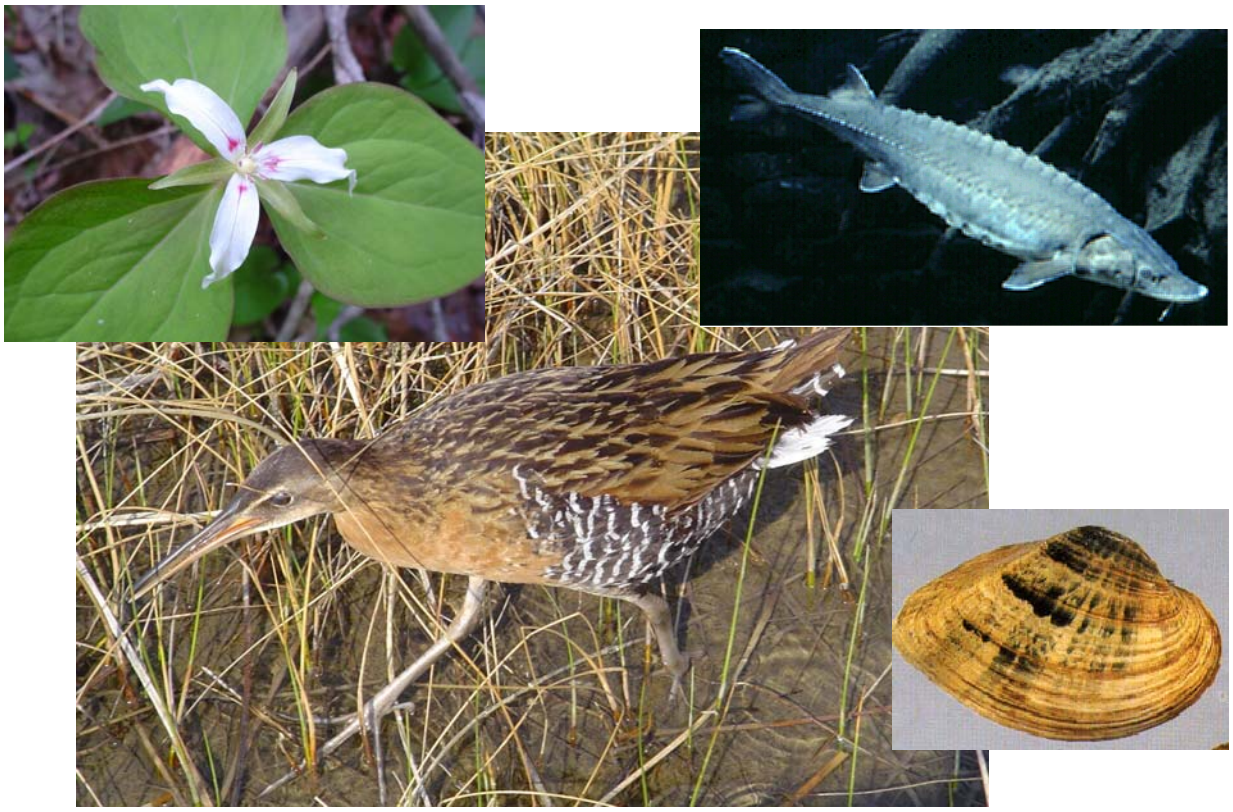
Potential Conservation Areas Assessment and Natural Features Summary for Macomb and St. Clair Counties



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MICHIGAN STATE UNIVERSITY EXTENSION

This document was prepared by Michigan Natural Features Inventory, a program of Michigan State University Extension, on behalf of the Macomb County Department of Planning and Economic Development.

MNFI maintains a continuously updated information base, the only comprehensive, single source of data on Michigan's endangered, threatened, or special concern plant and animal species, natural communities, and other natural features. MNFI has responsibility for inventorying and tracking the State's rarest species and exceptional examples of the whole array of natural communities. MNFI also provides information to resource managers for many types of permit applications regarding these elements of diversity.

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Introduction

The Lake St. Clair area has been targeted for increased habitat conservation and restoration by a large number of organizations due to its unique natural assets. The St. Clair delta is the only major river delta in the Great lakes and the largest freshwater delta in the world. The delta's wetlands provide important feeding and resting habitats at a critical location along the Mississippi and Atlantic flyways, and are internationally recognized as being of continental significance to hundreds of thousands of migratory waterfowl, shorebirds, and songbirds. In addition, the Lake St. Clair marshes provide valuable habitat to over sixty-five species of fish for spawning, nursery areas, shelter or feeding. Prior to European settlement, vast expanses of marsh complexes, containing both lake plain prairie and oak openings, covered the coastal areas and provided some of the most outstanding wetland bird and fish habitat in the Great Lakes region.

The Lake St. Clair watershed has experienced a long history of human settlement due to its rich natural resources and key location along the Great Lakes trade routes. By the early 1900's settlers converted much of the native forests, wetlands, and prairies into agricultural lands. The area has also been home to a major ship building industry in the delta; salt mining companies, oil production, and Great Lakes shipping. To accommodate increased demand for residential development, roads and railroads were built through marshes and prairies, and natural levees were modified by bulk heading for cottages. As a result, nearly all the coastal wetlands and other natural habitat (aquatic and terrestrial) that historically surrounded Lake St. Clair have been degraded or lost as industry, urbanization, commercial agriculture and suburban development have reshaped the landscape. Despite these dramatic changes, the Lake St. Clair coastal area is currently home to several occurrences of three globally imperiled natural communities: lake plain prairie, lake plain oak openings, and Great Lakes marsh. In addition, numerous rare plants and animals associated with these rare communities continue to be found within the coastal region of the lake.

Management of Lake St. Clair and its watershed has been addressed at least partially by plans such as the *Lake St. Clair Management Plan*, the *Lake Erie Lake Area Management Plan*, and several *Area of Concern* plans. To date, most environmental protection efforts within the watershed have focused on eliminating point and nonpoint source pollution from the tributaries to improve overall water quality within the lake. However, an important component of the long-term ecological health of Lake St. Clair that has not received sufficient attention, direction, or funding is the protection and enhancement of large landscape complexes, important natural communities, and associated plants and animals.

With over three million people residing in the coastal counties of the Lake St. Clair watershed on the U.S. side and growing, local communities, local conservation organizations, and state and federal agencies are struggling to identify the most important ecological areas, and the most effective ways to provide for the long-term protection and enhancement of these areas.

Purpose

The purpose of this three-year project is to develop a strategic conservation action plan that identifys, protects, and restores the remaining high ecological value areas (both aquatic and terrestrial) within the northern portion of Lake St. Clair and its watershed. A key element of this project is that the action plan will be a collaborative effort between two counties (Macomb and St. Clair Counties), a regional agency (Southeast Michigan Council of Governments), two non-profit agencies (Clinton River Watershed Council and Six Rivers Regional Land Conservancy) and twenty local communities. The result of this collaboration effort will be an accurate, current action plan that identifies the best set of strategies and actions for ensuring the long-term sustainability of each ecologically significant site.

In essence, this project will provide the necessary information for partnerships, consisting of local communities, non-profit conservation organizations, counties and regional agencies, to strategically target and respond to future funding opportunities aimed at the restoration and protection of Lake St. Clair's natural features. Information in the action plan will include identifying specific actions, procedures and costs for acquiring, protecting and/or enhancing these important ecological areas. To complete the circle, funding for implementation activities will be actively sought from a variety of funding sources as opportunities arise such as the Water Resources Development Act (WRDA) of 2007, and the recent Great Lakes Restoration Initiative.

Methods

Stakeholder meetings will be held periodically throughout the duration of the project with participating local governments, land conservancies and land owners to discuss the purpose and progress of the project and solicit participation in the planning and implementation processes. During this first year of the project, stakeholder meetings were held in each township and city within the study area. The purpose of these meetings was to gather information from local units of government regarding priority natural resource sites in their jurisdiction that also have a very high social value. A map of these sites is provided in the report. In addition, a stakeholder team will be developed to assist with identifying the best parcels of land and stretches of river for protection and restoration action, developing strategies and actions, contacting landowners, maintain momentum, and implementing the action plan.

A summary of natural features is provided in the report. The summary contains information about circa 1800 vegetation, 2005 landuse/ landcover, landcover change, rare plants, rare animals, and exemplary natural communities. Potential conservation areas were identified in both Macomb and St. Clair Counties using the most current GIS data available. Macomb County's potential conservation area data layer (for the entire county) was updated from 2004, and an initial potential conservation area data layer for St. Clair County was developed. Sites were prioritized based on a variety of ecological criteria, information, and data.

These mapping activities will be augmented with on-the-ground site visits in years two and three by staff scientists to acquire environmental information. Scientists will use aerial photographs, LIDAR, topography data, and other tools to identify specific parcels within and adjacent to high priority PCA's that appear to be the best candidates for protection and restoration action. Terrestrial and aquatic scientists will conduct field surveys at the highest priority parcels, as well as stretches of lake St. Clair shoreline, and river segments to assess condition, landscape context,

threats, uniqueness, and restoration potential (if applicable).

Based on this information and local input, a strategic conservation and restoration action plan will be collaboratively developed for several of the highest ecological value sites in the watershed. The action plan will consider a number of alternatives and tools to identify the best strategies and actions for ensuring the long-term sustainability of each site. Maps, site ecological summaries, and conservation zones for each priority site will be indentified in year two. This plan will serve as the basis for funding proposals, identifying actions, procedures and costs for acquiring, protecting or restoring these local sites of high valued habitat. The action plan will be initiated in year two, and completed in year three.

Funding for implementation of the action plan will be sought from a variety of federal and state agencies and funding sources such as the Water Resources Development Act (WRDA) of 2007, the National Fish and Wildlife Foundation, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, NOAA, U.S. EPA-GLNPO and the Michigan Department of Natural Resources.

Land Use History and Land Cover Change

Macomb and St. Clair Counties are both located in the Maumee Lake Plain sub-subsection of Michigan. The Maumee Lake Plain sub-subsection is located in the southeast corner of Lower Michigan bordered by Lake Erie and Lake St. Clair to the East, and the Ann Arbor Moraine to the West. The Maumee Lake Plain is a broad, flat, clay lake plain which slopes gradually east. The lake plain is dissected by sandy drainage ways and narrow beach ridges, and is a mosaic of slight rises and depressions (Albert 1995). Elevation differences between areas supporting different vegetation types are often only 1-2 feet.

Prior to the logging era in the mid-1800's, beech-sugar maple forests, located on the well and moderately well drained sites, dominated the landscape (as well as most of the southern Lower Peninsula). Mixed hardwood swamps, which contained a large variety of trees including American elm, red ash, and silver maple, often occupied large depressions adjacent to these beech-sugar maple forests. Large pockets of a unique type of wet prairie called lakeplain prairie were found throughout the lakeplain primarily on poorly drained sandy soils particularly along the shoreline between beach ridges. Dry oak-hickory forests, oak savannas (or oak openings), and a few dry prairies occupied the well to excessively drained beach ridges. Small pockets of black ash swamp, tamarack swamp, bogs, and emergent marsh were found scattered throughout the lakeplain in poorly drained depressions. Kentucky coffee tree, sycamore, red ash, cottonwood, Ohio buckeye, and hackberry, were found on the floodplains along the major creeks and rivers such as the Clinton River (Comer et.al 1995b).

The northern boundary of the sub-subsection is somewhat arbitrary, indicating the gradual change from the warm climate of the southern Maumee lakeplain to the cooler climate of the northern Huron lakeplain. To the north, the lakeplain actually continues onward all the way to the north end of Saginaw Bay and beyond. The sugar maple-beech forest continued to be the dominant natural community circa 1800 until approximately the Sanilac County border. At approximately the southern edge of Sanilac County, the circa 1800 vegetation seemed to dramatically change from hardwood communities to communities that had a strong conifer component, namely: hemlock-white pine forest, mixed conifer swamp, and beech-sugar maple-hemlock forest.

Project Area – Macomb and St. Clair Counties

Before the logging era, the landscape of the project area was characterized as very flat, and poorly-drained. Hardwood forests, primarily beech-maple forest and mixed hardwood swamp, dominated this extensive, flat landscape. Vast beech-sugar maple forests were located on the moderately well-drained sites, while large and small pockets of mixed hardwood swamp were scattered throughout the clay lake plain in slight depressions and sandy glacial drainage ways. Beech-sugar maple forest occupied approximately 506,572 acres or 65 % of the landscape. One mixed hardwood swamp, located in the middle of the study area along the Belle River, stretched over 77 square miles in size. The rest of the interior of the project area consisted of scattered pockets of other types of wooded and open wetlands such as tamarack swamp, black ash swamp, shrub swamp, and emergent marsh (Table 1).

Table 1. Circa 1800 Vegetation.

Covertype	Macomb Circa 1800	% Cover	St. Clair Circa 1800	% Cover	Total Circa 1800	% Cover of Project Area
Aspen-Birch Forest			904	0.2%	904	0.1%
Beech-Sugar maple Forest	196,050	63.4%	310,121	66.1%	506,172	65.0%
Black Ash Swamp	5,455	1.8%	3,369	0.7%	8,824	1.1%
Black Oak Barren	10,459	3.4%			10,459	1.3%
Cedar Swamp	38	0.0%	3,508	0.7%	3,546	0.5%
Hemlock-White Pine Forest			6,818	1.5%	6,818	0.9%
Lake/River	562	0.2%	6,602	1.4%	7,163	0.9%
Mixed Conifer Swamp	5,321	1.7%	25,955	5.5%	31,276	4.0%
Mixed Hardwood Swamp	53,324	17.2%	74,774	15.9%	128,098	16.4%
Mixed Oak Forest	12,294	4.0%			12,294	1.6%
Mixed Oak Savanna	2,613	0.8%	2,779	0.6%	5,392	0.7%
Muskeg/Bog	13	0.0%	251	0.1%	264	0.0%
Oak-Hickory Forest	10,746	3.5%	3,486	0.7%	14,232	1.8%
Sand Dune	183	0.1%			183	0.0%
Shrub Swamp/Emergent marsh	5,040	1.6%	15,350	3.3%	20,389	2.6%
Wet Prairie	7,372	2.4%	15,330	3.3%	22,702	2.9%
Total	**309,470**	**100.0%**	**469,247**	**100.0%**	**778,717**	**100.0%**

A large variety of natural communities occupied the Lake St. Clair and St. Clair River shorelines. Beech-maple forests were found on the well drained sites, mixed hardwood swamps were located on the poorly drained sites, and large Great Lakes marshes were located at the mouths of two major rivers. One of the marshes was located at the mouth of the St. Clair River, and stretched inland as far as 5 miles along large bends of the river. The other marsh developed at the mouth of the St. Clair River on the largest freshwater delta in the United States and possibly the world. This large delta historically supported several unique natural communities, including the largest Great Lakes marsh in Michigan. Great Lakes marshes are located in the transition zone between upland vegetation and the open water of the Great Lakes. Vegetation of the Great Lakes marsh varies with depth of water and other site characteristics, but typically includes a deep marsh with submerged plants, an emergent zone in shallower water, and a wet meadow further inland. The upland margin is often characterized by shrub swamp and/or forested swamp (Figure 1).

This area also includes three very rare natural communities: Lakeplain wet prairie, Lakeplain wet mesic prairie, and oak openings. The two prairie types occurred on sandy or sometimes clayey soils, typically on intermittently flooded level sites. Lakeplain oak openings, a grassland community with scattered wide-spreading oaks, were located on the well-drained beach ridges and dunes near historic and existing shorelines. All three of these communities are fire dependent and it is believed that the native American tribes historically maintained these grassland communities through the use of fire.

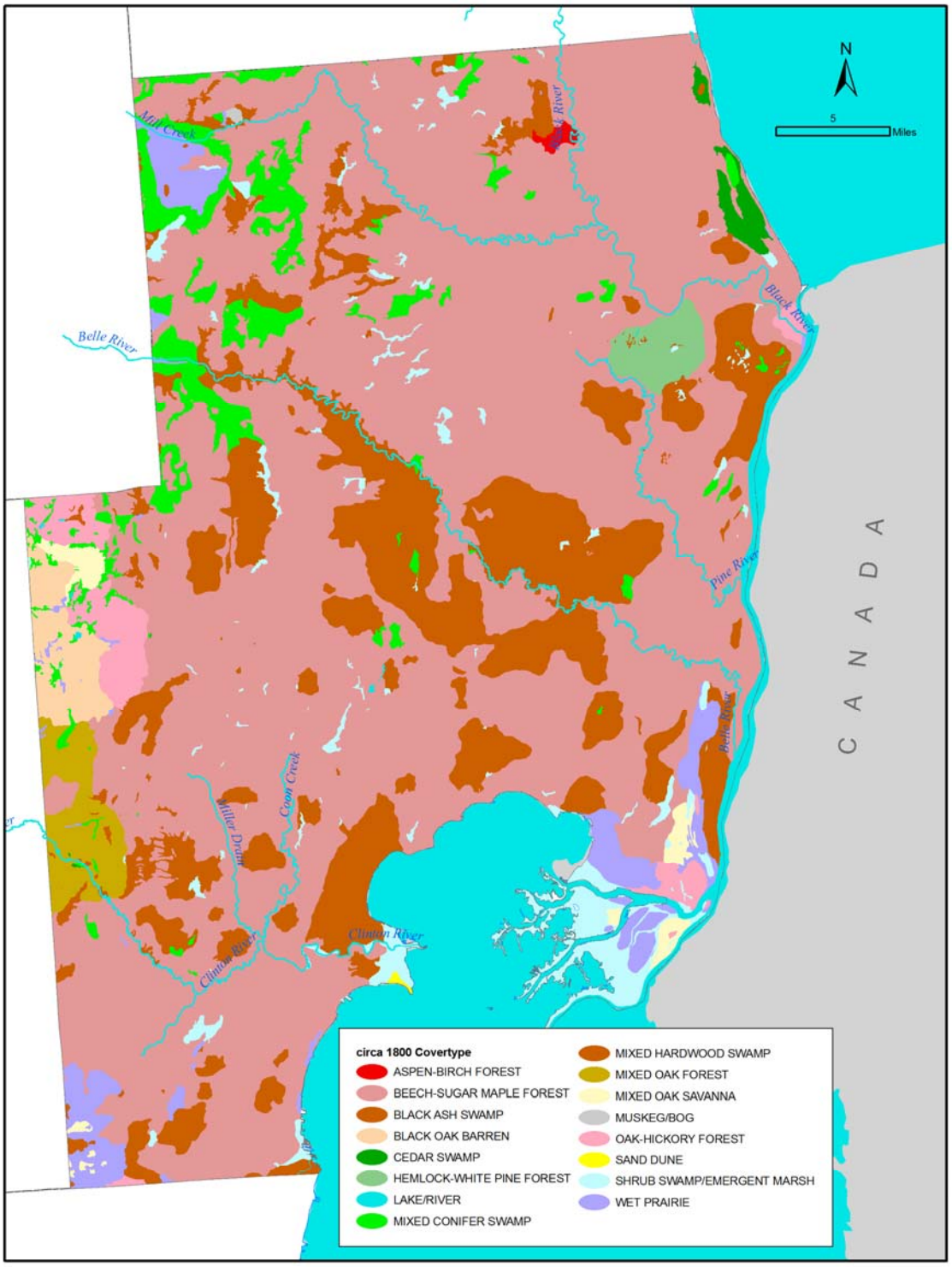


Figure 1. Circa 1800 Vegetation

Human Settlement - Early History

The archeological records reveal that the Native American population in the Lake St. Clair region was relatively high compared to other coastal areas in Michigan (Peebles and Black, 1976). Sixty three prehistoric sites occur in Macomb County, the highest number in any county in the state. St. Clair and Macomb Counties have 1.2 and 4.4 prehistoric sites per km of shoreline respectively, and most of these sites are concentrated near Port Huron in St. Clair County and the shoreline of Anchor Bay in Macomb County (Edsall et. al. 1988). Between 1400 and 1600 AD, the area was dominated by the woodland Iroquois association. By 1720, Missasauga and Ojibway (Algonquin origin) tribes had villages in the vicinity of the St Clair River Delta (Tanner 1986), and as early as 1840 Pottawatomi and Ottawa tribes arrived in the area as a result of displacement after the French and Indian Wars (Clifton, et. al. 1986; Tanner 1986; Paskus 1992).

The French were the first European settlers in the St. Clair waterway establishing Fort St. Joseph on the upper Detroit River in 1686. Today, the French longlot patterns are still visible on the landscape primarily along the coastal areas (Edsall et. al. 1988).

1800's-1950's

Three major cultural activities in the 19th and 20th century significantly altered the landscape within the study area: 1) lumbering, 2) agricultural development and 3) urban growth. The latter two particularly had an impact on the coastal wetlands along Lake St. Clair. Historical accounts suggest that the wetlands of Lake St. Clair were not excessively exploited by the fur traders as were other wetlands of the Great Lakes such as those along western Lake Erie. In addition, historical maps reveal that the wetlands were not significantly impacted in the 1850's (Meade 1857).

Interestingly, the first sawmills of the Northwest Territory were located on the St. Clair River and its tributaries with at least 8 built before 1800 (Mitts 1968). The lumbering era reached its peak in the St. Clair River area in the late 1870's, and forests were worked until they were depleted.

During the late 1800's, Great Lakes shipping utilized the North Channel of the river because this channel was the deepest. Anchor Bay received its name from the ships that anchored there while waiting for their cargo to be lightened for transit over the river mouth bar of the North Channel (Edsall et. al. 1988). In 1873, a channel 6 meters deep was dredged through the South Channel to avoid shipping delays caused by the sand bar at the mouth of the North Channel (USACE 1981). In 1886, the US Congress authorized the deepening of the Clinton River to 2.4 meters and Lake St. Clair and the St. Clair Flats Channel to 8.4 meters. By 1892 the St Clair River was also dredged (Herdenoff et. al. 1986).

The 1850 Swamp Acts stimulated tremendous alteration of wetlands in the state of Michigan, and by 1873 most of the land between the Detroit and Clinton Rivers was converted to agriculture (Herdendoff et. al. 1986). In addition to the Swamp Acts, the abundance of fish and wildlife in the marshes of Lake St. Clair attracted farmers from the Detroit area, and eventually led to the establishment of fishing and hunting clubs in the late 1800's, particularly in the St.

Clair Flats.

However, it wasn't until the 1880's, after the timber disappeared, that full attention was given over to agriculture. The study area had very diverse, productive soils suitable to many types of agricultural crops. The sandy soils were used to grow potatoes and fruits, while the heavy clay soils were used to grow wheat, grains, hay, and oats. Later farmers grew dry beans, sugar beets, and alfalfa. As agriculture became more prominent, small agricultural towns, such as Richmond and New Haven, developed along the major transportation routes in the interior. Today, an old grist mill still exists at Wetzel State Park along Coon Creek as a reminder of agriculture's past in Macomb County.

The city of Algonac, settled in 1836, was the first town established in the region, and St. Clair, located at the mouth of the Pine River, was later established in 1858. Marine City, located at the mouth of the Belle River, was established as a village in 1865, and New Baltimore was incorporated in 1867. Marine City, Algonac, and St. Clair all prospered as a result of salt and lumber production. In 1859, the North America railroad from Detroit to Port Huron was completed, and in 1900 an electric railway was built connecting the cities of Detroit, New Baltimore, Algonac, Marine City, St. Clair, and Port Huron. Soon afterwards in the early 1900's, M-29 was built which essentially paralleled the railroad. As a result of these transportation improvements, urbanization more than doubled between 1900 and 1930, and the entire lake and river shore from New Baltimore to Marine City was populated by summer cottages.

Vegetation Change

A dramatic change in the vegetation occurred as a result of the numerous changes brought on by European settlers and modern day people over the past 200 years. As human communities have increased in population and infrastructure has broadened out to the entire study area, the vast natural communities that were documented by the GLO surveyors in the mid 1800's have virtually disappeared. In many cases only small fragments remain scattered across the landscape.

Given that lumber was the principle natural resources in the early years of European settlement, it is not surprising that beech-sugar maple forests have undergone the most dramatic change. Between circa 1800 and circa 2000, the project area has lost 444,675 acres of mesic forest, a decrease of 88% (Table 2). Once considered the matrix community type in the region, remaining beech-sugar maple forests are now typically only 10-40 acres in size. Once these forests were logged in the mid to late 1800's, farmers quickly moved into these areas to exploit the relatively rich soils.

Other forest types that underwent significant change include: cedar swamp, mixed hardwood swamp, mixed conifer swamp, and hemlock white pine forest. All of these forest types saw a decrease of at least 90% since the mid 1800's (Table 2). The largest remaining patches of wetland forest can be found west of Port Huron, North of Algonac, and along several of the major systems such as the Black, Upper Belle, and Clinton Rivers. Of note is a unique type of wetland forest found only on the Lakeplain that was just recently recognized by ecologists as its own type of natural community. This unique forest type, called wet-mesic flatwoods, is dominated by several oaks such as red oak, Shumard's oak, white oak, swamp white oak,

Table 2. Vegetation Change between Circa 1800 and 2006.

Covertype	Macomb Circa 1800	% Cover of Macomb	Macomb 2000	St. Clair Circa 1800	% Cover of St. Clair	St. Clair 2000	Total Circa 1800	% Cover Project Area	Total 2000	Acreage Change	% Change
Aspen-Birch Forest				904	0.2%	218	904	0.1%	218	-686	-75.9%
Beech-Sugar maple Forest	196,050	63.4%	20,901	310,121	66.1%	40,596	506,172	65.0%	61,497	-444,675	-87.9%
Black Ash Swamp	5,455	1.8%	489	3,369	0.7%	159	8,824	1.1%	648	-8,176	-92.7%
Black Oak Barren	10,459	3.4%	1,981				10,459	1.3%	1,981	-8,478	-81.1%
Cedar Swamp	38	0.0%	4	3,508	0.7%	10	3,546	0.5%	14	-3,532	-99.6%
Hemlock-White Pine Forest				6,818	1.5%	26	6,818	0.9%	26	-6,792	-99.6%
Lake/River	562	0.2%	562	6,602	1.4%	6,602	7,163	0.9%	7,163	0	0.0%
Mixed Conifer Swamp	5,321	1.7%	84	25,955	5.5%	87	31,276	4.0%	171	-31,105	-99.5%
Mixed Hardwood Swamp	53,324	17.2%	2,055	74,774	15.9%	4,554	128,098	16.4%	6,609	-121,489	-94.8%
Mixed Oak Forest	12,294	4.0%	1,966				12,294	1.6%	1,966	-10,328	-84.0%
Mixed Oak Savanna	2,613	0.8%	59	2,779	0.6%	335	5,392	0.7%	394	-4,998	-92.7%
Muskeg/Bog	13	0.0%	0	251	0.1%	8	264	0.0%	8	-256	-96.8%
Oak-Hickory Forest	10,746	3.5%	1,312	3,486	0.7%	383	14,232	1.8%	1,695	-12,537	-88.1%
Sand Dune	183	0.1%	2				183	0.0%	2	-181	-98.9%
Shrub Swamp/Emergent marsh	5,040	1.6%	305	15,350	3.3%	4,279	20,389	2.6%	4,584	-15,805	-77.5%
Wet Prairie	7,372	2.4%	72	15,330	3.3%	1,845	22,702	2.9%	1,917	-20,785	-91.6%
Total	**309,470**	**100.0%**	**29,792**	**469,247**	**100.0%**	**59,102**	**778,717**	**100.0%**	**88,894**	**-689,823**	**-88.6%**

Table 3. 2006 Land Use/Land Cover

Land Cover/Land Use	Macomb Acres	% Cover Macomb	St. Clair Acres	% Cover St. Clair	Project Area Acres	% Cover Project Area
Low Intensity Urban	31,360.1	10.1%	6,939.6	1.5%	38,299.7	4.9%
High Intensity Urban	25,979.3	8.4%	4,881.3	1.0%	30,860.6	4.0%
Roads / Paved	34,322.0	11.1%	18,011.5	3.8%	52,333.5	6.7%
Non-vegetated Farmland	1,181.1	0.4%	1,609.9	0.3%	2,791.1	0.4%
Row Crops	30,056.0	9.7%	71,726.8	15.3%	101,782.8	13.1%
Forage Crops	52,932.0	17.1%	139,678.4	29.8%	192,610.4	24.8%
Orchards / Vineyards / Nurserys	1,063.3	0.3%	398.1	0.1%	1,461.4	0.2%
Herbaceous Openland	42,359.3	13.7%	40,262.4	8.6%	82,621.7	10.6%
Upland Shrub / Low-density trees	2,940.7	0.9%	7,739.6	1.7%	10,680.3	1.4%
Parks / Golf Courses	6,695.6	2.2%	1,033.7	0.2%	7,729.3	1.0%
Northern Hardwood Association	15,285.0	4.9%	27,348.1	5.8%	42,633.1	5.5%
Oak Association	5,084.6	1.6%	4,503.9	1.0%	9,588.6	1.2%
Aspen Association	5,254.7	1.7%	28,059.3	6.0%	33,314.1	4.3%
Other Upland Deciduous	90.5	0.0%	155.0	0.0%	245.5	0.0%
Mixed Upland Deciduous	18,238.2	5.9%	32,580.6	7.0%	50,818.8	6.5%
Pines	5,258.1	1.7%	9,770.9	2.1%	15,029.0	1.9%
Other Upland Conifers	1,352.6	0.4%	921.2	0.2%	2,273.8	0.3%
Upland Mixed Forest	3,601.0	1.2%	8,817.3	1.9%	12,418.3	1.6%
Water	1,909.5	0.6%	5,917.9	1.3%	7,827.4	1.0%
Lowland Deciduous Forest	11,025.0	3.6%	22,079.8	4.7%	33,104.8	4.3%
Lowland Coniferous Forest	421.4	0.1%	830.9	0.2%	1,252.3	0.2%
Lowland Mixed Forest	46.3	0.0%	114.5	0.0%	160.8	0.0%
Floating Aquatic	1,553.9	0.5%	4,161.0	0.9%	5,714.9	0.7%
Lowland Shrub	4,535.5	1.5%	13,589.4	2.9%	18,125.0	2.3%
Emergent Wetland	4,271.1	1.4%	10,727.2	2.3%	14,998.3	1.9%
Mixed Non-Forest Wetland	1,924.2	0.6%	5,861.4	1.3%	7,785.6	1.0%
Sand / Soil	636.5	0.2%	272.2	0.1%	908.7	0.1%
Other Bare / Sparsely Vegetated	259.8	0.1%	98.5	0.0%	358.3	0.0%
Total	**309,637.2**		**468,090.7**		**777,727.9**	

chinkapin oak, and pin oak, as well as several maple, hickory, and ash species. It is found on medium acid sandy loam to loam soils overlaid on top of a clay lens in depressions on relatively flat landscapes (Kost et. al. 2007). Only a few examples of this forest type have been found in Michigan, however surveys for this unique forest type have been limited.

In terms of ecological function, the decrease in Great Lakes marsh may be the most significant in the region. Great Lakes marshes provide a variety of ecological functions to human communities such as storm protection, soil stabilization, nutrient cycling, and pollution control. In addition these large marshes provide critical habitat for fish, reptiles, amphibians, mussels, insects, mammals, and birds. Historically, 11,150 acres of Great Lakes marsh occurred in the Lake St. Clair nearshore zone. Today, only 3,117 acres of non-dyked natural marsh can be found in the project area, a decrease of approximately 72%.

From a rarity perspective, Lakeplain wet prairie, lakeplain wet mesic prairie, and oak openings are by far the rarest natural communities in the project area. In fact, lakeplain wet mesic prairie is considered to be one of the rarest natural communities in the world. Ecologists estimate that we have lost approximately 99% of each of these communities across their range. As a result, these communities are considered to be critically imperiled both in the Great Lakes region and globally. Only a few small remnants of each community remain in the project area. Four patches of lakeplain wet prairie still occur in the study area totaling 295 acres. Fourteen patches of lakeplain wet mesic prairie can be found in the study area, however they are very small remnants and only total 133 acres. The vegetative communities in lakeplain prairies are among the most diverse in Michigan, with 200 or more plant species in a single prairie (Albert and Kost 1998b). Fluctuating water levels with saturated soils in combination with periodic fires were the main ecosystem process that maintained these unique prairie types.

The drier sandy beach ridges and other slightly raised features inland from the lakeplain prairies were characterized by lakeplain oak openings. The oak-dominated community consists of widely spaced trees (black, white, and scarlet oak), with a sparse understory of ferns, grasses, and perennial forbs. The open canopies of the lakeplain oak openings were primarily maintained by fire, with fluctuating water tables also a contributing factor. Today, only two patches totaling 267 acres of lakeplain oak openings still exist in the project area. The biggest threats to the remaining natural communities are hydrologic disruptions, fire suppression, and invasive native and non-native species.

Current Vegetation

Today, the region that was dominated by mature beech sugar maple forest and other forest types, is now dominated by agriculture. Agricultural lands now occupy 38.5% of the northern Lake St. Clair region, with the majority found in northern Macomb and northwest St. Clair County (Table 3). Development is scattered throughout the project area, but is concentrated in a few places. It currently occupies 15.6% of the landscape. Development is concentrated in southern Macomb County and along the coastal areas of Lake St. Clair and the St. Clair River. The third most dominant land cover type is upland forest. Upland forest, which covers 21.3% of the area, can be found is small scattered woodlots throughout the region. One area with a high concentration of native upland forest is the northeastern portion of St. Clair County. Old fields and upland shrublands, found scattered throughout the region, cover approximately 12% of the area while forested and non-forested wetlands covering 4.5% and 5.9% respectively (figure 2).

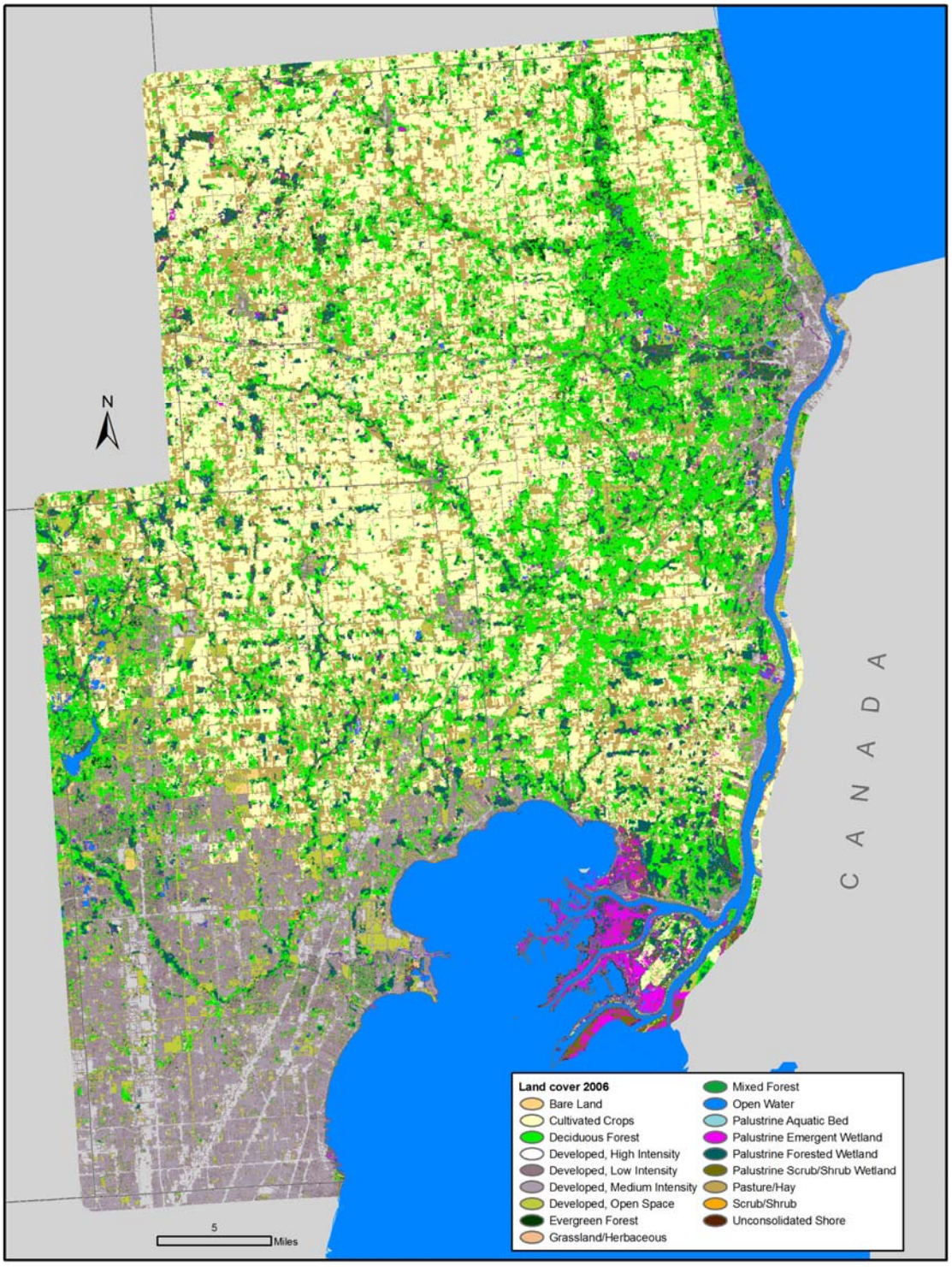


Figure 2. Circa 2006 Land Use Land Cover.

Unique Natural Features Summary of the Lake St. Clair Region

The MNFI Heritage Database

The Michigan Natural Features Inventory has been inventorying and tracking Michigan's threatened, endangered, and special concern species and high quality natural communities since 1979. As of April 2009, MNFI tracked 420 plant species, 216 animal species, and 76 natural community types. In addition to species and natural communities, MNFI also tracks other natural features such as colonial bird nesting colonies and significant geological features. The tracked species include those with Federal and State legal protection and special concern species which have no legal protection. Like the special concern species, natural communities also have no legal protection status. As of March 2011, The MNFI database contained approximately 15,831 records of these natural features (plants, animals, and natural communities) ranging from historic information to very current information from the latest field season. The data in the MNFI database are based on ground-truthed observations by reliable experts and are continually updated. The database is the most complete record of Michigan's sensitive species and natural features. The MNFI database is more than a presence/absence database. Among other information, it contains dates of sightings, global and state imperilment rankings for species, and a quality (or viability) ranking for individual occurrences.

Limitations

The primary limitations to MNFI's element occurrence database are 1) it contains static information – each specific element occurrence is updated infrequently, 2) there is a lack of a statewide systematic survey, and 3) in some cases, it contains old and/or general (imprecise location) records. Biological information from the field is collected annually from MNFI staff and other reliable contributors. Once this information is entered into the database, it may be decades before it gets updated again. For example, approximately 36% of the records in the database are over 20 years old. More significantly, there has never been a systematic survey of element occurrences in the state. This means that something can be said about the biological significance of an area containing element occurrence records; however nothing can be said definitively about the biological significance of areas with no known element occurrence records. This is where the aphorism "absence of evidence is not evidence of absence" comes into play. Related to this, is that there have been small areas of the state that have been systematically surveyed; however they are predominantly owned by public agencies or non-governmental organizations such as The Nature Conservancy.

Unique Elements of Macomb and St. Clair Counties

Our assessment of the status of rare plants and animals, exemplary natural communities, and other unique features of Macomb and St. Clair Counties is based on element occurrence records from the MNFI Biotics database. As of Winter 2011, there are a total of 453 element occurrences in the region. Of these 453 EO's, 173 are historic element occurrences representing 74 species and other features, and 245 are extant element occurrences representing 77 plant and animal species and other features in the northern Lake St. Clair region. In addition there are 35 element occurrences representing nine different natural community types, as well as seven occurrences of great blue heron rookeries.

Unique Natural Communities

As of Winter 2011, 35 natural community element occurrences were documented in Macomb and St. Clair Counties (figure 3). These 35 occurrences represent only 5,092 acres, or .6% of the two county region (table 4). In general, natural community EOs are examples of natural communities that exhibit high ecological integrity, including relatively unaltered structure, a full complement of characteristic native species, and functioning ecological processes. Two occurrences of Great Lakes marsh and two occurrences of northern mesic forest account for 4,069 acres (or 80%) of the 5,092 acres of exemplary natural communities in the region. Mesic southern forest, once the dominant natural community in the region, is represented by only two EOs totaling 51 acres or .01% of its original coverage of the area. This region is home to three of the rarest communities in Michigan, the Great Lakes region, and the world. St. Clair County still contains small remnants of lakeplain wet-mesic prairie, globally critically imperiled, lakeplain wet prairie, globally imperiled, and lakeplain oak openings, globally critically imperiled. Among the 35 natural community occurrences, only four are considered to be of good or excellent viability (≥B-rank) (MNFI Biotics database 2011).

Table 4. Natural Community Element Occurences Summary.

Natural Community Type	# of EOs	Acres	Global Rank	State Rank
Dry-mesic Southern Forest	1	19	G4	S3
Floodplain Forest	3	59	G3?	S3
Great Lakes Marsh	2	3,117	G2	S3
Hardwood-Conifer Swamp	2	121	G4	S3
Lakeplain Oak Openings	2	267	G2?	S1
Lakeplain Wet Prairie	4	295	G2	S1
Lakeplain Wet-mesic Prairie	14	133	G1?	S1
Mesic Northern Forest	4	1,003	G4	S3
Wet-mesic Flatwoods	3	78	G2G3	S2
Total	**35**	**5,092**		

Rare Plants

According to the MNFI statewide database, 67 rare plant species have been documented for the region, comprising a total of 124 rare plant element occurrences. In terms of richness, the total of 67 identified rare taxa is significant in that it represents 16% of the listed rare flora for the state. Tables 5 and 6 provide summaries of the extant and historical (records older than 40 years old) or extirpated rare plant species respectively. These tables include information on federal and state listing status, global and state rank, and the number of occurrences of each species. Despite the high rare plant species richness, it is important to note that 58 EOs, or 47% of the total rare plant EOs, are considered historic or extirpated. Relative to the statewide average of 36% of EOs labeled as historic, 47% of EOs identified as historic or extirpated is considered a high value. This can probably be attributed to the high rate of development in the region over the past 40 years, as well as lack of recent survey effort particularly on private lands.

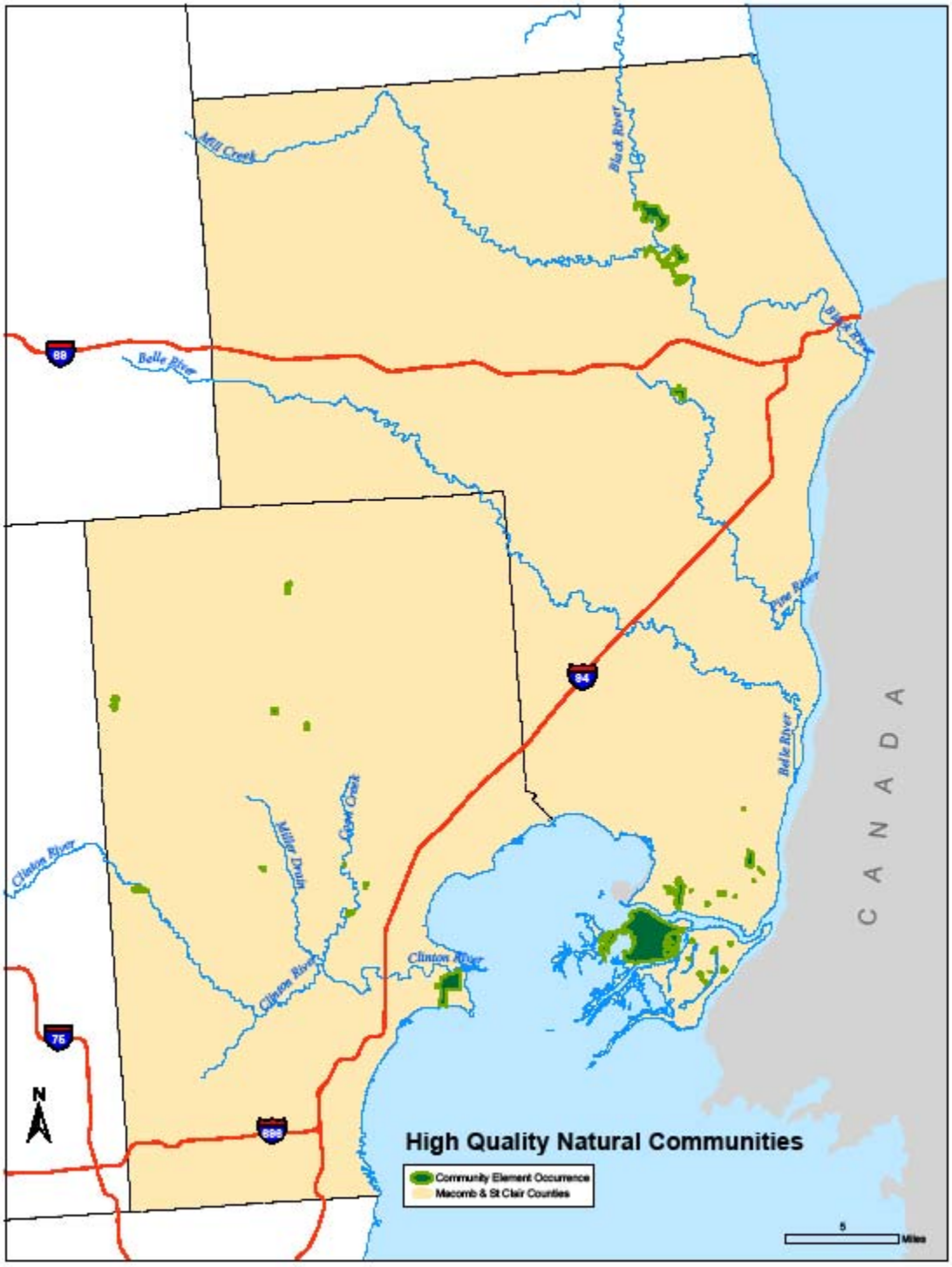


Figure 3. Natural Community Element Occurrences of the Region.

The majority of plant species found in the project area are plants typically associated with wetlands. Many of the listed plants are associated with two globally critically imperiled or globally imperiled (G1-G2) plant communities; lakeplain wet prairie and lakeplain wet-mesic prairie. In fact, Lakeplain wet-mesic prairie is not only considered one of the rarest plant communities in Michigan but one of the rarest in the world.

Table 5. Extant Plant Element Occurrences.

Scientific Name	Common Name	Count	US	MI	Global Rank	State Rank
Agalinis gattingeri	Gattinger's gerardia	1		E	G4	S1
Agalinis skinneriana	Skinner's gerardia	1		E	G3G4	S1
Aristida longespica	Three-awned grass	2		T	G5	S2
Asclepias purpurascens	Purple milkweed	3		T	G5?	S2
Asclepias sullivantii	Sullivant's milkweed	10		T	G5	S2
Beckmannia syzigachne	Slough grass	5		T	G5	S2
Carex davisii	Davis's sedge	1		SC	G4	S3
Carex platyphylla	Broad-leaved sedge	1		E	G5	S1
Cypripedium candidum	White lady slipper	1		T	G4	S2
Dentaria maxima	Large toothwort	2		T	G5	S1S2
Diarrhena obovata	Beak grass	1		T	G4G5	S2
Euonymus atropurpurea	Wahoo	1		SC	G5	S3
Fraxinus profunda	Pumpkin ash	2		T	G4	S2
Hemicarpha micrantha	Dwarf-bulrush	1		SC	G5	S3
Hydrastis canadensis	Goldenseal	2		T	G4	S2
Hypericum gentianoides	Gentian-leaved St. John's-wort	2		SC	G5	S3
Juncus brachycarpus	Short-fruited rush	1		T	G4G5	S1S2
Juncus scirpoides	Scirpus-like rush	2		T	G5	S2
Lithospermum latifolium	Broad-leaved puccoon	4		SC	G4	S2
Lycopodiella margueritae	Northern prostrate clubmoss	1		T	G2	S2
Lycopodiella subappressa	Northern appressed clubmoss	1		SC	G2	S2
Penstemon calycosus	Beard tongue	1		T	G5	S2
Platanthera leucophaea	Prairie white-fringed orchid	2	LT	E	G3	S1
Quercus shumardii	Shumard's oak	3		SC	G5	S2
Scirpus clintonii	Clinton's bulrush	1		SC	G4	S3
Scleria triglomerata	Tall nut rush	1		SC	G5	S3
Silphium integrifolium	Rosinweed	1		T	G5	S2
Trillium undulatum	Painted trillium	10		E	G5	S1S2
Zizania aquatica var. aquatica	Wild rice	2		T	G5T5	S2S3
Subtotal	**29**	**66**				

Table 6. Historic Plant Element Occurrences

Scientific Name	Common Name	Count	US	MI	Global Rank	State Rank
Agalinis gattingeri	Gattinger's gerardia	1		E	G4	S1
Arabis missouriensis var. deamii	Missouri rock-cress	1		SC	G5?QT3?Q	S2
Aristida longespica	Three-awned grass	1		T	G5	S2
Armoracia lacustris	Lake cress	2		T	G4?	S2
Baptisia lactea	White or prairie false indigo	1		SC	G4Q	S3
Callitriche heterophylla	Large water starwort	1		T	G5	S1
Carex festucacea	Fescue sedge	1		SC	G5	S1
Carex lupuliformis	False hop sedge	2		T	G4	S2
Carex richardsonii	Richardson's sedge	2		SC	G4	S3S4
Castanea dentata	American chestnut	1		E	G4	S1S2
Cirsium hillii	Hill's thistle	2		SC	G3	S3
Cuscuta indecora	Dodder	1		SC	G5	SH
Dalea purpurea	Purple prairie clover	1		X	G5	SX
Dichanthelium leibergii	Leiberg's panic grass	1		T	G5	S2
Draba reptans	Creeping whitlow grass	1		T	G5	S1
Fimbristylis puberula	Chestnut sedge	1		X	G5	SX
Galearis spectabilis	Showy orchis	5		T	G5	S2
Gentiana flavida	White gentian	1		E	G4	S1
Gentiana puberulenta	Downy gentian	1		E	G4G5	S1
Gentianella quinquefolia	Stiff gentian	2		T	G5	S2
Gymnocarpium robertianum	Limestone oak fern	1		T	G5	S2
Hieracium paniculatum	Panicled hawkweed	1		T	G5	S2
Jeffersonia diphylla	Twinleaf	1		SC	G5	S3
Linum virginianum	Virginia flax	1		T	G4G5	S2
Lithospermum incisum	Narrow-leaved puccoon	1		X	G5	SX
Mimulus alatus	Winged monkey flower	1		X	G5	SX
Panax quinquefolius	Ginseng	1		T	G3G4	S2S3
Penstemon calycosus	Beard tongue	1		T	G5	S2
Plantago cordata	Heart-leaved plantain	2		E	G4	S1
Platanthera ciliaris	Orange-fringed orchid	2		E	G5	S1S2
Poa paludigena	Bog bluegrass	1		T	G3	S2
Polygala cruciata	Cross-leaved milkwort	1		SC	G5	S3
Polygala incarnata	Pink milkwort	3		X	G5	SX
Polygonum careyi	Carey's smartweed	1		T	G4	S1S2
Pterospora andromedea	Pine-drops	2		T	G5	S2
Ranunculus ambigens	Spearwort	1		T	G4	SH
Ranunculus rhomboideus	Prairie buttercup	2		T	G5	S2
Scirpus clintonii	Clinton's bulrush	1		SC	G4	S3
Scleria pauciflora	Few-flowered nut rush	1		E	G5	S1
Scleria triglomerata	Tall nut rush	1		SC	G5	S3
Solidago bicolor	White goldenrod	1		E	G5	S1
Triplasis purpurea	Sand grass	1		SC	G4G5	S2
Vitis vulpina	Frost grape	1		T	G5	S1S2
Total	**43**	**58**				

Rare Animals

According to the MNFI statewide database, 57 rare animal species have been documented in the region, comprising a total of 287 rare animal element occurrences. In terms of richness, the total of 57 identified rare taxa is significant in that it represents approximately % of the listed rare flora for the state. Tables 7 and 8 provide summaries of the extant and historical (records older than 40 years old) or extirpated rare animal species respectively. These tables include information on federal and state listing status, global and state rank, and the number of occurrences of each species. Total number of extant plant species and element occurrences the number of presumed extant (existing) records (30 EOs) is a relatively small percentage (41%) of the total occurrences documented, likely reflecting the high degree of land clearing and habitat alteration that have occurred in this area.

There are 48 extant animal species represented by 174 extant element occurrences in the two counties. The remaining 9 species and 113 element occurrences (39%) are considered either historic or extirpated. This is slightly above the statewide average of 36% labeled as historic or extirpated. Interestingly, the majority of listed animal species as well as element occurrences found in the study area are aquatic; mussels and fish. Although there are no known natural lakes in the study area, the St. Clair region includes many different types of river systems as well as the variety of habitats associated with Lake St. Clair itself that support a very high diversity of fish and native mussels relative to other places in Michigan. This area is home to 15 different listed native mussel species and a total of 143 mussel element occurrences (both extant and historic). This represents approximately 50% of all animal EOs in the region. Unfortunately, 81 of those mussel EO's, or 57%, are considered historic.

Approximately 50% of all mussel species tracked by MNFI are considered either globally critically imperiled, globally imperiled, or globally vulnerable (G1-G3). This represents approximately 29% of the 45 species of native mussels known to occur in Michigan. In terms of species richness, the total of 15 rare mussel species found in the northern Lake St. Clair region is significant in that it represents approximately 53% of the listed rare mussels in the state, and 33% of all known native mussels in the state. In addition, this area is home to 11 rare fish species representing a total of 71 element occurrences (both extant and historic). In total, tracked mussels and fish account for 26 out of the 57 listed animal species, or 46%, and 214 out of the 287 EOs, or 75% or the total animal EOs known to occur the region.

Table 7. Extant Animal Element Occurrences

Scientific Name	Common Name	Count	US	MI	Global Rank	State Rank
Birds						
Ammodramus henslowii	Henslow's sparrow	1		E	G4	S2S3
Botaurus lentiginosus	American bittern	2		SC	G4	S3S4
Buteo lineatus	Red-shouldered hawk	1		T	G5	S3S4
Chlidonias niger	Black tern	2		SC	G4	S3
Cistothorus palustris	Marsh wren	2		SC	G5	S3S4
Dendroica cerulea	Cerulean warbler	2		T	G4	S3
Falco peregrinus	Peregrine falcon	3		E	G4	S1
Gallinula chloropus	Common moorhen	2		T	G5	S3
Haliaeetus leucocephalus	Bald eagle	1		SC	G5	S4
Ixobrychus exilis	Least bittern	1		T	G5	S2
Protonotaria citrea	Prothonotary warbler	1		SC	G5	S3
Rallus elegans	King rail	2		E	G4	S1
Seiurus motacilla	Louisiana waterthrush	2		T	G5	S2S3
Sterna forsteri	Forster's tern	1		T	G5	S2
Sterna hirundo	Common tern	1		T	G5	S2
Wilsonia citrina	Hooded warbler	1		SC	G5	S3
Subtotal	**16**	**25**				
Fish						
Acipenser fulvescens	Lake sturgeon	17		T	G3G4	S2
Ammocrypta pellucida	Eastern sand darter	8		T	G3	S1S2
Hiodon tergisus	Mooneye	2		T	G5	S2
Macrhybopsis storeriana	Silver chub	1		SC	G5	S2S3
Noturus miurus	Brindled madtom	13		SC	G5	S2S3
Noturus stigmosus	Northern madtom	3		E	G3	S1
Percina copelandi	Channel darter	10		E	G4	S1S2
Percina shumardi	River darter	2		E	G5	S1
Subtotal	**8**	**56**				
Amphibians						
Acris crepitans blanchardi	Blanchard's cricket frog	1		T	G5T5	S2S3
Subtotal	**1**	**1**				
Insects						
Dorydiella kansana	Leafhopper	1		SC	GNR	S1S2
Flexamia delongi	Leafhopper	1		SC	GNR	S1S2
Flexamia reflexus	Leafhopper	3		SC	GNR	S1
Papaipema beeriana	Blazing star borer	4		SC	G2G3	S1S2
Papaipema sciata	Culvers root borer	3		SC	G3G4	S2S3
Prosapia ignipectus	Red-legged spittlebug	4		SC	G4	S2S3
Subtotal	**6**	**16**				

Table 7 Continued.

Scientific Name	Common Name	Count	US	MI	Global Rank	State Rank
Mussels						
Alasmidonta marginata	Elktoe	7		SC	G4	S2S3
Alasmidonta viridis	Slippershell	5		T	G4G5	S2S3
Epioblasma triquetra	Snuffbox	6	C	E	G3	S1
Lampsilis fasciola	Wavyrayed lampmussel	5		T	G5	S2
Obovaria subrotunda	Round hickorynut	5		E	G4	S1
Pleurobema sintoxia	Round pigtoe	3		SC	G4G5	S2S3
Potamilus ohiensis	Pink papershell	1		T	G5	SNR
Ptychobranchus fasciolaris	Kidney shell	1		SC	G4G5	SNR
Simpsonaias ambigua	Salamander mussel	4		E	G3	S1
Villosa fabalis	Rayed bean	9	C	E	G2	S1
Villosa iris	Rainbow	16		SC	G5Q	S2S3
Subtotal	**11**	**62**				
Reptiles						
Clemmys guttata	Spotted turtle	3		T	G5	S2
Emydoidea blandingii	Blanding's turtle	2		SC	G4	S3
Pantherophis gloydi	Eastern fox snake	6		T	G3	S2
Sistrurus catenatus catenatus	Eastern massasauga	1	C	SC	G3G4T3T4Q	S3S4
Subtotal	**4**	**12**				
Other						
Great Blue Heron Rookery	Great Blue Heron Rookery	5			G5	SU
Subtotal	**1**	**5**				

Table 8. Historic Animal Element Occurences.

Scientific Name	Common Name	Count	US	MI	Global Rank	State Rank
Birds						
Asio otus	Long-eared owl	1		T	G5	S2
Buteo lineatus	Red-shouldered hawk	1		T	G5	S3S4
Chlidonias niger	Black tern	1		SC	G4	S3
Circus cyaneus	Northern harrier	1		SC	G5	S3
Haliaeetus leucocephalus	Bald eagle	1		SC	G5	S4
Nycticorax nycticorax	Black-crowned night-heron	1		SC	G5	S2S3
Rallus elegans	King rail	3		E	G4	S1
Sterna forsteri	Forster's tern	2		T	G5	S2
Sterna hirundo	Common tern	2		T	G5	S2
Subtotal	**9**	**13**				
Fish						
Acipenser fulvescens	Lake sturgeon	2		T	G3G4	S2
Ammocrypta pellucida	Eastern sand darter	1		T	G3	S1S2
Hiodon tergisus	Mooneye	3		T	G5	S2
Macrhybopsis storeriana	Silver chub	1		SC	G5	S2S3
Moxostoma carinatum	River redhorse	1		T	G4	S1
Notropis anogenus	Pugnose shiner	4		E	G3	S3
Sander canadensis	Sauger	3		T	G5	S1
Subtotal	**7**	**15**				
Retiles						
Clemmys guttata	Spotted turtle	4		T	G5	S2
Pantherophis gloydi	Eastern fox snake	1		T	G3	S2
Subtotal	**2**	**5**				
Insects						
Nicrophorus americanus	American burying beetle	1	LE	X	G2G3	SH
Subtotal	**1**	**1**				
Mussels						
Alasmidonta marginata	Elktoe	7		SC	G4	S2S3
Alasmidonta viridis	Slippershell	13		T	G4G5	S2S3
Cyclonaias tuberculata	Purple wartyback	1		T	G5	S2S3
Epioblasma triquetra	Snuffbox	5	C	E	G3	S1
Lampsilis fasciola	Wavyrayed lampmussel	9		T	G5	S2
Ligumia nasuta	Eastern pondmussel	7		E	G4	SNR
Obovaria olivaria	Hickorynut	2		E	G4	S2S3
Obovaria subrotunda	Round hickorynut	9		E	G4	S1
Pleurobema sintoxia	Round pigtoe	11		SC	G4G5	S2S3
Toxolasma parvus	Lilliput	1		E	G5	SNR
Villosa fabalis	Rayed bean	5	C	E	G2	S1
Villosa iris	Rainbow	11		SC	G5Q	S2S3
Subotal	**12**	**81**				

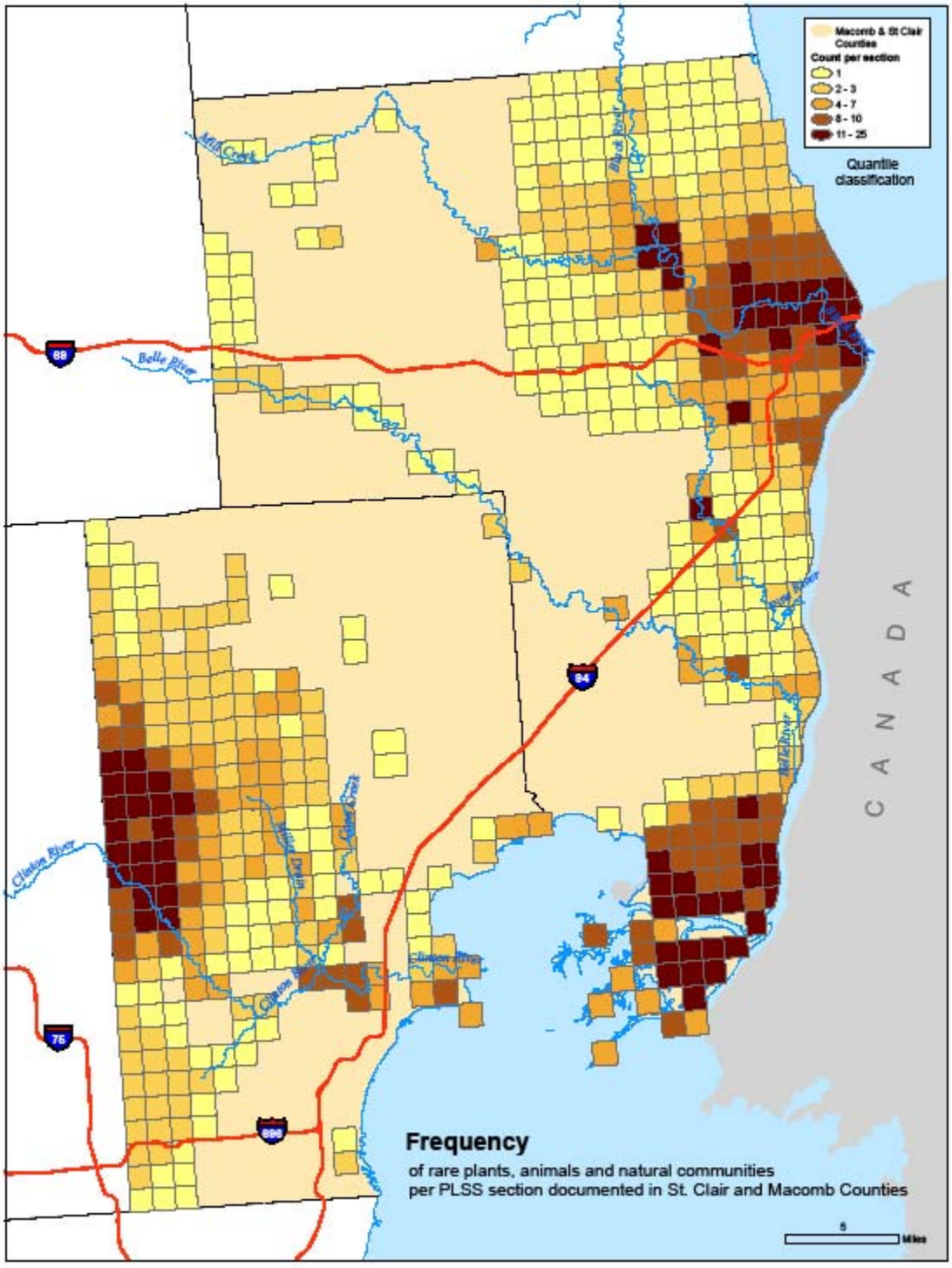


Figure 4. Element Occurrence Frequency Map

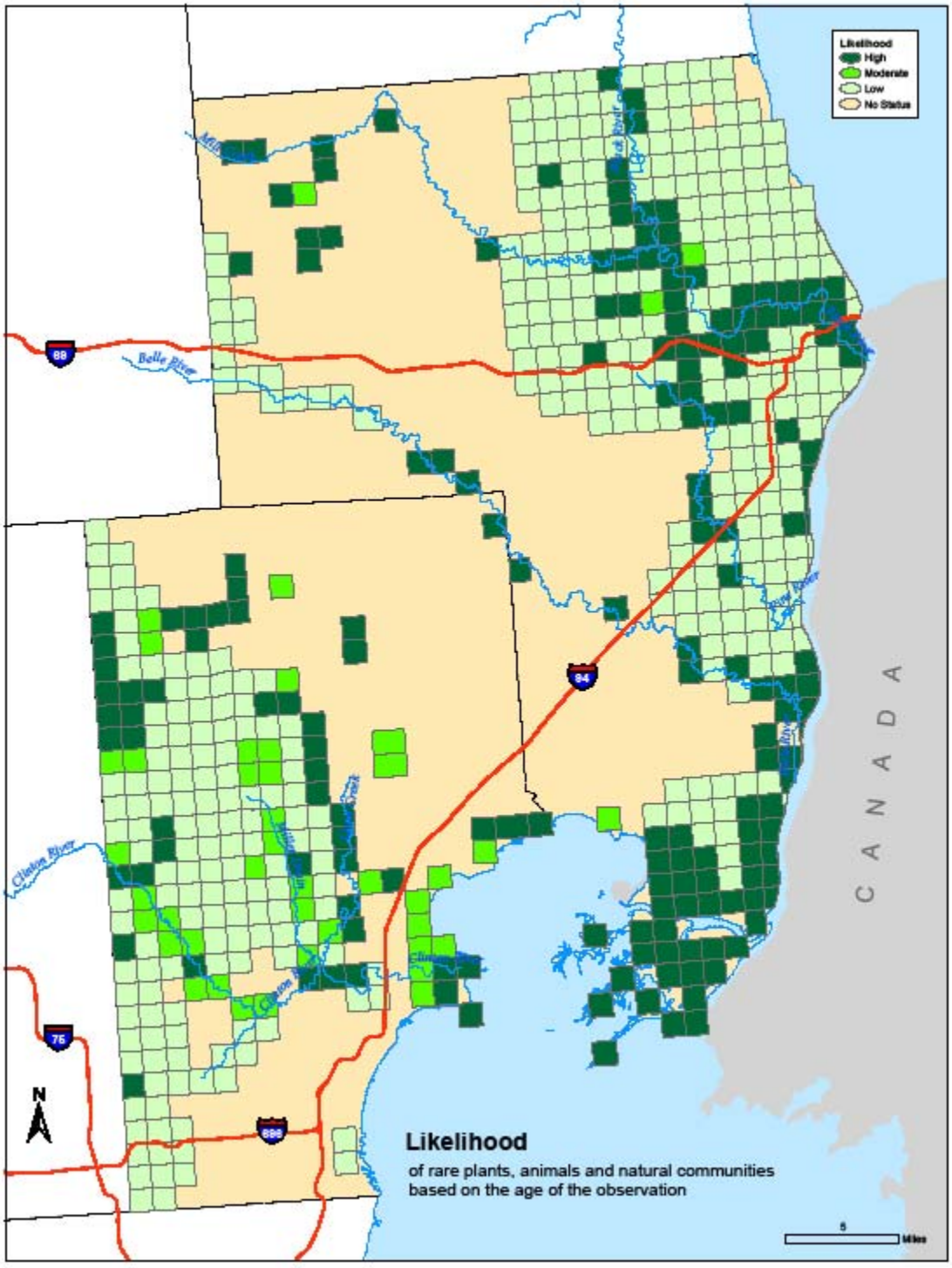


Figure 5. Element Occurrence Likelihood Map.

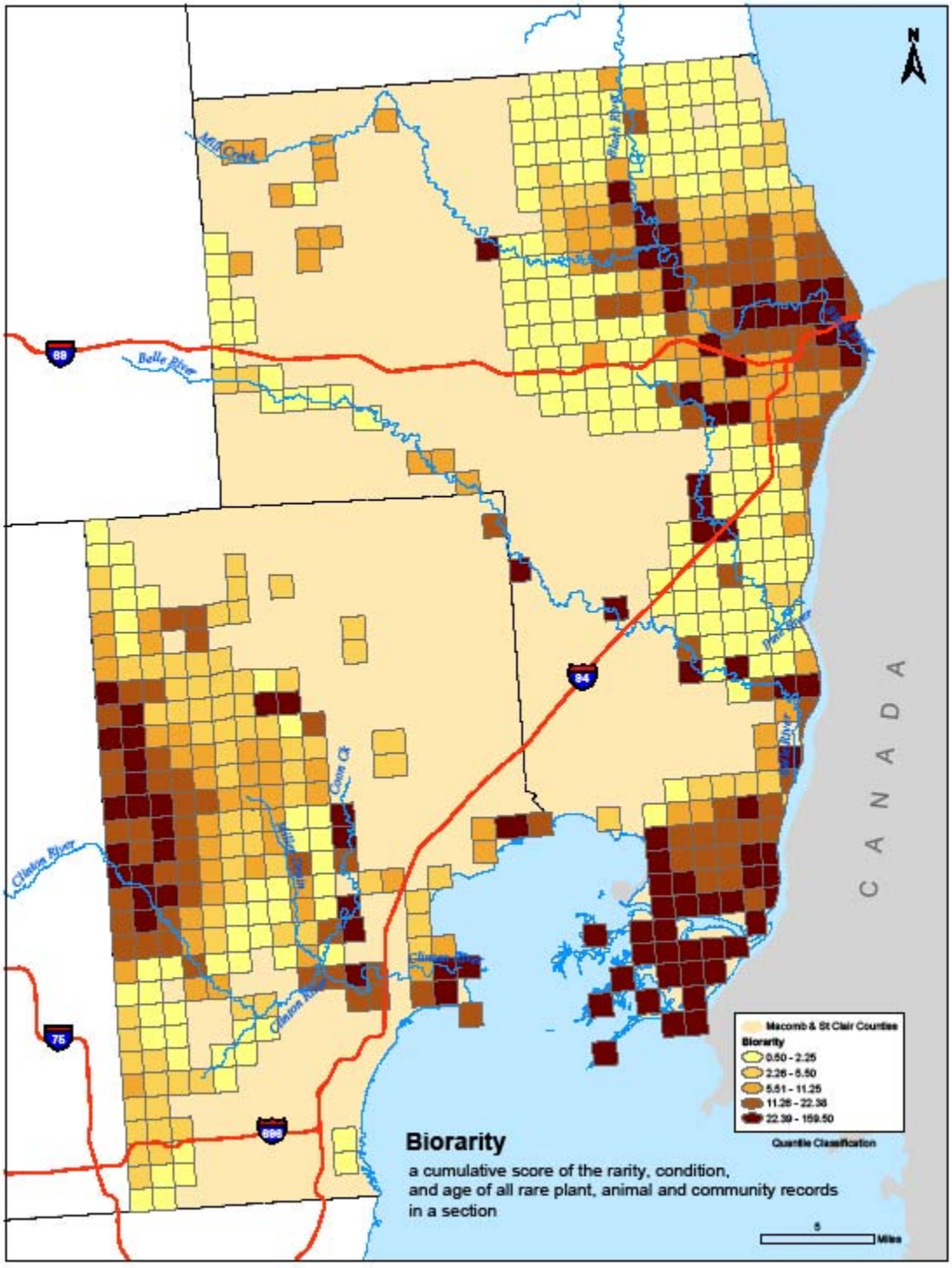


Figure 6. Biological Rarity Map.

Potential Conservation Area Assessment

Introduction

Natural resource conservation is a fundamental component of a community's long-term environmental and economic health. Natural resource areas perform important natural functions such as water filtration and they provide recreational opportunities and wildlife habitat that enhance the overall vitality of a community. Abundant natural resources once surrounded population centers in the area. Now, much reduced in size, natural resource areas are becoming encircled by development. These remaining sites are the foundation of Macomb and St. Clair Counties' natural heritage; they represent the last remaining remnants of the areas native ecosystems, natural plant communities and scenic qualities. Consequently, it is to a community's advantage that these sites be carefully integrated into the planning for future development. Striking a balance between development and natural resource conservation and preservation is critical if Macomb and St. Clair Counties are to maintain their unique natural heritage.

Successful land use planning requires more than simply protecting small preserves and trusting that they will remain in their current condition indefinitely. Many human activities such as road construction, chemical and fertilizer application, fire suppression, and residential development can have a detrimental impact on populations of plants, animals, and insects and the natural communities in which they live. Changes in zoning, building codes, and technology can cause areas that were once considered "safe" from development to be exposed to development. In order to maintain the integrity of the most fragile natural areas, a more holistic approach to resource conservation must be taken, an approach that looks beyond the borders of the site itself. What happens on adjacent farmland, in a nearby town, or upstream should be considered equally as important as what happens within the preserve

This report identifies and ranks the Potential Conservation Areas (PCA's) remaining in Macomb and St. Clair Counties. Potential Conservation Areas are defined as places on the landscape dominated by native vegetation that have various levels of potential for harboring high quality natural areas and unique natural features. In addition these areas may provide critical ecological services such as maintaining water quality and quantity, soil development and stabilization, pollination of cropland, wildlife travel corridors, stopover sites for migratory birds, sources of genetic diversity, and floodwater retention. **However, the actual ecological value of these areas can only be truly ascertained through on the ground biological surveys**. The process established by the Michigan Natural Features Inventory (MNFI) for identifying potential conservation areas, can also be used to update and track the status of these remaining sites. MNFI recommends that local municipalities in Macomb and St. Clair Counties incorporate this information into their comprehensive natural area mapping services. The site map and ranking data can be used by local municipalities, land trusts, and other agencies to prioritize conservation efforts and assist in finding opportunities to establish an open space system of linked natural areas in the region.

Materials and Interpretation Methodology

Identification of potential conservation areas in the Lake St. Clair region was conducted using the 2005 C-CAP national landcover, MNFI's Circa 1800 Vegetation, MNFI's heritage database (BIOTICS), and the State of Michigan 8.1 Framework stream and roads data layers. The 2005 land cover data were updated using 2010 aerial imagery for gross errors. In addition, the natural land cover classes for the PCA analysis were obtained from running a filter on the C-CAP land cover data set. The filter removed all patches less than 4 pixels in size, and replaced them with the nearest neighboring value.

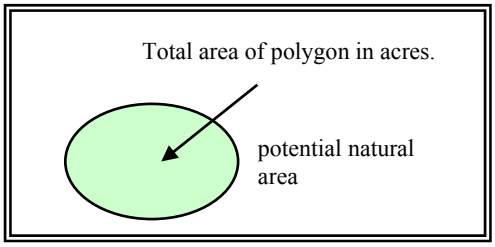
The study area for the Lake St. Clair region was delineated by buffering the two counties by one mile. This was so that the potential conservation areas (PCA's) were not given a lower score due to being cut off by the county boundary. Delineation of potential conservation areas was done through analysis in a geographic information system with emphasis placed on 1) intactness, 2) wetlands and wetland complexes, 3) riparian corridors, and 4) forested tracts. PCA's were identified by focusing on wetland and forested land cover and eliminating as much development (including roads), active agriculture, and old fields as much as possible. Water was included only if it was surrounded by other PCA land cover types. All natural land cover types were combined, and major roads were buffered by 30 meters and removed. The resulting blocks of natural vegetation were then converted into a shapefile. Boundaries were defined by hard edges such as roads, parking lots, developments and railroad beds. All potential conservation areas were identified and delineated regardless of size. Municipal boundaries were not utilized to delineate site boundaries unless the boundary corresponded to a defined hard edge, such as a road. Once all sites were delineated, sites under 20 acres were removed from the shapefile (due to the large number of small patches).

Site Selection and Prioritization

Following the delineation of PCA's, a more rigorous level of examination was undertaken based upon specific spatially based criteria to prioritize sites. Spatially based criteria that were determined to be important indicators of ecological health included: total size, size of core area, length of stream corridor, landscape connectivity, restorability of surrounding lands, vegetation quality, and bio-rarity score. Each criterion was then divided into several different categories, or levels, which were translated to a numerical score. Each site was then assessed and compared to other sites based upon the sum of the scores for each criterion. Scores for the Lake St. Clair Region sites ranged from 1 to 29 (out of a possible 45).

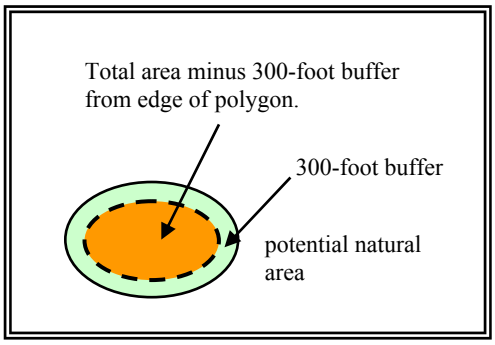
Description of Criteria

Total Size - The total size of a site is recognized as an important factor for viability of species and ecosystem health. Larger sites tend to have higher species diversity, higher reproductive success, and improve the chances of plant and animal species surviving a catastrophic event such as a fire, tornado, ice storm, or flood.



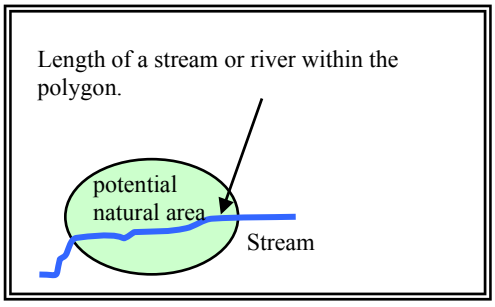
Size is defined as the total area of the resultant polygon.

Size of Core Area - Many studies have shown that there are negative impacts associated with the perimeter of a site on "edge-sensitive" animal species, particularly amphibians, reptiles, and forest and grassland songbirds. Buffers vary by species, community type, and location, however most studies recommend a buffer somewhere between 200 and 600 ft. to minimize negative impacts. Three hundred feet is considered a sufficient buffer for most "edge-sensitive" species in forested landscapes.



For this project, core area is defined as the total area minus a 300-foot wide buffer measured inward from the edge of the polygon. Core area is different from total area of the site because it takes into account the shape of the site. Typically, round shapes contain a larger core area relative to the total site than long narrow shapes.

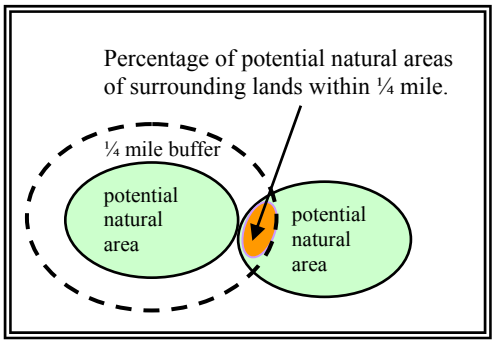
Stream Corridor (length) - Water is essential for life. Streams are also dynamic systems that interact with the surrounding terrestrial landscape creating new habitats. Waterways also provide the added benefit of a travel corridor for wildlife, connecting isolated patches of natural vegetation, particularly fragmented landscapes such as those found in Southeastern Michigan.



Sites that are part of riparian corridors were given a score 0-4 points depending upon the length of stream

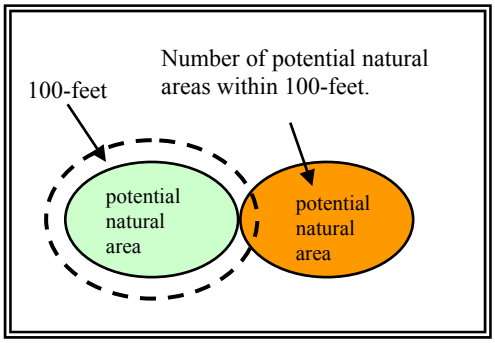
or river that was present at the site.

Landscape Connectivity - Connectivity between habitat patches is considered a critical factor for wildlife health. High connectivity improves gene flow between populations, allows species to recolonize unoccupied habitat, improves resilience of the ecosystem, and allows ecological processes, such as flooding, fire, and pollination to occur at a more natural rate and scale. Landscape connectivity was measured in two ways, *percentage* and *proximity*.



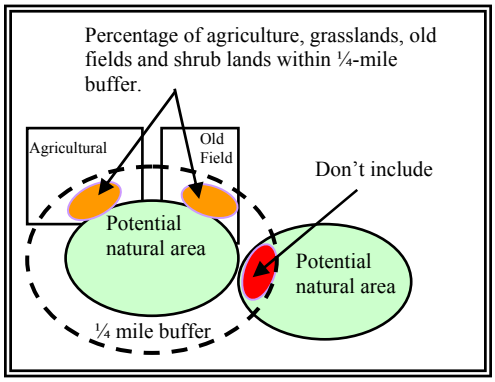
Percentage
Landscape connectivity was measured by building a ¼ mile buffer around each polygon and measuring the percentage of area that falls within other potential conservation areas.

Proximity
In addition to measuring the area around a polygon that is considered natural, connectivity can also be measured by the number of individual potential conservation areas in close proximity to the site. The greater the number of polygons in "close proximity," the higher the probability for good connectivity. Close proximity was determined to be 100 feet. One hundred feet was chosen as the threshold based on digitizing error and typical width of transportation right-of-ways, pipelines, and powerline corridors.

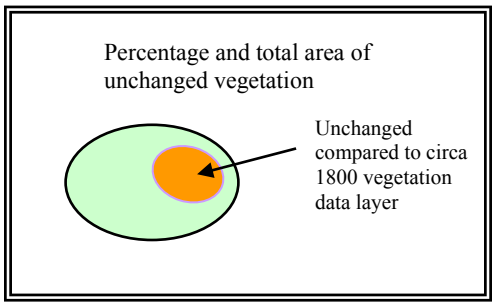


Restorability of Surrounding Lands
Restorability is important for increasing the size of existing natural communities, providing linkages to other habitat patches, and providing a natural buffer from development and human activities.

Restorability is measured by the potential for restoration activities in areas adjacent to the delineated site. First, a ¼ mile buffer was built around each site. PCAs as defined by MNFI, located within the buffer area were then removed, and the percentage of agricultural land, grasslands, shrub lands and old fields within the remaining buffer area was measured.



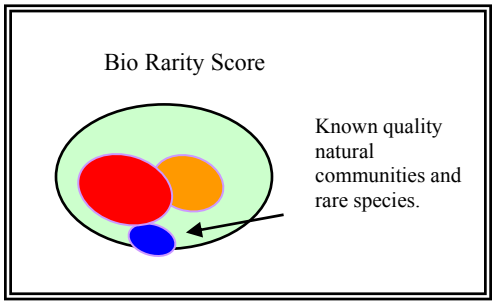
Vegetation Quality – The quality of vegetation is critical in determining the quality of a natural area. Vegetation can reflect past disturbance, external impacts, soil texture, moisture gradient, aspect (cardinal direction of slope), and geology. Vegetative quality however is very difficult to measure without recent field information. As a surrogate to field surveys, a vegetation change map comparing the 2000 IFMAP land cover data layer to the MNFI circa 1800-vegetation data layer was created. The resulting potential unchanged vegetation can then act as an indicator of vegetation quality.



Percentage
Vegetation quality was measured by calculating the percentage of the site that contains potentially unchanged vegetation. This allows small sites with a high percentage of potentially unchanged vegetation to score points.

Area
Vegetation quality was also measured by calculating the area of potentially unchanged vegetation that falls within each site. This balances the bias of small sites with a high percentage of potentially unchanged vegetation by awarding points based on actual area covered.

Bio Rarity Score - The location of quality natural communities and rare species tracked by MNFI are often, although not always, indicative of the quality of a site. The occurrences in and of themselves are important.



The Bio Rarity Score is based on the cumulative score of each element occurrence (EO) found within a site. Each EO is scored based on its probability of being found, global rarity, state rarity, and condition or viability. For example, a much higher score would be awarded to a population of Mitchell's satyr, which is globally and state imperiled, and that is in good condition, compared to a population of box turtles, which is globally secure and rare in the state, and is in fair condition.

Note: The number of points assigned for each criterion is in the *site criteria table* on page 13.

An element occurrence is an occurrence record of a federally and/or state listed species, state special concern species, exemplary and/or rare natural community, or another type of natural feature such as a unique geologic formation or bird colony.

Table 9. Potential Conservation Areas Criteria

CRITERIA	*DESCRIPTION*	*DETAIL*	*PTS*
Total Size	Total size of the polygon in acres. ❑ *Size is recognized as an important factor for viability of species and ecosystems.*	20 - 40 ac.	0
		>40 - 80 ac.	1
		>80 - 240 ac.	2
		>240 ac.	4
Size of Core area	Acres of core area. - Defined as total area minus 300 ft. buffer from edge of polygon. ❑ *Greater core area limits negative impacts on "edge-sensitive" animal species.*	0 - 60ac	0
		>60 - 120 ac	2
		>120 - 230 ac	4
		>230 ac	8
Stream Corridor (length)	Length of a stream or river within the polygon. ❑ *Stream corridors provide wildlife connections between patches of habitat.*	0	0
		>0-400 m	1
		>400-800m	2
		>800-1600m	3
		>1600-3200m	4
		>3200 m	6

CRITERIA	*DESCRIPTION*	*DETAIL*	*PTS*
Landscape Connectivity Percentage	Percentage of potential conservation areas within 1/4 mile. - build 1/4 mile buffer - measure % of buffer that is a potential conservation area	0 - 11% >11 - 22% >22 - 33% >33%	0 2 3 4
Proximity	Number of potential conservation areas within 100 ft. ❑ *Connectivity between habitat patches is considered a critical factor for wildlife health.*	0 1 2 3 4+	0 1 2 3 4
Restorability of surrounding lands	Restorability of surrounding lands within 1/4 mi. - build 1/4 mile buffer - subtract potential conservation areas from buffer - measure % agricultural lands and old fields ❑ *Restorability is important for increasing size of existing natural communities, providing linkages to other habitat patches, and providing a natural buffer from development.*	0 - 35% >35 - 65% >65%	1 2 3
Vegetation Quality Percentage	Estimates the quality of vegetation based on circa 1800 vegetation maps and 2000 IFMAP land cover data (only done for Michigan sites). Measures the percentage of potentially unchanged vegetation within a polygon.	1 - 10% 10.1 -30% 30.1 – 65% 65.1 – 100%	0 1 2 4
Area	Measures the actual area within a polygon of potentially unchanged vegetation regardless of the size of the polygon. ❒ *The quality of vegetation is critical to determining the quality of a natural area.*	0 – 10ac 10.1 – 40ac 40.1 – 80ac 80.1 - 160 > 160ac	0 1 2 3 4
Bio Rarity Score	Known element occurrences increase the significance of a site and increase the bio rarity score. ❑ *The location of quality natural communities and rare species tracked by MNFI are often, although not always, indicative of the quality of a site.* ❑ *Values were determined using the Jenk's optimization formula.*	0 – 5.75 5.75 – 19.5 19.5 -41.5 41.5 -68	1 2 3 4
Parcel Fragmentation	Measures the feasibility of conservation for a site by analyzing parcel numbers and size. It is calculated by multiplying the percent area of the largest parcel in the site by the mean size of parcels within the site. ❒ *The results were classified using the Jenk's optimization formula (numbers in the table are meters squared).* ❒ *The associated consequences of subdividing land can adversely affect habitat.*	0 -2.5 ac 2.6 – 8 ac 8.1 – 18 ac 18.1 – 43 ac < 43 ac	0 1 2 3 4
Total Possible Points = 45			

Potential Conservation Areas of the Northern Lake St. Clair Region

Potential Conservation Areas were tallied for the Lake St. Clair region as well as within each of the two counties. The analysis for each county only included the portion of the PCA's that were contained within the county and did not include any portion of the PCA that extended into the neighboring county. PCA's that straddled more than one county were divided at the county line and were counted within each county. Thus, the total number and acres of the PCA's for the two counties is greater than the number and acres of PCA's and for the entire region.

A total of 1,511 sites, totaling 182,635 acres were identified as potential conservation areas (PCA's) in the Tri-County Region. **This represents 23.4% of the total land base (777,942 acres) in the region**. Each of the 1,511 delineated sites was scored based upon the criteria described in the following table. Total scores ranged from a high of 29 points (out of a possible 45 points) to a low of 1 point. The mean score was 7.75.

All three of the highest scoring sites are located in St. Clair County. The site that received the highest score of 29 is located in the northeast corner of St. Clair County. It is located along the Black River in Clyde Township. It is 2,585 acres in total size, with a core area of 1,753 acres. The site with the second highest score of 28 is also located in the northeast corner of St. Clair County in Grant Township along the Black River just north of the PCA described above. It encompasses 2,066 acres in total size with a core area of 1,199 acres. The majority of both sites fall within the boundaries of the Port Huron State Game Area. Each site also contains a portion of a large northern mesic forest element occurrence that totals 823 acres. The third site, also with a score of 28, is located in the southern portion of St. Clair County near the shoreline of Lake St. Clair. This site is 2,172 acres in total size and has a core area of 1,637 acres and encompasses the majority of the St. John's Marshland State Wildlife Area. This site also contains a large lakeplain wet prairie element occurrence. The lakeplain wet prairie totals 265 acres and contains over 170 different native plant species.

Once the total scores were tabulated, the next step was to determine a logical and reasonable break between highest, high, medium, and low priority sites. Many potential conservatin area sites can be just one point away from being placed into another category. Natural break and equal interval classification are two legitimate methods for classifying sites. Equal interval classification, as defined for this project, is based on absolute values. It shows the value of each site relative to the highest (45) and lowest (1) possible values. Equal interval classification breaks all possible scores into equal classes regardless of actual scores. This eliminates the relative nature of scores when sites are compared only to other sites within a given area.

The natural break method is the default classification method in ArcView. This method identifies breakpoints between classes using a statistical formula called Jenk's optimization. The Jenk's method finds groupings and patterns inherent in the data by minimizing the sum of the variance within each of the classes. Based on the results of each method, MNFI recommends using the natural break method for the Lake St. Clair Region.

As a result of applying the natural break method, 436 sites were placed in the low priority category, 652 sites were placed in the moderate category, 331 sites were placed in the high priority category, and 65 sites were placed in the highest category. Breaking it down into percentages of total sites identified, 29.4% were labeled low priority, 44.2% were labeled moderate priority, 21.9% of the sites were labeled as high priority, and 4.3% were labeled as highest priority. Breaking it down by acreage, 13% (23,713 acres) fell into the low priority category, 32% (58,340 acres) fell into the moderate category, 32.4% (59,234 acres) fell into the high priority category, and 22.6% (41,348 acres) fell into the highest priority category.

Despite the more methodical approach to classification, it still could be argued that sites scoring one point below should be included in the higher category or that sites scoring right at the low end of a category should be placed in the next lowest category. To help alleviate anxieties about which category a particular site is placed, actual numeric total scores can be displayed in the middle of each polygon. This would allow the viewer to see how a site compares directly to another site without artificially categorizing it within a group.

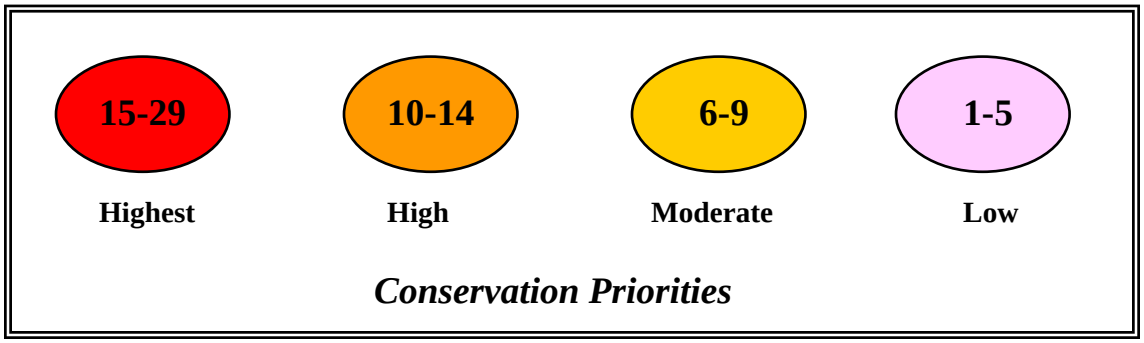


Table 10. Potential Conservation Areas of the Northern Lake St. Clair Region

PCA Class	PCA Count	Percentage	Acres	% of PCA acreage	% of Tri-County area
Low 1-5	448	29.6%	23,713	13.0%	3.0%
Mod 6-9	667	44.2%	58,340	32.0%	7.5%
High 10-14	331	21.9%	59,234	32.4%	7.6%
Highest 15-29	65	4.3%	41,348	22.6%	5.3%
Total	1,511	100%	182,635	100%	23.4%

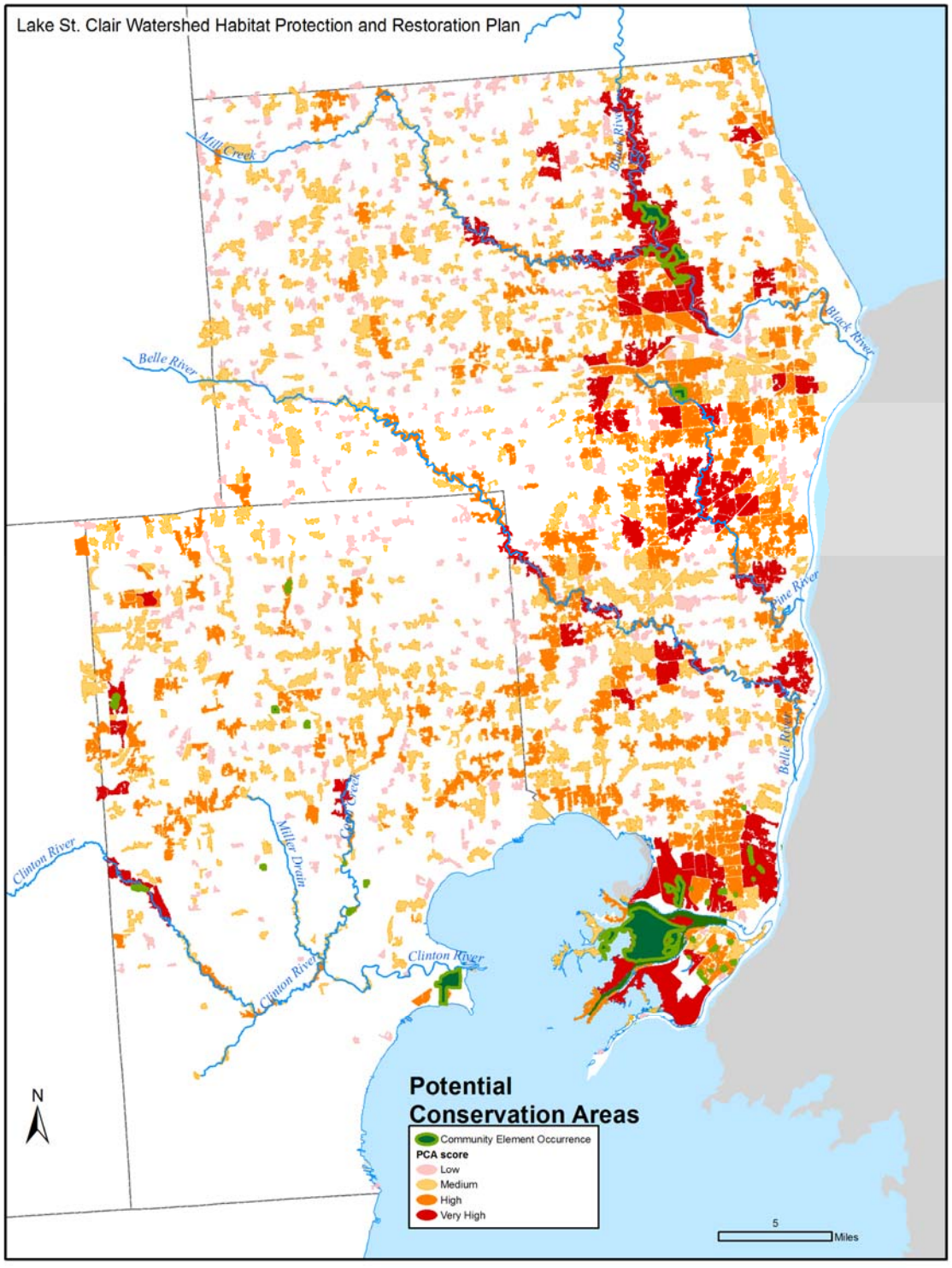


Figure 7. Potential Conservation Areas of the Northern Lake St. Clair Region.

Macomb County Potential Conservation Area Summary

In Macomb County, there are **460 sites**, **totaling 41,950 acres** identified as potential conservation areas. **This represents 13.5% of the total area in the county**. Each of the 460 delineated sites was given a total score based upon the criteria described in the following table. Total scores ranged from a high of 17 points (out of a possible 45 points) to a low of 1 point. The mean score was seven.

The site that received the highest score of 17 is located in the western edge of the county. It is located along the Clinton River in the southeast corner of Shelby Township and primarily falls within the River Bends Township Park. It includes 691 acres in total size, with a core area of 382 acres. This site also contains a 46 acre element occurrence of hardwood conifer swamp. There are four sites tied with a score of 16. The first site is located just north of the site mentioned above, along the Clinton River, and mostly falls within River Bends Township Park. It encompasses 420 acres in total size with a core area of 225 acres. The second site is located in the southeast corner of Washington Township in the northwest corner of the county. This site is 310 acres in total size with a core area of 60 acres. The majority of this site falls within Stony Creek Metro Park. The third site is located north of the site just mentioned and the southern portion of the site also falls within Stony Creek Metro Park. This site includes 544 acres in total size and has a core area of 304 acres, and it contains a large hardwood conifer swamp element occurrence totaling 74 acres. The fourth site with a score of 16 is located in the center of Bruce Township in the northwest corner of the county. It appears that this site is located on an abandoned test track, and the majority of vegetation cover is shrub scrub and early successional forest. As a result, we included one more additional site with a score of 15. This site is located along Coon Creek in the northwest corner of Macomb Township, and is connected to the north branch of the Clinton River. It is 434 acres in total size, and has a core area of 156 acres.

As a result of applying the natural break method, 133 sites were placed in the low priority category, 223 sites were placed in the moderate category, 96 sites were placed in the high priority category, and only 8 sites were placed in the highest category. Breaking it down into percentages of total sites identified, 28.9% were labeled low priority, 48.6% were labeled moderate priority, 20.8% were identified as high priority, and 1.7% were labeled highest priority. Breaking it down by acreage, 16.1% (6,745 acres) fell into the low quality category, 42.5% (17,823 acres) fell into the moderate quality category, 33.5% (14,070 acres) fell into the high priority category, and 7.9% (3,314) fell into the highest priority category.

Table 11. Priority Rankings for Macomb County

PCA Class	PCA Count	Percentage	Acres	% of PCA acreage	% County acreage
Low 1-5	133	28.9%	6,745	16.1%	2.2%
Mod 6-9	223	48.6%	17,823	42.5%	5.7%
High 10-14	96	20.8%	14,070	33.5%	4.5%
Highest 15-17	8	1.7%	3,314	7.9%	1.1%
Total	460	100%	41,952	100%	13.5%

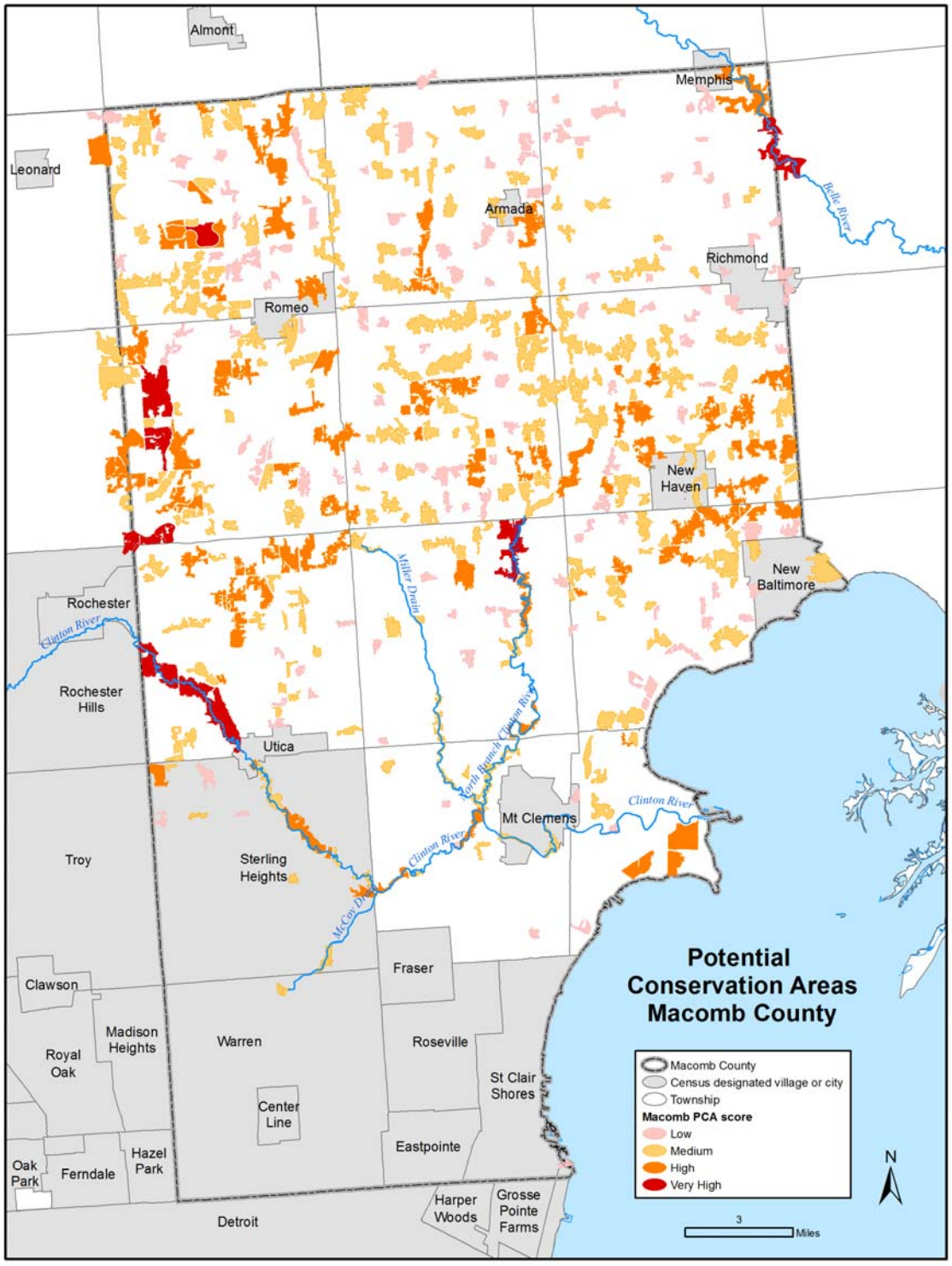


Figure 8. Potential Conservation Areas of Macomb County

St. Clair County Potential Conservation Area Summary

In St. Clair County, there are **1,057 sites, totaling 141,715 acres** identified as potential conservation areas. **This represents 30% of the total area in the County**. Each of the 729 delineated sites was given a total score based upon the criteria described in table 1. Total scores ranged from a high of 29 points (out of a possible 45 points) to a low of 1 point. The mean score was eight. **The site that received the highest score of 29 is located in the Northeast corner of the county.** It is located along the Black River just south of the confluence between Mill Creek and the Black River and primarily falls within the Port Huron State Game Area. It is 2,585 acres in total size, with a core area of 1,753 acres. The site with the second highest score of 28 is also located in the northeast corner of St. Clair County along the Black River just north of the PCA described above. It encompasses 2,066 acres in total size with a core area of 1,199 acres. The majority of both sites fall within the Port Huron State Game Area. Each of these sites also contains a portion of a large northern mesic forest element occurrence along the Black River that totals 823 acres. The third site, also with a score of 28, is located in the southern portion of St. Clair County near the shoreline of Lake St. Clair. This site is 2,172 acres in total size and has a core area of 1,637 acres and encompasses the majority of the St. John's Marshland State Wildlife Area. This site also contains a large lakeplain wet prairie element occurrence. The lakeplain wet prairie totals 265 acres and contains over 170 different native plant species.

As a result of applying the natural break method, 319 sites were placed in the low priority category, 445 sites were placed in the moderate category, 235 sites were placed in the high priority category, and 58 sites were placed in the highest priority category. Breaking it down into percentages of total sites identified, 30.2% were labeled low priority, 42.1% were labeled moderate priority, 22.2% of the sites were identified as high priority, and 5.5% were identified as highest priority. Breaking it down by acreage, 12.2% (17,259 acres) fell into the low quality category, 28.8% (40,807 acres) fell into the moderate quality category, 31.9% (45,164 acres) fell into the high priority category, and 27.2% (38,485 acres) fell into the highest priority category.

Table 12. Priority Rankings for St. Clair County

PCA Class	PCA Count	Percentage	Acres	% of PCA acreage	% County acreage
Low 1-5	319	30.2%	17,259	12.2%	3.7%
Med 6-9	445	42.1%	40,807	28.8%	8.7%
High 10-14	235	22.2%	45,164	31.9%	9.6%
Highest 15-29	58	5.5%	38,485	27.2%	8.2%
Total	1,057	100.0%	141,715	100.0%	30.1%

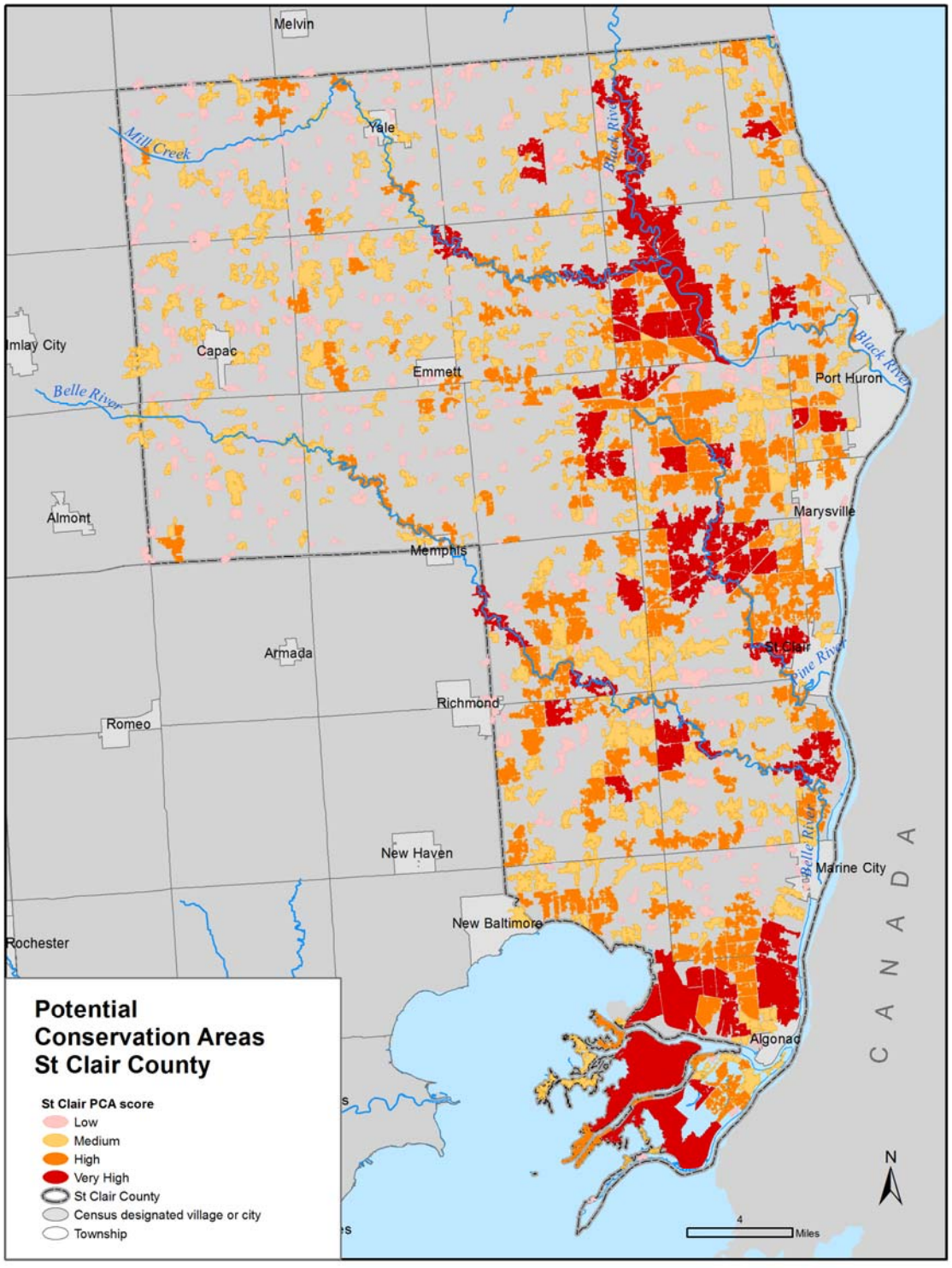


Figure 9. St. Clair County Potential Conservation Areas

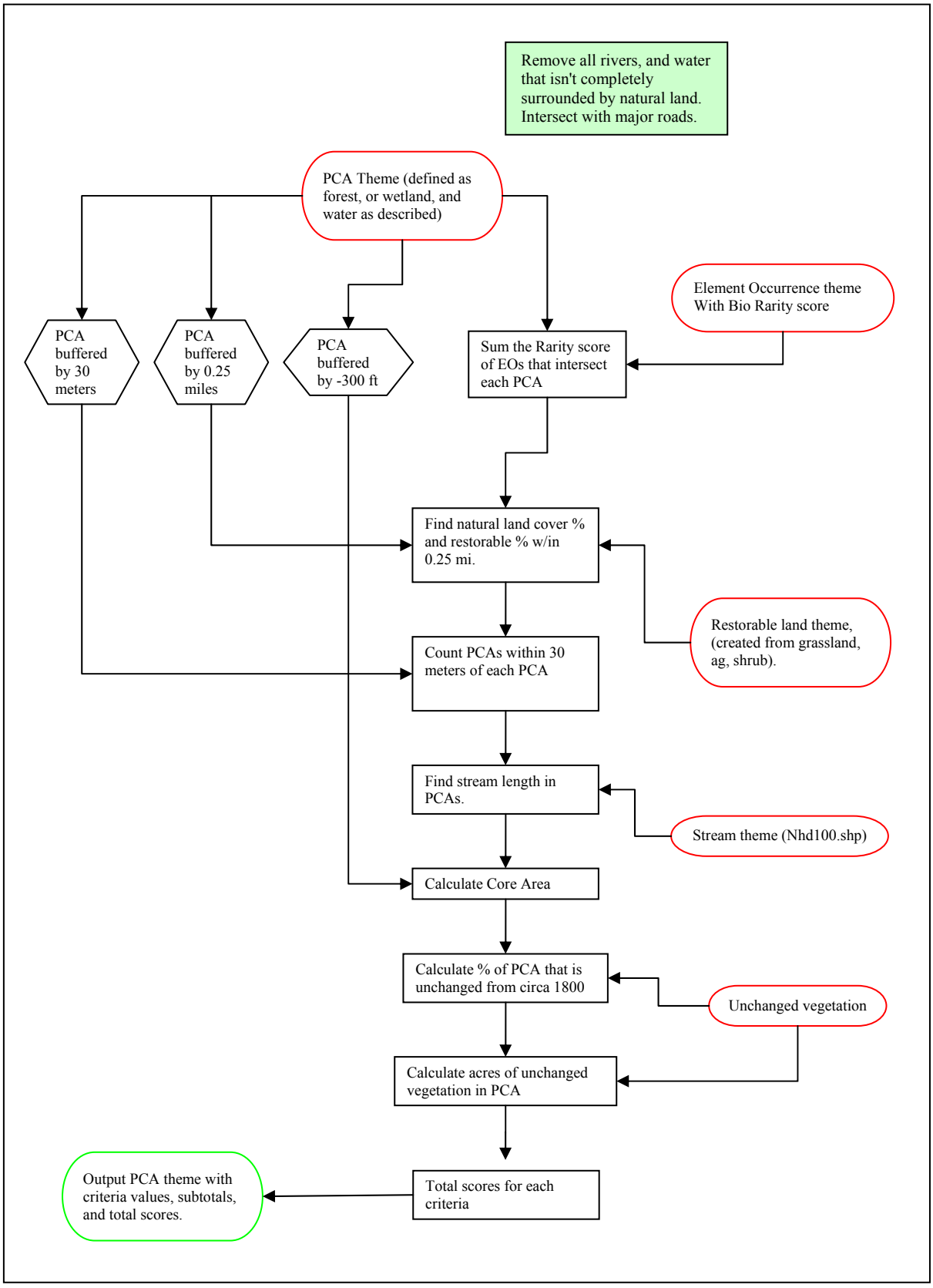


Figure 10. Potential Conservation Area Flowchart

Potential Conservation Area Conclusion

This inventory documents that the northern Lake St. Clair region has several high quality natural areas that still look and function the way they did 200 years ago. Of the remaining high quality sites, some have the potential of harboring endangered, threatened, or special concern animal and plant species. With the high rate of development and its associated stresses on the natural environment, conservation of these remaining areas and their native plant and animal populations are vital if the Lake St. Clair region's diverse, natural heritage is to be conserved.

When using this information it is important to keep in mind that site boundaries and rankings are a starting point and tend to be somewhat general in nature. Consequently, each community, group or individual using this information should determine what additional expertise is needed in order to establish more exact boundaries and the most appropriate conservation efforts.

Comments/Recommendations

- Local units of government, individuals and interest groups using this information should consult a publication produced by SEMCOG in 2003 entitled, "Land use Tools and Techniques." The publication includes information on tools and techniques that help conserve natural resources and create open space linkages while allowing for economically viable development.

- Municipalities should identify opportunities to link other possible natural resource sites not mapped during this project. This would include small patches of land, tree and fence row plantings, agriculture land, and open fields (greenways). Due to the size of the project area, only sites equal to and larger than 20 acres were included in the analysis.

- Field inventories should be conducted in identified potential conservation areas, starting with the highest priority sites first. This fieldwork would provide much needed additional site-specific data that should be considered when developing in and around such areas.

- All identified sites, regardless of their priority, have significance to their local setting. This is especially true in areas that have experienced a high degree of development and landscape fragmentation, such as most of the areas in Macomb County, particularly in the southern region, as well as coastal areas along St. Clair River.

- A direct relationship exists between natural area protection and long-term water quality. Natural area protection should be integrated into local water quality management plans especially in the St. Clair, Belle, Pine, Black, and Clinton River systems.

- Municipalities should work together and adopt a comprehensive green infrastructure plan. The conservation of critical natural areas is most effective, and successful, in the context of an overall plan or strategy especially in an urbanized region at the northern edge of Detroit.

- Funding should be secured to update the mapping and assessment of this project's potential conservation areas approximately every three to five years.

- Efforts to conserve potential conservation areas should include on-going site assessment and stewardship.

- Local units of government in Macomb and St. Clair Counties should undertake widespread distribution of this information in order to build awareness and encourage long-term natural resource planning and stewardship. Knowledge of potential conservation areas is meaningless unless action is taken to ensure that they will remain part of this area's natural heritage.

- When establishing sites for possible field inventory, each community, group or individual should consider all available criteria in conjunction with their unique local conditions. Site selection may well be influenced by local growth pressure, land ownership patterns, parcel size, accessibility, and local knowledge of the flora and fauna.

Summary of Socially Significant Sites in the Region

During the month of May and June, 2010, the Macomb County Department of Planning and Economic Development (MCDPED) led a series of interviews with local government officials to identify sites of high ecological value natural areas as well as activities that could enhance public use of the Lake St. Clair watershed. The interview team was comprised of representatives from the following agencies: MCDPED, Macomb County Public Works Office, St. Clair Health Department, and the South East Michigan Council of Governments (SEMCOG). In addition, a questionnaire was developed and sent to all local communities throughout the project area prior to visiting with each interested community. Recreational opportunities were frequently cited by local officials as a priority. Many municipal plans included some link to blueways and canoeing/kayaking opportunities in local drains and natural waterways. There is also an interest and willingness to participate in the development of eco-tourism opportunities such as Blueways of St. Clair County project (http://www.bluewaysofstclair.org/about.asp). Interviews were conducted in the following sixteen local communities (table 13):

Table 13. Local Communities that were interviewed.

Macomb County	St. Clair County
Harrision Township	Clay Township
Richmond Township	City of Algonac
Chesterfield Township	Cottrellville Township
City of Utica	Ira Township
City of St. Clair Shores	China Township
Shelby Township	
City of Richmond	
Mount Clemens	
Clinton Township	
Macomb Township	
New Baltimore	

Following the community meetings, MNFI, SEMCOG, and MCDPED staff met to discuss the findings of the local government interviews. New Baltimore was revisited to gather additional information from community representatives. Over 80 sites of interest were identified in the two counties and those that had a high level of "social value" were highlighted for GIS mapping.

Socially significant natural resource sites were transferred from large hard copy maps and digitized on screen using ArcGIS 9.2 software and several base layers. A total of fifty two sites across the project area were digitized (table 14; figures 11 and 12). The socially significant data layer that was created will be used for future analyses. A priority GIS analysis that needs to be conducted in year two of the project is the identification of privately owned sites that are identified as priorities by both MNFI and the local communities. The goal is to capture sites with the highest value for the community. Additionally, it will be important to identify socially significant sites adjacent to or in close proximity to the high priority PCA's.

Information regarding this stage of the project was presented at the Lake St. Clair, Anchor Bay, Red Run, Clinton River East, and North Branch Stormwater Advisory Group meetings in August and September, 2010.

Table 14. Socially Significant Sites

Project Name	Location	Project Type	Acres
Sites of High Ecological Value			
Wooded Wetland Remnant	Harrison TWP	Conservation	155
Harley Ensign Wetland Restoration at mouth of Clinton River	Harrison TWP	Restoration	
Partridge Creek Commons – Remnant Oak Opening*	Clinton TWP	Acquisition/ Restoration/ Conservation	
Meldrum Drain Fish and Wildlife Habitat Restoration Project	Chesterfield TWP	Restoration/ Conservation	16
River Voss Fish and Wildlife Restoration Project	Chesterfield TWP	Restoration/ Conservation	
Restoration of Blossom Health Beach	City of St. Clair Shores	Restoration	
Orem Stilson Wetland	Mount Clemens	Acquisition/ Restoration/ Conservation	
Stramiglia Site (Superfund)	Mount Clemens	Restoration/ Acquisition/ Conservation	
Coastal Shoreline Restoration at City Waterworks	Mount Clemens	Restoration	
Marsac Creek Wooded Wetland Remnant – M-29 along eastern municipal boundary*	New Baltimore	Acquisition/ Conservation	
Coastal Restoration at Schmid Marina	New Baltimore	Acquisition/ Restoration	1.6
MDNRE Wetland Conservation District	New Baltimore	Conservation	50
Phragmites infested area – south end of Algonac	City of Algonac	Restoration	
Pelton Drain Habitat Management and Restoration Project	Ira TWP	Pollution reduction/ Restoration/ fish passage	
Marsac Creek Fish and Wildlife Habitat Restoration Project	Ira TWP	Restoration	
Headwaters protection of Meldrum Drain and Swan Creek	Casco/China TWPs	Conservation/Restoration	
Fish and Wildlife Habitat Restoration along Lester-Bammel Drain	Cottrellville TWP	Restoration/ Education	
Marine City BMP and Habitat Restoration Project	Cottrellville/ Algonac	Pollution reduction/ restoration	
Beaubien Creek Fish and Wildlife Habitat Restoration	Cottrellville TWP	Restoration/ fish passage	
Restoration and redevelopment of Hunt Club property*	Clay TWP	Redevelopment /Restoration	540
Beach area along St. Clair River with riprap that could be softened in Algonac State Park	Clay TWP	Restoration	
Beach area at turn around at end of South Channel Drive (Harsen's Island) contains rip/rap that could be softened	Clay TWP	Restoration	
Assessment of habitat restoration and enhancement at all seven TWP boat launches	Clay TWP	Restoration	

Table 14. Socially Significant Sites Continued

Project Name	Location	Project Type	Acres
Restoration/redevelopment of former Harsen's Island airport	Clay TWP	Restoration/ Redevelopment	55
Restoration of Trash Island – end of South Island Drive	Clay TWP	Restoration/ conservation	
Restoration of wetlands (Phragmites control) just east of Butterfield Road	Clay TWP	Restoration	
Develop Belle River Woody Debris Management Plan	China TWP	Restoration/ Recreation	
Development of Blueway Recreation Initiatives			
Blueway Kayaking on Clinton River	Harrison TWP		
Tree Planting along Metro Parkway (Jefferson to I-94)	Harrison TWP		
Salt River Blueway Recreation Area	Chesterfield TWP	Acquisition/ Conservation/ Restoration	
Several foreclosed sites along Salt River that could be used to form a Blueway/Greenway Corridor up to 26 mile Road	Chesterfield TWP	Acquisition/ Restoration	
Establishment of Blueway Corridor along Clinton River	City of Utica	Conservation/ Recreation	
Clinton River Blueway Initiative	Clinton TWP	Recreation/ Conservation	
Egret Floodplain Restoration Project	Clinton TWP	Conservation	
Heron Rookery	Clinton TWP	Conservation	
Marocco owned properties along Clinton River/North Branch	Clinton TWP	Acquisition/ Restoration/ Conservation	
Restoration of Shadyside Park • Clean up of contaminants	Mount Clemens	Restoration	
Control of Invasives (Phragmites, et al) at Sleepy Hollow	Mount Clemens	Restoration/ Conservation	15-20
Acquisition/Redevelopment of M-29 DNRE Access Site	Ira TWP	Acquisition/ Restoration	
Waterworks Park Redevelopment Project – Blueway recreation	Ira TWP	Redevelopment /Restoration	1-2
Acquire natural area along point of outlet of Swan Creek – Blueway recreation	Ira TWP	Acquisition/ Redevelopment /Restoration	
TWP to purchase site along western boundary NW of Normandy Blvd.	Ira TWP	Recreation/ Restoration	17
Develop bike trail along South Channel Drive	Clay TWP	Recreation	
Restoration of interior drains and waterways for Blueway recreation (Harsens Island)	Clay TWP	Restoration	
Restoration of Abandoned marina at Crystal Island	Clay TWP	Restoration/ Redevelopment	
Development of Bluewater kayaking along Dyke Road canal out to Anchor Bay	Clay TWP	Recreation	
Restore Pearl Beach Pier	Clay TWP	Fish habitat Restoration	

Table 14. Socially Significant Sites Continued.

Project Name	Location	Project Type	Acres
Development of Belle River Blueway Recreation	China TWP	Recreation	
Development of R-O-W along Recor Road as Belle River access	China TWP	Development/ Restoration	
Redevelopment of Brownfield Projects			
Transit project – Site along NW border of city	City of Utica	Redevelopment	
Brownfield park site	Clay TWP	Clean-up/ Redevelopment	16
Former industrial site	Clay TWP	Clean-up/ Redevelopment	

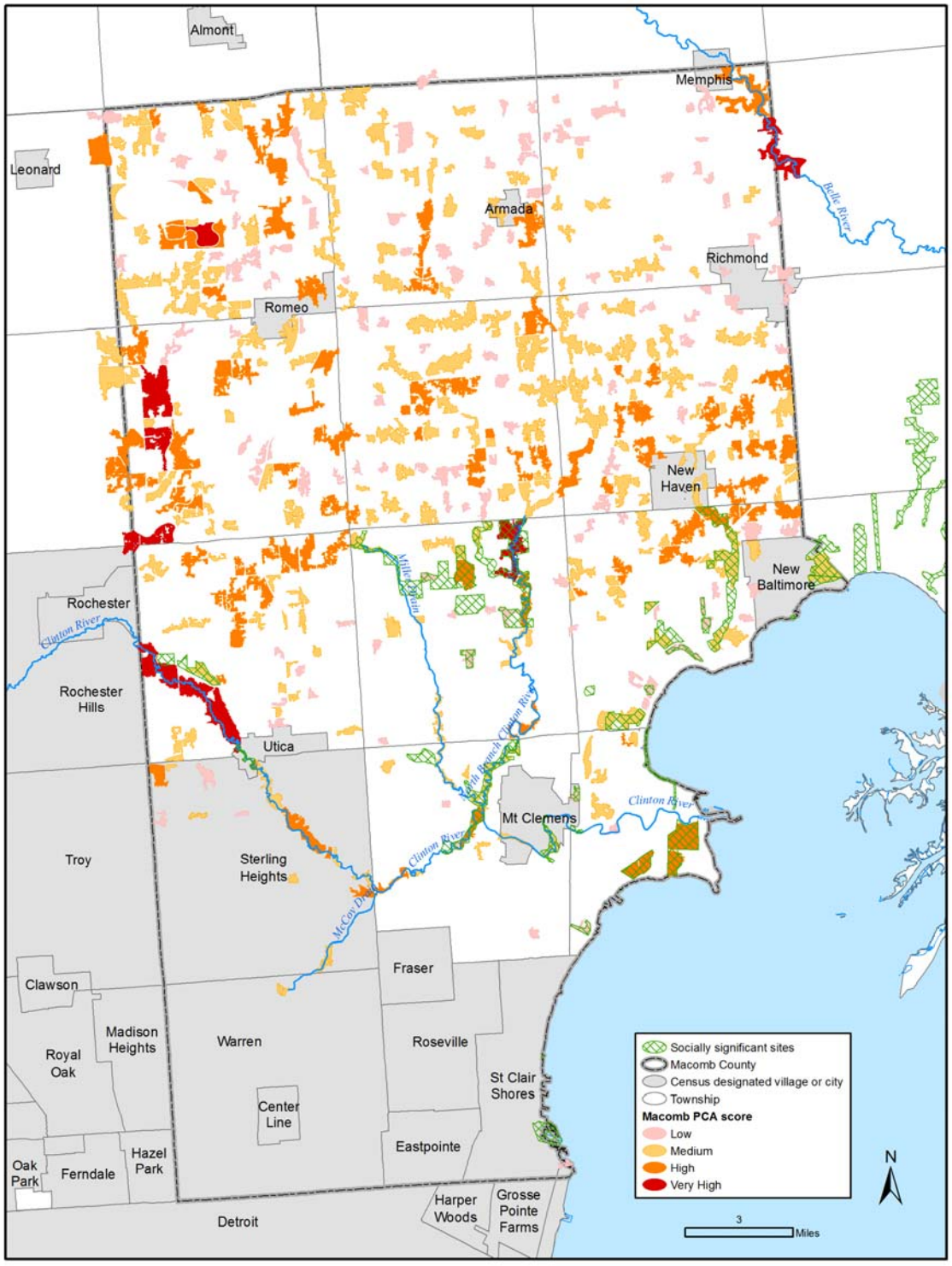


Figure 11. Macomb County Socially Significant Sites

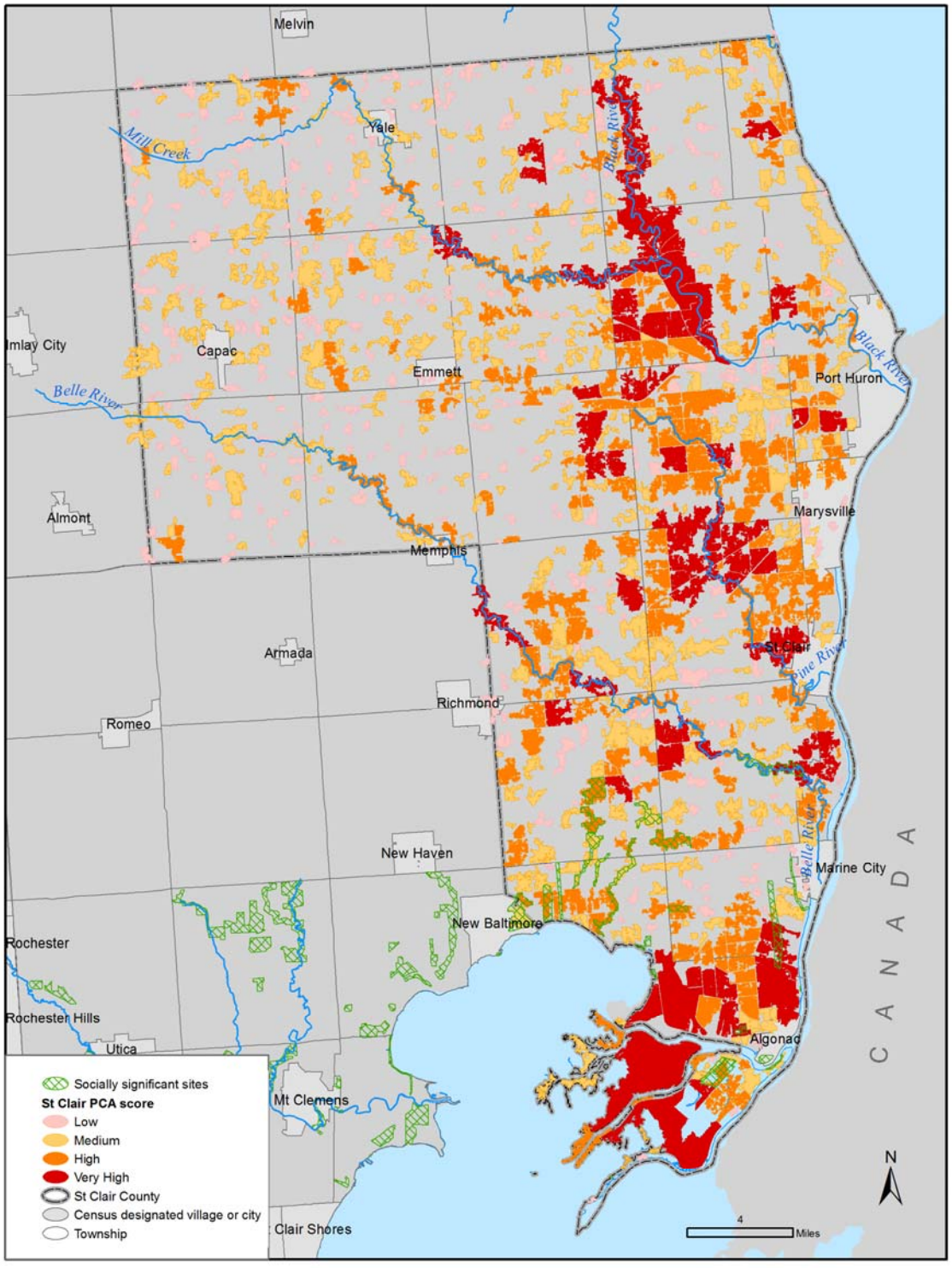


Figure 12. Socially Significant Sites of St. Clair County

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