the areas adjacent to Huron Meadows have been transformed to a semi-urbanized landscape, with the metropark and adjacent Brighton State Recreation Area providing some of the only remaining natural habitats.

Today, Lake Erie Metropark supports mowed lawn, agricultural fields, a golf course, Great Lakes marsh, and several very small patches of forest that harbor a diverse assemblage of tree species. The remaining small patches of forest were once part of an expansive mesic southern forest that occurred throughout southeast Michigan and stretched into the Thumb region and further north and west (Comer et al. 1995). For detailed information on mesic southern forest please see the natural community abstract by Cohen (2004). The small forest fragments at Lake Erie Metropark have hard edges and are bordered by mowed lawn, old field, and marsh.

Metroparks serve an increasingly important role in the conservation of the biodiversity for southeast Michigan. The areas surrounding both Huron Meadows and Lake Erie Metroparks are rapidly converting to an urbanized landscape. As development proceeds, the metroparks, along with other public lands will likely harbor some of the only remaining examples of native ecosystems in southeast Michigan. Protecting and stewarding the remaining natural habitats within the metroparks is an extremely important component of any long-term strategy for biodiversity conservation in southeast Michigan.

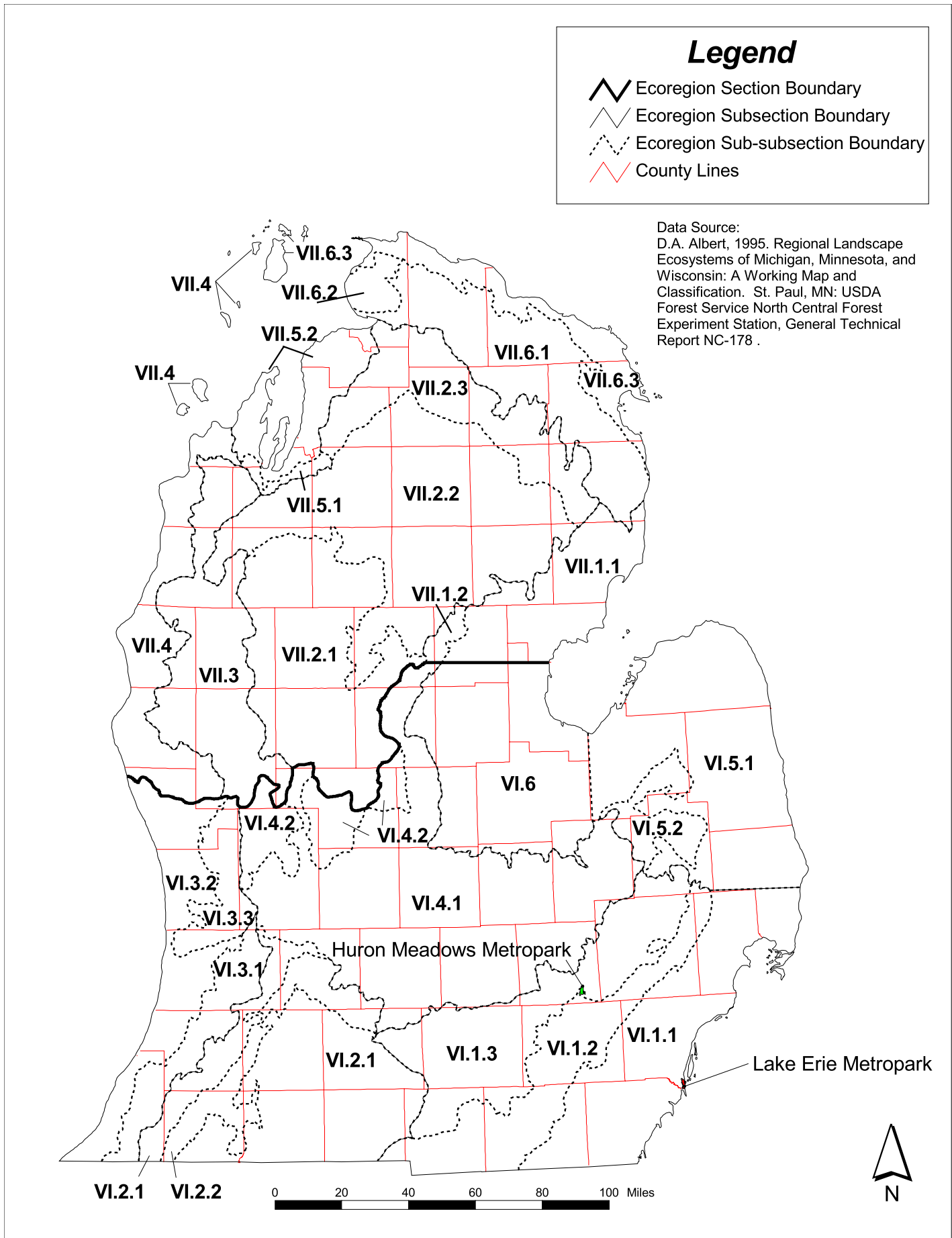


Figure 1. Ecoregions of Lower Michigan (Albert 1995).

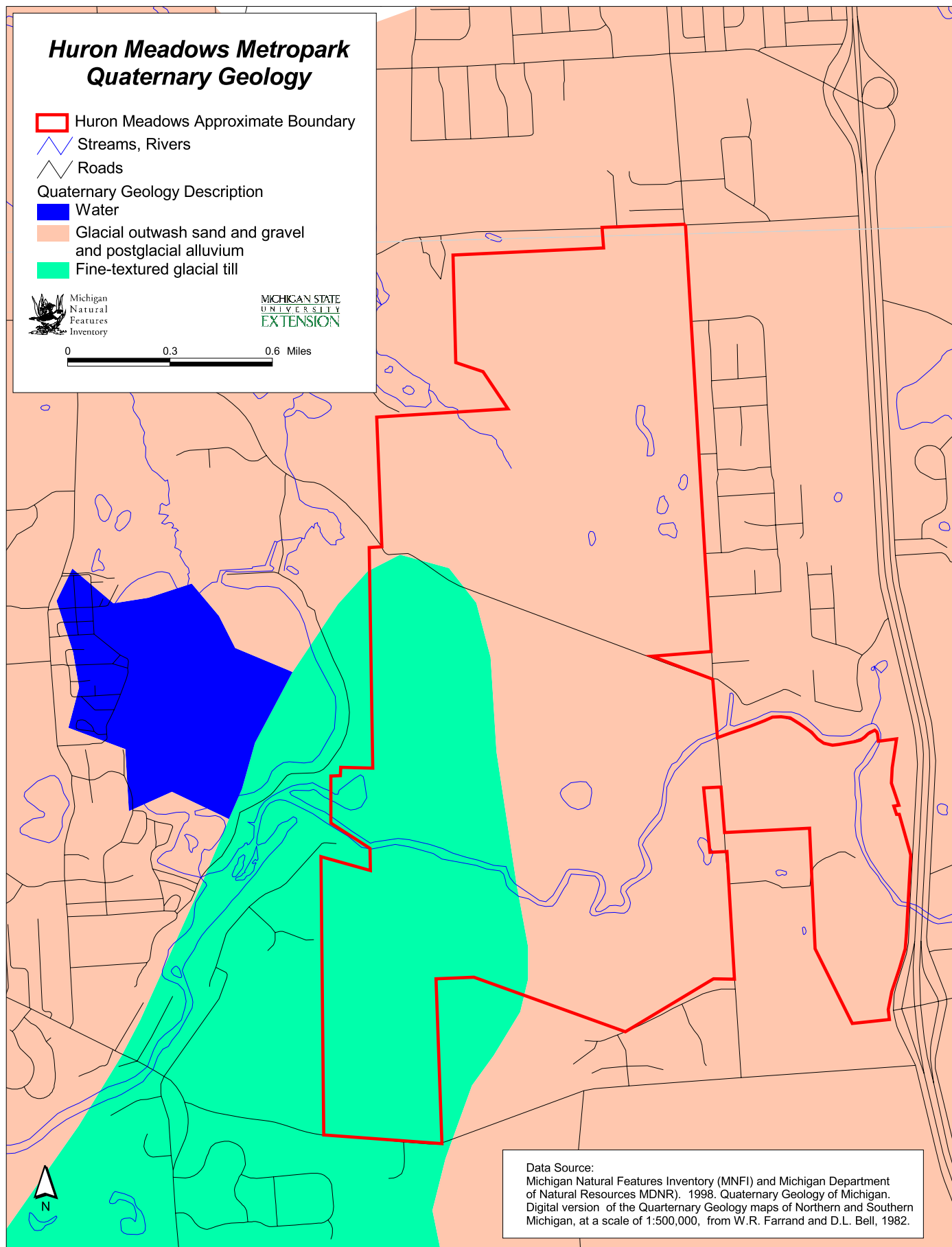


Figure 2. Surface Geology of Huron Meadows Metropark (Farrand and Bell 1982).

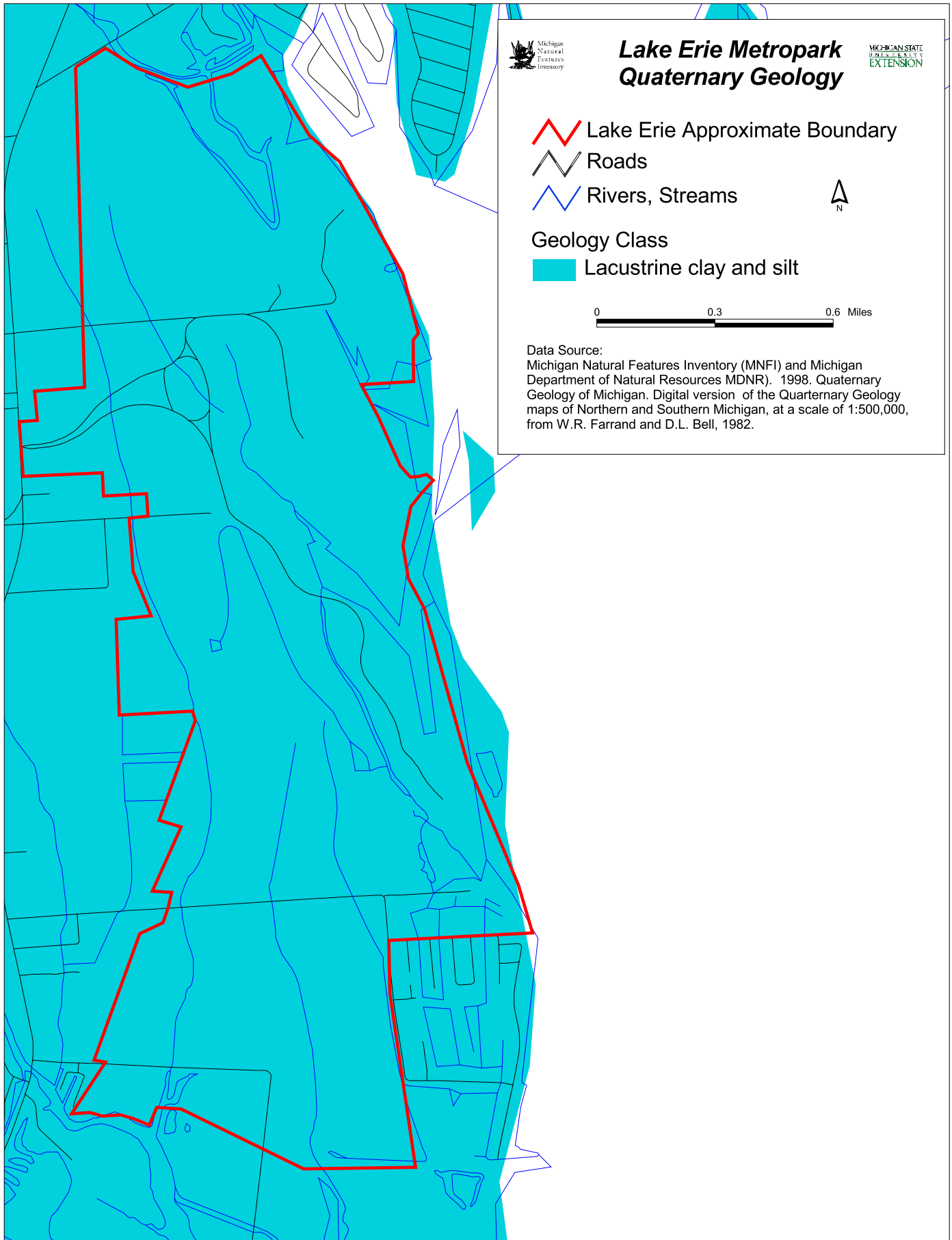


Figure 3. Surface Geology of Lake Erie Metropark (Farrand and Bell 1982).

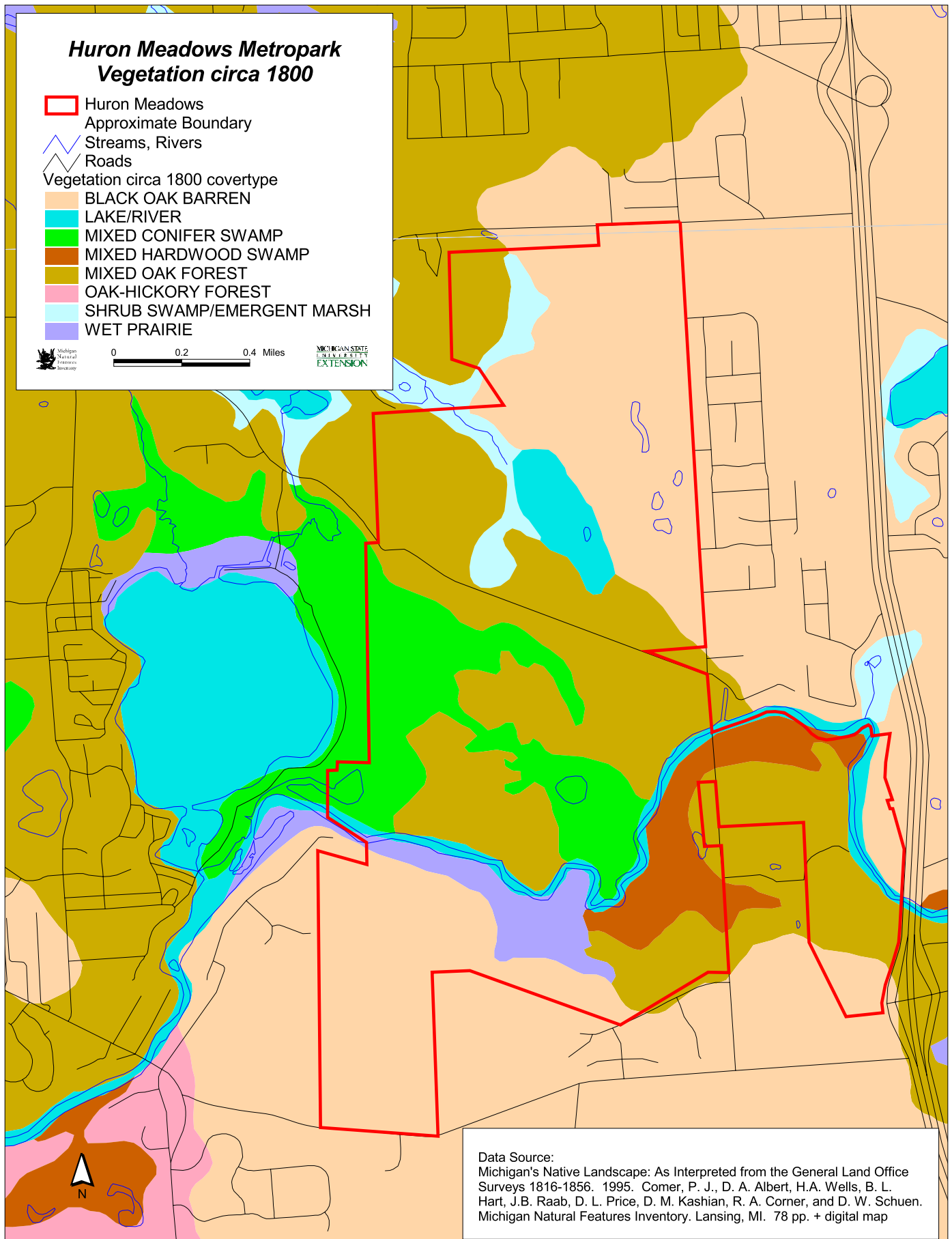


Figure 4. Vegetation circa 1800 of Huron Meadows Metropark (Comer et al. 1995).

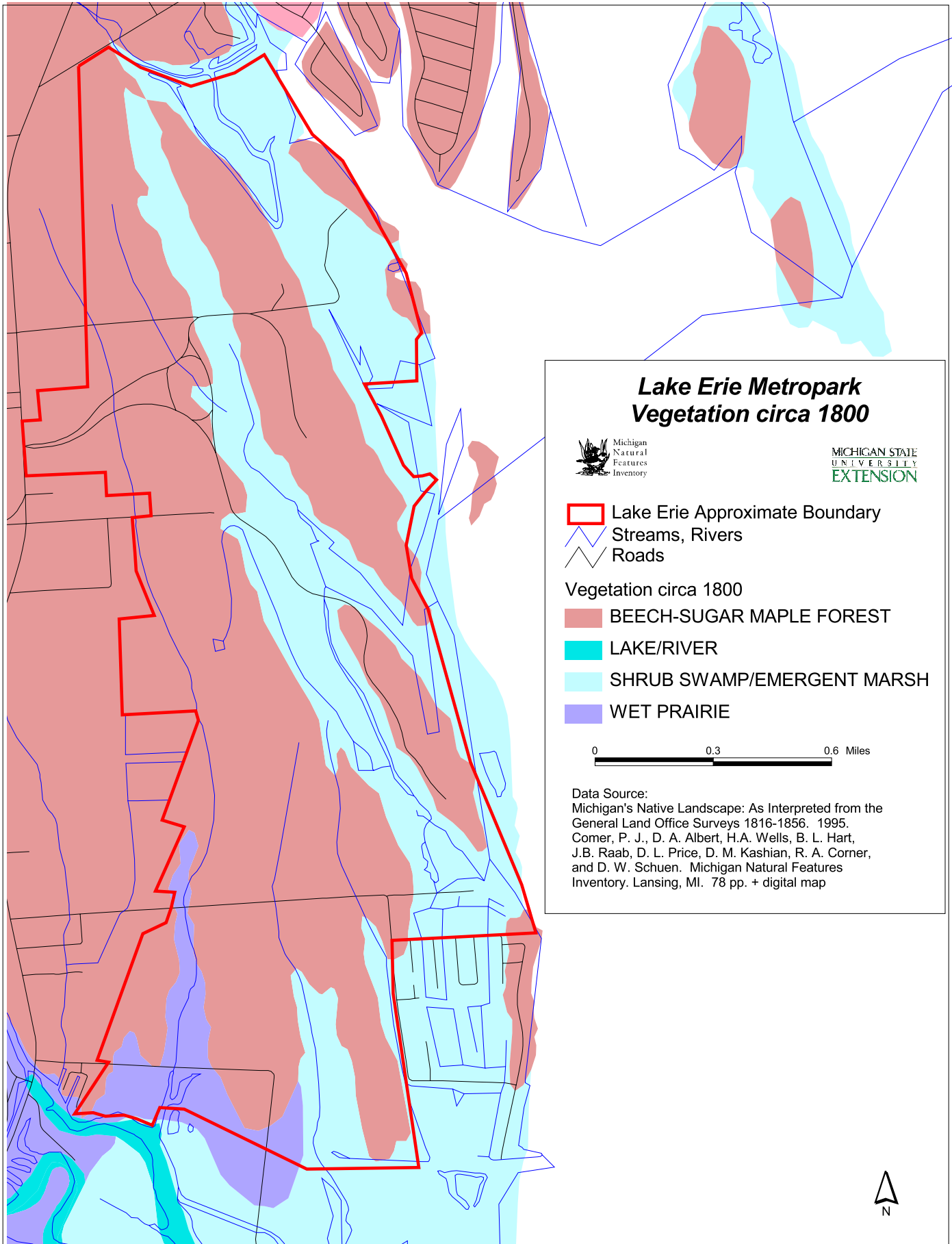


Figure 5. Vegetation circa 1800 of Lake Erie Metropark (Comer et al. 1995).

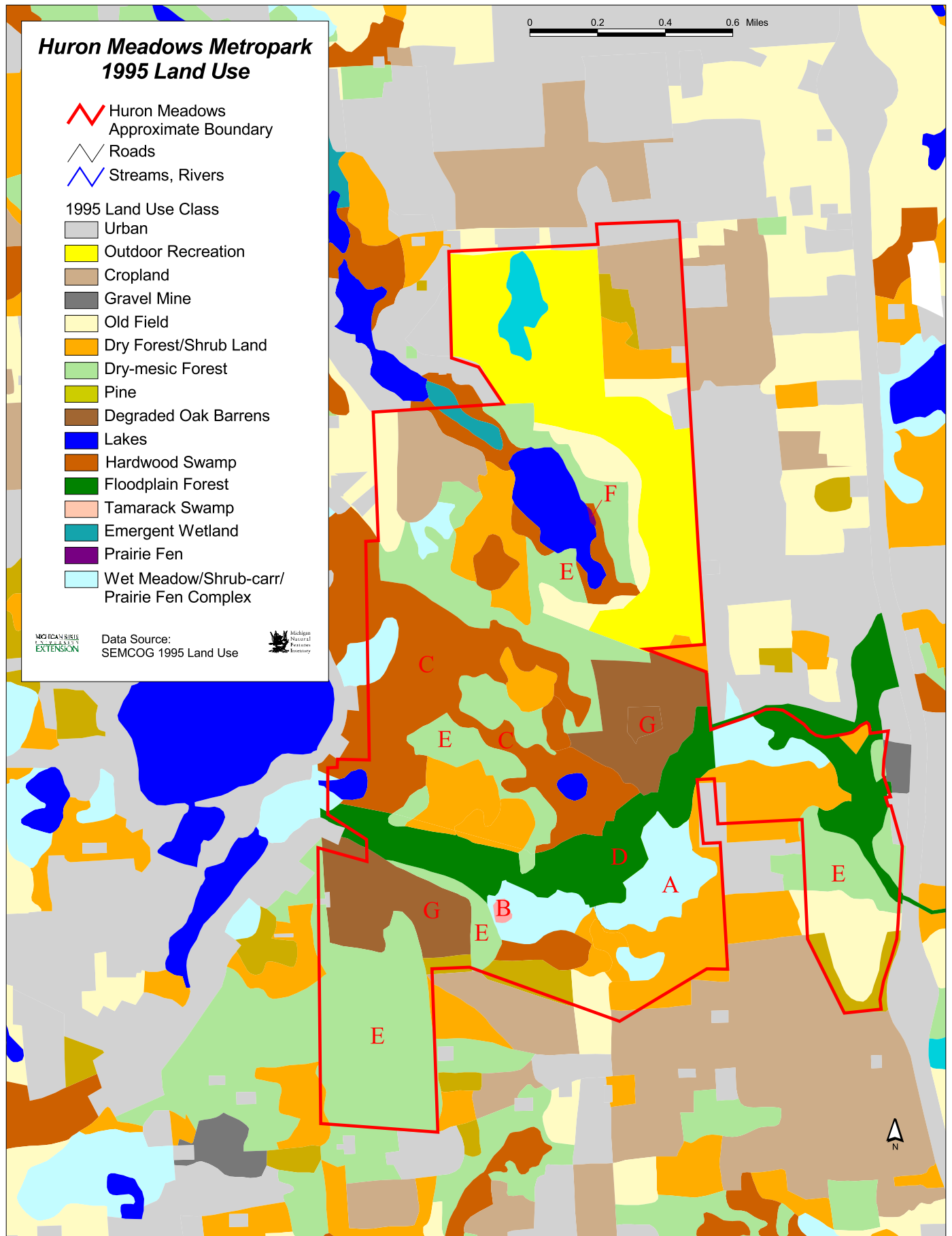


Figure 6. Huron Meadows Metropark 1995 Land Cover.

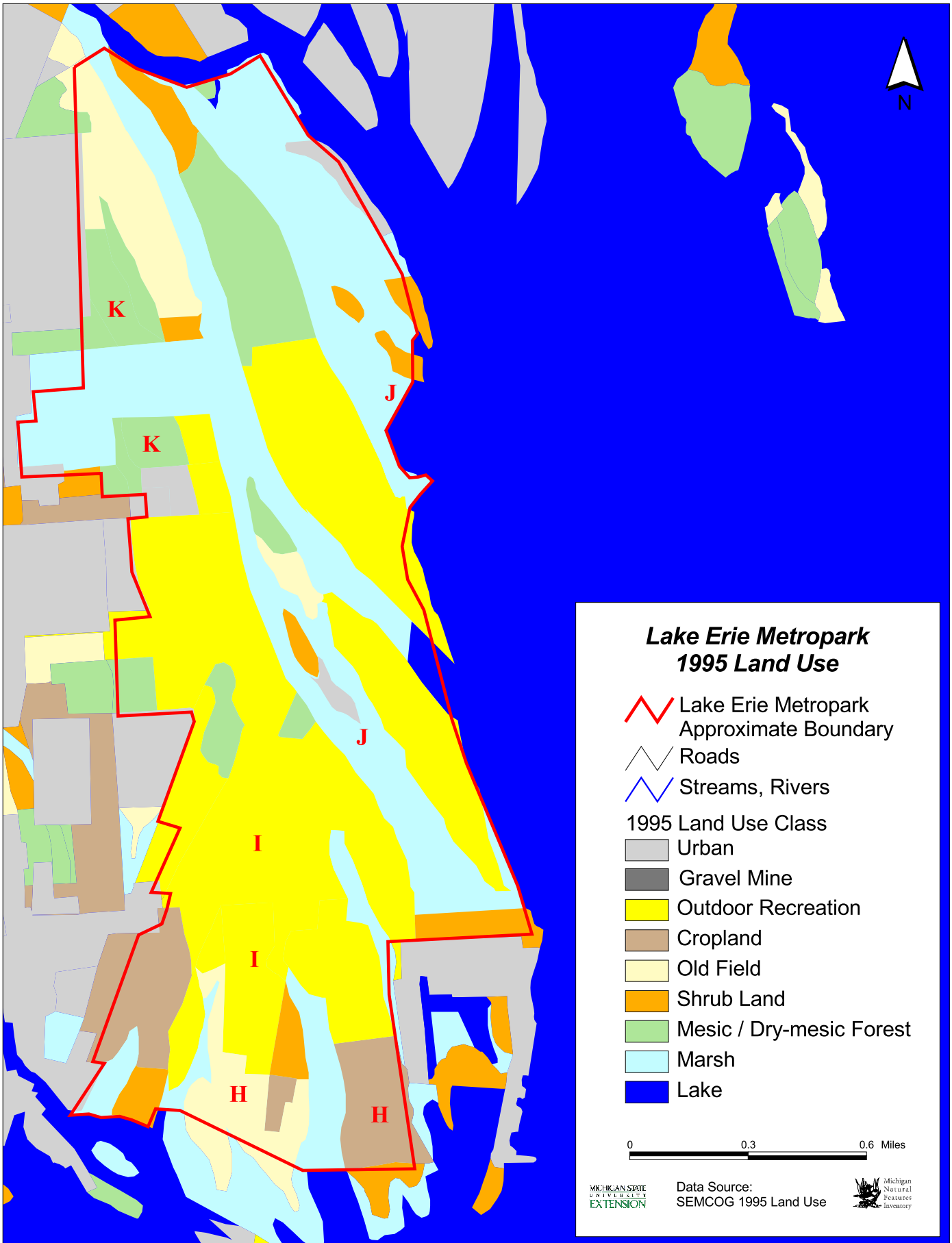


Figure 7. Lake Erie Metropark 1995 Land Cover.

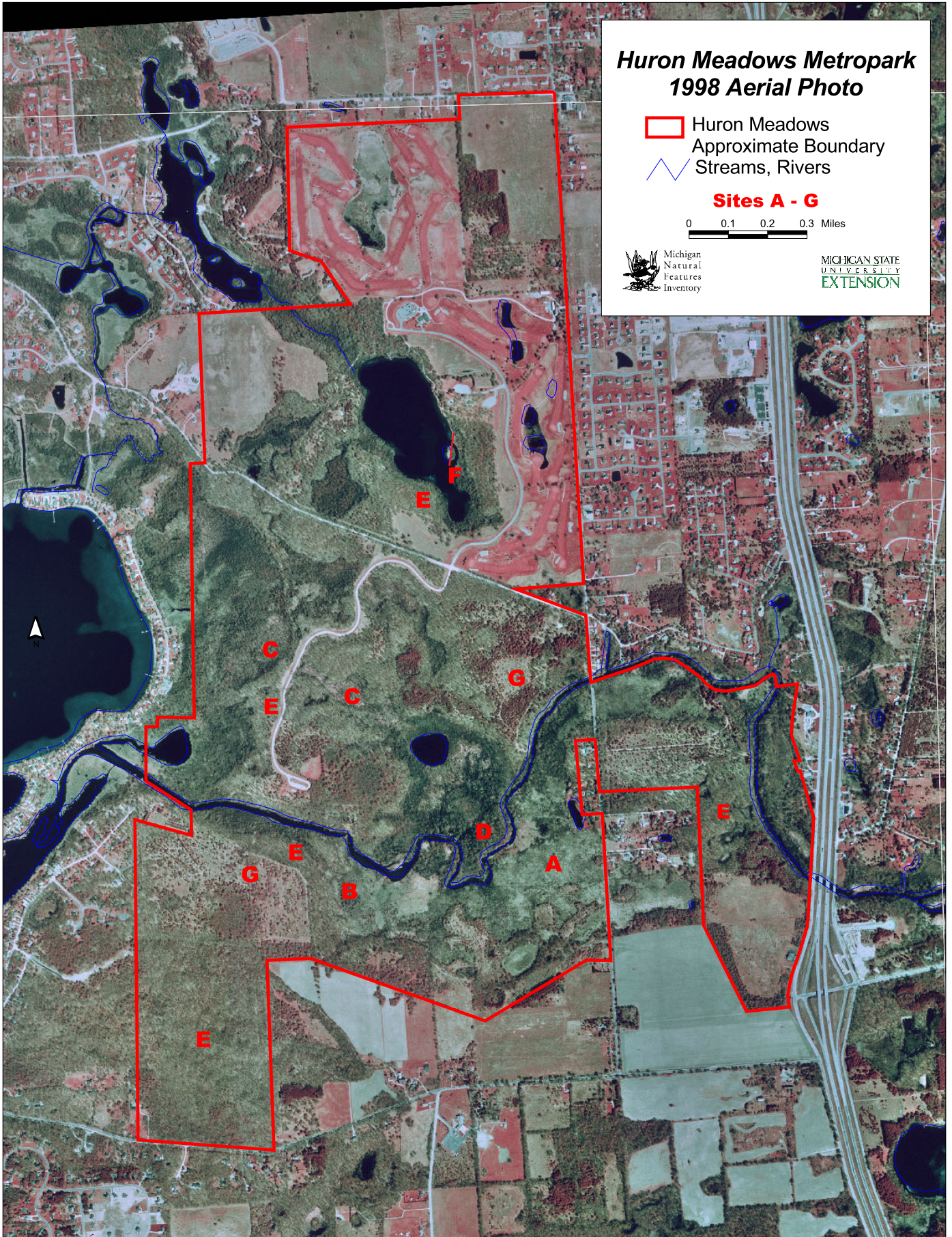


Figure 8. Huron Meadows Metropark 1998 Aerial Photo.



## Lake Erie Metropark 1998 Aerial Photos

 Lake Erie Metropark  
 Approximate Boundary

 Sites H - K



Figure 9. Lake Erie Metropark 1998 Aerial Photos.

## METHODS

### Natural Communities

Natural community surveys were conducted in conjunction with rare plant surveys. Prior to surveys, aerial photos were interpreted to determine the types of natural communities likely to be present within each of the metroparks. Field surveys concentrated on identifying high-quality natural areas and recording management concerns, such as evidence of fire suppression, excessive deer herbivory, hydrologic manipulation, farming, logging, and invasive species. Species lists were compiled for high-quality sites and sites deemed to have potential to significantly improve with restoration. Site names and site codes used in the accompanying metropark maps (Figures 6 - 9) are listed in Table 1. Partial species lists were recorded for most of the areas visited and are included as appendices for each metropark (Appendices 1 and 2). Site summaries were written for all high-quality natural communities and sites thought to have good potential for significant improvement with restoration and management. Species lists for this report were tabulated with the Florist Quality Assessment Program and species nomenclature follows Herman et al. (2001).

### Rare Plant Inventories

Rare plant species were targeted for survey based on the natural communities determined to be present in the park through aerial photo review and known historical and current rare plant distribution patterns

within the region. Table 2 lists the rare species by associated natural community that were focused on during the surveys. Rare plant inventories were performed by meander survey of appropriate habitat during periods when the plants are most recognizable (usually flowering or fruiting periods). When a rare plant was encountered, an MNFI special plant form was filled out, selected photos were taken, and when necessary a voucher specimen was collected for later determination.

**Table 1. Survey site names and associated site codes for accompanying maps (Figures 6, 7, 8 and 9).**

Site Name	Site Code
<b>Huron Meadow Metropark</b>	
Ricket Road Wet Meadow/Prairie Fen Complex	A
Winans Tamarack Swamp	B
Ore Lake Swamp	C
Huron River Floodplain Forest	D
Huron Meadows Oak-Hickory Forest	E
Maltby Lake Fen	F
Huron Oak Barrens	G
<b>Lake Erie Metropark</b>	
Erie Prairie	H
Erie Golf Course Wetlands	I
Erie Marsh	J
Erie Woods	K

**Table 2. Rare plants surveyed by associated natural communities. State status abbreviations are as follows: E, endangered; T, threatened; SC, special concern.**

<b>Community</b>	<b>Scientific Name</b>	<b>Common Name</b>	<b>State Status</b>
<b>Mesic Southern Forest</b>			
	<i>Castanea dentata</i>	American chestnut	E
	<i>Aristolochia serpentaria</i>	Virginia snakeroot	T
	<i>Carex oligocarpa</i>	Eastern few-fruited sedge	T
	<i>Carex platyphylla</i>	broad-leaved sedge	T
	<i>Dentaria maxima</i>	large toothwort	T
	<i>Galearis spectabilis</i>	showy orchis	T
	<i>Gentianella quinquefolia</i>	stiff gentian	T
	<i>Hybanthus concolor</i>	green violet	T
	<i>Hydrastis canadensis</i>	goldenseal	T
	<i>Panax quinquefolius</i>	ginseng	T
	<i>Polymnia uvedalia</i>	large-flowered leaf-cup	T
	<i>Spiranthes ovalis</i>	lesser ladies'-tresses	T
	<i>Tipularia discolor</i>	crane-fly orchid	T
	<i>Trillium recurvatum</i>	prairie trillium	T
	<i>Triphora trianthophora</i>	three-birds orchid	T
	<i>Adlumia fungosa</i>	climbing fumitory	SC
	<i>Jeffersonia diphylla</i>	twinleaf	SC
	<i>Liparis liliifolia</i>	purple twayblade	SC
<b>Southern Floodplain Forest</b>			
	<i>Chelone oblique</i>	red turtlehead	E
	<i>Arabis perstellata</i>	rock-cress	T
	<i>Camassia scilloides</i>	wild hyacinth	T
	<i>Carex conjuncta</i>	sedge	T
	<i>Carex davisii</i>	Davis's sedge	T
	<i>Carex lupuliformis</i>	false hop sedge	T
	<i>Carex typhina</i>	cat-tail sedge	T
	<i>Corydalis flavula</i>	yellow fumewort	T
	<i>Diarrhena americana</i>	beak grass	T
	<i>Fraxinus profunda</i>	pumpkin ash	T
	<i>Justicia americana</i>	water-willow	T
	<i>Lycopus virginicus</i>	Virginia water-horehound	T
	<i>Mertensia virginica</i>	Virginia bluebells	T
	<i>Morus rubra</i>	red mulberry	T
	<i>Polemonium reptans</i>	Jacob's ladder	T
	<i>Silphium perfoliatum</i>	cup-plant	T
	<i>Trillium recurvatum</i>	prairie trillium	T
	<i>Valerianella chenopodifolia</i>	goosefoot corn-salad	T
	<i>Wisteria frutescens</i>	wisteria	T
	<i>Carex squarrosa</i>	squarrose sedge	SC
	<i>Euonymus atropurpurea</i>	wahoo	SC
	<i>Gymnocladus dioica</i>	Kentucky coffee tree	SC
	<i>Hybanthus concolor</i>	green violet	SC
	<i>Lithospermum latifolium</i>	broad-leaved puccoon	SC
	<i>Viburnum prunifolium</i>	black haw	SC

**Table 2. Rare plants surveyed by associated natural communities (continued).**

<b>Community</b>	<b>Scientific Name</b>	<b>Common Name</b>	<b>State Status</b>
<b>Southern Swamp</b>			
	<i>Isotria medeoloides</i>	smaller whorled pogonia	E, LT
	<i>Plantago cordata</i>	heart-leaved plantain	E
	<i>Populus heterophylla</i>	swamp cottonwood	E
	<i>Dryopteris celsa</i>	log fern	T
	<i>Eupatorium fistulosum</i>	hollow-stemmed joe-pye-weed	T
	<i>Isotria verticillata</i>	whorled pogonia	T
	<i>Poa paludigena</i>	bog bluegrass	T
	<i>Cuscuta glomerata</i>	rope dodder	SC
	<i>Lysimachia hybrida</i>	swamp candles	SC
<b>Lakeplain Wet-Mesic Prairie</b>			
	<i>Gentiana flavida</i>	white gentian	E
	<i>Rhynchospora globularis</i>	globe beak-rush	E
	<i>Scelaria pauciflora</i>	few-flowered nut-rush	E
	<i>Aristida longespica</i>	three-awned grass	T
	<i>Asclepias sullivantii</i>	Sullivant's milkweed	T
	<i>Bartonia paniculata</i>	panicled screw-stem	T
	<i>Platanthera leucophaea</i>	eastern prairie-fringed orchid	E, LT
	<i>Silphium laciniatum</i>	compass plant	T
	<i>Sisyrinchium atlanticum</i>	Atlantic blue-eyed grass	T
	<i>Carex frankii</i>	Frank's sedge	SC
	<i>Hypericum gentianoides</i>	gentian-leaved St. John's-wort	SC
	<i>Ludwigia alternifolia</i>	seedbox	SC
	<i>Scelaria triglomerata</i>	tall nut-rush	SC
<b>Prairie Fen</b>			
	<i>Berula erecta</i>	cut-leaved water-parsnip	T
	<i>Cypripedium candidum</i>	small white lady's-slipper	T
	<i>Muhlenbergia richardsonis</i>	mat muhly	T
	<i>Phlox maculata</i>	spotted phlox	T
	<i>Polemonium reptans</i>	Jacob's ladder	T
	<i>Sanguisorba canadensis</i>	Canadian burnet	T
	<i>Valeriana edulis</i> var. <i>ciliata</i>	edible valerian	T
	<i>Sporobolus heterolepis</i>	prairie dropseed	SC
<b>Dry sand prairie</b>			
	<i>Panicum leibergii</i>	Leiberg's panic-grass	T
	<i>Ruellia humilis</i>	hairy ruellia	T
	<i>Solidago missouriensis</i>	Missouri goldenrod	T
	<i>Trichostema brachiatum</i>	false pennyroyal	T
	<i>Trichostema dichotomum</i>	bastard pennyroyal	T
	<i>Penstemon pallidus</i>	pale beard-tongue	SC
	<i>Tradescantia virginiana</i>	Virginia spiderwort	SC
	<i>Triplasis purpurea</i>	sand grass	SC

**Table 2. Rare plants surveyed by associated natural communities (continued).**

Community	Scientific Name	Common Name	State Status
<b>Dry-Mesic Southern Forest</b>			
	<i>Eupatorium sessilifolium</i>	upland boneset	T
	<i>Angelica venenosa</i>	hairy angelica	SC
	<i>Celtis tenuifolia</i>	dwarf hackberry	SC
	<i>Quercus shumardii</i>	Shumard's oak	SC
<b>Great Lakes Marsh</b>			
	<i>Nelumbo lutea</i>	American lotus	T
	<i>Sagittaria montevidensis</i>	broad-leaved arrowhead	T
	<i>Zizania aquatica</i> var. <i>aquatica</i>	wild rice	T
	<i>Hibiscus laevis</i>	smooth rose-mallow	SC
	<i>Hibiscus moscheutos</i>	swamp rose-mallow	SC
	<i>Strophostyles helvula</i>	trailing wild-bean	SC

## RESULTS

The surveys identified five new element occurrences (EOs). (All state and federally listed rare species and high-quality natural communities are referred to as elements and their occurrence at a specific location is referred to as an element occurrence or EO.) Natural community surveys identified one new high-quality community occurrence (Table 3). Surveys for rare plants resulted in four new element occurrences and three existing plant records were reconfirmed (Table 4). It is possible that additional rare species may be found in the future, especially with active restoration and management. All new natural community and rare plant occurrences have been entered into the statewide database managed by MNFI and all previously existing records have been updated.

### Natural Community Inventories Results

Natural community surveys resulted in the identification of a prairie fen at Huron Meadows (Figures 6 and 8: A) and a previously documented element occurrence of Great Lakes marsh was revisited in Lake Erie Metropark (Photograph 1 and Figures 7 and 9: J). In addition to these exemplary natural communities, both metroparks contain areas that have great potential of becoming high-quality natural communities with ecological restoration. The high-quality natural communities and sites with good potential for restoration are listed in Table 5 along with their associated stewardship needs. Detailed site descriptions and management recommendations for each area are included in the Site Summaries and Management Recommendations section (Page 20).

### Rare Plant Inventory Results

Rare plant surveys resulted in three new rare plant occurrences at Lake Erie including goldenseal (*Hydrastis canadensis*), American lotus (*Nelumbo lutea*), and Frank's sedge (*Carex frankii*). A new rare plant occurrence for purple twayblade orchid (*Liparis liliifolia*) was also discovered at Huron Meadows (Table 4). At Lake Erie, previously known records of eastern prairie-fringed orchid (*Platanthera leucophaea*) and swamp rose mallow (*Hibiscus moscheutos*) were reconfirmed and found in previously undocumented areas of the park. At Huron Meadows, a previously reported colony of dwarf hackberry (*Celtis tenuifolia*) was reconfirmed and also found in new areas of the park. A record of broad-leaved arrowhead (*Sagittaria montevidensis*) from Lake Erie was sought but could not be relocated.

At Lake Erie, rare plants were found primarily in marshes and adjacent open wetlands. American lotus was found in deeper water of emergent marshes, and swamp rose mallow was commonly located at the border between tall emergent marsh vegetation and adjacent uplands. Wet meadows throughout the park supported colonies of Frank's sedge. Eastern prairie-fringed orchid was also found in wet meadow habitat as well as old fields with moist soils. One plant, goldenseal, was found on the edge of a seasonally wet, dry-mesic forest.

At Huron Meadows, rare plants were found in dry upland habitat. Dwarf hackberry was located in dry-mesic forests and oak barrens remnants, and a small colony of purple twayblade was discovered in a pine plantation that was likely a former oak barrens.

**Table 3. Natural Community Occurrences.**

Community	Site Name (used for report)	Year First	Year Last	Metropark
		Observed	Observed	
prairie fen	Ricket Road Wet Meadow/Prairie Fen Complex	2004	2004	Huron Meadows
Great Lakes marsh	Erie Marsh	1988	2004	Lake Erie Metropark

**Table 4. Rare Plant Occurrences. Status abbreviations are as follows: E, state endangered; LT, federally threatened; T, state threatened; SC, state special concern.**

Species	Site Name (used for this report)	Status	Year First	Year Last	EO#	Metropark
			Observed	Observed		
<i>Carex frankii</i> Frank's sedge	Erie Golf Course Wetlands	SC	2004	2004	14	Lake Erie
<i>Celtis tenuifolia</i> Dwarf hackberry	Huron Meadows Oak-Hickory Forest and Huron Oak Barrens	SC	1973	2004	4	Huron Meadows
<i>Hibiscus moscheutos</i> Swamp rose mallow	Erie Marsh	SC	2003	2004	30	Lake Erie
<i>Hydrastis canadensis</i> Goldenseal	Erie Woods	T	2004	2004	77	Lake Erie
<i>Liparis liliifolia</i> Purple twayblade orchid	Huron Oak Barrens	SC	2004	2004	18	Huron Meadows
<i>Nelumbo lutea</i> American lotus	Erie Marsh	T	2004	2004	21	Lake Erie
<i>Platanthera leucophaea</i> Eastern prairie-fringed orchid	Erie Golf Course Wetlands	E, LT	1993	2004	2	Lake Erie
<i>Sagittaria montevidensis</i> Broad-leaved arrowhead	Erie Marsh	T	1988	1988	12	Lake Erie

**Table 5. Stewardship needs for high-quality natural communities and sites with good potential for improvement through restoration and management.**

<b>Metropark</b>		
<b>Site Name</b>	<b>Community Type</b>	<b>Management Recommendations</b>
<b>Huron Meadows Metropark</b>		
Ricket Road Wet Meadow/Prairie Fen Complex	southern wet meadow, prairie fen, and southern shrub-carr	<ul style="list-style-type: none"> <li>- remove invasive species</li> <li>- reduce shrub and tree cover</li> <li>- implement prescribed fire program</li> <li>- reduce deer densities</li> </ul>
Winans Tamarack Swamp	relict conifer swamp	<ul style="list-style-type: none"> <li>- remove invasive species</li> <li>- remove red maple trees and saplings</li> <li>- reduce deer densities</li> <li>- implement prescribed fire in surrounding uplands to reduce seed source for encroaching red maple and invasive shrubs</li> </ul>
Ore Lake Swamp	southern swamp	<ul style="list-style-type: none"> <li>- remove invasive species</li> <li>- reduce deer densities</li> <li>- reduce impacts of forest fragmentation by directing succession of adjacent open fields towards forest or oak barrens</li> <li>- monitor for emerald ash borer</li> </ul>
Huron River Floodplain Forest	southern floodplain forest	<ul style="list-style-type: none"> <li>- remove invasive species</li> <li>- reduce deer densities</li> <li>- reduce impacts of forest fragmentation by directing succession of adjacent open fields towards forest or oak barrens</li> <li>- monitor for emerald ash borer</li> </ul>
Huron Meadows Oak-Hickory Forest	dry-mesic southern forest and mesic southern forest	<ul style="list-style-type: none"> <li>- remove invasive species</li> <li>- reduce deer densities</li> <li>- implement prescribed fire program to promote oak regeneration</li> <li>- reduce impacts of forest fragmentation by directing succession of adjacent open fields towards forest or oak barrens</li> </ul>
Maltby Lake Fen	prairie fen	<ul style="list-style-type: none"> <li>- remove invasive species</li> <li>- reduce shrub and tree cover</li> <li>- implement prescribed fire program</li> <li>- reduce deer densities</li> </ul>
Huron Oak Barrens	degraded oak barrens and dry southern forest	<ul style="list-style-type: none"> <li>- remove invasive species</li> <li>- implement prescribed fire program</li> <li>- reduce shrub and tree cover</li> <li>- reduce deer densities</li> <li>- encourage large, scattered oaks</li> </ul>

**Table 5. Stewardship needs (continued).**

Metropark Site Name	Community Type	Management Recommendations
<b>Lake Erie Metropark</b>		
Erie Prairie	lakeplain wet-mesic prairie or lakeplain oak openings	<ul style="list-style-type: none"> <li>- remove invasive species</li> <li>- implement prescribed fire program</li> <li>- reduce shrub and tree cover</li> <li>- reduce deer densities</li> <li>- encourage large, scattered oaks</li> </ul>
Erie Golf Course Wetlands	wet meadow areas in golf course	<ul style="list-style-type: none"> <li>- avoid mowing wet meadows from June through September</li> <li>- reduce shrub encroachment in wet meadows</li> <li>- avoid overspray of broad spectrum herbicide in wet meadows</li> </ul>
Erie Marsh	Great Lakes marsh	<ul style="list-style-type: none"> <li>- remove invasive species</li> </ul>
Erie Woods	mesic southern forest	<ul style="list-style-type: none"> <li>- remove invasive species</li> <li>- reduce deer densities</li> <li>- reduce impacts of forest fragmentation by directing succession of adjacent open fields towards forest or lakeplain oak openings</li> <li>- monitor for emerald ash borer</li> </ul>



**Photograph 1. A primary stewardship need for the Lake Erie Marsh is to limit invasive species encroachment, especially where there are concentrations of rare plants such as this extensive bed of American lotus (Photo by Ryan O'Connor).**

# SITE SUMMARIES AND MANAGEMENT RECOMMENDATIONS

## HURON MEADOWS METROPARK

### Rickett Road Wet Meadow/Prairie Fen Complex

(Site Code: A)

A large wetland complex occurs on the southern side of the Huron River, just west of Rickett Road (Photograph 2 and Figures 6 and 8: A). The complex is composed of several different types of natural communities including southern wet meadow, prairie fen, emergent marsh, and southern shrub-carr. Over 100 plant species were identified within this diverse wetland (Appendix 1). The wetland occurs within a depression on a broad glacial outwash plain and borders a fine-textured moraine. Hydrology of the wetland is maintained by a steady flow of calcareous groundwater seepage and by over-the-bank flooding from the Huron River. Southern wet meadow is the dominant community type within most of the complex, especially along the Huron River and in the eastern portion of the open wetland complex. Areas of open, very diverse prairie fen occur in several places but have been significantly reduced in size as a result of tree and shrub invasion. Emergent marsh is limited to the areas adjacent to the river that experience the greatest flooding frequency. Vegetation of the emergent marsh is characterized by broad-leaved cattail (*Typha latifolia*), sweet-flag (*Acorus calamus*), common bur-reed (*Sparganium eurycarpum*), and softstem bulrush (*Schoenoplectus tabernaemontani*), with some areas dominated by the invasives reed canary grass (*Phalaris arundinacea*) and giant reed (*Phragmites australis*).

Open wetlands throughout this complex are subject to shrub encroachment due to prolonged fire suppression. Southern shrub-carr is most prevalent in the western portions of this wetland complex and in areas where the floodplain is narrowest. Prevalent shrubs include silky dogwood (*Cornus amomum*), gray dogwood (*Cornus foemina*), red-osier dogwood (*Cornus stolonifera*), Michigan holly (*Ilex verticillata*), Bebb's willow (*Salix bebbiana*), hoary willow (*Salix candida*), meadowsweet (*Spiraea alba*), and nannyberry (*Viburnum lentago*). However, many areas of shrub-carr are completely dominated by glossy buckthorn, which forms impenetrable thickets especially in the narrow portions of the floodplain.

The prairie fen has been entered into the MNFI database as a natural community occurrence. The community is dominated by sedges (*Carex lasiocarpa* and *Carex stricta*), big bluestem (*Andropogon gerardii*), shrubby cinquefoil (*Potentilla fruticosa*), poison sumac (*Toxicodendron vernix*), and tamarack. The prairie fen contains many species that occur in few

other natural communities types including bog valerian (*Valeriana uliginosa*), hoary willow, slender wheat grass (*Agropyron trachycaulum*), bog birch (*Betula pumila*), grass-of-parnassus (*Parnassia glauca*), Riddell's goldenrod (*Solidago riddellii*), and bog goldenrod (*Solidago uliginosa*). Prevalent graminoids include twig rush (*Cladium mariscoides*), beak-rush (*Rynchospora capillacea*), fringed brome (*Bromus ciliatus*), marsh wild-timothy (*Muhlenbergia glomerata*), smallhead rush (*Juncus brachycephalus*), and path rush (*Juncus tenuis*). Common wetland forbs include tall flat-top white aster (*Aster umbellatus*), bog lobelia (*Lobelia kalmia*), common boneset (*Eupatorium perfoliatum*), sneezeweed (*Helenium autumnale*), marsh pea (*Lathyrus palustris*), swamp-betony (*Pedicularis lanceolata*), common mountain mint (*Pycnanthemum virginianum*), and black-eyed susan (*Rudbeckia hirta*).

As noted, southern wet meadow is the most prevalent community type within the wetland complex with large blocks occurring along the south side of the Huron River and in the eastern portion of the wetland complex, just west of Rickett Road. The tussock forming sedge, *Carex stricta*, dominates most of the meadows and *Carex lacustris*, a wide-leaf sedge, is also a dominant in some places. Other abundant species occurring in the wet meadow include blue-joint grass (*Calamagrostis canadensis*), joe-pye-weed (*Eupatorium maculatum*), sensitive fern (*Onoclea sensibilis*), swamp aster (*Aster puniceus*), marsh fern (*Thelypteris palustris*), cut grass (*Leersia oryzoides*), swamp milkweed (*Asclepias incarnata*), marsh pea, northern bugle weed (*Lycopus uniflorus*), common mountain mint, common skullcap (*Scutellaria galericulata*), late goldenrod (*Solidago gigantea*), swamp goldenrod (*Solidago patula*), purple meadow-rue (*Thalictrum dasycarpum*), swamp thistle (*Cirsium muticum*), nodding bur-marigold (*Bidens cernuus*), arrow-leaved tear-thumb (*Polygonum sagittatum*), and gray dogwood. Shrub and tree encroachment is significant in some portions of the community and if left unchecked, woody species are likely to dominate these areas in the future. Common shrub and tree species include gray dogwood, silky dogwood, red-osier dogwood, hoary willow, red ash (*Fraxinus pennsylvanica*), silver maple (*Acer saccharinum*), quaking aspen (*Populus tremuloides*), eastern red-cedar (*Juniperus virginiana*), and American elm. Several areas are completely dominated by the exotic species reed canary grass. In these areas little other

vegetation can compete with the dominant mat of reed canary grass.

Overall management of the wetland complex should include a significant reduction in shrub and tree cover, control of invasive species, and prescribed fire. Shrub and tree encroachment into the open sedge meadow can be controlled by cutting shrubs and trees and applying herbicide directly to the cut stumps. Reducing shrub and tree cover will help maintain the open conditions required by most of the community's plant and animal species. Several invasive species were observed within the wetland including glossy buckthorn, purple loosestrife (*Lythrum salicaria*) (Photograph 2), reed canary grass, and giant reed. Glossy buckthorn should be cut and its stumps treated with herbicide to prevent further spread (Reinartz 1997). Similarly, purple loosestrife can be controlled by cutting flowering stems and applying herbicide to the cut stems. The patches of reed canary grass should be monitored annually and controlled if they appear to be spreading. Control of reed canary grass can be accomplished by applying an herbicide when the species is in flower. Prescribed fire can help maintain open conditions and species diversity and should be regularly used as a management tool in this wetland complex, especially in the pockets of prairie fen. Historically fires likely spread from the large area of oak barrens to the south into the open wetlands along the Huron River. The Huron River to the north provides an excellent fire break for conducting prescribed fires. For detailed information on prairie fen and southern wet meadow, refer to the Michigan Natural Features Inventory abstracts for these communities (Spieles et al. 1999, Kost 2001b).



**Photograph 2. Purple loosestrife is beginning to invade portions of the extensive wet meadow/prairie fen complex. (Photo by Joshua Cohen).**

### **Winans Tamarack Swamp (Site Code: B)**

A small tamarack swamp or relict conifer swamp occurs south of the Huron River (Figures 6 and 8: B). The tamarack swamp is fringed by an extensive prairie fen and wet meadow complex to the north and east, and dry-mesic southern forest on the morainal slopes (of the floodplain terrace) to the south. Soils within the swamp are marly and moderately alkaline pH (8.0). The hydrology of the wetland is maintained by calcareous groundwater seepage from the adjacent moraine. The overstory is dominated by tamarack, which ranges in dbh from 7 to 30 cm (3 to 12 inches), with scattered canopy red maple and American elm. Common shrub species include poison sumac, bog birch, spicebush (*Lindera benzoin*), Michigan holly, Bebb's willow, shrubby cinquefoil, silky dogwood, red-osier dogwood, and nannyberry. The ground layer is diverse with some portions of the swamp supporting a dense bog mat with sphagnum moss. Common ground layer species include sedges (*Carex stricta*, *C. buxbaumii*, and *C. lacustris*), bog goldenrod, Riddell's goldenrod, dwarf raspberry (*Rubus pubescens*), twig rush, marsh wild-timothy, marsh marigold (*Caltha palustris*), marsh bellflower (*Campanula aparinoides*), joe-pye-weed, common boneset, northern bugleweed, four-leaved loosestrife (*Lysimachia quadrifolia*), wild mint (*Mentha arvensis*), grass-of-parnassus, common mountain mint, pitcher-plant (*Sarracenia purpurea*), common skullcap, sensitive fern, marsh fern, and spotted touch-me-not (*Impatiens capensis*) (Appendix 1).

The only invasive species observed of significance was glossy buckthorn. This species should be removed using herbicide and the area closely monitored to detect further recruitment. As hardwoods, especially red maple, become established within the swamp they will eventually create a closed canopy and cause significant reductions in the amount of light that reaches the understory and ground layer. Light-demanding species such as tamarack and many of the shrub and ground layer species will eventually be eliminated unless measures are taken to reduce dominance of hardwoods such as red maple. Important basking sites for reptile species are also eliminated when relict conifer swamps are invaded by red maple. In order to maintain biodiversity within the tamarack swamp, red maple should be cut and herbicide applied to the stumps to prevent resprouting. Red maple trees and saplings can also be girdled. For detailed information on relict conifer swamp or tamarack swamp, refer to Michigan Natural Features Inventory abstract for this community (Kost 2001a).

### Ore Lake Swamp (Site Code: C)

The Ore Lake Swamp is a forested wetland dominated by deciduous trees species. This southern swamp occurs north of the Huron River in the outwash plain east of Ore Lake and extends east to the shores of the small lake east of the canoe launch (Figures 6 and 8: C). The road to the canoe launch divides the swamp into two blocks and has likely altered the hydrology of this system as manifest by the increased tree mortality due to flooding near the road. The swamp occurs north of floodplain forest along the Huron River and is intermixed with dry-mesic southern forest and small areas of mesic southern forest. Soils of the swamp are mucky, saturated organics. Interpretation of original land surveyor notes and the presence of scattered conifer stumps and sphagnum-covered, decaying conifer logs indicate that this swamp has converted from a conifer-dominated system to a hardwood swamp. Current canopy dominants include red maple, silver maple, swamp white oak (*Quercus bicolor*), and red ash. Additional canopy components include American elm, black ash, yellow birch (*Betula alleghaniensis*), and basswood. Red maple, yellow birch, and tulip poplar (*Lireodendron tulipifera*) were most common in the ecotone between the hardwood swamp and the adjacent dry-mesic southern forest and on slight rises within the swamp. Diameters of canopy trees typically range from 23 to 48 cm (10 to 20 inches). In the mature portion of the swamp, the understory layer is scattered with spice bush, blue-beech (*Carpinus caroliniana*), Michigan holly, buttonbush (*Cephalanthus occidentalis*), and smooth highbush blueberry (*Vaccinium corymbosum*) as characteristic shrub species. Closer to the Huron River and to the lakes, the swamp forest is younger with smaller diameter canopy trees and a heavy shrub component in the understory. In some areas, glossy buckthorn completely dominates and forms dense thickets. Additional exotic shrubs include Japanese barberry (*Berberis thunbergii*), common privet (*Ligustrum vulgare*), and multiflora rose (*Rosa multiflora*). Common ground cover species include poison ivy (*Toxicodendron radicans*), riverbank grape (*Vitis riparia*), fowl manna grass (*Glyceria striata*), white grass (*Leersia virginica*), false nettle (*Boehmeria cylindrica*), enchanter's-nightshade (*Circaea lutetiana*), wood nettle (*Laportea canadensis*), common water horehound (*Lycopus americanus*), northern bugle weed, fringed loosestrife (*Lysimachia ciliata*), golden ragwort (*Senecio aureus*), water-parsnip (*Sium suave*), skunk cabbage (*Symplocarpus foetidus*), nettle (*Urtica dioica*), ostrich fern (*Matteuccia struthiopteris*), royal fern (*Osmunda regalis*), marsh fern, water hemlock (*Cicuta*

*maculata*), spotted touch-me-not, and clearweed (*Pilea pumila*). Two exotic species were found to be common in the ground layer, ground ivy (*Glechoma hederacea*) and bittersweet nightshade (*Solanum dulcamara*) (Appendix 1).

Management for the swamp forest should focus on invasive species control with removal of glossy buckthorn, barberry, privet, and multiflora rose as the main priority. These shrubs should be cut and their stumps treated with herbicide to prevent resprouting (Reinartz 1997).



**Photograph 3. The floodplain forest along the Huron River is characterized by numerous windthrows and frequent flooding (Photo by Joshua Cohen).**

### Huron River Floodplain Forest (Site Code: D)

Mature floodplain forest occurs along portions of the Huron River, especially in areas east of the canoe launch on the north side of the river (Photograph 3 and Figures 6 and 8: D). West of the canoe launch, on both sides of the river, the floodplain forest is much younger with a heavy component of the invasive shrub, glossy buckthorn. On the south side of the river, east of the canoe launch where the floodplain is wide, the wetlands are open with wet meadow dominating. In areas where the floodplain is narrow the slope to the upland terrace is steep and dominated by dry-mesic southern forest, which is degraded on the north side of the river and high quality on the south side. The mature floodplain forest is dominated by medium-sized silver maple, with additional red ash, cottonwood (*Populus deltoides*), basswood, American elm, and swamp white oak as important canopy components. Swamp white oak, American elm, and black ash are most prevalent in areas of backswamp at the base of the terrace slope. Diameters of canopy trees range from 20 to 89 cm (8 to 36 inches). The closed canopy forest contains many multi-stemmed silver maple,

numerous canopy gaps from windthrow, and high levels of coarse woody debris (Photograph 3). Flooding was observed throughout the growing season with up to a foot of standing water in the spring and between three and four feet of standing water in some areas in August. Areas susceptible to heavy flooding tended to have a significant amount of canopy die-back with numerous standing snags. These areas were also characterized by an open canopy and dominance in the ground layer by the invasive exotic reed canary grass. In areas prone to less flooding, important ground cover species include Virginia creeper (*Parthenocissus quinquefolia*), poison ivy, riverbank grape, side-flowering aster (*Aster lateriflorus*), false nettle, wood nettle, arrow-arum (*Peltandra virginica*), common arrowhead (*Sagittaria latifolia*), and lizard's-tail (*Saururus cernuus*). Mature portions of the floodplain contain a sparse understory with spice bush and blue-beech and scattered pockets of buttonbush. As noted earlier, areas of younger floodplain forest contain a heavy understory component dominated by glossy buckthorn. Additional invasive exotics that pose a threat to the native vegetation of the floodplain include Japanese barberry and autumn-olive (*Elaeagnus umbellata*) (Appendix 1).

Stewardship priorities for this site should focus on removal of invasive shrubs scattered occasionally throughout the mature floodplain. Target shrubs for removal include glossy buckthorn, Japanese barberry, and autumn-olive. The shrubs can be cut and their stumps herbicided to prevent their further spread. Efforts to control the domination of reed canary grass should also be implemented. Control of reed canary grass can be accomplished by applying an herbicide when the species is in flower. Notably absent at this site was garlic mustard (*Alliaria petiolata*) and Dame's rocket (*Hesperis matronalis*), two highly invasive herbaceous species that often invade floodplain habitats. Vigilant monitoring and quick eradication of any adventive colonies of these species is critical to the stewardship of this site. We also recommend monitoring for ash mortality caused by the emerald ash borer (*Agilus planipennis*) within the floodplain forest and the adjacent hardwood swamp. Emerald ash borer is a recently discovered Asiatic beetle that has already killed millions of ash trees in southeastern Michigan and southeastern Ontario and threatens to drastically alter the region's forests (USDA Forest Service 2002, Roberts 2003). A crucial research need is to determine if it is possible to prevent this pest from radically altering ash-dominated forests. For detailed information on floodplain forest, refer to the Michigan Natural Features Inventory abstract for this community (Tepley et al. 2004).

### **Huron Meadows Oak-Hickory Forest (Site Code: E)**

Four distinct, relatively high-quality stands of dry-mesic southern forest occur within the metropark (Figures 6 and 8: E). The largest block occurs along the hiking path west of the road to the canoe launch, extending across to the east side of the road. This forest occurs on moderate slopes of ground moraine, intermixed with hardwood swamp, and contains pockets of mesic southern forest and seasonally wet depressions. South of the Huron River along the terrace slopes and on upland islands within the floodplain is another noteworthy block of dry-mesic southern forest. This forest is bordered by degraded floodplain forest to the north and degraded oak barrens/old field to the south. Further south, in the closed-canopy forest north of Winans Lake Road is an area with extreme rolling topography. In the center of this forested block is mature dry-mesic southern forest. However, the edges are characterized by degraded forest with high levels of exotic species in the understory and ground cover. The final stand of relatively high-quality dry-mesic southern forest occurs on the southern slopes of Maltby Lake just north of Hammel Road.

The dry-mesic southern forests can be characterized as oak-hickory forest. Soils are sandy loams with very slightly acid to neutral pH. Numerous snags and coarse woody debris are found throughout. Large-diameter trees dominate the canopy with dbh typically ranging from 28 to 74 cm (12 to 30 inches). Using tree rings from a cut oak stump of comparable diameter, the age of the canopy cohort of these stands is estimated to be over 150 years. Canopy dominance is shared by white oak, red oak, black oak, shagbark hickory (*Carya ovata*), and pignut hickory (*Carya glabra*). Additional canopy associates include basswood, big-toothed aspen (*Populus grandidentata*), white ash (*Fraxinus americana*), tulip poplar, American beech, and sugar maple. American beech and sugar maple occur in small pockets of mesic southern forest found within the mature forest north of the Huron River and west of the canoe launch road. This forested block also contains numerous seasonally wet depressions dominated by buttonbush and Michigan holly. Forested vernal pools provide critical breeding habitat for amphibians, as well as an insect-rich food resource for northward-migrating songbirds in the spring. Species characteristic of the dry-mesic southern forest understory include dwarf hackberry (special concern, SC), witch-hazel (*Hamamelis virginiana*), Juneberry (*Amelanchier arborea*), ironwood (*Ostrya virginiana*), flowering dogwood (*Cornus florida*), maple-leaved arrow-wood (*Viburnum acerifolium*), and blueberry (*Vaccinium angustifolium*).

A diversity of species are common within the ground cover including *Carex pedunculata*, *Carex pensylvanica*, bottlebrush grass (*Hystrix patula*), doll's-eyes (*Actaea pachypoda*), red baneberry (*Actaea rubra*), soft agrimony (*Agrimonia pubescens*), jack-in-the-pulpit (*Arisaema triphyllum*), big-leaved aster (*Aster macrophyllus*), enchanter's-nightshade, clustered-leaved tick-trefoil (*Desmodium glutinosum*), naked tick-trefoil (*Desmodium nudiflorum*), white wild licorice (*Galium circaezans*), wild geranium (*Geranium maculatum*), white avens (*Geum canadense*), round-lobed hepatica (*Hepatica americana*), lopseed (*Phryma leptostachya*), may-apple (*Podophyllum peltatum*), jumpseed (*Polygonum virginianum*), black snakeroot (*Sanicula gregaria*), blue-stemmed goldenrod (*Solidago caesia*), yellow violet (*Viola pubescens*), maidenhair fern (*Adiantum pedatum*), and hog-peanut (*Amphicarpaea bracteata*) (Appendix 1).

Numerous invasive species were observed within the dry-mesic southern forest stands including Oriental bittersweet (*Celastrus orbiculata*), Japanese barberry, autumn-olive, common privet, Amur honeysuckle (*Lonicera maackii*), and Tartarian honeysuckle (*Lonicera tatarica*). In addition, an extremely invasive tree species, the tree-of-heaven (*Ailanthus altissima*), was found just east of the canoe launch parking area along the degraded slopes above the river. These species, especially the tree-of-heaven, should be controlled through cutting, accompanied by herbicide application to the stumps to prevent resprouting. The blocks of forest along the slopes above the Huron River and north of the river on the west side of the road contain moderate levels of invasive exotic species and a concerted effort to eliminate non-native vegetation in conjunction with the implementation of prescribed fire would restore these systems to high-quality dry-mesic southern forest. Prescribed fire should be used to help reduce understory density and help control invasive species. Fire may also help create light gaps, which will facilitate oak reproduction. Removal or girdling of shade-tolerant trees like red maple may also help facilitate oak reproduction. These forested blocks should be monitored annually during the spring for garlic mustard, and if detected, all plants should be removed before setting seed.

#### **Maltby Lake Fen** (Site Code: F)

Just below the Sunset Ridge Picnic Area along the east shore of Maltby Lake is a small, diverse prairie fen (Figures 6 and 8: F). Bordered to the east by a steep oak-dominated ridge, the fen is maintained by a constant supply of calcareous groundwater seeping out of the base of the slope. Tamarack, quaking aspen, hoary willow, Bebb's willow, and gray dogwood

dominate the tree and shrub layer, and characteristic species such as *Carex stricta*, common mountain mint, shrubby cinquefoil, Riddell's goldenrod, and purple gerardia (*Agalinis purpurea*) occur in the ground layer (Appendix 1).

Management opportunities at this fen include a minimal amount of shrub control, particularly of a few scattered common buckthorn (*Rhamnus cathartica*). A prescribed burn would also benefit this site, and would be relatively easy to control given the natural firebreaks in the form of dense shrub-carr to the south, Maltby Lake to the west, and a moist seep to the east. This site also contains a unique opportunity for landscape-level restoration with the adjacent oak forest to the east. Dominated by large black and white oak, the steep west-facing slope contains pockets of vegetation associated with oak savanna. A prescribed burn encompassing both the fen and adjacent oak forest would greatly enhance biodiversity in both communities. In addition, restoring and maintaining open conditions in the fen and oak forest will create an important scenic vista and allow the metroparks to provide unique educational opportunities from the adjacent picnic area. For detailed information on prairie fen refer to the Michigan Natural Features Inventory abstract for this community (Spieles et al. 1999).

#### **Huron Oak Barrens** (Site Code: G)

Several prairie-like openings are scattered south of Hammel Road on the north side of the Huron River and just south of the river in an old field/degraded oak barrens complex (Figures 6 and 8: G). These openings are the remnants of oak barrens that characterized much of southern Livingston County circa 1800. These sites typically have somewhat droughty, infertile soils and at Huron Meadows are found on relatively flat glacial outwash terraces above the Huron River. The overstory canopy is sparse in these openings, and is typically dominated by black oak, though numerous other species are present, including black walnut (*Juglans nigra*) and aspen (*Populus grandidentata* and *P. tremuloides*) as well as non-native species like Siberian elm (*Ulmus pumila*), white mulberry (*Morus alba*), and apple (*Malus* sp.). Several pine plantations were established in the area north of the river. These barrens were once much more open, which is clearly evident on aerial photographs taken in 1937. Over the past 60 to 70 years, many of the oak barrens in the park have filled in with young trees and tall shrubs such as wild black cherry (*Prunus serotina*), gray dogwood, hawthorn (*Crataegus* sp.), and red-cedar as well as invasive shrubs like autumn-olive and multiflora rose. Dwarf hackberry (SC) is also present, but is concentrated along the edges of more mature

dry-mesic forests. Fragrant sumac (*Rhus aromatica*) is also prevalent throughout. In the remaining openings, a strong compliment of native groundflora is mixed with exotic plants of old fields. Some characteristic native species include wild bergamot (*Monarda fistulosa*), black-eyed susan, bush-clovers (*Lespedeza capitata*, *L. hirta*, and *L. virginica*), tick-trefoils (*Desmodium canadense*, *D. ciliare*, *D. illinoense*, and *D. sessilifolium*), goldenrods (*Solidago speciosa*, *S. nemoralis*, and *S. canadensis*), rough blazing star (*Liatris aspera*), and northern dewberry (*Rubus flagellaris*) as well as grasses like little bluestem (*Andropogon scoparius*), hair grass (*Deschampsia flexuosa*), and three-awned grass (*Aristida purpurascens*). Also occurring in the pine plantation north of the river is a small colony of the purple twayblade orchid (*Liparis lilifolia*), a species of special concern. Unfortunately, many of the remnant barrens are degraded with non-native invasive species. Ranging from occasionally present to locally dominant in more degraded areas are invasive species such as spotted knapweed (*Centaurea maculosa*), white sweet-clover (*Melilotus alba*), common St. John's-wort (*Hypericum perforatum*), sheep sorrel (*Rumex*

*acetosella*), smooth brome grass (*Bromus inermis*), timothy (*Phleum pratense*), red fescue (*Festuca rubra*), and Canada bluegrass (*Poa compressa*) (Appendix 1).

Management in these remnant oak barrens should focus on maintenance and expansion of openings and control of invasive species. Shrub and small tree species are encroaching on the native groundflora and should be removed. Resource managers should take care to maintain large-diameter, open-grown oaks to preserve the structural character of barrens of an open canopy with scattered overstory trees. Combining shrub removal with prescribed burning will stimulate native species and over time will help control exotic grasses and forbs. Some hand-pulling of troublesome weeds like sweet-clover may also be necessary for restoration. The pine plantation south of Hammel Road should also be removed and could eventually be restored to oak barrens, though care should be taken to minimize heavy disturbance to the area immediately surrounding the purple twayblade orchid site. For detailed information on oak barrens, refer to the Michigan Natural Features Inventory abstract for this community (Cohen 2001b).

## LAKE ERIE METROPARK

### Erie Prairie (Site Code: H)

The Erie Prairie consists of several small, level, agricultural fields and abandoned old fields that are separated by hedgerows, a gravel road, and a narrow channel of Great Lakes marsh (Figures 7 and 9: H). The site borders old fields on the Point Mouillee State Game Area to the south and the Lake Erie Metropark Golf Course to the north. The Erie Prairie site harbors a population of eastern prairie-fringed orchid, which is listed as state endangered (E) and federally threatened (LT) (Photograph 4). Because the eastern prairie-fringed orchid is extremely rare as a result of habitat conversion to agriculture, this site represents an excellent opportunity to undertake an ecological restoration project for a lakeplain prairie/lakeplain oak openings complex in partnership with the Michigan Department of Natural Resources (DNR), which owns the adjoining old fields. Once widespread throughout the lake plain in southeast Michigan, lakeplain prairie and lakeplain oak openings are now globally rare natural communities. A joint effort in partnership with the DNR to restore these rare natural communities and improve habitat for the eastern prairie-fringed orchid at Erie Prairie will greatly contribute to biodiversity conservation in southeast Michigan.



**Photograph 4. Eastern prairie-fringed orchid, a globally imperiled species, occurs at Lake Erie Metropark. Restoration of lakeplain prairie would benefit this ecologically significant population (Photo by Ryan O'Connor).**

Management of the site should include 1) removing hedgerows, 2) establishing appropriate native prairie plant species, 3) controlling exotic plants, 4) prescribed burning, and 5) maintaining or planting scattered oaks. Removing the hedge rows that separate the small fields will create a large open grassland/savanna and provide potential habitat for numerous rare and declining grassland birds such as the northern harrier (*Circus cyaneus*, SC), bobolink (*Dolichonyx oryzivorus*), savanna sparrow (*Passerculus sandwichensis*), Henslow's sparrow (*Ammodramus henslowii*, SC), grasshopper sparrow (*Ammodramus savannarum*, SC), short-eared owl (*Asio flammeus*, E), dickcissel (*Spiza americana*, SC), migrant loggerhead shrike (*Lanius ludovicianus migrans*, E), and western meadowlark (*Sturnella neglecta*, SC) (Herkert et al. 1993, Sample and Mossman 1997). The majority of the orchids observed during the surveys occurred in an old field dominated by exotic plants, particularly tall fescue (*Festuca arundinacea*). Other exotic species observed at the site that pose a threat to the orchids include white sweet-clover, yellow sweet-clover (*Melilotus officinalis*), quack grass (*Agropyron repens*), and Morrow honeysuckle (*Lonicera morrowii*) (Appendix 2). Successfully restoring prairie vegetation to the site will require the removal and control of invasive species. Long-term maintenance of the site should include prescribed burning to prevent tree and shrub encroachment, bolster plant diversity, and create a mosaic of grassland/savanna habitats (e.g., recently burned and unburned patches). Where oaks persist, resource managers should take care to maintain or promote large-diameter, open-grown oaks to create the structural character of lakeplain oak openings of scattered overstory trees in a grassland matrix. For detailed information on lakeplain prairies and lakeplain oak openings, refer to the Michigan Natural Features Inventory abstracts for these communities (Albert and Kost 1998a and 1998b, Cohen 2001a).

#### **Erie Golf Course Wetlands (Site Code: I)**

Numerous wetlands in various states of degradation occur along the margins of the golf course (Figures 7 and 9: I). Somewhat surprisingly, these wetlands also support a number of rare species. This is especially remarkable given the fact that prior to the construction of the golf course many of these areas were actively farmed for the better part of the past century. The most prominent of these wetlands is located immediately north of the clubhouse and stretches north between the tenth and eighteenth fairways of the golf course. Other important areas include wetlands between the second and fourth fairways, and between the fifth and eighth fairways.

These wetlands are mostly open and are dominated by sedges and rushes, as well as common boneset, and spotted touch-me-not. Purple loosestrife is also common but sufficiently controlled by beetles and few flowering stalks were observed. Three rare species also occur in wetlands along the golf course. Numerous individuals of eastern prairie-fringed orchid were observed, including several within a few feet of the maintained fairways. Dense colonies of Frank's sedge (SC) also occur, and are particularly common along the wetland margins north of the clubhouse. Numerous individuals occur immediately adjacent to the maintained fairways. Swamp rose mallow (SC) was observed in a ditch along the southern border of the golf course and has the potential to occur along the edges of other waterways and wetlands within the golf course.

Management of these wetlands need not conflict with management of the golf course, but care should be taken to minimize expansion of the mown fairway. Whenever possible, golf course maintenance staff should avoid mowing moist portions of the rough and wetland borders between early June and late September. Minimizing overspray and drift of broad spectrum herbicides and fungicides applied to the golf course during the growing season will also help reduce impacts to rare species that occur in the rough. Additionally, wetlands should be maintained in a relatively open state, and small trees and tall shrubs of species such as cottonwood, rough-leaved dogwood (*Cornus drummondii*), and willows should be controlled (Appendix 2). If possible, shrub cutting should be done during fall and winter, to minimize impacts to rare species during the growing season. Managing the rough areas in ways that will allow the rare plants to survive and even thrive will contribute to biodiversity conservation in southeast Michigan.

#### **Erie Marsh (Site Code: J)**

A large network of marshes is located in the eastern portion of the park (Photographs 1 and 5 and Figures 7 and 9: J). An element occurrence of Great Lakes marsh was originally documented in 1988 at Pt. Mouille State Game Area and extends into the southern portion of the metropark intersecting both the Erie Prairie and Erie Golf Course Wetlands sites. This area of Great Lakes marsh is associated with the mouth of the Huron River and within the metropark is heavily infested with giant reed, a robust invasive grass species. Additional areas of Great Lakes marsh occur in the central and northern portions of the metropark. These areas of marsh occur in wide channels that run parallel to the Detroit River and along the shore of the Detroit River. The hydrology of several of the channels in the north end of the park appears disrupted by past

dredging, and long-time area residents recall a local dredging operator storing equipment in an embayment near a constructed causeway. Despite this past disturbance, the hydrology of the marshes remains relatively intact and water levels still fluctuate with changing water levels in Lake Erie, a feature that distinguishes Great Lakes marshes from hydrologically isolated emergent marshes.



**Photograph 5. Great Lakes marsh provides critical habitat for spawning fish and for migrating, feeding, and nesting waterfowl (Photo by Ryan O'Connor).**

According to park naturalists, the character of the marshes has changed drastically over the past 5-10 years. During higher lake levels, the marshes were dominated by open water with emergent vegetation confined to the margins of the wetland. Currently, however, many of the marshes are dominated by extremely tall, dense giant reed and narrow-leaved cattail (*Typha angustifolia*). Small pockets of more open marsh occur in deeper water sections of the swales and along a small section of natural Lake Erie shoreline east and north of the wave pool. These portions of the marsh also support large beds of American lotus (T), a plant with large, round, peltate leaves and beautiful, large flowers (Photographs 1 and 6). Other common species in the emergent marshes include swamp rose-mallow (SC), common boneset, and swamp milkweed. In deeper, open water submergent aquatic vegetation is more common and includes species such as eel grass (*Vallisneria americana*), coontail (*Ceratophyllum demersum*), sweet-scented waterlily (*Nymphaea odorata*), pondweeds (*Potamogeton gramineus* and *P. natans*), common waterweed (*Elodea canadensis*), common arrowhead, water-plantain (*Alisma plantago-aquatica*), common water meal (*Wolffia columbiana*), and duckweeds (*Spirodela polyrhiza* and *Lemna minor*) (Appendix 2).

Management in the marshes at Lake Erie Metropark should focus on maintaining hydrologic connectivity to Lake Erie and controlling invasive species. The marsh contains numerous invasive species including common water hyacinth (*Eichhornia crassipes*), reed, purple loosestrife, glossy buckthorn, narrow-leaved cattail, black alder (*Alnus glutinosa*), and flowering rush (*Butomus umbellatus*). Unlike most of the other invasive plants mentioned above, common water hyacinth is not presently widespread. Thus, efforts to control water hyacinth can be cost effectively undertaken at this time. Further south, water hyacinth spreads rapidly and has proven very difficult to control. Efforts to control or eradicate the other invasive species listed above should be targeted to areas that support populations of rare species or are prime observation points for the public. In attempting to control invasive species, it is important to monitor the success of control efforts and follow up with additional treatments where necessary. For detailed information on Great Lakes marsh, refer to the Michigan Natural Features Inventory abstract for this community (Albert 2001).

#### **Erie Woods (Site Code: K)**

Lake Erie Metropark contains several small woodlots that are similar in species composition and structure (Figures 7 and 9: K). Like other upland areas of the park, the soils of these woodlots are dominated by clay and hold water at or near the surface for much of the year. Vernal ponds are a common feature of the woodlots and provide critical breeding sites for amphibians such as frogs and salamanders. With 22 tree species documented during the surveys, it is clear these woodlots support a diverse assemblage of trees. Mature oaks are abundant within the woodlots as are maples, especially near vernal ponds. Common tree species include the following: basswood, silver maple, American elm, black walnut, honey locust (*Gleditsia triacanthos*), red ash, swamp white oak, white oak, bur oak (*Q. macrocarpa*), and red oak, with one measuring 108 cm (42 inches) in diameter. Ten invasive species were identified, several of which have the potential to significantly reduce species diversity (Appendix 2). Signs of deer herbivory were abundant within the woodlots.

Management of the woodlots should include removal and monitoring of invasive species, especially garlic mustard and the following shrubs: Japanese barberry, Morrow honeysuckle, common privet, multiflora rose, european highbush-cranberry (*Viburnum opulus*), glossy buckthorn, and common buckthorn. For detailed information on mesic southern forest, refer to the Michigan Natural Features Inventory abstract for this community (Cohen 2004).

## DISCUSSION

### Rare Plants

**Eastern prairie-fringed orchid** is state endangered and federally threatened. The majority of orchid populations are known from wet prairies on glacial lake plain in the Saginaw Bay and Lake Erie regions, with smaller populations also found in southern Michigan bogs. Despite being observed in 40 locations in Michigan, it is considered very rare throughout its current range due to habitat alteration. Virtually all of the vast prairies it once thrived in were converted to agriculture at the time of settlement. In Michigan, these lakeplain prairie regions also occur in rapidly expanding metropolitan and suburban areas. Much of the remaining habitat is subject to shrub invasion unless maintained in an open condition through periodic mowing or prescribed fire. The populations of prairie-fringed orchid at Lake Erie Metropark, while significant in size, are widely scattered across old fields and the margins of the golf course. This presents a potential problem, since the orchid is pollinated only by particular species of night-flying hawkmoths (the Hermit sphinx, *Sphinx eremitis*; Pandorus sphinx, *Eumorpha pandorus*; and the Achemon sphinx, *Eumorpha achemon*), and it is uncertain if moths could locate and pollinate isolated orchid individuals or colonies (Cuthrell et al. 1999). The orchid is easily recognized while flowering, which typically occurs in the first or second week of July. Seed set and dispersal is thought to occur in September. As with other species of orchids, the tiny seeds require special conditions for germination, including the presence of certain mycorrhizal fungi. Conservation strategies to maintain and enhance populations of prairie-fringed orchid include controlling shrub invasion through periodic mowing or prescribed fire, and maintaining natural hydrologic regimes that allow soil moisture to fluctuate with changing Great Lakes' water levels. It is also important to note that population levels fluctuate from year to year, and individuals, and even entire colonies, may or may not flower in any given year. Thus, suitable habitat, especially along wet-mesic areas of the golf course and other moist meadows at Lake Erie Metropark should be monitored annually for new or expanding colonies. For additional information on eastern prairie-fringed orchid, refer to the Michigan Natural Features Inventory abstract for this species (Penskar and Higman 2000).

**American lotus** (Photographs 1 and 6) is a state-threatened species occurring in marshes and river mouths near the Great Lakes in southern lower Michigan. It is known from 21 sites in Michigan, but

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only seven of these are viable populations seen in the recent past. Occurrences typically range from only a few plants up to several thousand individuals in large colonies. The colonies at Lake Erie are particularly large and the park represents a significant site from the standpoint of conservation of the species. American lotus is easily recognized throughout the growing season by its large emergent leaves, and its characteristic yellowish-white flowers also grace the large aquatic beds from late July through August. Like many plants of the Lake Erie marshes, the sizes of lotus colonies are related to fluctuations in water levels of the Great Lakes. In addition, competition from tall, aggressive emergent marsh species such as giant reed and narrow-leaved cattail also likely affect the American lotus. Conservation strategies for this species include maintaining hydrologic connectivity to the naturally fluctuating water levels of the Great Lakes and, if necessary, controlling invasive emergent marsh vegetation.



**Photograph 6. Large colonies of American lotus thrive in Lake Erie Metropark. Conservation of this species depends on maintaining the hydrology of Great Lakes marshes and controlling invasive marsh vegetation (Photo by Ryan O'Connor).**

**Goldenseal** is a state-threatened plant. Prior to this study, there were 70 known occurrences of goldenseal. This species has declined throughout its range due to exploitation of roots for herbal medicine and significant loss of habitat due to development and modification. In Michigan this species is concentrated in the southern three tiers of counties in the Lower Peninsula. Typical habitat for goldenseal includes rich hardwood forests with beech/sugar maple/basswood or red oak/sugar maple canopies and occasionally upland rises in floodplain forests. The population at Lake Erie

is very small. Goldenseal can be easily recognized in early May when it is flowering. Conservation strategies include the preservation and restoration of ecologically viable tracts of rich woodland habitat, monitoring known populations to determine if plants are being poached or browsed, and educating the public about the detrimental effects caused by poaching and the use of wild herbs in the herbal market. For additional information on goldenseal, refer to the Michigan Natural Features Inventory abstract for this species (Penskar et al. 2001).

**Swamp rose mallow** is listed as a species of special concern. Plants are given the status of special concern when the status of the species is unknown. A species remains on the special concern list until specialists are able to determine whether the species should be elevated to state threatened or endangered status or is common enough to remain untracked. Recent surveys have shown this species to be more common and less threatened than previously assumed. As a result, in 2005, swamp rose mallow was proposed for delisting. However, this species is still quite a unique feature of this metropark and efforts should be made to protect this population and others to prevent future listing. Currently there are 31 occurrences of swamp rose mallow in the state, most occurring in the southern three tiers of counties. This species occupies moist meadows, ditches, and the edges of emergent marshes, and generally occurs more frequently in marshes and river mouths along Lake Michigan and Lake Erie. Swamp rose mallow is easily recognized by its large pink flowers during late July and August. Conservation strategies to protect this species include maintaining naturally fluctuating hydrologic regimes, especially in wetlands adjacent to the Great Lakes, and controlling aggressive invasive species such as giant reed and narrow-leaved cattail.

**Frank's sedge** is also a species of special concern. Prior to this study, there were 12 known sites for this species, with only four of these estimated to be viable populations. In 2005, botanical specialists determined that Frank's sedge was more common and less threatened than previously thought and as a result, the species has been proposed for delisting. Regardless of the potential change in status, this species is still quite a unique feature of this metropark and efforts should be made to protect this population and others to prevent future listing. Frank's sedge is found across the southern two tiers of counties, with the majority located in southeast Michigan. The colonies at Lake Erie Metropark are significant in size and may constitute the second-largest population currently known in the state. This species occupies wet-mesic

prairie and moist meadow habitats. Frank's sedge can be recognized by its characteristic fruiting structures from July through September. Conservation strategies to maintain and enhance populations of Frank's sedge at Lake Erie include maintaining open areas of wet-mesic prairies and golf course rough areas, and avoiding mowing moist meadows to low heights (approximately less than 4 inches) during the growing season.



**Photograph 7. Dwarf hackberry occurs in Huron Meadows in degraded oak barrens and oak-hickory forest. Efforts to restore oak barrens and implement prescribed fire in oak-hickory forest will benefit this species (Photo by Ryan O'Connor).**

**Dwarf hackberry** (Photograph 7) is listed as a special concern species. First identified in 1973, this small tree occurs in 36 sites in the southern portion of Michigan, and is almost exclusively found in glacial interlobate regions in the southeast and southwest portion of the state where the oak barrens habitat it thrives in was most common. Despite a relatively large number of occurrences, most populations are known from roadsides and very few large colonies in natural habitat have been documented. At Huron Meadows, the species is prevalent in degraded oak barrens and along south facing slopes of dry-mesic southern forest. This dwarf hackberry population is quite extensive; close to 300 stems were documented during surveys. Dwarf hackberry is easily recognized throughout the growing season by its short stature and leaves resembling the larger northern hackberry (*Celtis occidentalis*). Conservation strategies to conserve dwarf hackberry populations center on habitat restoration, including clearing closed-in oak barrens of invasive species and weedy native plants and implementing prescribed burning regimes to maintain a semi-open canopy.

**Purple twayblade** is also a species of special concern. Of the 17 occurrences known in Michigan prior to this study, most occurred in the two southern tier counties. Despite a sizable number of populations known from Washtenaw County to the south, the colony found at Huron Meadows represents the only known occurrence in Livingston County. Purple twayblade occurs in a variety of disturbed upland habitats, ranging from brushy second-growth thickets, to mixed oak woods to pine plantations. This orchid can be identified by its two broad basal leaves and purple flowers which bloom in late June through July. The habitat requirements of this orchid are poorly understood, but it is likely that it requires some shade. Conservation strategies to protect this species include restoring areas of degraded habitat by carefully removing invasive species and gradually converting pine plantations back to oak barrens and oak woodlands.

**Broad-leaved arrowhead** is a state-threatened species that had been previously reported from Lake Erie but was not reconfirmed during the 2004 surveys. In 1988, the species was reported from marshes near the Nature Center, but thorough searches in this area and adjacent marshes failed to locate the species. Park naturalists reported that the character of the marshes has changed significantly in the past several years with the lowering of water levels in the Great Lakes and subsequent invasion of formerly open water marshes with tall, aggressive giant reed and narrow-leaved cattail. Despite not finding broad-leaved arrowhead during this survey, large areas of suitable habitat remain. As water levels rise and if marsh restoration practices are implemented, there is a high likelihood that the species could be found again.

### **Fire as an Ecological Process**

Many of the areas within the metroparks we surveyed once supported fire-dependent ecosystems such as wet meadow, prairie fen, oak barrens, oak-hickory forest, lakeplain prairie, and lakeplain oak openings. In the past, lightning- and human-induced fires frequently spread over large areas of southern Michigan and other Midwestern states (Curtis 1959, Dorney 1981, Grimm 1984). In the absence of frequent fires, open oak savanna and prairie communities convert to forest such as oak-hickory forest or mixed oak forest (see oak barrens abstract, Cohen 2001b). The reduction of wildfires in Midwestern states following the loss of indigenous cultures in the early 1800s is well documented and resulted in a loss of fire-dependent natural communities through both active conversion for farming and succession from open barrens and prairie to forest (Curtis 1959).

The conversion of open barrens and prairie to forested communities continues today and often results in a loss of species and habitat diversity (Curtis 1959, McCune and Cottam 1985, McClain et al. 1993). This was evident at many of the sites we surveyed. At Huron Meadows Metropark the open character of prairie fen, oak barrens, and dry-mesic southern forest is being lost as the communities actively succeed to closed-canopy, shrub- and tree-dominated communities. As shade-tolerant woody species and canopy closure increases, light levels are reduced and light-demanding species such as prairie forbs, grasses, and oak seedling and saplings are unable to remain viable. As a result, both species diversity and habitat heterogeneity are reduced.

Some of the biggest changes as a result of fire suppression have taken place within the wetlands south of the river where shrub-carr has invaded previously open wetlands. Reintroduction of fire into these wetlands will help restore open systems such as prairie fen and wet meadow. More long term changes are occurring within the oak-hickory forest as the result of alteration of historic fire regimes. At present, oaks and hickories dominate the canopies of dry-mesic forests at Huron Meadows. However, oak regeneration within these forests is limited to slopes, light gaps, and edges of forest blocks and suppression of the historic fire regime has allowed thin-barked, shade-tolerant species such as red maple to infiltrate the subcanopy and forest understory (Abrams 1998). Repeat prescribed burns will eliminate the red maple seedlings and saplings and help control the exotic shrub invasion. A sustained fire management regime will allow for increased recruitment of oak seedlings and saplings.

The establishment of red maple within oak-hickory forests also results in significant changes in adjacent wetland communities. For example, at Huron Meadows fire suppression has enabled red maple to establish within the dry-mesic forest and the species is now beginning to colonize an adjacent relict conifer swamp (Huron Meadows Oak-Hickory Forest and Winans Tamarack Swamp, Figures 6 and 8: E and B). Species loss following invasion of relict conifer swamp by red maple can be significant. The shift from conifer-dominance to hardwood-dominance also results in a drastic reduction in shrub cover (Kost 2001c). The reduction of shrub cover that results from red maple invasion can adversely impact a wide range of both animal and plant species. In particular, many bird species rely heavily on the fruit of these wetland shrubs during fall migration and winter. While fire is not a frequent form of natural disturbance for relict conifer swamp, its absence in the broader landscape has significantly altered wetland successional pathways to the detriment of light-demanding species like

tamarack. Thus, actively cutting or girdling shade-tolerant hardwoods such as red maple from relict conifer swamps may be needed if this important natural community type is to be maintained.

Plant communities, whether upland or lowland, benefit from prescribed fire in several ways. Depending on the season and intensity of a burn, prescribed fire may be used to decrease the cover of exotic, cool-season grasses and woody species, and increase the cover of native warm-season grasses and forbs (White 1983, Abrams and Hulbert 1987, Tester 1989, Collins and Gibson 1990, Glenn-Lewin et al. 1990, Anderson and Schwegman 1991). Prescribed fire helps reduce litter levels, allowing sunlight to reach the soil surface and stimulate seed germination and enhance seedling establishment (Daubenmire 1968, Hulbert 1969, Knapp 1984, Tester 1989, Anderson and Schwegman 1991, Warners 1997). Important plant nutrients (e.g., N, P, K, Ca, and Mg) are elevated following prescribed fire (Daubenmire 1968, Viro 1974, Reich et al. 1990, Schmalzer and Hinkle 1992). Prescribed fire has been shown to result in increased plant biomass, flowering, and seed production (Abrams et al. 1986, Laubhan 1995, Warners 1997, Kost and De Steven 2000). Prescribed fire can also help express and rejuvenate seed banks, which may be especially important for maintaining species diversity (Leach and Givnish 1996, Kost and De Steven 2000).

Impacts to faunal communities should also be strongly considered when planning a prescribed burn. Dividing a large area into smaller burn units that can be burned in alternate years or seasons can protect populations of many species. This allows unburned units to serve as refugia for immobile invertebrates and slow moving amphibian and reptile species. When burning larger areas it may be desirable to strive for patchy burns by igniting during times of high relative humidity. The unburned patches may then serve as refugia, which facilitate recolonization of burned patches by fire-sensitive species. Burning under overcast skies and when air temperatures are cool (<55°F) can help protect reptiles, since they are less likely to be found basking above the surface when conditions are cloudy and cool. Lastly, conducting burns during the dormant season (late October through March) may also help minimize impacts to reptiles and amphibians (Kingsbury and Gibson 2002).

The southern portion of Huron Meadows offers an excellent opportunity for prescribed fire management. In this portion of the metropark, several fire-dependent communities occur adjacent to each other including prairie fen, wet meadow, dry-mesic southern forest, and degraded oak barrens. With prevailing winds from the southwest, the Huron River and Rickett Road provide excellent fire breaks along the north and east

sides of the site. Thus, the area is well suited for conducting a landscape-scale burn that encompasses several different natural communities, including both uplands and wetlands.

### **Implications for Forest Management**

In the absence of natural fires, the oak-hickory dominated, upland forests at Huron Meadows are likely to continue to undergo significant changes in structure and species composition as the oaks are replaced by more shade-tolerant tree species. Management of dry-mesic forests at Huron Meadows should focus on maintaining conditions suitable for oak regeneration, that is, an open canopy with high light levels. As noted, the first management step should be the reintroduction of fire. If a sustained fire management program does not result in an increase in oak and hickory regeneration and the reduction of red maple recruitment and other shade-tolerant species, metropark managers should consider more intrusive measures. Cutting or girdling shade-tolerant species like red maple is often effective. By removing competitors and also planting acorns or oak seedlings within large light gaps such as those created by recent tree-falls, metropark staff can direct the ecological succession of some portions of the forest. Any management for oak recruitment must also include reducing densities of white-tailed deer and protecting seedlings from browsing.

Another important forest management goal at both Huron Meadows and Lake Erie will be to reduce forest fragmentation. At present, a hard edge is maintained along many of the forest stands within the metroparks. Allowing oaks and hickories to establish within the old fields between blocks of forest and then directing the succession of these fields towards oak savanna or oak forest will enable isolated blocks of forest to be enlarged and connected. The formation of larger blocks of forest will help improve nesting success for raptors, neotropical migrant songbirds, and ground-nesting species because their nests are less likely to be parasitized and predated in larger blocks of forest (Wilcove et al. 1986). In addition, invasions by exotic species are reduced in larger blocks of contiguous habitat, since the ratio of interior habitat to edge typically increases with patch size.

### **Oak Barrens Restoration**

At Huron Meadows, two large areas of the park were historically oak barrens and mixed oak forest. Portions of both areas (see Figures 6 and 8: G) now harbor large pockets with prairie grasses and forbs and scattered oaks. They also contain areas of heavy shrub cover and closed-canopy oak, black cherry, and red cedar forest. These areas provide a very good

opportunity to restore large blocks of oak barrens, especially south of the river. Burning these areas will reduce canopy cover and allow native prairie and savanna species to expand or reestablish. Areas of former savanna and prairie often contain seed banks that are expressed with canopy opening and reintroduction of fire. Reduction of canopy and shrub coverage can also be accomplished by cutting and/or mowing.

### **Lakeplain Prairie Restoration**

An excellent opportunity for restoration of a lakeplain prairie/lakeplain oak openings complex is present at the Erie Prairie site within Lake Erie Metropark and the adjacent Pt. Mouille State Game Area. This restoration effort has the potential to serve as a prime example of ecosystem management in which multiple local, state, and federal partners work together to fund and implement a critical habitat restoration for a globally rare species and ecosystem (e.g., eastern prairie-fringed orchid and lakeplain prairie/lakeplain oak openings). The Huron-Clinton Metropolitan Authority (HCMA) in collaboration with the DNR, DEQ, MNFI, U.S. Fish and Wildlife Service (USFWS), and Great Lakes National Program Office of the U.S. Environmental Protection Agency (GLNPO) can all play important roles in restoring this site. The HCMA and DNR can provide planning, management, and monitoring resources. MNFI can assist in grant proposal development, and site planning and monitoring. The USFWS can assist in monitoring, management planning, and funding. The DEQ Coastal Zone Management grant program and the GLNPO are two very good partners for funding an ecological restoration project of this type.

By removing the hedgerows that separate agricultural fields and old fields within the metropark and adjacent State Game Area and maintaining or planting scattered oaks, over 100 acres of lakeplain prairie and lakeplain oak openings can be created. An area of native, open grassland/savanna of this size would represent a significant resource to grassland birds, many of which are rare or experiencing sharp population declines due to habitat loss and changing agricultural practices (e.g., early mowing of hay fields).

The significance of this restoration project is further heightened because the site includes a portion of an element occurrence for Great Lakes marsh, which like lakeplain prairie and lakeplain oak openings, is also considered a rare natural community. In addition, the potential juxtaposition of Great Lakes marsh and lakeplain prairie and lakeplain oak openings at this site would significantly contribute to habitat heterogeneity, which further increases its

importance to wildlife as many animal taxa such as turtles, snakes, birds, and invertebrates require the presence of both intact wetlands and uplands during their life cycles.

Several very helpful guides are available for restoring prairies and savannas. See Packard and Mutel (1997) for a comprehensive treatment of the subject and additional references. In addition, detailed management guidelines have been developed for managing grasslands for grassland birds by Herkert et al. (1993) and Sample and Mossman (1997). Listed below are several of the recommendations suggested by Herkert et al. (1993) (see publication for complete list of management guidelines).

1. Avoid fragmentation of existing grasslands.
2. Grassland restorations aimed at supporting populations of the most area-sensitive grassland birds should be at least 125 acres and preferably more than 250 acres in size. Area sensitive species requiring large patches of grassland (>100 acres) include northern harrier (SC), bobolink, savannah sparrow, Henslow's sparrow (SC), grasshopper sparrow (SC), eastern meadowlark (*Sturnella magna*), western meadowlark (SC), sedge wren (*Cistothorus platensis*), sharp-tailed grouse (*Tympanuchus phasianellus*, SC), upland sandpiper (*Bartramia longicauda*), short-eared owl (E), and barn owl (*Tyto alba*, E) (Herkert et al. 1993, Sample and Mossman 1997). Patches of grassland less than 50 acres will benefit the least area-sensitive grassland birds such as northern bobwhite (*Colinus virginianus*), red-winged black bird (*Agelaius phoeniceus*), American goldfinch (*Carduelis tristis*), Vesper sparrow (*Pooecetes gramineus*), field sparrow (*Spizella pusilla*), song sparrow (*Melospiza melodia*), dickcissel (SC), and common yellowthroat (*Geothlypis trichas*) (Herkert et al. 1993).
3. Maximize interior grassland habitat by establishing circular (best) or square grassland plantings and avoiding long, narrow plantings, which increase edge habitat.
4. Where grassland habitats border forests, strive to create a feathered edge by allowing prescribed fires to burn through adjacent forests as opposed to installing firebreaks along the forest edge. Grasslands with feathered edges experience lower rates of nest predation than those with sharply contrasting edges (Ratti and Reese 1988).
5. Grassland plantings should not be bordered by fence lines or groves of trees because these features attract nest predators and nest parasites.

6. Establish a mixture of native warm season grasses and forbs that will provide a diversity of both short and tall structure.
7. Use a prescribed burn rotation in which portions (e.g., 20 to 30%) of the area are burned annually to provide habitat for both species that prefer recently burned sites and unburned sites.
8. In large areas of grassland, encroaching woody vegetation that exceeds the height of the dominant grasses should be removed to decrease the frequency of nest predation and nest parasitism.
9. Restrict trails and activities to the edges of grassland plantings.
10. Avoid mowing grasslands through late July or early August and use a rotational mowing schedule similar to that described above for prescription burning.

### **Invasive Species**

Invasive species pose a major threat to species and habitat diversity within the metroparks. By outcompeting and replacing native species, invasives change species composition, alter vegetation structure and successional dynamics, and reduce native species diversity, often causing local or even complete extinction of native species (Harty 1986, Gorchoff and Trisel 2003). Invasive exotic species can also upset delicately balanced ecological processes such as trophic relationships, interspecific competition, nutrient cycling, soil erosion, hydrologic balance, and solar insolation (Bratton 1982). Lastly, exotic invasive species often have no natural predators and spread aggressively through rapid sexual and asexual reproduction.

While numerous invasive species occur within the metroparks the species highlighted below are likely to pose the greatest threat to biodiversity because of their ability to invade intact communities and quickly dominate. Invasive species abstracts, which include detailed methods for controlling invasive species, can be obtained at the following web site: <http://tncweeds.ucdavis.edu/>.

**Garlic mustard**, in particular, is of serious concern even in very small numbers because it is self-fertile, thus a single plant can establish an entire population and quickly result in a large infestation. While it invades all types of forested habitats, it is especially aggressive in mesic and wet-mesic sites (Meekins and McCarthy 2001). Garlic mustard should be removed prior to seedset wherever it is encountered.

**Glossy buckthorn** can also severely reduce species diversity, especially in alkaline, wetland habitats like prairie fen and relict conifer swamp. Left untreated, it can form large, impenetrable, monotypic stands in place of open, species diverse wetlands.

**Purple loosestrife** is another pernicious invader of wetland habitats, often completely replacing native emergent marsh communities. Some success in controlling purple loosestrife has recently occurred with the application of biological control agents, *Galerucella* beetles, which are native to purple loosestrife's European habitat (Hight and Drea 1991, Blossey 1992).

**Giant reed** dominates vast stretches of Great Lakes marsh and has become widespread at Lake Erie Metropark. Because of its robust stature, giant reed displaces native marsh vegetation and degrades wildlife habitat.

**Water hyacinth** is a plant of open wetlands that has been called the worst invasive aquatic plant in the world. Native to the Amazonian basin, water hyacinth reproduces prolifically by vegetative shoots and colonies can double in size in as little as twelve days. A pernicious pest causing severe ecological and economic disruption in Florida and other sub-tropical regions, it cannot tolerate cold winters and is limited in its northern distribution. Research has shown that temperatures near or below freezing for four continuous weeks are sufficient to kill water hyacinth (Owens and Madsen 1995). However, park naturalists have noted that this species appears in marshes in small amounts year after year in late summer. Despite observations that colonies do not appear to be spreading, it is recommended that the species be aggressively controlled to limit potential impacts in the future, both within the park and to prevent accidental transportation of the species by boat traffic to other regions.

Several invasive species also threaten the upland dry-mesic forests of Huron Meadows. Among the most problematic of these are **oriental bittersweet**, **common buckthorn**, **tree-of-heaven**, and **exotic honeysuckle** shrubs (**Amur, Morrow, and Tartarian honeysuckle**). By invading the shrub layer of semi-open forest communities, these species severely reduce the amount of light available to the ground layer, causing the elimination of many ground layer species and preventing the reproduction of overstory dominants (Gorchoff and Trisel 2003). Oriental bittersweet is especially problematic. A twining vine, it can literally strangle large trees by tightly wrapping around the trunk and preventing new growth of cambium tissue, effectively girdling the stem. These species can be effectively controlled by stem removal, but cutting without immediate herbicide application should be strictly avoided, since resprouting typically results in the proliferation of multiple stems, thus making it even more difficult to eliminate these problematic species.

## Deer Densities

Many studies have shown that high deer densities adversely impact local ecosystems and vegetation (Alverson et al. 1988, Balgooyen and Waller 1995, Waller and Alverson 1997, Augustine and Frelich 1998, Rooney 2001, Horsely et al. 2003). Deer browse was evident throughout both metroparks. Deer herbivory may be limiting oak regeneration within the oak-hickory forests of Huron Meadows (Strole and Anderson 1992). Through preferential grazing of native species, high deer densities are also thought to contribute to the spread of invasive, exotic species such as garlic mustard (Victoria Nuzzo pers. comm. 1998). It is recommended that the Huron-Clinton Metropolitan Authority work cooperatively with the Michigan Department of Natural Resources to assess metropark deer densities and reduce deer densities if determined to be higher than recommended by the DNR.

## Setting Stewardship Priorities

While invasive species occur in nearly all natural communities surveyed in this study, management priority should be given to the highest quality sites. By concentrating effort on a few high-quality sites, limited resources of time, personnel, volunteer effort, and money can be directed to make a significant impact on biodiversity. How should metropark managers and naturalists determine which sites to manage? That decision is one best made by metropark resource professionals, but evaluation criteria should include the following:

- 1) A preference toward high-quality sites with minimal infestations of invasive species. Biodiversity is most easily and effectively protected by preventing high-quality sites from degrading, and invasives are much easier to eradicate when they are not yet well established.
- 2) A focus on sites that harbor high levels of native species diversity or unique elements of biodiversity (e.g., prairie fens, tamarack swamps, floodplain forests, springs, rare species, etc.). Wetlands in particular, harbor a disproportionate number of rare species and provide critical habitat for many species.
- 3) Sites that enhance core areas of high-quality habitat or act as critical corridors for wildlife. Reducing forest fragmentation at Lake Erie or restoring oak barrens at Huron Meadows will enhance many of the existing high-quality sites.

- 4) High-profile sites that are viewed by many visitors such as well-used trails or sites with scenic overlooks or picturesque views. Opportunities to educate the public on biodiversity and stewardship are maximized by actively working to restore frequently-visited sites. Restoring sites that provide scenic vistas will promote an appreciation of the park's natural resources.

A brief summary of sites with high restoration potential in each park follows below. Detailed site descriptions and management recommendations are included in the Site Summaries and Management section (Page 20).

### High Priority Sites at Huron Meadows

At Huron Meadows, we identified several sites with high restoration potential. As noted earlier, the southern portion of the park offers a unique management opportunity in that several high-quality or restorable natural communities can be managed and restored simultaneously with the use of prescribed fire. These communities include prairie fen and wet meadow (**Rickett Road Wet Meadow/Prairie Fen Complex**), dry-mesic southern forest (**Huron Meadows Oak-Hickory Forest**), and oak barrens (**Huron Oak Barrens**). The **Rickett Road Wet Meadow/Prairie Fen Complex** (Photographs 2 and 8 and Figures 6 and 8: A) contains many high-quality pockets and would greatly benefit from shrub and tree removal and prescribed burning. The **Huron Meadows Oak-Hickory Forest** (Figures 6 and 8: E) is characterized by moderate levels of exotic species in the understory and ground cover that can be controlled with a concerted management effort. Repeat prescribed burns will help control exotic shrub invasion and also eliminate red maple seedlings and saplings. In addition, portions of the **Huron Meadows Oak-Hickory Forest** are highly visible and easily accessible. The nature trail passes through the block of mature dry-mesic southern forest just north of the canoe launch. Fire management of the **Maltby Lake Fen** (Figures 6 and 8: F) carried out in conjunction with burning of the adjacent oak-hickory forest slope would provide visitors with a unique glimpse of ecological restoration in action and an enhanced view of Maltby Lake. The most intensive restoration would involve the rehabilitation of the **Huron Oak Barrens** (Figures 6 and 8: G). Reintroduction of a sustained fire regime, likely in conjunction with extensive cutting, mowing, and herbicide would be required. Though this process would require heavy investment of time and money, the oak barrens restoration would pay rich

biodiversity dividends because of the rarity of oak barrens ecosystems and the species that depend on them. Other sites at Huron Meadows may also merit attention and should be evaluated for work based on available resources.



**Photograph 8. The juxtaposition of the extensive wet meadow/prairie fen complex with oak-hickory forest and degraded oak barrens provides HCMA stewards of Huron Meadows with the unique ecosystem management opportunity of conducting landscape-scale burns that encompass several different natural communities and include wetlands and uplands (Photo by Joshua Cohen).**

### **High Priority Sites at Lake Erie**

Lake Erie contains several regionally significant natural features and important sites for restoration. 1). The **Erie Marsh** (Photographs 1 and 5 and Figures 7 and 9: J) provides important fish and wildlife habitat and harbors several rare species. Reducing the dominance of giant reed will significantly improve habitat for native plants and animals that depend on Great Lakes marsh. 2). The **Erie Prairie** (Figures 7 and 9: H) has the potential to be restored as a lakeplain prairie/lakeplain oak openings complex. The site provides critical habitat for the eastern prairie-fringed orchid, a globally rare prairie plant. With the cooperation of the DNR managers at Point Mouille State Game Area, which borders the site to south, the site has the potential to provide habitat to rare and declining grassland birds. Lakeplain prairie and lakeplain oak openings are considered globally rare natural communities and efforts to restore these systems are critically important to the long-term protection of biodiversity. 3) **Erie Woods** (Figures 7 and 9: K) currently consists of several isolated blocks of forest with hard edges. Managing these sites to prevent colonization of invasive species like garlic mustard, buckthorn, and honeysuckles will help ensure that they continue to harbor a diverse assemblage of native species. In addition, softening the forest edges by allowing succession of some of the adjacent old fields and mowed lawns to forest or savanna will increase breeding habitat for forest species and help protect the core areas of mature forest. Other sites at Lake Erie may also merit attention, and should be evaluated for work based on available resources.

## CONCLUSION

The Huron-Clinton Metropolitan Authority has the considerable responsibility of stewarding numerous populations of rare species and ecologically significant natural communities. As the region becomes more developed, the prominence of natural features harbored by the metroparks is substantially heightened. Both rare and common native species are threatened by the rapid pace of development in southeast Michigan. In addition, changes taking place outside the metropark boundaries are having significant repercussions within their borders. For example, as new roads, subdivisions, shopping centers, and industries are built outside the park, invasive plants used in landscaping quickly find their way into the park and cause severe degradation to natural communities and their associated complement of native species. Historic wildlife corridors are disrupted, and cosmopolitan edge species such as white-tailed deer increasingly seek refuge within the confines of the metroparks. The increased deer densities within the metroparks result in extirpation of numerous plant and animal species as their effects on ecosystems reverberate at multiple trophic levels (McShea and Rappole 1992, Waller and Alverson 1997, Augustine and Frelich 1998, Rooney 2001). As rare plants and high-quality natural communities are lost due to development, the regional significance of safeguarding these natural features within the metroparks becomes even more important.

Conservation scientists and practitioners are more aware today than ever before that protecting rare species and ecologically significant natural communities requires far more than simply building preserves to prevent their outright destruction (Janzen 1986). Because changes occurring outside the metropark boundaries result in significant impacts within the park, protection of rare species and natural communities today requires the active participation by metropark staff in stewarding the land for ecological integrity. This formidable task requires metropark staff to identify significant natural features, develop conservation strategies, and apply their considerable expertise in resource management to the active stewardship of ecological integrity.

Both Huron Meadows and Lake Erie Metroparks support significant natural features that are threatened by events taking place within the parks as well as outside their boundaries. The metroparks have lost a considerable amount of their biodiversity as a result of fire suppression, infestation of pernicious invasive species, and high white-tail deer populations. Restoring the ecological process of fire to the ecosystems at Huron Meadows and Lake Erie will profoundly enhance their ecological integrity. Prime opportunities exist for restoring oak barrens in Huron Meadows Metropark and a lakeplain prairie/lakeplain oak openings complex in Lake Erie Metropark. The loss of biodiversity caused by infestations of invasive plants can be reversed by developing monitoring and eradication programs that are focused on protecting the centers of biodiversity, namely the prairie fens, wet meadows, dry-mesic southern forests, mesic southern forests, floodplain forests, southern swamps, relict conifer swamps, and Great Lakes marsh. Active management of the local deer herd is likely to result in the recovery of many plants and ground- and shrub-nesting animal species over time.

Tremendous ecological benefits can also be gained by directing the ecological succession of old fields towards oak barrens, lakeplain oak openings, oak woodlands, mesic southern forest, or floodplain forest. Connecting isolated forest patches, enlarging current woodlands, and creating a more natural transition between open field and forest edge will help increase nesting success rates of ground-nesting birds and mammals, forest raptors, and neotropical migrant songbirds, many of which are experiencing sharp declines in their populations.

The diversity of natural features found within the Huron Meadows Metropark and the Lake Erie Metropark are threatened by a wide range of factors. Mitigating these threats and enhancing biodiversity presents the HCMA staff with a diverse array of stewardship opportunities. As southeastern Michigan continues to develop, the responsibility for conserving regional biodiversity within these metroparks will become increasingly imperative.

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## LITERATURE CITED

- Abrams, M.D. 1998. The red maple paradox: What explains the widespread expansion of red maple in eastern forests? *BioScience* 48: 355-363.
- Abrams, M.D., and L.C. Hulbert. 1987. Effect of topographic position and fire on species composition in tallgrass prairie in northeast Kansas. *The American Midland Naturalist* 117: 442-445.
- Abrams, M.D., A.K. Knapp, and L. C. Hulbert. 1986. A ten year record of aboveground biomass in a Kansas tallgrass prairie: Effects of fire and topographic position. *American Journal of Botany* 73: 1509-1515.
- Albert, D.A. 1995. Regional landscape ecosystems of Michigan, Minnesota, and Wisconsin: A working map and classification. Gen. Tech. Rep. NC-178. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. Northern Prairie Wildlife Research Center Home Page. <http://www.npwrc.usgs.gov/resource/1998/rlandscp/rlandscp.htm> (Version 03JUN98).
- Albert, D.A. 2001. Natural community abstract for Great Lakes marsh. Michigan Natural Features Inventory, Lansing, MI. 11 pp. [http://web4.msue.msu.edu/mnfi/abstracts/ecology/Great\\_lakes\\_marsh.pdf](http://web4.msue.msu.edu/mnfi/abstracts/ecology/Great_lakes_marsh.pdf)
- Albert, D.A., and M.A. Kost. 1998a. Natural community abstract for lakeplain wet-mesic prairie. Michigan Natural Features Inventory, Lansing, MI. 4 pp. [http://web4.msue.msu.edu/mnfi/abstracts/ecology/Lakeplain\\_wet-mesic\\_prairie.pdf](http://web4.msue.msu.edu/mnfi/abstracts/ecology/Lakeplain_wet-mesic_prairie.pdf)
- Albert, D.A., and M.A. Kost. 1998b. Natural community abstract for lakeplain wet prairie. Michigan Natural Features Inventory, Lansing, MI. 4 pp. [http://web4.msue.msu.edu/mnfi/abstracts/ecology/Lakeplain\\_wet\\_prairie.pdf](http://web4.msue.msu.edu/mnfi/abstracts/ecology/Lakeplain_wet_prairie.pdf)
- Alverson, W.S., D.M. Waller, and S.L. Solheim. 1988. Forest too deer: Edge effects in northern Wisconsin. *Conservation Biology* 2: 348-358.
- Anderson, R.C., and J.E. Schwegman. 1991. Twenty years of vegetational change on a Southern Illinois barren. *Natural Areas Journal* 11: 100-107.
- Augustine, D.J., and L.E. Frelich. 1998. Effects of white-tailed deer on populations of an understory forb in fragmented deciduous forests. *Conservation Biology* 12: 995-1004.
- Balgooyen, C.P., and D.M. Waller. 1995. The use of *Clintonia borealis* and other indicators to gauge impacts of white-tailed deer on plants in communities in northern Wisconsin, USA. *Natural Areas Journal* 15: 308-318.
- Blossey, B. 1992. Impact of *Galerucella pusilla* Duft. and *G. californiensis* L. (Coleoptera: Chrysomelidae) on field populations of purple loosestrife (*Lythrum salicaria* L.). Proceedings of the Eighth International Symposium on Biological Control of Weeds. 2-7 February, 1992.
- Bratton, S.P. 1982. The effects of exotic plant and animal species on nature preserves. *Natural Areas Journal* 2(3): 3-13.

- Cohen, J.G. 2001a. Natural community abstract for lakeplain oak openings. Michigan Natural Features Inventory, Lansing, MI. 9 pp. [http://web4.msue.msu.edu/mnfi/abstracts/ecology/Lakeplain\\_oak\\_opening.pdf](http://web4.msue.msu.edu/mnfi/abstracts/ecology/Lakeplain_oak_opening.pdf)
- Cohen, J.G. 2001b. Natural community abstract for oak barrens. Michigan Natural Features Inventory, Lansing, MI. 8 pp. [http://web4.msue.msu.edu/mnfi/abstracts/ecology/Oak\\_barrens.pdf](http://web4.msue.msu.edu/mnfi/abstracts/ecology/Oak_barrens.pdf)
- Cohen, J.G. 2004. Natural community abstract for mesic southern forest. Michigan Natural Features Inventory, Lansing, MI. 12 pp. [http://web4.msue.msu.edu/mnfi/abstracts/ecology/Mesic\\_southern\\_forest.pdf](http://web4.msue.msu.edu/mnfi/abstracts/ecology/Mesic_southern_forest.pdf)
- Collins, S.L., and D.J. Gibson. 1990. Effects of fire on community structure in tallgrass and mixed grass prairie. Pp. 81-98 in S.L. Collins and L.L. Wallace, eds., *Fire in North American Tallgrass Prairies*. University of Oklahoma Press, Norman, OK.
- Comer, P.J., D.A. Albert, H.A. Wells, B.L. Hart, J.B. Raab, D.L. Price, D.M. Kashian, R.A. Corner, and D.W. Schuen. 1995. Michigan's presettlement vegetation, as interpreted from the General Land Office Surveys 1816-1856. Michigan Natural Features Inventory, Lansing, MI. Digital Map.
- Comer, P.J., D.A. Albert, L.J. Scrimger, T. Leibfreid, D. Schuen, and H. Jones. 1993. Historical wetlands of Michigan's Coastal Zone and Southeastern Lakeplain. Report to the Michigan Department of Natural Resources, Land and Water Management Division. Michigan Natural Features Inventory, Lansing, MI. 105 pp.
- Curtis, J.T. 1959. *Vegetation of Wisconsin*. The University of Wisconsin Press, Madison, WI. 657 pp.
- Cuthrell, D. L., P. J. Higman, M. R. Penskar, and J. L. Windus. 1999. The Pollinators of Ohio and Michigan populations of Eastern prairie-fringed orchid (*Plantanthera leucophaea*). Report to U. S. Fish & Wildlife Service. Michigan Natural Features Inventory report number 1999-08. 19pp.
- Daubenmire, R. 1968. Ecology of fire in grasslands. *Advances in Ecological Research* 5: 209-66.
- Dorney, J.R. 1981. The impact of Native Americans on presettlement vegetation in southeastern Wisconsin. *Transactions of the Wisconsin Academy of Science, Arts, and Letters*. 69: 26-36.
- Farrand, W.R., and D.L. Bell. 1982. Quaternary geology of southern Michigan. Dept. of Geological Sciences, The University of Michigan, Ann Arbor, MI. Map.
- Glenn-Lewin, D.C., L.A. Johnson, T.W. Jurik, A. Akey, M. Leoschke, and T. Rosberg. 1990. Fire in central North American grasslands: Vegetative reproduction, seed germination, and seedling establishment. Pp. 28-45 in S.L. Collins and L.L. Wallace, eds., *Fire in North American Tallgrass Prairies*. University of Oklahoma Press, Norman, OK.
- Gorchov, D.L., and D.E. Trisel. 2003. Competitive effects of the invasive shrub, *Lonicera maackii* (Rupr.) Herder (Caprifoliaceae), on the growth and survival of native tree seedlings. *Plant Ecology* 166: 13-24.
- Grimm, E.C. 1984. Fire and other factors controlling the big woods vegetation of Minnesota in the mid-nineteenth century. *Ecological Monographs* 54: 291-311.
- Harty, F.M. 1986. Exotics and their ecological ramifications. *Natural Areas Journal* 6(4): 20-26.
- Herkert, J.R., R.E. Szafoni, V.M. Kleen, and J.E. Schwegman. 1993. Habitat establishment, enhancement and management for forest and grassland birds in Illinois. Division of Natural Heritage, Illinois Department of Conservation, Natural Heritage Technical Publication #1, Springfield, IL, 20pp. (Available at: <http://www.npwrc.usgs.gov/resource/othrdata/manbook/manbook.htm>)
- Herman, K.D., L.A. Masters, M.R. Penskar, A.A. Reznicek, G.S. Wilhelm, W.W. Brodowicz, and K.P. Gardiner. 2001. Floristic quality assessment with wetland categories and computer application programs for the state of Michigan. Michigan Dept. of Natural Resources, Wildlife Division, Natural Heritage Program, Lansing, MI.
- Hight, S.D., and J.J. Drea, Jr. 1991. Prospects for a classical biological control project against purple loosestrife (*Lythrum salicaria* L.). *Natural Areas Journal* 11(3): 151-157.
- Horsely, S.B., S.L. Stout, and D.S. DeCalesta. 2003. White-tailed deer impact on the vegetation dynamics of a northern hardwood forest. *Ecological Applications* 13: 98-118.
- Hulbert, L.C. 1969. Fire and litter effects in undisturbed bluestem prairie in Kansas. *Ecology* 50: 874-877.
- Janzen, D.H. 1986. The eternal external threat. Pp. 286-303 in M.E. Soule, ed., *Conservation Biology: The Science of Scarcity and Diversity*. Sinauer Associates, Sunderland, MA.

- Knapp, A.K. 1984. Post-burn differences in solar radiation, leaf temperature and water stress influencing production in a lowland tallgrass prairie. *American Journal of Botany* 71: 220-227.
- Kingsbury, B., and G. J. Gibson. 2002. Habitat management guidelines for amphibians and reptiles of the Midwest. Partners in Amphibian and Reptile Conservation publication. 57 pp.
- Kost, M.A. 2001a. Natural community abstract for relict conifer swamp. Michigan Natural Features Inventory, Lansing, MI. 6 pp. [http://web4.msue.msu.edu/mnfi/abstracts/ecology/Relict\\_conifer\\_swamp.pdf](http://web4.msue.msu.edu/mnfi/abstracts/ecology/Relict_conifer_swamp.pdf)
- Kost, M.A. 2001b. Natural community abstract for southern wet meadow. Michigan Natural Features Inventory, Lansing, MI. 5 pp. [http://web4.msue.msu.edu/mnfi/abstracts/ecology/Southern\\_wet\\_meadow.pdf](http://web4.msue.msu.edu/mnfi/abstracts/ecology/Southern_wet_meadow.pdf)
- Kost, M.A. 2001c. Potential indicators for assessing biological integrity of forested, depressional wetlands in southern Michigan. Michigan Natural Features Inventory, Lansing, MI. 69 pp.
- Kost, M.A., and D. De Steven. 2000. Plant community responses to prescribed burning in Wisconsin sedge meadows. *Natural Areas Journal* 20: 36-49.
- Laubhan, M.K. 1995. Effects of prescribed fire on moist-soil vegetation and macronutrients. *Wetlands* 15: 159-166.
- Leach, M.K., and T.J. Givnish. 1996. Ecological determinants of species loss in remnant prairies. *Science* 273: 1555-1558.
- McClain, W.E., M.A. Jenkins, S.E. Jenkins, and J.E. Ebinger. 1993. Changes in the woody vegetation of a bur oak savanna remnant in central Illinois. *Natural Areas Journal* 13: 108-114.
- McCune, B., and G. Cottam. 1985. The successional status of a southern Wisconsin oak woods. *Ecology* 66:1270-1278.
- McShea, W.J., and J.H. Rappole. 1992. White-tailed deer as keystone species within forest habitats of Virginia. *Virginia Journal of Science* 43: 177-186.
- Meekins, F.J., and B.C. McCarthy. 2001. Effect of environmental variation on the invasive success of a nonindigenous forest herb. *Ecological Applications* 11: 1336-1348.
- Nuzzo, V. 1998. Natural Area Consultants, Groton, NY.
- Owens, C.S., and J.D. Madsen. 1995. Low temperature limits of water-hyacinth. *Journal of Aquatic Plant Management* 33: 63-68.
- Packard, S., and C.F. Mutel. 1997. The tallgrass restoration handbook for prairies, savannas, and woodlands. Island Press, Washington D.C. 463 pp.
- Penskar, M.R., and P.J. Higman. 2000. Special plant abstract for *Platanthera leucophaea* (eastern prairie fringed-orchid). Michigan Natural Features Inventory, Lansing, MI. 3 pp. [http://web4.msue.msu.edu/mnfi/abstracts/botany/Platanthera\\_leucophaea.pdf](http://web4.msue.msu.edu/mnfi/abstracts/botany/Platanthera_leucophaea.pdf)
- Penskar, M.R., E.G. Choberka, and P.J. Higman 2001. Special Plant Abstract for *Hydrastis canadensis* (goldenseal). Michigan Natural Features Inventory, Lansing, MI. 3 pp. [http://web4.msue.msu.edu/mnfi/abstracts/botany/Hydrastis\\_canadensis.pdf](http://web4.msue.msu.edu/mnfi/abstracts/botany/Hydrastis_canadensis.pdf)
- Ratti, J.T., and K.P. Reese. 1988. Preliminary test of the ecological trap hypothesis. *Journal of Wildlife Management* 52: 484-491.
- Reich, P.B., M.D. Abrams, D.S. Ellsworth, E.L. Kruger, and T.J. Tabone. 1990. Fire affects ecophysiology and community dynamics of central Wisconsin oak forest regeneration. *Ecology* 71: 2179-2190.
- Reinartz, J.A. 1997. Controlling glossy buckthorn (*Rhamnus frangula* L.) with winter herbicide treatments of cut stumps. *Natural Areas Journal* 17: 38-41.
- Roberts, D.L. 2003. The emerald ash borer: A threat to ash in North America. Michigan State University Extension, East Lansing, MI. Available: [http://www.msue.msu.edu/reg\\_se/roberts/ash/eab\\_threat03.pdf](http://www.msue.msu.edu/reg_se/roberts/ash/eab_threat03.pdf). (Accessed: March 1, 2004.)
- Rooney, T.P. 2001. Deer impacts on forest ecosystems: A North American perspective. *Forestry* 74: 201-208.
- Sample, D.W., and M.J. Mossman. 1997. Managing habitat for grassland birds: A guide for Wisconsin. Bureau of Integrated Science Services, Department of Natural Resources, Madison, WI. 154 pp.
- Schmalzer, P.A., and C.R. Hinkle. 1992. Soil dynamics following fire in *Juncus* and *Spartina* marshes. *Wetlands* 12: 8-21.
- Spieles, J.B., P.J. Comer, D.A. Albert, and M.A. Kost. 1999. Natural community abstract for prairie fen. Michigan Natural Features Inventory, Lansing, MI. 4 pp. [http://web4.msue.msu.edu/mnfi/abstracts/ecology/Prairie\\_fen.pdf](http://web4.msue.msu.edu/mnfi/abstracts/ecology/Prairie_fen.pdf)
- Strole, T.A., and R.C. Anderson. 1992. White-tailed deer browsing: Species preferences and implications for central Illinois forests. *Natural Areas Journal* 12: 139-144.

- Tepley, A.J., J.G. Cohen, and L. Huberty. 2004. Natural community abstract for floodplain forest. Michigan Natural Features Inventory, Lansing, MI. 14 pp. [http://web4.msue.msu.edu/mnfi/abstracts/ecology/floodplain\\_forest.pdf](http://web4.msue.msu.edu/mnfi/abstracts/ecology/floodplain_forest.pdf)
- Tester, J.R. 1989. Effects of fire frequency on oak savanna in east-central Minnesota. *Bulletin of the Torrey Botanical Club* 116: 134-144.
- USDA Forest Service. 2002. Pest Alert – Emerald Ash Borer. St Paul, MN. Available: [http://www.na.fs.fed.us/spfo/pubs/pest\\_al/eab/eab.htm](http://www.na.fs.fed.us/spfo/pubs/pest_al/eab/eab.htm). (Accessed: March 1, 2004.)
- Viro, P.J. 1974. Effects of forest fire on soil. Pp. 7-45 in T.T. Kozlowski and C.E. Ahlgren, eds., *Fire and Ecosystems*. Academic Press, New York, NY.
- Waller, D.M., and W.S. Alverson. 1997. The white-tailed deer: A keystone herbivore. *Wildlife Society Bulletin* 25: 217-226.
- Warners, D. P. 1997. Plant diversity in sedge meadows: Effects of groundwater and fire. Ph.D. dissertation, U. of Mich., Ann Arbor, MI. 231 pp.
- White, A.S. 1983. The effects of thirteen years of annual prescribed burning on a *Quercus ellipsoidalis* community in Minnesota. *Ecology* 64: 1081-1085.
- Wilcove, D.S., C.H. McLellan, and A.P. Dobson. 1986. Habitat fragmentation in the temperate zone. Pp. 237-256 in M.E. Soule, ed., *Conservation Biology: The Science of Scarcity and Diversity*. Sinauer Associates, Sunderland, MA.

**Appendix 1.** Plant species observed at **Huron Meadows Metropark**. "X" indicates the species occurred within the site. "-" indicates species was not observed at the site. Capitalized scientific and common names indicate non-native species. Life form acronyms are as follows: Nt, native; P, perennial; Ad, adventive; B, biannual; A, annual. "C" is the Coefficient of Conservation for each species (Herman et al. 2001).

Site Name	Site Abbreviation	Site Code
Ricket Road Wet Meadow/Prairie Fen Complex	WMPF	A
Winans Tamarack Swamp	WTS	B
Ore Lake Swamp	OLS	C
Huron River Floodplain Forest	HRFF	D
Huron Meadows Oak-Hickory Forest	HOHF	E
Maltby Lake Fen	MLF	F
Huron Oak Barrens	HOB	G

Site			Name	WMPF	WTS	OLS	HRFF	HOHF	MLF	HOB
Site			Code	A	B	C	D	E	F	G
<b>Scientific Name</b>	<b>Common Name</b>	<b>Life Form</b>	<b>C</b>							
Acer negundo	box elder	Nt Tree	0	-	-	-	X	X	-	-
Acer nigrum	black maple	Nt Tree	4	-	-	-	-	X	-	-
ACER PLATANOIDES	NORWAY MAPLE	Ad Tree	0	-	-	-	-	X	-	-
Acer rubrum	red maple	Nt Tree	1	-	X	X	-	X	-	-
Acer saccharinum	silver maple	Nt Tree	2	-	-	X	X	-	-	-
Acer saccharum	sugar maple	Nt Tree	5	-	-	-	-	X	-	-
Achillea millefolium	yarrow	Nt P-Forb	1	-	-	-	-	X	-	X
Acorus calamus	sweet-flag	Nt P-Forb	6	X	-	-	X	-	-	-
Actaea pachypoda	doll's-eyes	Nt P-Forb	7	-	-	-	-	X	-	-
Actaea rubra	red baneberry	Nt P-Forb	7	-	-	-	-	X	-	-
Adiantum pedatum	maidenhair fern	Nt Fern	6	-	-	-	-	X	-	-
Agalinis purpurea	purple gerardia	Nt A-Forb	7	-	-	-	-	-	X	-
Agrimonia pubescens	soft agrimony	Nt P-Forb	5	-	-	-	-	X	-	-
Agropyron trachycaulum	slender wheat grass	Nt P-Grass	8	X	-	-	-	-	-	-
AILANTHUS ALTISSIMA	TREE-OF-HEAVEN	Ad Tree	0	-	-	-	-	X	-	-
Alisma plantago-aquatica	water-plantain	Nt P-Forb	1	-	-	-	X	-	-	-
ALLIARIA PETIOLATA	GARLIC MUSTARD	Ad B-Forb	0	-	-	-	-	X	-	-
Amelanchier arborea	juneberry	Nt Tree	4	-	-	-	-	X	-	-
Amphicarpaea bracteata	hog-peanut	Nt A-Forb	5	-	X	-	-	X	-	-
Andropogon gerardii	big bluestem	Nt P-Grass	5	X	-	-	-	-	-	X
Andropogon scoparius	little bluestem grass	Nt P-Grass	5	X	-	-	-	-	-	X
Anemone cylindrica	thimbleweed	Nt P-Forb	6	-	-	-	-	-	-	X
Anemonella thalictroides	rue anemone	Nt P-Forb	8	-	-	-	-	X	-	-

Appendix 1. Plant species observed at Huron Meadows Metropark (continued).

		Site										
Scientific Name	Common Name	Life Form	A	B	C	D	E	F	G	H	I	J
			WMPF	WTS	OLS	HRRF	HOHF	MLF	HOB			
Site Name												
Apocynum androsaemifolium	groundnut	Nt P-Forb	-	-	X	X	X	X	-	-	-	-
Apocynum cannabinum	spreading dogbane	Nt P-Forb	-	-	-	-	X	-	-	-	-	-
Aralia nudicaulis	indian hemp	Nt P-Forb	-	-	-	-	X	-	-	-	-	X
Arisaema triphyllum	wild sarsaparilla	Nt P-Forb	-	-	X	-	X	-	-	-	-	-
Aristida purpurascens	jack-in-the-pulpit	Nt P-Forb	-	-	X	-	X	-	-	-	-	-
Asclepias amplexicaulis	three-awned grass	Nt P-Grass	-	-	-	-	-	-	-	-	-	X
Asclepias exaltata	clasping milkweed	Nt P-Forb	-	-	-	-	-	-	-	-	-	X
Asclepias incarnata	poke milkweed	Nt P-Forb	-	-	-	-	X	-	-	-	-	-
Asplenium platyneuron	swamp milkweed	Nt P-Forb	X	X	X	-	-	-	-	-	-	-
Aster borealis	ebony spleenwort	Nt Fern	-	-	-	-	X	-	-	-	-	X
Aster laevis	northern bog aster	Nt P-Forb	X	-	-	-	-	-	-	-	-	-
Aster lanceolatus	smooth aster	Nt P-Forb	X	-	-	-	-	-	-	-	-	-
Aster lateriflorus	eastern lined aster	Nt P-Forb	X	-	-	-	-	-	-	-	-	-
Aster macrophyllus	side-flowering aster	Nt P-Forb	-	-	-	X	-	-	-	-	-	-
Aster novae-angliae	big-leaved aster	Nt P-Forb	-	-	-	-	-	-	-	X	-	-
Aster puniceus	New England aster	Nt P-Forb	-	-	-	-	-	-	-	-	-	-
Aster umbellatus	swamp aster	Nt P-Forb	X	-	-	-	-	-	-	-	-	-
Athyrium filix-femina	tall flat-top white aster	Nt P-Forb	X	-	X	-	-	X	-	X	-	-
BERBERIS THUNBERGII	lady fern	Nt Fern	-	-	X	-	-	-	-	X	-	-
BERTEROA INCANA	JAPANESE BARBERRY	Ad Shrub	-	-	X	X	X	-	-	-	-	-
Betula alleghaniensis	HOARY ALYSSUM	Ad A-Forb	-	-	-	-	-	-	-	-	-	X
Betula pumila	yellow birch	Nt Tree	-	-	X	-	-	-	-	X	-	-
Bidens cernuus	bog birch	Nt Shrub	X	X	-	X	-	-	-	-	-	-
Boehmeria cylindrica	nodding bur-marigold	Nt A-Forb	X	-	X	-	-	-	-	-	-	-
Botrychium virginianum	false nettle	Nt P-Forb	X	-	X	-	X	X	-	X	-	-
Brachyelytrum erectum	rattlesnake fern	Nt Fern	-	-	-	-	X	-	-	X	-	-
Bromus ciliatus	long-awned wood grass	Nt P-Grass	-	-	-	-	-	-	-	X	-	-
BROMUS INERMIS	fringed brome	Nt P-Grass	X	X	-	-	-	-	-	-	-	-
Calamagrostis canadensis	SMOOTH BROME	Ad P-Grass	-	-	-	-	-	-	-	X	-	X
Caltha palustris	blue-joint grass	Nt P-Grass	X	-	X	-	-	-	-	-	-	-
Campanula americana	marsh marigold	Nt P-Forb	X	X	-	X	-	-	-	-	-	-
	tall bellflower	Nt A-Forb	-	-	-	-	-	-	-	X	-	-

**Appendix 1. Plant species observed at Huron Meadows Metropark (continued).**

		Site										
		Name	WMPF	WTS	OLS	HRFF	HOHF	MLF	HOB			
		Site	A	B	C	D	E	F	G			
Scientific Name	Common Name	Life Form	Code	A	B	C	D	E	F	G		
Campanula aparinoidea	marsh bellflower	Nt P-Forb	7	-	X	-	-	-	X	-	-	
Carex albursina	sedge	Nt P-Sedge	5	-	-	-	-	X	-	-	-	
Carex aquatilis	sedge	Nt P-Sedge	7	X	-	-	-	-	-	-	-	
Carex buxbaumii	sedge	Nt P-Sedge	10	X	X	-	-	-	-	-	-	
Carex cryptolepis	sedge	Nt P-Sedge	10	-	-	-	-	-	X	-	-	
Carex hystericina	sedge	Nt P-Sedge	2	-	-	X	-	-	X	-	-	
Carex lacustris	sedge	Nt P-Sedge	6	X	X	X	X	-	-	-	-	
Carex lasiocarpa	sedge	Nt P-Sedge	8	X	-	-	-	-	-	-	-	
Carex lupulina	sedge	Nt P-Sedge	4	-	-	X	-	-	-	-	-	
Carex muhlenbergii	sedge	Nt P-Sedge	7	-	-	-	-	-	-	X	-	
Carex pedunculata	sedge	Nt P-Sedge	5	-	-	-	-	X	-	-	-	
Carex pensylvanica	sedge	Nt P-Sedge	4	-	-	-	-	X	-	-	-	
Carex stricta	sedge	Nt P-Sedge	4	X	X	X	X	-	X	-	-	
Carex vulpinoidea	sedge	Nt P-Sedge	1	-	-	-	-	-	-	-	-	
Carpinus caroliniana	blue-beech	Nt Tree	6	-	-	X	X	X	-	-	-	
Carya cordiformis	bitternut hickory	Nt Tree	5	-	-	-	-	X	-	-	-	
Carya glabra	pignut hickory	Nt Tree	5	-	-	-	-	X	-	-	-	
Carya ovata	shagbark hickory	Nt Tree	5	-	-	-	-	X	-	-	-	
CELASTRUS ORBICULATA	ORIENTAL BITTERSWEET	Ad W-Vine	0	-	-	X	-	X	-	-	-	
Celtis tenuifolia	dwarf hackberry	Nt Shrub	5	-	-	-	-	X	-	X	-	
CENTAUREA MACULOSA	SPOTTED KNAPWEED	Ad B-Forb	0	-	-	-	-	X	-	X	-	
Cephalanthus occidentalis	buttonbush	Nt Shrub	7	-	-	X	X	-	-	-	-	
Cercis canadensis	redbud	Nt Tree	8	-	-	X	X	-	-	-	-	
Chelone glabra	turtlehead	Nt P-Forb	7	-	X	X	-	-	-	-	-	
CHRYSANTHEMUM	OX-EYE DAISY	Ad P-Forb	0	-	-	-	-	-	-	X	-	
LEUCANTHEMUM												
Cicuta bulbifera	water hemlock	Nt P-Forb	5	X	X	-	-	-	-	-	-	
Cicuta maculata	water hemlock	Nt B-Forb	4	-	-	X	X	-	-	-	-	
Circaea lutetiana	enchanter's-nightshade	Nt P-Forb	2	-	-	X	-	X	-	-	-	
Cirsium muticum	swamp thistle	Nt B-Forb	6	X	X	-	-	-	X	-	-	
Cladium mariscoides	twig rush	Nt P-Sedge	10	X	X	-	-	-	-	-	-	
Collinsonia canadensis	richweed	Nt P-Forb	8	-	-	-	-	X	-	-	-	

Appendix 1. Plant species observed at Huron Meadows Metropark (continued).

		Site										
Scientific Name	Common Name	Life Form	A	B	C	D	E	F	G	H	I	J
		Site										
Code			A	B	C	D	E	F	G	H	I	J
<i>Comandra umbellata</i>	bastard toadflax	Nt P-Forb	x	-	-	-	-	-	-	-	-	-
<i>CONVALLARIA MAJALIS</i>	LILY-OF-THE-VALLEY	Ad P-Forb	-	-	-	-	x	-	-	-	-	-
<i>Coptis trifolia</i>	goldthread	Nt P-Forb	-	-	x	-	-	-	-	-	-	-
<i>Cornus alternifolia</i>	alternate-leaved dogwood	Nt Tree	-	-	x	-	-	-	-	-	-	-
<i>Cornus amomum</i>	silky dogwood	Nt Shrub	x	x	-	x	-	-	-	-	-	-
<i>Cornus florida</i>	flowering dogwood	Nt Tree	-	-	-	-	x	-	-	-	-	-
<i>Cornus foemina</i>	gray dogwood	Nt Shrub	x	-	-	x	x	x	x	-	-	-
<i>Cornus stolonifera</i>	red-osier dogwood	Nt Shrub	x	x	-	-	-	-	-	-	-	-
<i>CORONILLA VARIA</i>	CROWN-VETCH	Ad P-Forb	-	-	-	-	-	-	-	-	x	-
<i>Corylus americana</i>	hazelnut	Nt Shrub	-	-	x	-	x	-	-	-	-	-
<i>Cuscuta groenovii</i>	common dodder	Nt A-Forb	x	x	-	-	-	-	-	-	-	-
<i>Crataegus sp.</i>	hawthorn	Nt Tree	-	-	-	-	-	-	-	-	x	-
<i>Cyperus filiculmis</i>	slender sand sedge	Nt P-Sedge	-	-	-	-	-	-	-	-	x	-
<i>DAUCUS CAROTA</i>	QUEEN-ANNE'S-LACE	Ad B-Forb	-	-	-	-	x	-	-	-	x	-
<i>Decodon verticillatus</i>	whorled or swamp loosestrife	Nt Shrub	-	-	x	-	-	-	-	-	-	-
<i>Deschampsia flexuosa</i>	hair grass	Nt P-Grass	-	-	-	-	-	-	-	-	x	-
<i>Desmodium canadense</i>	showy tick-trefoil	Nt P-Forb	-	-	-	-	-	-	-	-	x	-
<i>Desmodium ciliare</i>	hairy tick-trefoil	Nt P-Forb	-	-	-	-	-	-	-	-	x	-
<i>Desmodium glutinosum</i>	clustered-leaved tick-trefoil	Nt P-Forb	-	-	-	-	-	-	-	x	-	-
<i>Desmodium illinoense</i>	prairie tick-trefoil	Nt P-Forb	-	-	-	-	-	-	-	-	-	x
<i>Desmodium nudiflorum</i>	naked tick-trefoil	Nt P-Forb	-	-	-	-	-	-	-	x	-	-
<i>Desmodium sessilifolium</i>	sessile-leaved tick-trefoil	Nt P-Forb	-	-	-	-	-	-	-	-	-	x
<i>DIANTHUS ARMERIA</i>	DEPTFORD PINK	Ad A-Forb	-	-	-	-	-	-	-	-	-	x
<i>Dioscorea villosa</i>	wild yam	Nt P-Forb	-	-	-	x	-	-	-	-	-	-
<i>Dryopteris carthusiana</i>	spinulose woodfern	Nt Fern	-	-	x	-	x	-	-	-	-	-
<i>Dryopteris cristata</i>	crested shield fern	Nt Fern	-	-	x	-	-	-	-	-	-	-
<i>Echinocystis lobata</i>	wild-cucumber	Nt A-Forb	-	-	-	-	-	-	-	-	-	-
<i>ELAEAGNUS UMBELLATA</i>	AUTUMN-OLIVE	Ad Shrub	-	x	-	-	x	-	-	-	-	x
<i>Eleocharis elliptica</i>	golden-seeded spike-rush	Nt P-Sedge	x	-	-	-	-	-	-	-	-	-
<i>Eleocharis rostellata</i>	spike-rush	Nt P-Sedge	-	x	-	-	-	-	-	-	-	-
<i>Elymus virginicus</i>	Virginia wild-rye	Nt P-Grass	-	-	-	-	-	-	-	x	-	-
<i>Epifagus virginiana</i>	beech drops	Nt P-Forb	-	-	-	-	-	-	-	-	x	-

**Appendix 1. Plant species observed at Huron Meadows Metropark (continued).**

		Site										
Scientific Name	Common Name	Life Form	A	B	C	D	E	F	G	H	I	J
			WMPF	WTS	OLS	HRRF	HOHF	MLF	HOB			
			Site									
Code			A	B	C	D	E	F	G			
Epilobium coloratum	cinnamon willow-herb	Nt P-Forb	X	-	-	-	-	-	-	-	-	-
Equisetum arvense	common horsetail	Nt Fern Ally	-	-	X	-	X	-	-	-	-	-
Equisetum fluviatile	water horsetail	Nt Fern Ally	-	X	X	-	-	-	-	-	-	-
Erigeron strigosus	daisy fleabane	Nt P-Forb	-	-	-	-	-	-	-	X	-	-
EUONYMUS ALATA	WINGED WAHOO	Ad Shrub	-	-	-	-	X	-	-	-	-	-
Euonymus obovata	running strawberry-bush	Nt Shrub	-	-	-	-	X	-	-	-	-	-
Eupatorium maculatum	joe-pye-weed	Nt P-Forb	X	X	X	X	-	X	-	-	-	-
Eupatorium perfoliatum	common boneset	Nt P-Forb	X	X	X	-	-	X	-	-	-	-
Euphorbia corollata	flowering spurge	Nt P-Forb	-	-	-	-	-	-	-	-	-	X
Euthamia graminifolia	grass-leaved goldenrod	Nt P-Forb	X	-	-	-	-	X	-	-	-	-
Fagus grandifolia	American beech	Nt Tree	-	-	-	-	-	-	X	-	-	-
FESTUCA RUBRA	RED FESCUE	Ad P-Grass	-	-	-	-	-	-	-	-	-	X
Fragaria virginiana	wild strawberry	Nt P-Forb	-	-	-	-	-	-	-	-	-	X
Fraxinus americana	white ash	Nt Tree	-	-	-	-	-	-	X	-	-	-
Fraxinus nigra	black ash	Nt Tree	-	-	X	X	-	-	-	-	-	-
Fraxinus pennsylvanica	red ash	Nt Tree	X	-	X	X	-	-	-	-	-	-
Galium aparine	annual bedstraw	Nt A-Forb	X	-	-	-	-	X	-	-	-	-
Galium boreale	northern bedstraw	Nt P-Forb	X	X	-	-	-	-	-	-	-	-
Galium circaezans	white wild licorice	Nt P-Forb	-	-	-	-	-	X	-	-	-	-
Gaylussacia baccata	huckleberry	Nt Shrub	-	-	-	-	-	X	-	-	-	-
Gentianopsis procera	small fringed gentian	Nt A-Forb	X	-	-	-	-	-	-	-	-	-
Geranium maculatum	wild geranium	Nt P-Forb	-	-	-	-	-	X	-	-	-	-
Geum canadense	white avens	Nt P-Forb	-	-	-	-	-	X	-	-	-	-
GLECHOMA HEDERACEA	GROUND IVY	Ad P-Forb	-	-	X	X	-	-	-	-	-	-
Glyceria striata	fowl manna grass	Nt P-Grass	-	-	X	-	-	-	-	-	-	-
Hackelia virginiana	beggar's-lice	Nt P-Forb	-	-	-	-	-	X	-	-	-	-
Hamamelis virginiana	witch-hazel	Nt Shrub	-	-	-	-	-	X	-	-	-	-
Helenium autumnale	sneezeweed	Nt P-Forb	X	-	-	-	-	-	-	-	-	-
Helianthemum bicknellii	rockrose	Nt P-Forb	-	-	-	-	-	-	-	-	-	X
Hepatica americana	round-lobed hepatica	Nt P-Forb	-	-	-	-	-	X	-	-	-	-
HESPERIS MATRONALIS	DAME'S ROCKET	Ad P-Forb	-	-	-	-	-	X	-	-	-	-
HIERACIUM AURANTIACUM	ORANGE HAWKWEED	Ad P-Forb	-	-	-	-	-	-	-	-	-	X

Appendix 1. Plant species observed at Huron Meadows Metropark (continued).

Scientific Name	Common Name	Life Form	Site														
			Name	WMPF	WTS	OLS	HRRF	HOHF	MLF	HOB	A	B	C	D	E	F	G
HIERACIUM CAESPITOSUM	KING-DEVIL	Ad P-Forb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x
Humulus lupulus	common hop	Nt H-Vine	-	-	-	-	-	-	-	-	-	-	-	x	-	-	-
HYPERICUM PERFORATUM	COMMON ST. JOHN'S-WORT	Ad P-Forb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x
Hystrix patula	bottlebrush grass	Nt P-Grass	-	-	-	x	-	-	-	x	-	-	-	-	-	-	-
Ilex verticillata	Michigan holly	Nt Shrub	x	x	x	x	x	x	x	-	-	-	-	-	-	-	-
Impatiens capensis	spotted touch-me-not	Nt A-Forb	x	x	x	x	x	x	x	-	-	-	-	-	-	-	-
Iris virginica	southern blue flag	Nt P-Forb	x	-	-	x	-	-	-	-	-	-	-	-	-	-	-
Juglans nigra	black walnut	Nt Tree	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x
Juncus brachycephalus	rush	Nt P-Forb	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Juncus tenuis	path rush	Nt P-Forb	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Juniperus communis	common or ground juniper	Nt Shrub	-	x	-	-	-	-	-	-	-	-	-	x	-	-	-
Juniperus virginiana	red-cedar	Nt Tree	x	-	-	-	-	-	-	-	-	-	-	x	-	-	x
Laportea canadensis	wood nettle	Nt P-Forb	-	-	-	x	-	-	x	-	-	-	-	-	-	-	-
Larix laricina	tamarack	Nt Tree	x	x	x	x	x	x	x	-	-	-	-	-	-	-	-
Lathyrus palustris	marsh pea	Nt P-Forb	x	x	x	-	-	-	-	-	-	-	-	-	-	-	-
Leersia oryzoides	cut grass	Nt P-Grass	x	-	-	x	-	-	-	-	-	-	-	-	-	-	-
Leersia virginica	white grass	Nt P-Grass	-	-	-	x	-	-	-	-	-	-	-	-	-	-	-
Lemna minor	small duckweed	Nt A-Forb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LEONURUS CARDIACA	MOTHERWORT	Ad P-Forb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lespedeza capitata	round-headed bush-clover	Nt P-Forb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x
Lespedeza hirta	hairy bush-clover	Nt P-Forb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x
Lespedeza virginica	slender bush-clover	Nt P-Forb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x
Liatis aspera	rough blazing star	Nt P-Forb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x
LIGUSTRUM VULGARE	COMMON PRIVET	Ad Shrub	-	-	-	x	-	-	-	-	-	-	-	-	-	-	-
Lindera benzoin	spicebush	Nt Shrub	-	x	x	x	x	x	x	-	-	-	-	-	-	-	-
Liparis lilifolia	purple twayblade orchid	Nt P-Forb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x
Liriodendron tulipifera	tulip tree	Nt Tree	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lobelia cardinalis	cardinal flower	Nt P-Forb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lobelia kalmii	bog lobelia	Nt P-Forb	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lobelia siphilitica	great blue lobelia	Nt P-Forb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LONICERA MAACKII	AMUR HONEYSUCKLE	Ad Shrub	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LONICERA MORROWII	MORROW HONEYSUCKLE	Ad Shrub	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



**Appendix 1. Plant species observed at Huron Meadows Metropark (continued).**

		Site										
		Name	WMPF	WTS	OLS	HRRF	HOHF	MLF	HOB			
Site	Code	A	B	C	D	E	F	G				
Scientific Name	Common Name	Life Form										
Peltandra virginica	arrow-arum	-	-	-	X	-	-	-	-	-	-	-
Phalaris arundinacea	reed canary grass	X	X	X	X	-	X	-	-	-	-	-
PHLEUM PRATENSE	TIMOTHY	-	-	-	-	-	-	-	-	-	-	X
Phragmites australis	reed	X	-	-	X	-	-	-	-	-	-	-
Phryma leptostachya	lopsseed	-	-	-	-	X	-	-	-	-	-	-
Physocarpus opulifolius	ninebark	X	-	-	-	-	-	-	-	-	-	-
Phytolacca americana	pokeweed	-	-	-	-	X	-	-	-	-	-	-
PICEA ABIES	NORWAY SPRUCE	-	-	-	-	X	-	-	-	-	-	-
Pilea pumila	clearweed	-	-	X	-	-	-	-	-	-	-	-
Pinus strobus	white pine	-	-	-	-	X	-	-	-	-	-	-
PINUS SYLVESTRIS	SCOTCH PINE	-	-	-	-	X	-	-	-	-	-	X
PLANTAGO MAJOR	COMMON PLANTAIN	-	-	-	-	-	-	-	-	-	-	X
Platanus occidentalis	sycamore	-	-	-	-	-	-	-	X	-	-	-
POA COMPRESSA	CANADA BLUEGRASS	-	-	-	-	X	-	-	X	-	-	X
Poa palustris	fowl meadow grass	-	-	X	-	-	-	-	-	-	-	-
Podophyllum peltatum	may-apple	-	-	-	-	-	-	-	X	-	-	-
Polygonatum pubescens	downy solomon-seal	-	-	-	-	-	-	-	X	-	-	-
Polygonum hydropiper	water-pepper	X	-	-	X	-	-	-	-	-	-	-
Polygonum sagittatum	arrow-leaved tear-thumb	X	-	-	X	-	-	-	-	-	-	-
Polygonum virginianum	jumpseed	-	-	-	-	-	-	-	X	-	-	-
Populus deltoides	cottonwood	-	-	-	-	X	-	-	-	-	-	-
Populus grandidentata	big-toothed aspen	-	-	-	-	-	-	-	X	-	-	X
Populus tremuloides	quaking aspen	X	-	-	-	-	-	-	X	-	-	X
Potentilla fruticosa	shrubby cinquefoil	X	X	-	-	-	-	-	-	-	X	-
Prunus serotina	wild black cherry	-	-	-	-	-	-	-	X	-	-	X
Prunus virginiana	choke cherry	-	-	-	-	-	-	-	X	-	-	-
Pteridium aquilinum	bracken fern	-	-	-	-	-	-	-	X	-	-	-
Pycnanthemum virginianum	common mountain mint	X	X	X	-	-	-	-	-	-	X	-
Pyrola elliptica	large-leaved shinleaf	-	-	-	-	-	-	-	-	-	X	-
Quercus alba	white oak	-	-	-	-	-	-	-	-	-	-	-
Quercus bicolor	swamp white oak	-	-	-	X	-	-	-	-	-	-	-
Quercus macrocarpa	bur oak	-	-	-	X	-	-	-	-	-	X	-

**Appendix 1. Plant species observed at Huron Meadows Metropark (continued).**

Scientific Name	Common Name	Life Form	Site										
			Name	WMPF	WTS	OLS	HRFF	HOHF	MLF	HOB			
Code	A	B	C	D	E	F	G						
Quercus rubra	red oak	Nt Tree	-	-	-	-	-	-	-	-	-	-	-
Quercus velutina	black oak	Nt Tree	-	-	-	-	-	-	-	-	-	-	-
Ranunculus abortivus	small-flowered buttercup	Nt A-Forb	-	-	-	-	-	-	-	-	-	-	-
Rhamnus alnifolia	alder-leaved buckthorn	Nt Shrub	-	-	-	-	-	-	-	-	-	-	-
RHAMNUS CATHARTICA	COMMON BUCKTHORN	Ad Tree	-	-	-	-	-	-	-	-	-	-	-
RHAMNUS FRANGULA	GLOSSY BUCKTHORN	Ad Shrub	x	x	-	x	-	x	-	x	-	-	-
Rhus aromatica	fragrant sumac	Nt Shrub	-	-	-	-	-	-	-	-	-	-	-
Rhus glabra	smooth sumac	Nt Tree	-	-	-	-	-	-	-	-	-	-	-
Rhynchospora capillacea	beak-rush	Nt P-Sedge	x	x	-	-	-	-	-	-	-	-	-
Ribes cynosbati	prickly or wild gooseberry	Nt Shrub	-	-	-	-	-	-	-	-	-	-	-
ROBINIA PSEUDOACACIA	BLACK LOCUST	Ad Tree	-	-	-	-	-	-	-	-	-	-	-
ROSA MULTIFLORA	MULTIFLORA ROSE	Ad Shrub	-	-	-	x	-	x	-	x	-	-	-
Rosa palustris	swamp rose	Nt Shrub	x	x	-	-	-	-	-	-	-	-	-
Rubus allegheniensis	common blackberry	Nt Shrub	-	-	-	-	-	-	-	-	-	-	-
Rubus flagellaris	northern dewberry	Nt Shrub	-	-	-	-	-	-	-	-	-	-	-
Rubus occidentalis	black raspberry	Nt Shrub	-	-	-	-	-	-	-	-	-	-	-
Rubus pubescens	dwarf raspberry	Nt P-Forb	x	x	-	x	-	-	-	-	-	-	-
Rudbeckia hirta	black-eyed susan	Nt P-Forb	x	x	-	-	-	-	-	-	-	-	-
RUMEX ACETOSELLA	SHEEP SORREL	Ad P-Forb	-	-	-	-	-	-	-	-	-	-	-
Rumex orbiculatus	great water dock	Nt P-Forb	-	-	-	x	-	x	-	-	-	-	-
Sagittaria latifolia	common arrowhead	Nt P-Forb	-	-	-	-	-	-	-	-	-	-	-
Salix amygdaloides	peach-leaved willow	Nt Tree	-	-	-	x	-	-	-	-	-	-	-
Salix bebbiana	Bebb's willow	Nt Shrub	x	x	-	-	-	-	-	-	-	-	-
Salix candida	hoary willow	Nt Shrub	x	x	-	x	-	x	-	x	-	-	-
Salix exigua	sandbar willow	Nt Shrub	-	-	-	-	-	-	-	-	-	-	-
Salix petiolaris	slender willow	Nt Shrub	x	x	-	-	-	-	-	-	-	-	-
Sambucus canadensis	elderberry	Nt Shrub	-	-	-	x	-	-	-	-	-	-	-
Sanicula gregaria	black snakeroot	Nt P-Forb	-	-	-	-	-	-	-	-	-	-	-
Sarracenia purpurea	pitcher-plant	Nt P-Forb	x	x	-	-	-	-	-	-	-	-	-
Sassafras albidum	sassafras	Nt Tree	-	-	-	-	-	-	-	-	-	-	-
Saururus cernuus	lizard's-tail	Nt P-Forb	-	-	-	-	-	-	-	-	-	-	-
Schoenoplectus acutus	hardstem bulrush	Nt P-Sedge	-	-	-	-	-	-	-	-	-	-	-

Appendix 1. Plant species observed at Huron Meadows Metropark (continued).

Site		Site										
Name	WMPF	WTS	OLS	HRFF	HOHF	MLF	HOB					
Code	A	B	C	D	E	F	G					
Scientific Name	Common Name	Life Form										
Schoenoplectus pungens	three-square	Nt P-Sedge	-	-	-	X	-					-
Schoenoplectus tabernaemontani	softstem bulrush	Nt P-Sedge	X	-	-	-	-					-
Scirpus atrovirens	bulrush	Nt P-Sedge	-	-	-	X	-					-
Scutellaria galericulata	common skullcap	Nt P-Forb	X	-	-	-	-					-
Senecio aureus	golden ragwort	Nt P-Forb	-	-	-	-	-					-
SILENE PRATENSIS	WHITE CATCHFLY	Ad P-Forb	-	-	-	-	-					X
Sium suave	water-parsnip	Nt P-Forb	-	X	-	X	-					-
Smilacina stellata	starry false solomon-seal	Nt P-Forb	-	-	X	-	-					-
SOLANUM DULCAMARA	BITTERSWEET NIGHTSHADE	Ad P-Forb	-	-	-	-	-					-
Solidago altissima	tall goldenrod	Nt P-Forb	X	-	-	X	-					-
Solidago caesia	blue-stemmed goldenrod	Nt P-Forb	-	-	X	-	-					-
Solidago canadensis	Canada goldenrod	Nt P-Forb	-	-	-	-	-					X
Solidago gigantea	late goldenrod	Nt P-Forb	X	-	-	-	-					-
Solidago nemoralis	old field goldenrod	Nt P-Forb	-	-	-	-	-					-
Solidago ohioensis	Ohio goldenrod	Nt P-Forb	-	-	-	-	-					X
Solidago patula	swamp goldenrod	Nt P-Forb	X	-	-	-	-					-
Solidago riddellii	Riddell's goldenrod	Nt P-Forb	X	X	-	X	-					-
Solidago rugosa	rough goldenrod	Nt P-Forb	X	-	-	X	-					-
Solidago speciosa	showy goldenrod	Nt P-Forb	-	-	-	-	-					X
Solidago uliginosa	bog goldenrod	Nt P-Forb	X	-	-	-	-					-
Sparganium eurycarpum	common bur-reed	Nt P-Forb	X	-	X	-	-					-
Spiraea alba	meadowsweet	Nt Shrub	X	-	X	-	-					-
Spiranthes cernua	nodding ladies'-tresses	Nt P-Forb	X	-	-	-	-					-
Staphylea trifolia	bladdernut	Nt Shrub	-	-	-	-	-					-
STELLARIA GRAMINEA	STARWORT	Ad P-Forb	-	-	-	-	-					X
Symplocarpus foetidus	skunk cabbage	Nt P-Forb	-	X	X	-	-					-
Thalictrum dasycarpum	purple meadow-rue	Nt P-Forb	X	-	-	-	-					-
Thalictrum dioicum	early meadow-rue	Nt P-Forb	-	-	-	X	-					-
Thelypteris palustris	marsh fern	Nt Fern	X	X	X	-	-					X
Thuja occidentalis	northern white-cedar	Nt Tree	-	-	-	-	-					-
Tilia americana	basswood	Nt Tree	-	-	X	-	-					-
TORILIS JAPONICA	HEDGE-PARSLEY	Ad A-Forb	-	-	-	-	-					X

Appendix 1. Plant species observed at Huron Meadows Metropark (continued).

		Site										
		Name	WMFP	WTS	OLS	HRRF	HOHF	MLF	HOB			
Scientific Name	Common Name	Life Form	A	B	C	D	E	F	G			
Toxicodendron radicans	poison ivy	Nt W-Vine	-	X	X	X	X	-	-			
Toxicodendron vernix	poison sumac	Nt Shrub	X	X	X	X	-	X	-			
TRAGOPOGON DUBIUS	GOAT'S BEARD	Ad B-Forb	-	-	-	-	-	-	X			
Triadenum fraseri	marsh St. John's-wort	Nt P-Forb	X	X	-	-	-	-	-			
TRIFOLIUM CAMPESTRE	LOW HOP CLOVER	Ad A-Forb	-	-	-	-	-	-	-	X		
TRIFOLIUM PRATENSE	RED CLOVER	Ad P-Forb	-	-	-	-	-	-	-	X		
Typha latifolia	broad-leaved cattail	Nt P-Forb	X	X	X	X	-	X	-	-		
Ulmus americana	American elm	Nt Tree	X	X	X	X	X	-	-	-		
ULMUS PUMILA	SIBERIAN ELM	Ad Tree	-	-	-	-	-	-	-	X		
Urtica dioica	nettle	Nt P-Forb	-	X	X	X	X	-	-	-		
Utricularia intermedia	flat-leaved bladderwort	Nt P-Forb	X	X	-	-	-	-	-	-		
Uvularia grandiflora	bellwort	Nt P-Forb	-	-	-	-	X	-	-	-		
Vaccinium angustifolium	blueberry	Nt Shrub	-	-	-	-	X	-	-	-		
Vaccinium corymbosum	smooth highbush blueberry	Nt Shrub	-	-	-	-	X	-	-	-		
Valeriana uliginosa	bog valerian	Nt P-Forb	X	-	-	-	-	-	-	-		
VERBASCUM THAPSUS	COMMON MULLEIN	Ad B-Forb	-	-	-	-	-	-	-	X		
Verbena hastata	blue vervain	Nt P-Forb	X	-	-	-	-	-	-	-		
Verbena urticifolia	white vervain	Nt P-Forb	-	-	-	-	X	-	-	-		
Viburnum acerifolium	maple-leaved arrow-wood	Nt Shrub	-	-	-	-	X	-	-	-		
Viburnum dentatum	smooth arrow-wood	Nt Shrub	-	-	X	-	X	-	-	-		
Viburnum lentago	nannyberry	Nt Shrub	X	X	X	X	X	-	-	-		
VIBURNUM OPULUS	EUROPEAN HIGHBUSH-CRANBERRY	Ad Shrub	-	-	-	-	X	-	-	-		
Viola nephrophylla	northern bog violet	Nt P-Forb	-	-	X	-	-	-	-	-		
Viola pubescens	yellow violet	Nt P-Forb	-	-	-	-	X	-	-	-		
Viola sororia	common blue violet	Nt P-Forb	-	-	-	X	-	-	-	-		
Vitis aestivalis	summer grape	Nt W-Vine	-	-	-	-	X	-	-	-		
Vitis riparia	riverbank grape	Nt W-Vine	-	-	X	X	-	-	-	-		
Zanthoxylum americanum	prickly-ash	Nt Shrub	-	-	-	-	X	-	-	-		
<b>Total number of species observed in survey site</b>			<b>102</b>	<b>65</b>	<b>100</b>	<b>68</b>	<b>145</b>	<b>42</b>	<b>75</b>			
<b>Total number of species observed in Huron Meadows Metropark: 338</b>												

**Appendix 2.** Plant species observed at **Lake Erie Metropark**. "X" indicates the species occurred within the site. "-" indicates species was not observed at the site. Capitalized scientific and common names indicate non-native species. Life form acronyms are as follows: Nt, native; P, perennial; Ad, adventive; B, biannual; A, annual. "C" is the Coefficient of Conservation for each species (Herman et al. 2001).

Site Name	Site Abbreviation	Site Code
Erie Prairie	EP	H
Erie Golf Course Wetlands	EGCW	I
Erie Marsh	EM	J
Erie Woods	EW	K

Scientific Name	Common Name	Life Form	Site						
			Name	EP	EGCW	EM	EW		
Site Code	H	I	J	K					
Acer negundo	box elder	Nt Tree	0	x	-	-	-	-	
Acer saccharinum	silver maple	Nt Tree	2	-	-	-	-	x	
Acer saccharum	sugar maple	Nt Tree	5	-	-	-	-	x	
Agrimonia gryposepala	tall agrimony	Nt P-Forb	2	-	x	-	-	x	
AGROPYRON REPENS	QUACK GRASS	Ad P-Grass	0	x	-	-	-	-	
Alisma plantago-aquatica	water-plantain	Nt P-Forb	1	-	-	x	-	-	
ALLIARIA PETIOLATA	GARLIC MUSTARD	Ad B-Forb	0	-	-	-	-	x	
ALNUS GLUTINOSA	BLACK ALDER	Ad Tree	0	-	-	x	-	-	
Anemone canadensis	Canada anemone	Nt P-Forb	4	x	-	-	-	-	
Apocynum cannabinum	indian hemp	Nt P-Forb	3	x	-	-	-	-	
ARCTIUM MINUS	COMMON BURDOCK	Ad B-Forb	0	-	-	-	-	x	
Arisaema triphyllum	jack-in-the-pulpit	Nt P-Forb	5	-	-	-	-	x	
Asclepias incarnata	swamp milkweed	Nt P-Forb	6	-	x	-	-	-	
Asclepias syriaca	common milkweed	Nt P-Forb	1	x	-	-	-	-	
Aster lateriflorus	side-flowering aster	Nt P-Forb	2	-	-	-	-	x	
BERBERIS THUNBERGII	JAPANESE BARBERRY	Ad Shrub	0	-	-	-	-	x	
Bidens cernuus	nodding bur-marigold	Nt A-Forb	3	-	-	x	-	-	
Boehmeria cylindrica	false nettle	Nt P-Forb	5	-	-	-	-	x	
Bolboschoenus fluviatilis	bulrush	Nt P-Sedge	6	-	x	-	-	-	
BUTOMUS UMBELLATUS	FLOWERING RUSH	Ad P-Forb	0	-	-	-	x	-	
Calamagrostis canadensis	blue-joint grass	Nt P-Grass	3	-	-	-	x	-	
Calystegia sepium	hedge bindweed	Nt P-Forb	2	-	-	-	x	-	
Carex bebbii	sedge	Nt P-Sedge	4	x	-	-	-	-	
Carex comosa	sedge	Nt P-Sedge	5	-	-	-	x	-	
Carex frankii	Frank's sedge	Nt P-Sedge	4	-	x	-	-	-	

Appendix 2. Plant species observed at Lake Erie Metropark (continued).

		Site						
		Name	EP	EGCW	EM	EW		
		Site Code	H	I	J	K		
Scientific Name	Common Name	Life Form	C					
Carex granularis	sedge	Nt P-Sedge	2	x	-	-	-	-
Carex grayi	sedge	Nt P-Sedge	6	-	-	-	-	x
Carex hirtifolia	sedge	Nt P-Sedge	5	-	-	-	-	x
Carex leptonevria	sedge	Nt P-Sedge	3	-	-	-	-	x
Carex muskingumensis	sedge	Nt P-Sedge	6	-	-	-	-	x
Carex pensylvanica	sedge	Nt P-Sedge	4	-	-	-	-	x
Carex plantaginea	sedge	Nt P-Sedge	8	-	-	-	-	x
Carex radiata	straight-styled wood sedge	Nt P-Sedge	2	-	-	-	-	x
Carex stricta	sedge	Nt P-Sedge	4	x	-	-	-	-
Carex vulpinoidea	sedge	Nt P-Sedge	1	x	x	-	-	x
Carpinus caroliniana	blue-beech	Nt Tree	6	-	-	-	-	x
Carya cordiformis	bitternut hickory	Nt Tree	5	-	-	-	-	x
Carya laciniosa	shellbark hickory	Nt Tree	9	-	-	-	-	x
Carya ovata	shagbark hickory	Nt Tree	5	-	-	-	-	x
Celtis occidentalis	hackberry	Nt Tree	5	-	-	-	-	x
Ceratophyllum demersum	coontail	Nt P-Forb	1	-	-	-	x	-
Circaea lutetiana	enchanter's-nightshade	Nt P-Forb	2	-	-	-	-	x
CIRSIUM ARVENSE	CANADIAN THISTLE	Ad P-Forb	0	-	x	x	-	-
Cornus drummondii	rough-leaved dogwood	Nt Shrub	6	x	x	x	x	x
Crataegus sp.	hawthorn	Nt Tree		x	-	-	-	-
Cuscuta groenovii	common dodder	Nt A-Forb	3	-	-	-	x	-
Cyperus erythrorhizos	umbrella sedge	Nt A-Sedge	6	-	-	-	x	-
Cyperus strigosus	long-scaled nut sedge	Nt P-Sedge	3	-	-	-	x	-
DIPSACUS FULLONUM	COMMON TEASEL	Ad P-Forb	0	-	x	-	-	-
Dryopteris carthusiana	spinulose woodfern	Nt Fern	5	-	-	-	-	x
Echinocystis lobata	wild cucumber	Nt A-Forb	2	-	-	-	-	x
EICHHORNIA CRASSIPES	COMMON WATER HYACINTH	Ad A-Forb	0	-	-	-	x	-
Elodea canadensis	common waterweed	Nt P-Forb	1	-	-	-	x	-
Epilobium coloratum	cinnamon willow herb	Nt P-Forb	3	-	-	-	x	-
EPILOBIUM HIRSUTUM	GREAT HAIRY WILLOW-HERB	Ad P-Forb	0	-	x	-	-	-
Erechtites hieracifolia	fireweed	Nt A-Forb	2	-	-	-	x	x

Appendix 2. Plant species observed at Lake Erie Metropark (continued).

Site Name	EP	EGCW	EM	EW
Site Code	H	I	J	K
Scientific Name	Common Name	Life Form	C	
Eupatorium perfoliatum	common boneset	Nt P-Forb	4	- x -
Fagus grandifolia	American beech	Nt Tree	6	- - x
FESTUCA ARUNDINACEA	TALL FESCUE	Ad P-Grass	0	x - -
Fraxinus americana	white ash	Nt Tree	5	- x -
Fraxinus nigra	black ash	Nt Tree	6	- - x
Fraxinus pennsylvanica	red ash	Nt Tree	2	- - x
Galium triflorum	fragrant bedstraw	Nt P-Forb	4	x - -
Geranium maculatum	wild geranium	Nt P-Forb	4	- - x
Geum canadense	white avens	Nt P-Forb	1	- - x
Geum rivale	purple avens	Nt P-Forb	7	- - x
Gleditsia triacanthos	honey locust	Nt Tree	8	- - x
Glyceria striata	fowl manna grass	Nt P-Grass	4	- - x
Hibiscus moscheutos	swamp rose mallow	Nt P-Forb	7	- - x
HORDEUM JUBATUM	SQUIRREL-TAIL GRASS	Ad P-Grass	0	x - -
Hydrastis canadensis	goldenseal	Nt P-Forb	5	- - x
Hystrix patula	bottlebrush grass	Nt P-Grass	5	- - x
Impatiens capensis	spotted touch-me-not	Nt A-Forb	2	- - x
Juglans nigra	black walnut	Nt Tree	5	- - x
Juncus dudleyi	Dudley's rush	Nt P-Forb	1	x - -
Laportea canadensis	wood nettle	Nt P-Forb	4	- - x
Lathyrus palustris	marsh pea	Nt P-Forb	7	x - -
Leersia oryzoides	cut grass	Nt P-Grass	3	- - x
Leersia virginica	white grass	Nt P-Grass	5	- - x
Lemna minor	small duckweed	Nt A-Forb	5	- - x
LIGUSTRUM VULGARE	COMMON PRIVET	Ad Shrub	0	- - x
LONICERA MORROWII	MORROW HONEYSUCKLE	Ad Shrub	0	x - -
Lycopus uniflorus	northern bugle weed	Nt P-Forb	2	- - x
LYSIMACHIA NUMMULARIA	MONEYWORT	Ad P-Forb	0	- - x
LYTHRUM SALICARIA	PURPLE LOOSESTRIFE	Ad P-Forb	0	- - x
MELILOTUS ALBA	WHITE SWEET-CLOVER	Ad B-Forb	0	x - -
MELILOTUS OFFICINALIS	YELLOW SWEET-CLOVER	Ad B-Forb	0	x - -

Appendix 2. Plant species observed at Lake Erie Metropark (continued).

Scientific Name	Common Name	Life Form	Site Name	EP	EGCW	EM	EW
Site Code			H	I	J	K	
Menispermum canadense	moonseed	Nt W-Vine	-	-	-	-	X
Mentha arvensis	wild mint	Nt P-Forb	-	-	X	-	-
Nelumbo lutea	American lotus	Nt P-Forb	-	-	X	-	-
Nymphaea odorata	sweet-scented waterlily	Nt P-Forb	-	-	X	-	-
Oenothera biennis	common evening primrose	Nt B-Forb	-	-	X	-	-
Ostrya virginiana	ironwood; hop-hornbeam	Nt Tree	-	-	-	X	X
Parthenocissus quinquefolia	Virginia creeper	Nt W-Vine	-	-	-	-	X
Phalaris arundinacea	reed canary grass	Nt P-Grass	X	X	-	-	-
PHLEUM PRATENSE	TIMOTHY	Ad P-Grass	X	X	-	-	-
Phragmites australis	reed	Nt P-Grass	-	X	X	-	X
Platanthera leucophaea	eastern prairie-fringed orchid	Nt P-Forb	X	-	-	-	-
POA PRATENSIS	KENTUCKY BLUEGRASS	Ad P-Grass	-	X	-	-	-
Podophyllum peltatum	may-apple	Nt P-Forb	-	-	-	-	X
Polygonum amphibium	water smartweed	Nt P-Forb	-	-	X	-	-
Polygonum hydropiper	water-pepper	Nt A-Forb	-	-	X	-	-
POLYGONUM PERSICARIA	LADY'S THUMB	Ad A-Forb	-	-	X	-	-
Polygonum virginianum	jumpseed	Nt P-Forb	-	-	-	-	X
Populus deltoides	cottonwood	Nt Tree	X	X	X	-	X
POTAMOGETON CRISPUS	PONDWEED	Ad P-Forb	-	-	X	-	-
Potamogeton gramineus	pondweed	Nt P-Forb	-	-	X	-	-
Potamogeton natans	pondweed	Nt P-Forb	-	-	X	-	-
Potentilla simplex	old field cinquefoil	Nt P-Forb	-	-	-	-	X
Prenanthes alba	white lettuce	Nt P-Forb	-	-	-	-	X
Prunus serotina	black cherry	Nt Tree	-	-	-	-	X
Quercus alba	white oak	Nt Tree	-	-	-	-	X
Quercus bicolor	swamp white oak	Nt Tree	-	-	-	-	X
Quercus macrocarpa	bur oak	Nt Tree	-	X	-	-	X
Quercus rubra	red oak	Nt Tree	-	-	-	-	X
RHAMNUS CATHARTICA	COMMON BUCKTHORN	Ad Tree	-	-	-	-	X
RHAMNUS FRANGULA	GLOSSY BUCKTHORN	Ad Shrub	-	-	-	X	X
Rhus typhina	staghorn sumac	Nt Tree	X	-	-	-	-

Appendix 2. Plant species observed at Lake Erie Metropark (continued).

		Site							
		Name	EP	EGCW	EM	EW			
		Site							
Scientific Name	Common Name	Life Form	H	I	J	K			
Ribes americanum	wild black currant	Nt Shrub	-	-	-	-	-	X	
ROSA MULTIFLORA	MULTIFLORA ROSE	Ad Shrub	-	-	-	-	-	X	
Rosa setigera	prairie rose	Nt Shrub	X	X	-	-	-	-	
RUMEX CRISPUS	CURLY DOCK	Ad P-Forb	X	-	-	-	-	-	
Sagittaria latifolia	common arrowhead	Nt P-Forb	-	-	X	X	-	-	
Salix exigua	sandbar willow	Nt Shrub	-	X	X	-	-	-	
Sambucus canadensis	elderberry	Nt Shrub	-	X	-	-	-	-	
Sanicula gregaria	black snakeroot	Nt P-Forb	-	-	-	-	-	X	
Schoenoplectus acutus	hardstem bulrush	Nt P-Sedge	-	X	-	-	-	-	
Scirpus atrovirens	bulrush	Nt P-Sedge	-	-	-	X	-	-	
Scirpus pendulus	bulrush	Nt P-Sedge	X	X	-	-	-	-	
Scutellaria galericulata	common skullcap	Nt P-Forb	-	-	X	-	-	-	
Scutellaria lateriflora	mad-dog skullcap	Nt P-Forb	-	-	X	X	-	-	
Sium suave	water-parsnip	Nt P-Forb	-	-	-	X	-	-	
Smilacina racemosa	false spikenard	Nt P-Forb	-	-	-	-	-	X	
SOLANUM DULCAMARA	BITTERSWEET NIGHTSHADE	Ad P-Forb	-	X	-	-	-	X	
Solidago altissima	tall goldenrod	Nt P-Forb	-	X	-	-	-	-	
Spirodela polyrhiza	great duckweed	Nt A-Forb	-	-	X	-	-	-	
Teucrium canadense	wood sage	Nt P-Forb	-	-	-	-	-	X	
Tilia americana	basswood	Nt Tree	-	-	-	-	-	X	
Toxicodendron radicans	poison ivy	Nt W-Vine	2	X	-	-	-	X	
TRIFOLIUM PRATENSE	RED CLOVER	Ad P-Forb	0	X	-	-	-	-	
Triosteum perfoliatum	horse-gentian	Nt P-Forb	5	-	-	-	-	X	
TYPHA ANGUSTIFOLIA	NARROW-LEAVED CATTAIL	Ad P-Forb	0	-	-	-	X	-	
Typha latifolia	broad-leaved cattail	Nt P-Forb	1	-	X	X	-	-	
Ulmus americana	American elm	Nt Tree	1	X	X	-	-	X	
Vallisneria americana	eel grass	Nt P-Forb	7	-	-	X	-	-	
Verbena hastata	blue vervain	Nt P-Forb	4	-	-	X	-	-	
Verbena urticifolia	white vervain	Nt P-Forb	4	-	-	X	-	X	
Vernonia missurica	Missouri ironweed	Nt P-Forb	4	X	-	-	-	-	
Viburnum lentago	nannyberry	Nt Shrub	4	-	-	-	-	X	

**Appendix 2.** Plant species observed at **Lake Erie Metropark** (continued).

		<b>Site</b>							
		<b>Name</b>	<b>EP</b>	<b>EGCW</b>	<b>EM</b>	<b>EW</b>			
		<b>Site</b>							
<b>Code</b>	<b>H</b>	<b>I</b>	<b>J</b>	<b>K</b>					
<b>Scientific Name</b>	<b>Common Name</b>	<b>Life Form</b>	<b>C</b>						
VIBURNUM OPULUS	EUROPEAN HIGHBUSH-CRANBERRY	Ad Shrub	0	-	-	-	-	x	
Vitis riparia	riverbank grape	Nt W-Vine	3	-	x	x	x	x	
Wolffia columbiana	common water meal	Nt A-Forb	5	-	-	x	x	-	
Zanthoxylum americanum	prickly-ash	Nt Shrub	3	-	-	-	-	x	
<b>Total number of species observed in survey site</b>				31	32	52	76		
<b>Total number of species observed in Lake Erie Metropark: 153</b>									