

# Chapter III

## Delineation and Ranking of Natural Areas

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### Chapter III. DELINEATION AND RANKING OF NATURAL AREAS

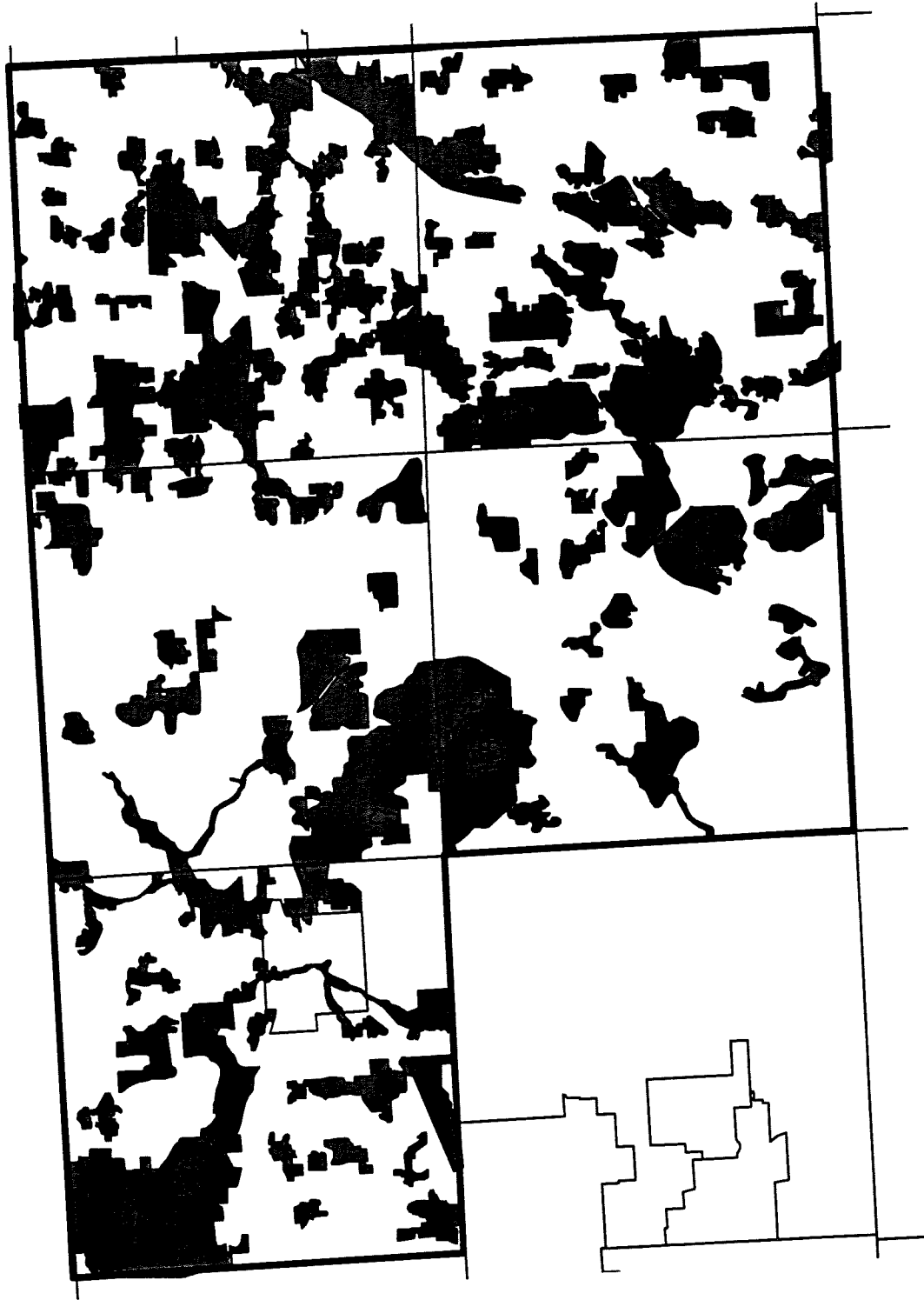
The Steering Committee for the S&H Project contracted with the Michigan Natural Features Inventory (MNFI) to conduct a natural resources inventory of the project area. MNFI is a partnership between the Michigan Department of Natural Resources and The Nature Conservancy. MNFI staff includes biologists, botanists, and wildlife specialists. The MNFI staff started its inventory work using 1997 aerial photos covering the project area. Potentially significant natural areas were delineated based on the following criteria developed by the MNFI:

1. Size
2. Intactness
3. Upland and wetland complexes
4. Important riparian corridors within the respective watersheds
5. Large, contiguous forested tracts
6. Areas with potential for restoration

The degree or type of fragmentation was a critical component in delineating sites. If sites were fragmented, for example, with development around their edges, but a relatively large core of habitat remained, then it had high (or higher) potential for delineation. Sites of a comparable size but with more dispersed development such as houses scattered throughout the forested tract, were generally eliminated from consideration. Habitats that were found to be fragmented but had some apparent relationship or ecological connection to other habitats or sites in close proximity, were also considered for broad delineation if there were potential for re-establishing the ecological connection through restoration activities. Delineation of sites was done conservatively, such that the chance of capturing sites that may end up being eliminated upon closer inspection was greater than the chance of omitting sites that should have been delineated.

Through this process, 114 sites were identified. The map on the next page shows the location of the sites identified by the MNFI. MNFI then ranked each site according to the following scale:

Criterion	Detail	Points	Detail	Points	Detail	Points
Size	<40 acres	1	40-160 acres	2	>160 acres	3
Intactness	High level Dispersed fragment.	1	Low level Dispersed Fragment.	2	Little or non- dispersed fragment.	3
Riparian Corridor	No	0	Minor Corridor	1	Major Corridor	2
Upland/ Wetland Complex	No	0	Yes	1		
Restora- bility	Low	0	Medium	1	High	2
Known rare comm. or Species present	None	0	1-2	1	3+	2



## MNFI Sites

### LEGEND

 MNFI Sites

 Community Boundary

 Study Area

Shiawassee & Huron  
Headwaters Resource Preservation Project



Based on this scale a total of 13 points were possible. The Steering Committee reviewed the above scale. They were concerned that the criterion of “known rare communities or species present” would give more points to sites that had been previously studied since information on threatened plants and animals would be available from those previous studies. Sites of potentially high ecological significance that had not been previously studied would not receive as high a score. Therefore, to eliminate this potential bias, the Steering Committee looked at the rankings without the category of “known rare communities or species present.” Based on this revised scale, a total of 11 points were now possible.

Out of the 114 sites, four sites had 11 points with the revised ranking system. They were the Huron Swamp Complex and Long Lake in Springfield Township, Buckhorn Lake Complex in Rose Township, and Pontiac State Recreation Area (SRA) West in White Lake Township. The top 19 ranked sites are listed below.

Site Name	Township	Size	Intact-ness	Corridor	Upland-wetland Complex	Restora-bility	Total Points
Huron Swamp Complex	Springfield	3	3	2	1	2	11
Buckhorn Lake Comp	Rose	3	3	2	1	2	11
Long Lake	Springfield	3	3	2	1	2	11
Pontiac SRA West	White Lake	3	3	2	1	2	11
Mill Pond	Rose	3	3	2	1	1	10
Huron River Corridor	White Lake	3	2	2	1	2	10
I-75 Woods	Springfield	3	3	2	1	1	10
Kenyon Lake	Rose	3	3	1	1	2	10
Rattalee Lake Complex	Rose	3	2	2	1	1	9
Haven Hill Comp. East	White Lake	3	3	0	1	2	9
Haven Hill Comp. West	Highland	3	3	0	1	2	9
Kent Lake Complex	Milford	3	2	2	1	1	9
Pontiac SRA East	White Lake	3	3	0	1	2	9
Waterbury Lake Comp.	Highland	3	3	0	1	2	9
Pettibone Lake Comp.	Highland	3	3	1	1	1	9
Brendel Lake Complex	White Lake	3	2	2	1	1	9
Schmitt Lake Complex	Springfield	3	3	0	1	2	9
SW Tipsico Lake	Rose	3	3	0	1	2	9
Perch Lake Complex	Rose	3	3	0	1	2	9

## Analysis of MNFI Sites

Given the magnitude of change that has taken place since the first European settlers started farming in Oakland County, it is not surprising that most, if not all, of the high quality sites identified by the Michigan Natural Features Inventory are limited to scattered isolated patches. Analysis of the project area shows that there are four (4) key points to understand when developing an ecosystem approach to conservation in the project area:

1. Focus efforts on large landscape complexes,
2. Protect remaining wetlands by also managing adjacent uplands,
3. Provide connectivity via river and stream corridors, and
4. Identify opportunities for oak barrens and savanna restoration.



First, many of the sites identified by MNFI are relatively large and diverse, consisting of a variety of natural communities from uplands to wetlands and from forests to grasslands. When several natural communities, ranging from upland to wetland, are found together in one site, ecologists call it a landscape complex. The habitat diversity found at many of the sites in Oakland County is primarily due to the irregular topography, which ranges from steep sandy slopes to broad, flat, outwash channels. Many of the plants and animals that have evolved in this diverse landscape, require a variety of habitats, ranging from uplands to wetlands, to breed and survive. Landscape complexes made up of a mosaic of open and forested wetlands and uplands provide the habitat diversity needed for many birds, reptiles, amphibians, and mammals. For example, the eastern massasauga rattlesnake inhabits prairie fens in the spring and fall to breed, and moves into the adjacent undeveloped uplands to forage in the summer. Or, Blanding's turtles, which utilize small ponds for hibernation and feeding, require sunlit areas with moist, sandy soil, typical of old fields and forest clearings for egg laying. In addition, the relatively large size of landscape complexes provides the necessary space for natural communities and individual species to adapt to the changing environment, allows ecological processes to occur more naturally, and provides natural buffers for species that are sensitive to human activities. For example, many woodland and grassland songbirds and raptors require forests and grasslands that are at least 100 acres in size.

Second, it is important to understand the relationship between uplands and wetlands, and the potential impacts upland activities can have on the flora and fauna of adjacent wetlands. Within the high priority sites identified by MNFI, many of the highest quality ecosystems are wetlands such as prairie fens, wet meadow, and southern swamp. Due to the relatively steep topography in northwest Oakland County, the health of these wetlands is heavily influenced by activities that take place in the adjacent uplands. For example, prairie fens are developed and sustained over time by a constant flow of cold, calcium rich groundwater. If something happens that alters that flow of groundwater such as road construction near the wetland margin, the unique flora and fauna of the fen will slowly disappear over time. Therefore, although many of the second growth upland forests, brushlands, and old farm fields are not high priority ecosystems, they still provide important ecological services to the adjacent high quality wetlands. In addition, many of these degraded upland sites may be restorable to historical vegetation types such as oak barrens, savanna, and oak-hickory forest.

Third, it is important to realize that the majority of the remaining natural areas are located along or near streams or rivers. These "water highways" provide a connection between isolated sites, and often flow through the highest quality remnants of prairie fen, hardwood-conifer swamp, and oak forest. Corridors between isolated patches of forest, wetlands, and prairies allow plants and animals to disperse to other areas for refuge, food, and water. This dispersal allows for ecological processes to occur at more natural rhythms and scales, and facilitates geneflow from one population to another. In addition, a wealth of native biological diversity can be found within these rivers and streams including fish, insects, and mussels. Other species that utilize forested river corridors include: neotropical migratory songbirds during migration and for nesting, rare species such as the state threatened red shouldered hawk, and federally threatened Indiana bat, and common species such as turkeys, raccoons, and deer. The linear nature of river corridors also facilitates land stewardship in a highly fragmented landscape by providing a visible landmark for the local community to focus on. Through natural succession and focused ecological restoration efforts, degraded or developed areas along selected streams and rivers can be enhanced to improve both wildlife habitat and water quality.

Lastly, it is important to identify potential areas for oak barrens and savanna restoration. Both of these communities are considered globally imperiled and are very rare in Michigan. In fact, only a few small remnants have been documented in southern Michigan. These unique fire-dependent natural communities that once dominated the rolling sandy hills found throughout the majority of Oakland County are conspicuously missing. Due to farming, fire suppression, pine plantations, and more recently urban sprawl, the vast majority of these open grassland communities have converted to agricultural fields, brushlands, and young closed canopy oak forest. Although these community types are not a high priority in the project area, they do provide an opportunity to restore some of the original grasslands found in Oakland County, and increase the diversity of plants, mammals, birds, and insects within the study area. For example, grassland bird species such as bobolinks and grasshopper sparrows, whose populations are dramatically declining across the midwest, would likely benefit from any grassland restoration in the area. When planning greenways and corridors, existing pastures, hayfields, old fields, and brushlands can be considered as future, native grassland restoration sites.

In summary, while most of the study area is characterized by highly fragmented landscapes, a few large diverse landscape complexes persist. These remnant complexes of uplands and wetlands provide Oakland County residents with an opportunity to manage and restore important areas for biodiversity conservation. Therefore, all 114 identified sites are important. Some sites will prove to have higher ecological value than others, although all sites contribute to wildlife habitat and the rural, natural character. A complete listing of all 114 sites identified and ranked by MNFI is included in the appendix. The sites are grouped by community and site names were assigned by the MNFI. The charts include points for known rare communities or species present. The sites identified in Milford Township and Milford Village are grouped together.

## **Analysis of MNFI Sites by Community**

In looking at the map of MNFI sites, there is a difference in the number, size, and distribution of sites throughout the project area. In order to understand these differences, the sites were analyzed by community by the criteria used to score them. Size, site fragmentation/intactness, riparian corridor, upland and wetland complex, and restorability were evaluated to see how each community's MNFI identified sites compared to the other communities' sites. The charts on the following pages show these comparisons.

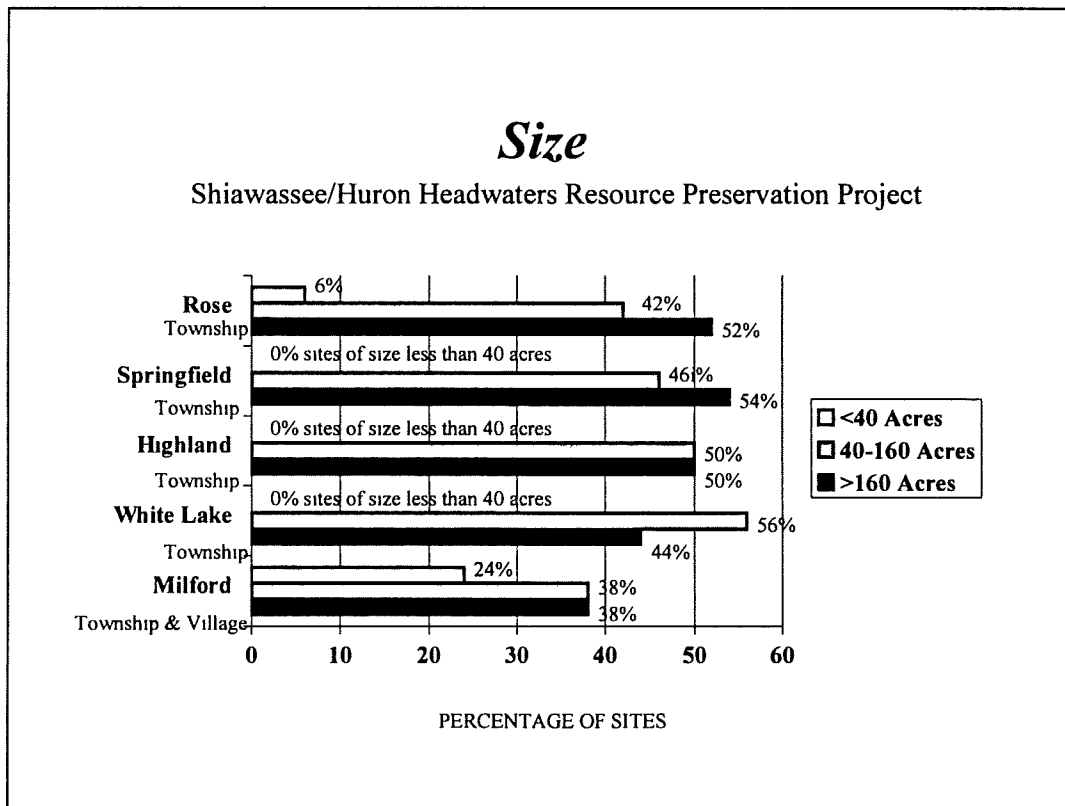
In terms of distribution of MNFI sites, Rose Township has the most sites with 33. Springfield Township comes next with 24. Milford Township and Village combined have 21. White Lake Township has 18 and Highland has 18. These numbers, in and of themselves, mean little but are important to keep in mind when reviewing the percentages on the charts.

In terms of size, all of the communities have the majority of their sites over 40 acres and most of the communities have approximately 50% of their sites over 160 acres. However, Milford Township and Village have a proportionately greater number of sites less than 40 acres.

In terms of site fragmentation/intactness, Springfield Township has the greatest percentage of sites intact (37%). Milford Township and Village have no sites identified as intact. In fact, 62% of the sites in Milford Township and Village are identified as having high fragmentation. High fragmentation means fragmentation is dispersed throughout the site compared to that which might be concentrated mostly around the edges or confined to one location. Both the amount of fragmentation and its configuration are important to many species; in most cases, the larger the blocks of contiguous habitat the better.

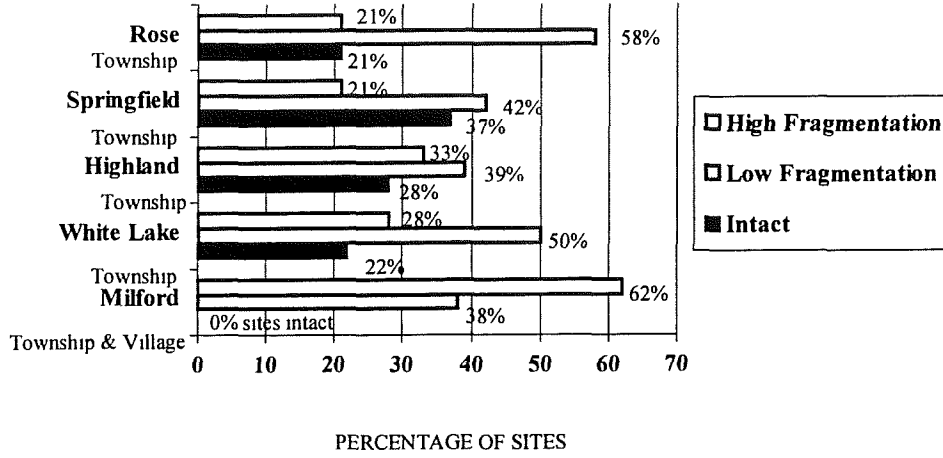
The majority of the sites identified by MNFI are not part of a riparian corridor. This holds true for every community in the project area. At least 50% of the sites in each community and as much as 78% of the sites in Highland and White Lake Townships are not part of a riparian corridor. However, most of the sites identified by the MNFI are part of an upland/wetland complex. As previously mentioned, these landscape complexes are especially important because they provide the diversity needed for wildlife habitat

Restorability of sites varies greatly throughout the project area. Points for restorability were given to indicate the potential for restoration activities around the edges of the delineated site. Most of the communities have approximately 70% or more of their sites identified as having medium to high restorability. However, Milford Township and Milford Village have no sites identified as having high restorability and 62% of their sites classified as low restorability. No other community's percentage of low restorability comes close. This fact, coupled with the smaller sites in Milford Township and Village and the high degree of fragmentation, illustrates the relationship between fragmentation and restorability. By definition, if a site has high fragmentation, meaning that there is development throughout the site, restorability of that site will be low because opportunities for restoration are poor due to the existing development. This analysis of MNFI sites by communities suggests that resource conditions in the southern most part of the project area are different and may require a different approach in terms of conservation.



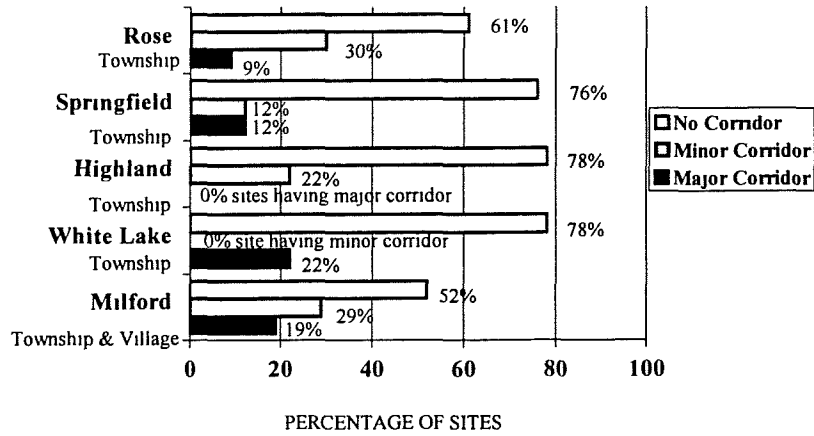
## *Site Fragmentation / Intactness*

Shiawassee/Huron Headwaters Resource Preservation Project



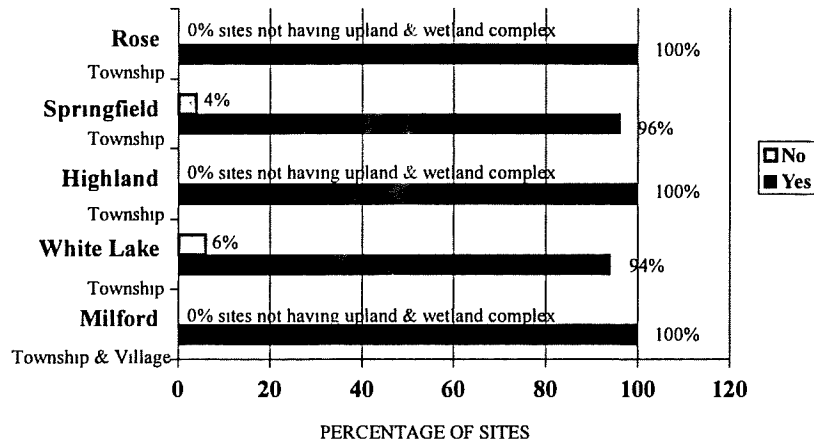
## *Riparian Corridor*

Shiawassee/Huron Headwaters Resource Preservation Project



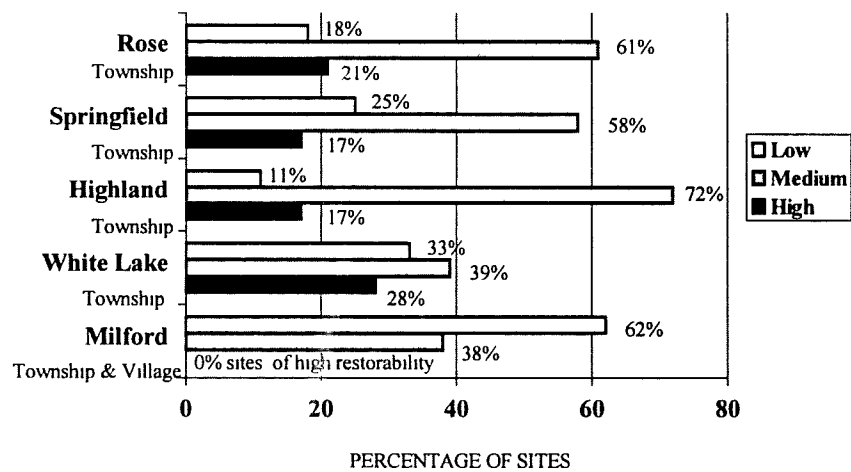
## *Upland & Wetland Complex*

Shiawassee/Huron Headwaters Resource Preservation Project



## *Restorability*

Shiawassee/Huron Headwaters Resource Preservation Project



## **Field Inventory Selection**

The initial delineation of potentially significant natural areas was the first task performed by the MNFI staff. The next task was to conduct field inventories. However, the amount of money available for actual field inventories was limited. MNFI estimated that approximately six (6) or seven (7) sites could receive a full field inventory that would consist of three disciplines visiting the site. ecologists, zoologists, and botanists. Therefore, the Steering Committee needed to further rank the sites to determine which sites would receive the field inventories.

The ecological ranking that was provided by the MNFI was a major consideration for the Steering Committee. In addition, it was felt that each municipality should have one site inventoried. Due to the limited number of sites identified in the Village of Milford, one site in Milford Township near the Village could be the Milford site. In addition, sites that were under more immediate growth pressure were given higher priority. Immediacy was defined as near term development that could occur within the next three (3) years.

The ownership of the land was also considered. Lands under public ownership, such as state recreation lands or those owned by the Huron Clinton Metropolitan Authority were felt to have some level of protection from development. This criterion was modified though to acknowledge the difference between recreation and conservation. Highly significant natural areas can be degraded by intensive recreational uses. Therefore, some public lands remained on the list for consideration, especially since it was assumed that they contained significant ecological ecosystems, such as the Huron Swamp.

Finally, the committee looked at which sites were made up of large parcels (over 40 acres) under single ownership. This condition would allow the parcel to be more easily assembled for development. On the next page are small versions of the maps that were prepared showing these other considerations for field inventory selection

## **Permission Required**

The Steering Committee applied the above criteria to the list of highly ranked MNFI sites. Several sites were identified for each community. Each community then had the responsibility to identify all the parcels within the chosen MNFI sites and send letters to the property owners requesting permission for the MNFI to access the site. Permission was a requirement of MNFI

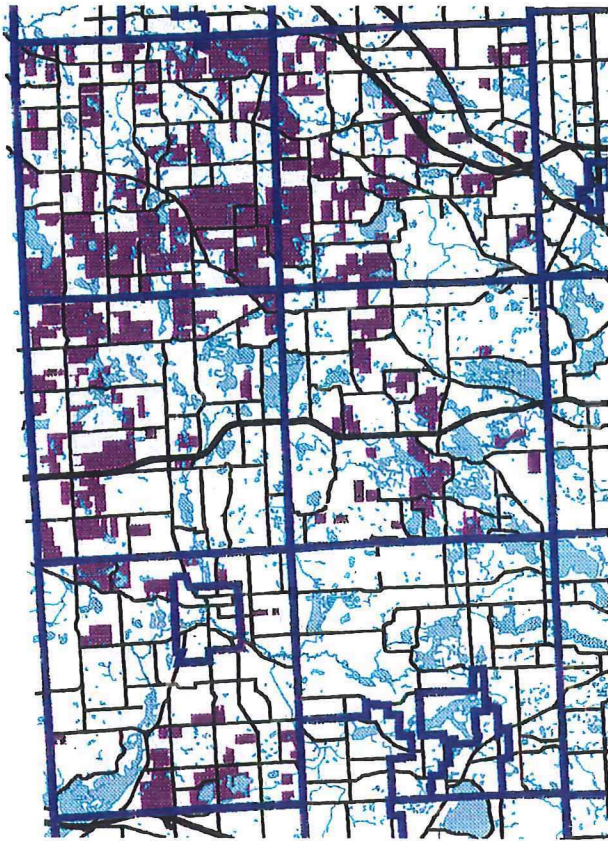
The process of obtaining permission took longer than anticipated and often required two and three follow-up letters. For several sites permission was denied, even after follow-up attempts were made. In some cases permission was granted for only a few small parcels making up the site. When the large property owners did not grant permission, the MNFI could not justify going out to the site since the core of the ecosystem could not be inventoried. In these cases, the site was eliminated from consideration and the next site was pursued. For one or two sites, MNFI staff did an initial ecological review but determined the site was sufficiently degraded not to warrant further inventory. On the other hand, a community that was able to obtain permission for more than one site was more likely to have more than one site inventoried.

In the end, eight sites received full field inventories. Those sites are:

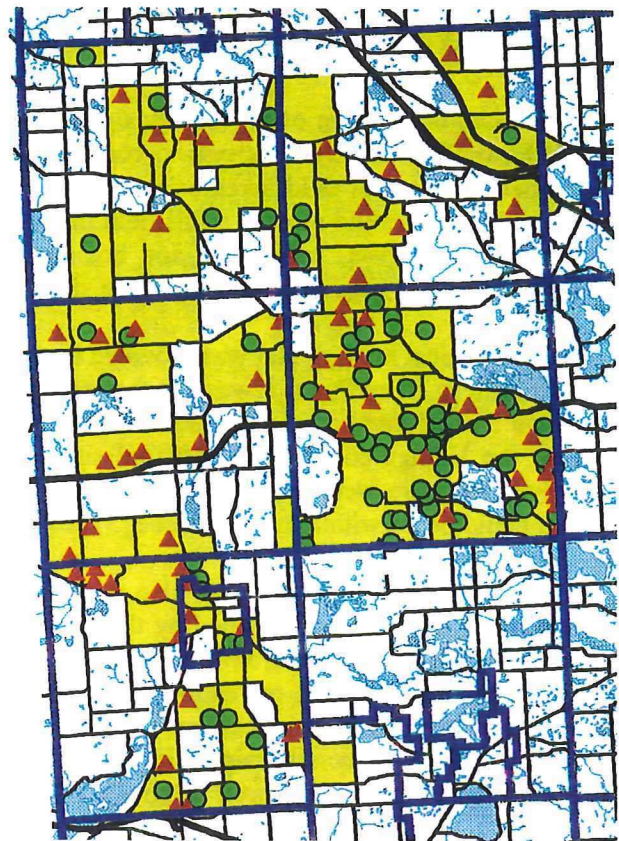
1. I-75 Woods in Springfield Township
2. Long Lake in Springfield Township
3. Huron Swamp Complex in Springfield Township



# Field Inventory Selection - Other Considerations



Parcel Size



Growth Pressures as Identified by Steering Committee Members



Public Ownership

## Legend

-  Parcels Over 40 Acres
-  Road Bounded Areas where growth pressures were Identified
-  Near Term Development Expected Within 3 Years
-  Development Expected Within 3 to 5 Years
-  Parcels in Public Ownership
-  MNFI Sites

4. Huron River Corridor in White Lake Township
5. General Motors Road site in Milford Township
6. Buckhorn Lake Complex in Rose Township
7. Buckhorn Southeast in Highland Township
8. Perch Lake Complex in Rose Township

The Site Ecological Reports prepared by MNFI are included in the appendix to this report. They are technical documents that identify the ecological significance of the site, detail the types of natural communities, plants, and animals found within the site, outline threats to those communities, plants, and animals, and suggest stewardship actions to maintain the integrity of the site. Below are summaries of the Site Ecological Reports highlighting the key findings of the MNFI. A Glossary is included in the appendix. Generic descriptions of natural community types are included in the Glossary.

## **Site Summaries**

### **I-75 WOODS**

#### **Site Description:**

The I-75 Woods site, approximately 425 acres, is characterized by a large, high quality, and highly diverse wetland complex that lies along a stream corridor and a large upland forest dominated by oak and hickory. The forest contains associated wetlands with numerous shallow depressions (vernal pools) that fill with water in the spring, providing prime breeding habitats for invertebrates, which are an important food source for migratory song birds and amphibians. Bordering the forest are several old fields dominated by a variety of exotic (non-native) plants. Dry-mesic forest, emergent marsh, wet meadow, tamarack relict conifer swamp, red pine, old field, and prairie fen are the natural communities that make up the site. Many native plant species were documented in the wetland complex, and the upland areas. The site's hydrology has been altered as a result of the dam at the base of the Davisburg Trout pond. This pond is fed by several small tributaries that flow through a variety of natural communities located both on and off the site.

The northwest portion of the site forms a large, wetland complex comprised of forest, shrub, and herbaceous communities that drain into the Davisburg Trout Pond and ultimately into the Shiawassee River. The high diversity of native species, limited impact by invasive species, and lack of human disturbances are among the factors categorizing this wetland complex as a high quality natural area. A small pocket of prairie fen occurs in the wetland complex, west of the Davisburg Trout Pond and along the channel of the small tributary in the southern portion of the site.

Rolling forested uplands dominate the eastern two-thirds of the site, with pockets of wetland vegetation found in the numerous vernal pools and large ponds. The upland areas are predominantly closed canopy oak-hickory forest. While not found during this field survey, potential animal species associated with the upland forests include the red-shouldered hawk, Cooper's hawk, and some rare forest interior songbird species. The upland areas have sustained considerable disturbance in the past, likely due to logging, haying, and/or grazing.

Several old abandoned fields are found at the site and are almost completely dominated by exotic plant species. One field, however, located in the southern portion of the site, contains a significant number and abundance of native, dry sand prairie plant species, such as wild lupine, big bluestem, Indian grass, and showy goldenrod.



The Secondary Boundary consists of residential development, old fields, agricultural lands, small tributaries, a small lake, and several natural communities including a Relict Conifer Swamp, shrub-carr, and southern wet meadow. Portions of two potentially significant natural areas identified by MNFI are within the secondary boundary Eliza Lake and Shiawassee Lake.

**Element Occurrences:**

The MNFI documented the following noteworthy sensitive plant and animal species and an exemplary natural habitat type (the prairie fen) at the I-75 Woods site (for explanation of the following chart, see Legend for Element Occurrences at the end of this chapter)

<b>Element Occurrence (EO)</b>	<b>Date Last Observed</b>	<b>State Status</b>	<b>Global Rank</b>	<b>State Rank</b>	<b>EO Rank</b>
Tamarack Tree cricket	1999	SC	G1G2	S1S2	BC
Prairie fen	1998	N/A	G3	S3	C
Small white lady's slipper	1987	T	G4	S2	BC

**Threats:**

- Continued spread of exotic species in both the upland and wetland communities
- Disruption to the natural hydrology is a major threat to the prairie fen. This includes any factor affecting aquifer recharge, groundwater flow or water chemistry.
- Habitat fragmentation.

**Stewardship – Primary Boundary:**

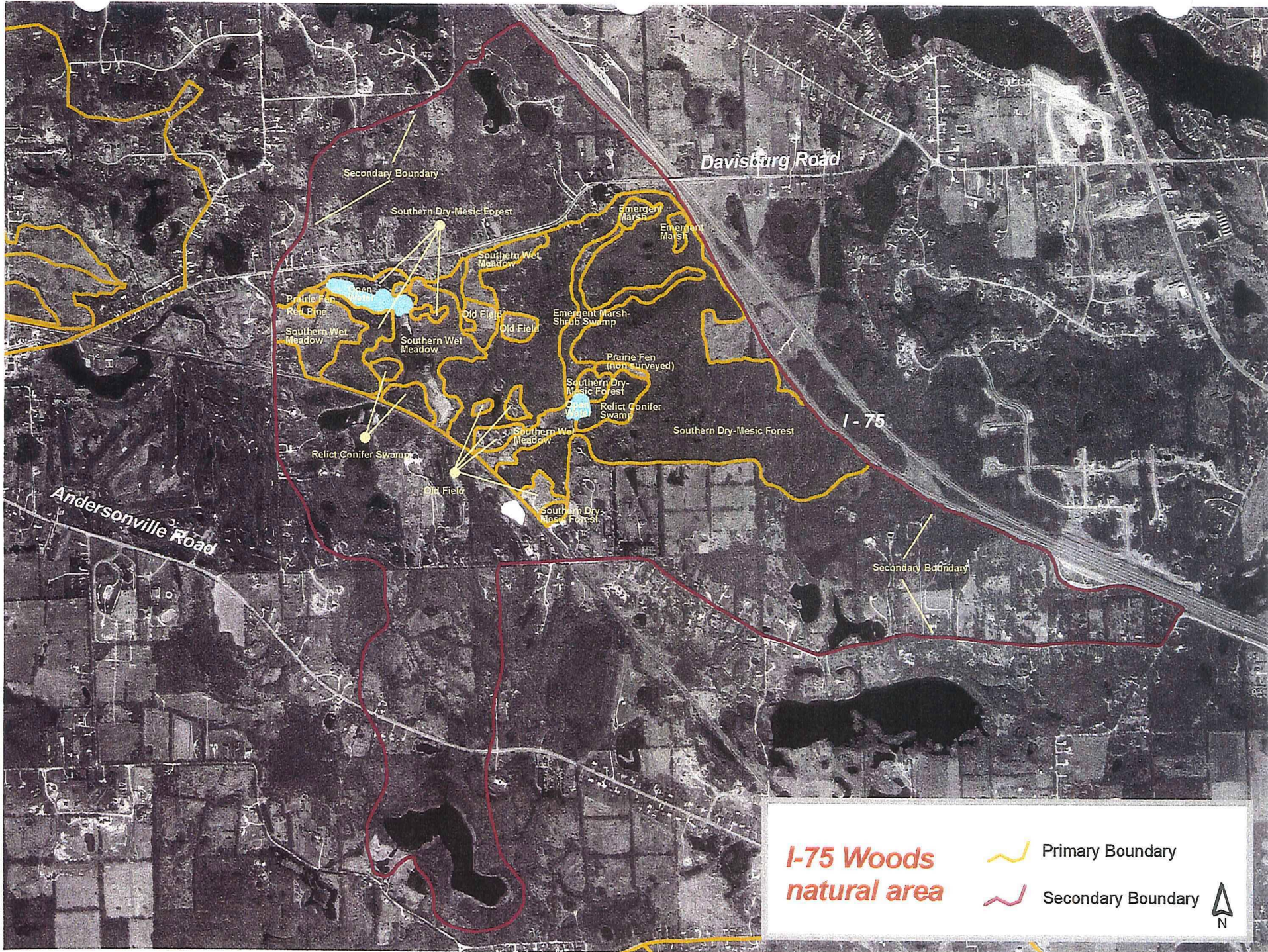
1. The wetland complex should be afforded maximum protection from disturbance. No grazing, timber cutting, Off Road Vehicle (ORV) traffic, or mountain biking should be allowed within the wetland complex. Excessive foot traffic should be minimized.
2. Additional development within the primary boundary should be avoided, minimized, or designed to have minimal impact.
3. Immediate steps should be taken to eliminate purple loosestrife in the wetland complex and a yearly monitoring plan for this and other species should be developed and implemented.
4. The use of prescribed burning as a management tool should be considered.
5. In the uplands, immediate control of garlic mustard should be undertaken and a yearly monitoring plan for this and other exotic species should be developed and implemented.
6. Restoration in the uplands of oak barrens and oak savanna should be undertaken.

**Stewardship – Secondary Boundary:**

Future development within this area should be designed to maximize contiguous natural open space, and provide adequate buffers to the natural communities within the primary boundary. Any development that occurs should be required to address water runoff, percolation, and groundwater consumption.


1. Minimize the size of lawns
2. Landscape with native plants, particularly prairie species.
3. Keep precipitation on-site (especially on ridge tops).
4. Require wells to be drilled to a depth below the aquifer that supports the fen.
5. Maintain adequate septic systems
6. Encourage the management of parcels immediately adjacent to the primary site as natural buffers to the adjacent natural communities





**I-75 Woods  
natural area**

 Primary Boundary

 Secondary Boundary





## LONG LAKE

### Site Description:

The Long Lake site, approximately 600 acres, consists of open water, relict conifer swamp, wet meadow, prairie fen, and an upland forest with adjacent old fields. It is an integral part of an even larger natural complex bordering the headwaters of the Shiawassee River. Together with the adjacent Rattalee Lake site and I-75 Woods site, they form an undisturbed, intact and highly significant natural complex of exceptional ecological value. The existing site encompasses a variety of habitats suitable for different life stages or activities critical to the survival of many wildlife species

Particularly unique to the Long Lake site, and considered very rare, is a high quality prairie fen which supports a number of native plants and animals. The fen extends along the entire length of the river corridor, approximately 265 acres. It is one of the largest known remaining prairie fens in southern Michigan. Rare species found include mat muhly, Poweshiek skipper, and red-legged spittlebug.

Adjacent to the prairie fen to the north is a 200 acre block of second growth upland forest. This southern dry-mesic forest is dominated by varieties of oak and hickory with maple and hazelnut in the understory. The mix of dry uplands interspersed with wet depressions contributes to the forest's moderately high diversity. In the southern portion of the forest is a large great blue heron rookery. This forest is an important habitat for numerous migratory birds and native amphibian species because of its size, occurrence of vernal pools, and proximity to the large wetland complex. Thirty-six bird species were observed during the breeding season. In southeast Michigan, where extensive fragmentation of the natural ecology has occurred, these remaining intact associations of natural communities greatly increase the ecological value of the site.

### Element Occurrences:

The Michigan Natural Features Inventory documented four noteworthy sensitive plants and animal species and an exemplary natural habitat type (the prairie fen) at the Long Lake site (for explanation of the following chart, see Legend for Element Occurrences at the end of this chapter).

Element Occurrence (EO)	Date Last Observed	State Status	Global Rank	State Rank	EO Rank
Prairie fen	1998	N/A	G3	S3	A
Tamarack Tree cricket	1999	SC	G1G2	S1S2	AB
Poweshiek skipper	1998	SC	G2	S1S2	AB
Mat muhly grass	1998	T	G5	S2	A
Massasauga rattlesnake	1993	SC	G3G4	S2S3	B

### Threats:

- Exotic species such as purple loosestrife and glossy buckthorn in the prairie fen and autumn olive in the uplands.
- Continuation of fire suppression in the oak forest.
- Trails throughout the oak forest.
- Potential increase in mountain bike and/or ORV use in the uplands as well as use within the sensitive areas.

- Alteration to the natural hydrology is the biggest threat to the prairie fen. This includes any factor affecting aquifer recharge, hydrologic head, and water chemistry. Such threats include water runoff, overuse of fertilizers and herbicides, trampling, and leaking septic systems.
- Habitat fragmentation.

**Stewardship – Primary Boundary:**

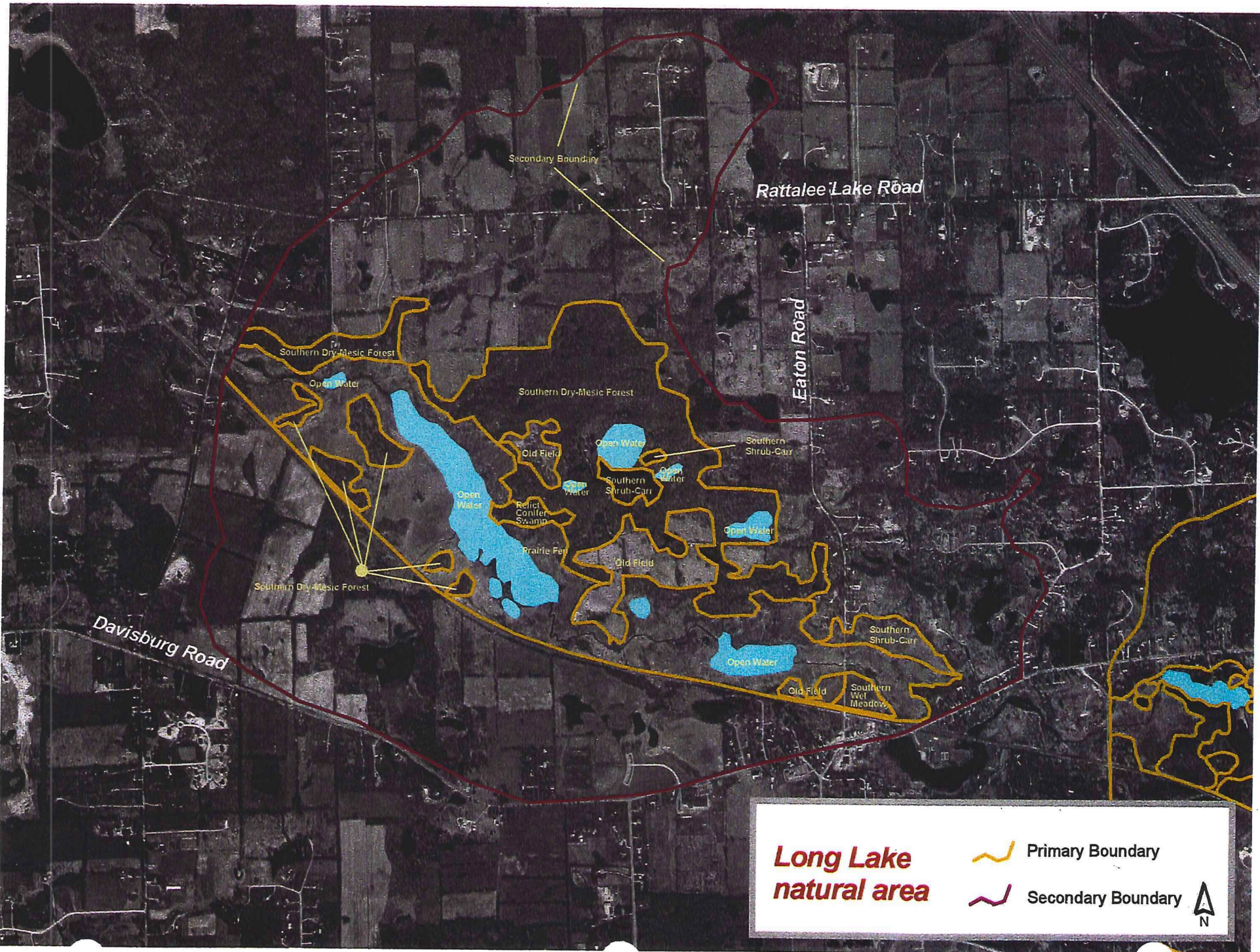
1. Because of the significance of this site and relative fragility of the prairie fen, this site should be afforded maximum protection from disturbance.
2. No grazing, timber cutting, ORV traffic, mountain biking, or excessive foot traffic should be allowed within the prairie fen and adjacent wetlands.
3. Additional development within the primary boundary should be avoided, minimized, or designed to have minimal impact.
4. Populations of exotic plant species within the prairie fen complex, such as purple loosestrife and glossy buckthorn, should be monitored and controlled.
5. Fragmentation of both the wetlands and uplands by utility rights-of-way, trails, and roads should be avoided to minimize impacts of exotic species and predation of bird and turtle nests.
6. It may be advisable to conduct prescribed burns in the prairie fen to reduce shrub and tree growth and enhance the establishment of prairie plants.
7. The oak-hickory forest will require prescribed burns and/or tree thinning in order to stimulate oak regeneration in the understory, as well as herbaceous plants such as coreopsis, sunflower, and pennsylvania sedge.

**Stewardship – Secondary Boundary:**




The primary concern within the secondary boundary is the protection of the flow and quality of groundwater that supports the prairie fen. Future development within this area should be designed to maximize contiguous natural open space, and provide adequate buffers to the natural communities within the primary boundary. Any development that occurs should be required to address water runoff, percolation, and groundwater consumption.

1. Minimize the size of lawns.
2. Landscape with native plants, particularly prairie species.
3. Keep precipitation on-site (especially on ridge tops).
4. Require wells to be drilled to a depth below the aquifer that supports the fen.
5. Maintain adequate septic systems.
6. Encourage the management of parcels immediately adjacent to the primary site as natural buffers to the adjacent natural communities.





**Long Lake  
natural area**

-  Primary Boundary
  -  Secondary Boundary
- 



## HURON SWAMP COMPLEX

### Site Description:

While the surrounding landscape is characterized by steep hillsides and kettle depressions, the Huron Swamp site consists of approximately 1,850 acres of broad, flat, sandy outwash plain. More than two-thirds of the site is dominated by southern swamp and southern mesic forest with scattered pockets of southern wet meadow, southern shrub-carr, and vernal pools, and a prairie fen bordering a small lake. The area constitutes the headwaters of the Huron River and supports many native plant and animal species. This site provides important breeding habitat for amphibians and insect-rich food resources for migrating songbirds. It is also a critical breeding habitat for forest interior songbirds.

The southern swamp contains numerous soft, mucky depressions dominated by red maple, American elm, and black ash. The southern mesic forest is dominated by sugar maple and American beech and harbors a diverse understory and ground layer. The large, contiguous mosaic of southern swamp and southern mesic forest represents an area of high quality and rarity within the surrounding rapidly developing suburban landscape.

Old abandoned agricultural fields occur on several of the level and gently rolling uplands at the northern, southern, and eastern edges of the site. These old fields are primarily dominated by exotic grasses but also contain some native prairie species, particularly in the northern portion. The old fields also provide habitat for declining bird species, such as bobolinks.

A pair of red-shouldered hawks was documented in the Huron Swamp during the field survey. Once common throughout southern Michigan, this occurrence represents one of seventeen known nesting areas in the entire southern Lower Peninsula, and one of only six known nesting areas in southeast Michigan. Because the old fields are adjacent to this vast wetland complex, they provide potential habitat for the eastern massasauga rattlesnake and Blanding's turtle, both state listed as special concern.

The southern portion of the site has been developed as a public park, with parking areas, a nature center, picnic sites, a golf course, and recreation trails including an eight-mile paved bike path.

### Element Occurrences:

MNFI documented four noteworthy animal species and an exemplary natural habitat type (the Southern Swamp) at the Huron Swamp site (for explanation of the following chart, see Legend for Element Occurrences at end of this chapter).

Element Occurrence (EO)	Date Last Observed	State Status	Global Rank	State Rank	EO Rank
Massasauga rattlesnake	1998	SC	G3G4	S3S4	B
Cooper's hawk	1980	SC	G5	S3S4	U
Great blue heron rookery	1982	N/A	N/A	N/A	N/A
Red shouldered hawk	1980	T	G5	S2S3	U
Southern swamp	1986	N/A	G3	S3	B

**Threats:**

- Residential and commercial development in the surrounding area represents a significant threat to the site's hydrology due to runoff, non-point source pollution, and drawdown of the water table.
- The high white-tailed deer population density within the forest will reduce native plant species diversity in many natural communities.
- Invasion by exotic plant species, particularly garlic mustard in the southern mesic forest
- Glossy buckthorn, if not controlled, will eventually dominate the fen and neighboring swamp forest understory.

**Stewardship – Primary Boundary:**

1. Maintain the closed canopy of the southern mesic forest and southern swamp to ensure habitat for forest interior species.
2. Annually monitor for garlic mustard and glossy buckthorn. Remove all invasive plants from the fen, forest, and southern wet meadow.
3. Develop and implement a management plan to reduce the number of white-tailed deer
4. Maintain old fields as grasslands to provide habitat for grassland nesting birds.
5. Conduct prescribed burns to encourage the growth and reproduction of native prairie species in the uplands.

**Stewardship – Secondary Boundary:**

Private lands surrounding the site should be encouraged to provide a native plant buffer between high use areas and the swamp.

1. Minimize the size of lawns.
2. Landscape with native plants.
3. Maintain adequate septic systems.
4. Designate area for lawn clippings that is a safe distance from the natural buffer area.

Minimize runoff of chemicals from the golf course into the adjacent natural areas.

1. Develop and naturalize detention ponds.
2. Use safe procedures for handling chemicals.
3. Incorporate natural buffers around waterways, using native plants.
4. Minimize chemical inputs.







## **HURON RIVER CORRIDOR**

### **Site Description:**

The Huron River Corridor site, approximately 900 acres, contains a large, high quality and diverse upland and wetland forest complex that lies along the Huron River providing habitat for a high number of native plants and animals. Broad, flat, sandy outwash plains with numerous glacial features, creating a mosaic of steep ridges, scattered depressions, and outwash channels generally characterize the area. It is contiguous with the Huron Swamp to the north and Pontiac Lake Recreation Area to the east. Collectively, the three sites form an extensive and relatively intact wetland/upland complex along the upper Huron River and its headwaters. The broad outwash plain continues south from the Huron Swamp occupying most of the eastern and southern portions of the site. The Huron River channel is quite narrow and shallow, while the remainder of the outwash plain forms a fairly level but complex matrix of southern shrub-carr, relict conifer swamp, southern swamp, southern mesic forest, and southern dry-mesic forest. In contrast, the northwest portion of the corridor consists of very hilly uplands dominated by southern dry-mesic forest. Interspersed are numerous wet depressions forming permanent and vernal pools. Several successional old fields are scattered along the edges of the forest matrix. Twenty-eight species of songbirds were found at the site, including the area-sensitive wood thrush, acadian flycatcher, scarlet tanager, and rose-breasted grosbeak.

Similar to the Huron Swamp complex to the north, the mosaic of southern swamp in the eastern portions of the site is of high quality. The swamp grades to shrub-carr and relict conifer swamp along the river corridor. Pockets of relict conifer swamp also occur along Chittenden Lake in the northeast portion of the site and a large unnamed pond to the west. This wetland mosaic is also interspersed with islands of upland southern dry-mesic forest. Rare species likely to be found in the upland forests include goldenseal, twinleaf, showy orchis, ginseng and hairy angelica.

Several scattered old fields that border the upland forested matrix show evidence of once having been an oak barrens community. Most of these areas have significant amounts of exotic plant species, such as brome grass, spotted knapweed and ox-eye daisy. Native species typical of oak barrens and dry sand prairie, however, are interspersed, such as butterflyweed, flowering spurge, little bluestem, compass plant, white false indigo, yellow coneflower, false sunflower, and tall coreopsis.

The amount of upland/wetland forest with the interspersed vernal pools directly contributes to the rich biodiversity of the site. Numerous native animal species require this diverse natural environment to complete the phases of their life cycle. Some of these species include: mole salamanders, wood frog, red-legged spittlebug, tamarack tree cricket, woodland mole, Blanding's turtle, copperbelly water snake, eastern massasauga rattlesnake, red-shouldered hawk, Cooper's hawk, cerulean warbler, prothonotary warbler, vesper sparrow, and grasshopper sparrow. The site is also conducive to providing stop-over breeding habitat for neotropical migratory songbirds.

There is evidence of past logging, grazing, and haying activity in the area. A trail system meanders through the site and is used by hikers, horseback riders, mountain bikers and snowmobilers. These disturbances provide means for transport and establishment of exotic plant species, particularly in the old field and along the edges of the forest matrix.

### **Element Occurrences:**

MNFI did not document any noteworthy sensitive plant and animal species or exemplary natural habitat types at the Huron River Corridor site.

**Threats:**

- The spread of exotic species.
- High deer population.
- High raccoon population.
- Forest fragmentation.
- Chemical runoff.

**Stewardship – Primary Boundary:**

1. Maintain the closed canopy of the southern mesic and southern swamp, as well as portions of the southern dry-mesic forest, to ensure habitat for forest interior species.
2. Annually monitor forest communities for garlic mustard and exotic shrubs and remove from the site.
3. Develop and implement a management plan to reduce the number of white-tailed deer and raccoon at the site and surrounding area.
4. Encourage oak regeneration, as well as increase species diversity, through fire management and if necessary supplemental seeding.
5. Limit further fragmentation of intact forest blocks by utility rights-of-ways and recreational trails.

**Stewardship – Secondary Boundary:**

1. Minimize runoff of chemicals from the golf course into the adjacent natural areas by developing and naturalizing detention ponds, using safe procedures for handling chemicals, incorporating natural buffers around waterways, and minimizing chemical inputs.
2. Manage the forests on both sides of Teggerdine Road as one unit, to maximize the interior area of the forest, providing additional nesting habitat.







## **GENERAL MOTORS ROAD**

### **Site Description:**

The General Motors Road site occupies less than 80 acres of relatively flat land along the Huron River. The surrounding landscape is characterized by rolling topography with numerous outwash channels and wetland depressions. The western half of the site is dominated by old fields with a prevalence of exotic (non-native) plant species (spotted knapweed, common St. John's-wort, and brome grass). Planted trees and weedy shrubs (red cedar, Scots pine, red pine, autumn olive, and tartarian honeysuckle) are also scattered throughout. A small fringe of degraded riparian forest represented by native (red oak, sugar maple, and gray dogwood) and exotic species (black locust and tartarian honeysuckle) borders the river. A relict conifer swamp dominated by tamarack comprises the slightly lower, eastern portion of the site with typical understory species (poison sumac, red maple, and gray and red dogwood) and small areas of southern shrub-carr dominated by thick groves of dogwood. Exotic species (cattail, purple loosestrife, and glossy buckthorn) are common in the open areas and wetlands indicating an altered hydrology. The sparse scattering of particular native species (shrubby cinquefoil and mountain mint) at the southwestern edge of the wetland complex provides some evidence of a former prairie fen.

All portions of the site are highly degraded as evidenced by the dominance of exotic species in the wetland and upland areas and altered hydrology in the wetlands. The site has experienced considerable degradation, first from adjacent homesteading, and more recently through the installation of two gas lines, which bisect the site. The site's hydrology has been altered by extensive development of the surrounding landscape, including the damming of the Huron River to create Hubble Pond to the northeast, recreational use at Camp Dearborn to the north, and the placement of a waste water treatment plant to the east. In addition, the unrestricted public access to the site has allowed for the introduction of exotic species. Although not harboring rare species or unique ecological features, the site hosts a number of common native plant and animal species providing a small refuge in a highly fragmented landscape.

### **Element Occurrences:**

MNFI did not document any noteworthy sensitive plant and animal species or exemplary natural habit types at the General Motors Road site.

### **Threats:**

- Potential development.
- Degradation of the water quality of the Huron River

### **Stewardship – Primary Boundary:**

1. Maintain site in its undeveloped state.
2. Prevent the use of off-road vehicles and illegal dumping at the site.
3. Use controlled burning and seeding of native prairie species to restore the oak barrens community in the uplands.
4. Maintain the riparian buffer along the river.
5. Minimize the further spread of exotic species such as purple loosestrife and glossy buckthorn.
6. Remove all purple loosestrife and glossy buckthorn plants from the site and monitor annually the areas where they occurred

### **Stewardship - Secondary Boundary:**

None were identified due to the quality and limitations of the site.





Milford Twp.

Milford Village

Secondary Boundary

Southern Shrub-Carr

Relict Conifer Swamp

Southern Swamp

Emergent Marsh

Old Field

Old Field

Southern Swamp

General Motors Road

Martindale Road

**GM Road**  
**natural area**



Primary Boundary



Secondary Boundary



ty Picture>



## **BUCKHORN LAKE COMPLEX (ROSE TOWNSHIP)**

### **Site Description:**

The Buckhorn Lake Complex, approximately 740 acres, is a significant wetland and forested upland complex. It is a site of high ecological value due to the occurrence of a high quality prairie fen along the west side of the railroad tracks, known as Big Valley fen, coupled with a smaller prairie fen on the western portion of the site. The Big Valley prairie fen is considered high quality because of its overall native plant species diversity, high proportion of sedges and grasses, large size, and intactness. Being approximately two miles in length and 150 acres in size, it is one of the largest known prairie fen complexes in southern Michigan. Several types of prairie fen exist in the complex, such as a domed fen, hanging fen, and marl pool which provide habitat for a broad array of native plant and animal species, including poweshiek skipper (state threatened), small white lady's slipper (state threatened), and massasauga rattlesnake (state special concern). There is little evidence of direct disturbance to the Big Valley prairie fen, but the occurrence of exotic plant species such as glossy buckthorn, purple loosestrife, and narrow-leaved cattail is evident. The smaller prairie fen complex in the western part of the site is composed of three distinct patches surrounding a small irregularly shaped pond. Although the size of each patch of fen is relatively small, together they contain a high diversity of plant and animal species, including mat muhly (state threatened), tamarack tree cricket (state special concern), and Blanding's turtle (state special concern). In addition, the southern shrub-carr scattered along the southern wet meadows, prairie fens throughout the complex, and the emergent marsh adjacent to the lake contain potential habitat for several rare, plant and animal species.

The upland areas are relatively small and isolated due to the topography at the site. Most areas are either old field or early successional southern dry-mesic forest with some patches of second growth forest. In the central portion of the site is a relatively large southern dry-mesic forest, approximately 115 acres, with several vernal pools scattered toward the east. Very little oak regeneration is found in the understory due to years of fire suppression. As a result, exotic species, particularly garlic mustard and autumn olive, are abundant in the ground cover. South of the central forest tract, between a southern wet meadow and the old field, is a small southern dry-mesic to southern mesic forest that includes a population of goldenseal (state threatened).

Old fields are scattered throughout the uplands and are dominated by exotic plant species such as brome grass, orchard grass, and spotted knapweed. A few of these old fields along the railroad tracks that border the prairie fen and wet meadow, however, contain several prairie plant species such as black-eyed Susan, Indian grass, little bluestem, and bush cover. They also provide potential habitat for several rare species such as eastern massasauga rattlesnake, Blanding's turtle, spotted turtle, and box turtle.

### **Element Occurrences:**

MNFI documented seven noteworthy sensitive plants and animal species and an exemplary natural habitat type (the prairie fens) at the Buckhorn Lake Complex site. For an explanation of the chart, see the Legend for Element Occurrences at the end of this chapter.

Element Occurrence (EO)	Date Last Observed	State Status	Global Rank	State Rank	EO Rank
Prairie fen	1999	N/A	G3	S3	A
Prairie fen	1999	N/A	G3	S3	BC
Small white lady's slipper	1999	T	G4	S2	C
Goldenseal	1999	T	G4	S2	BC
Blanding's turtle	1999	SC	G4	S3	E
Massasauga rattlesnake	1995	SC	G3G4	S3S4	B?
Mat muhly grass	1999	T	G5	S2	BC
Tamarack Tree cricket	1999	SC	G1G2	S1S2	A
Tamarack Tree cricket	1999	SC	G1G2	S1S2	AB
Poweshiek skipper	1999	T	G2	S1S2	BC

**Threats:**

- The spread of exotic species.
- Increased ORV use
- Disruption of the natural hydrology.
- Water runoff.
- Superfund Site on Demode Road
- Overuse of fertilizers and herbicides.
- Leaky septic systems
- Fire suppression
- Habitat fragmentation.

**Stewardship – Primary Boundary:**

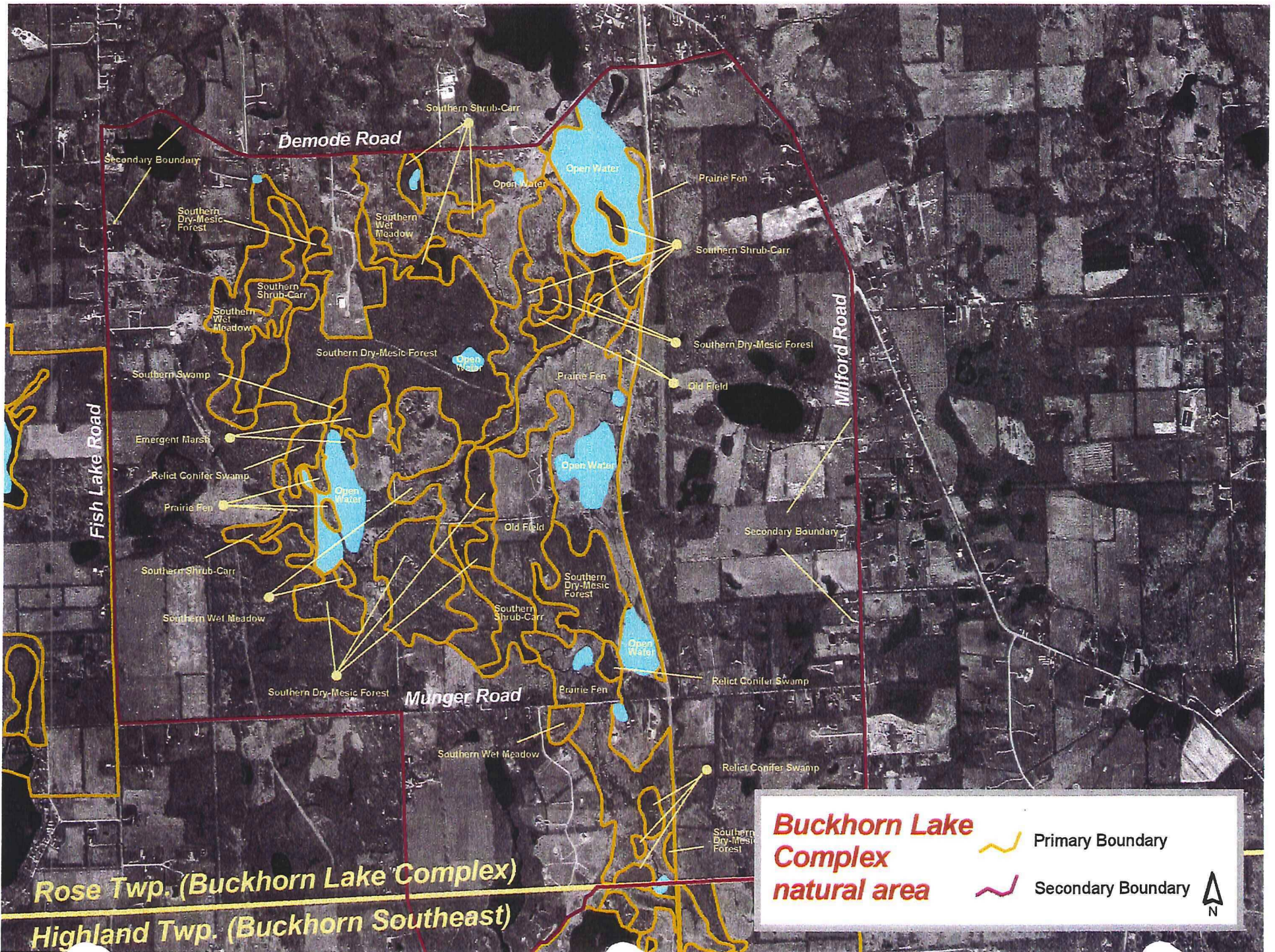
1. No grazing, timber cutting, ORV traffic, mountain biking, or excessive foot traffic should be allowed within the prairie fen complexes.
2. Develop an alternative to herbicide spraying to control vegetative growth along the railroad tracks.
3. Development should be avoided, minimized, or designed to have minimal impact.
4. Monitor and control populations of exotic plant species within the prairie fen complex.
5. Avoid fragmentation of both the wetlands and uplands by utility right-of-ways, trails, and roads.
6. Conduct prescribed burns in the prairie fen to reduce shrub and tree growth and enhance the establishment of prairie plants.
7. Conduct prescribed burns and tree thinning to stimulate oak regeneration as well as herbaceous plants.
8. Remove exotic plants from old fields and restore to oak barrens.
9. Consider acquisition and focus restoration on the largest old field in the primary boundary located north of Perry Road and to the east of the Big Valley fen.
10. Inform landowners of the unique natural features in the area and how they can help conserve those features.

**Stewardship – Secondary Boundary:**

1. Development should be designed to maximize contiguous natural open space and provide adequate buffers to the natural communities within the primary boundary.

2. Require development to address surface water runoff, percolation, and groundwater consumption by minimizing lawn size, landscaping with native plants; keeping precipitation on-site, requiring wells to be drilled to a depth below the aquifer that supports the fen; and maintaining adequate septic systems
3. Encourage parcels immediately adjacent to the primary site to manage their lands in a way that enhances or provides an adequate buffer to the adjacent natural communities in the primary boundary
4. Inform landowners adjacent to the prairie fen complex of the unique natural features in the area and how they can help conserve those features.







## BUCKHORN SOUTHEAST (HIGHLAND TOWNSHIP)

### Site Description:

The topography at the Buckhorn Southeast site ranges from steep hills to narrow, relatively flat channels. The core area of the site consists of approximately 210 acres and is characterized by scattered sandy knolls surrounded by outwash channels that are low and wet. No high quality natural communities were found at the site and the majority of wetland and upland patches are small in size. The primary significance of the site is its location just to the south of the Buckhorn Lake Complex, and the northward flow of surface water from Buckhorn Southeast to the Buckhorn Lake Complex. Plant communities found at the site include southern dry-mesic forest, southern mesic forest, old field, southern shrub-carr, emergent marsh, and southern wet meadow.

The site predominately consists of low narrow channels dominated by two wetland communities common throughout the Midwest, southern wet meadow and southern shrub-carr. A few pockets of emergent marsh are also found in the outwash channels. Typical plant species were found in each community. The quality of the wetlands at the site is moderate, however, the wet meadow and emergent marsh complex at the north end of the site contains significant amounts of purple loosestrife, a very aggressive, exotic wetland plant.

The uplands in the site tend to be small knolls or hills scattered throughout and isolated by outwash channels. They are dominated by old fields and fragmented young southern dry-mesic forests. A relatively large southern mesic forest is located in the central-east portion of the site. Exotic plant species such as tartarian honeysuckle, autumn olive, white swallow-wort, common St. John's wort, and Canada bluegrass are found throughout the upland forests. The old fields are dominated by exotic plant species such as brome grass, orchard grass, and spotted knapweed. A few of the old fields near the railroad tracks also contain native prairie plant species such as black-eyed susan, bee balm, and big bluestem and suggest the potential for oak barrens or savanna restoration. Several of these old fields border wet meadow and may provide potential habitat for several state listed species such as the eastern massasauga rattlesnake, Blanding's turtle, spotted turtle, and box turtle.

### Element Occurrences:

MNFI documented one noteworthy sensitive animal species at the Buckhorn Southeast site (for explanation of the following chart, see the Legend for Element Occurrences at the end of this chapter).

Element Occurrence (EO)	Date Last Observed	State Status	Global Rank	State Rank	EO Rank
Blanding's turtle	1999	SC	G4	S3	E

### Threats:

- The spread of exotic plants
- Fire suppression
- Habitat fragmentation in the uplands
- Exposing wetlands to increased nutrient loading from adjacent uplands.
- Increased residential development in the uplands.

**Stewardship – Primary Boundary:**

1. Development within the primary area should be avoided, minimized, or designed to have minimal impact on remaining natural communities and associated species
2. Conduct prescribed burns and tree thinning in the patches of southern dry-mesic forests to stimulate oak regeneration as well as herbaceous plants.
3. Control and monitor exotic plants in the uplands.
4. Remove exotic plants from old fields and restore to oak barrens.
5. Eradicate purple loosestrife and reed canary grass from the site and monitor the results of management activities.

**Stewardship – Secondary Boundary:**

1. Protect the flow and quality of ground and surface water that supports the wet meadows, emergent marshes, and shrub-carr communities.
2. Development should be designed to maximize contiguous natural open space, and provide adequate buffers to the natural communities within the primary boundary
3. Require development in the northeast portion of the site to address surface water runoff, percolation, and groundwater consumption by minimizing lawn size, landscaping with native plants; keeping precipitation on-site; requiring wells to be drilled to a depth below the aquifer that supports the fen; and maintaining adequate septic systems.
4. Inform landowners, adjacent to the prairie fen complex bordering the north end of the site, of the unique natural features in the area and how they can help conserve those features.
5. Increase connectivity and native habitat by converting old fields to oak barrens or southern dry-mesic forest.
6. Development in this area should be designed to maximize contiguous natural open space, and provide adequate buffers to the natural communities within the primary boundary



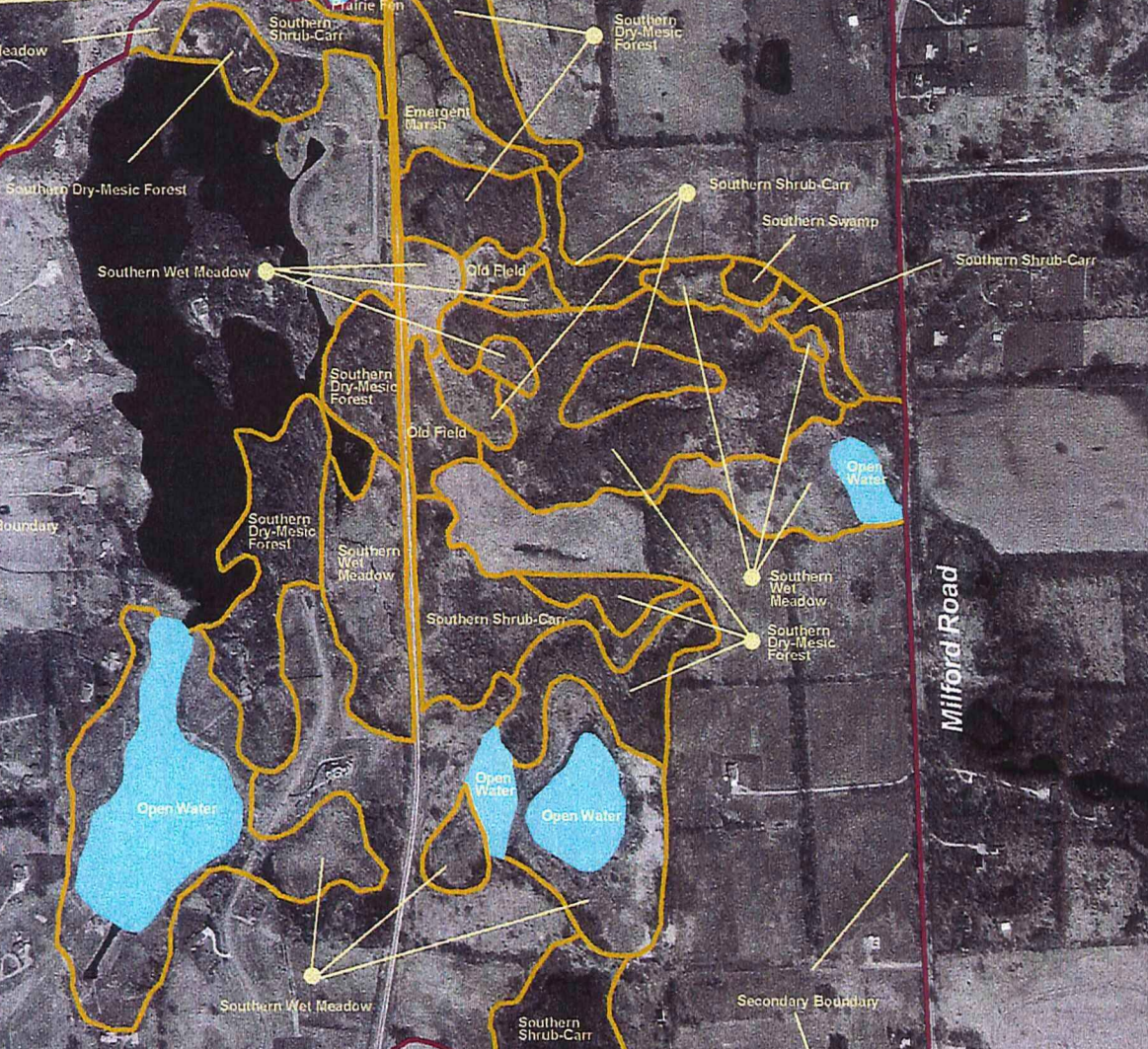
Rose Twp. (Buckhorn Lake Complex)

Highland Twp. (Buckhorn Southeast)


Buckhorn Road

Milford Road

Clyde Road



**Buckhorn  
Southeast  
natural area**

 Primary Boundary

 Secondary Boundary





## PERCH LAKE COMPLEX

### Site Description:

Perch Lake is one of the largest forested complexes in the western portion of the project area, consisting of approximately 350 acres of contiguous wetlands, lakes, and upland forest. The site consists of gently rolling, sandy moraines surrounding a broad outwash plain. The uplands support dry-mesic forests, which surround an outwash plain harboring wetland forests and two glacial lakes. Natural communities occurring at the Perch Lake site include open bog, relict conifer swamp, mixed hardwood-conifer swamp, and dry-mesic forest. The wetland complex located in the center of the Perch Lake Complex is the most ecologically significant area of the site and is dominated by hardwood-conifer forest. The hardwood-conifer swamp is the dominant natural community in the outwash plain, covering approximately 80 acres.

North of the small lake, the hardwood-conifer swamp grades into a black spruce dominated relict conifer swamp, which is considered rare in southern Michigan. The size of the relict conifer swamp appears to be decreasing. In the center of the outwash plain sits a small lake bordered by a narrow band of open bog, a unique natural community that is considered uncommon in southern Michigan.

Where the land rises, the sandy, rolling uplands support a dry-mesic forest dominated by oak and hickory species. In addition, several exotic plant species such as multiflora rose, common buckthorn, and Norway maple are found throughout the forest. Norway maple is the most problematic in southern Michigan upland forests. Vernal pools are also found throughout the upland southern dry-mesic forests and serve as important habitats for numerous amphibian species. Salamanders and frogs, such as the wood frog, utilize vernal pools for mating, egg laying, and feeding during the aquatic phase of their life cycle. Several active and abandoned agricultural fields border the dry-mesic forest.

While no rare species were found, there is potential habitat for several state listed birds and turtles including spotted turtle, Blanding's turtle, box turtle, cerulean warbler, prothonotary warbler, and Cooper's hawk. Thirty-two species of birds were found at the site during the breeding season including an osprey. The three lakes on the site combined with the large size of the surrounding wetland forests suggest that Perch Lake is an important stopover point for neotropical migrants.

### Element Occurrences:

MNFI documented an exemplary natural habit type (the Relict Conifer Swamp) at the Perch Lake Complex site (for explanation of the following chart, see Legend for Element Occurrences at the end of this chapter).

Element Occurrence (EO)	Date Last Observed	State Status	Global Rank	State Rank	EO Rank
Relict Conifer Swamp	1999	N/A	G5	S4?	BC

### Threats:

- The spread of exotic plants.
- Runoff of storm water, lawn chemicals, or fertilizers into the wetland.
- Residential development in the uplands.
- High density of red maple and other broad-leaved tree species.

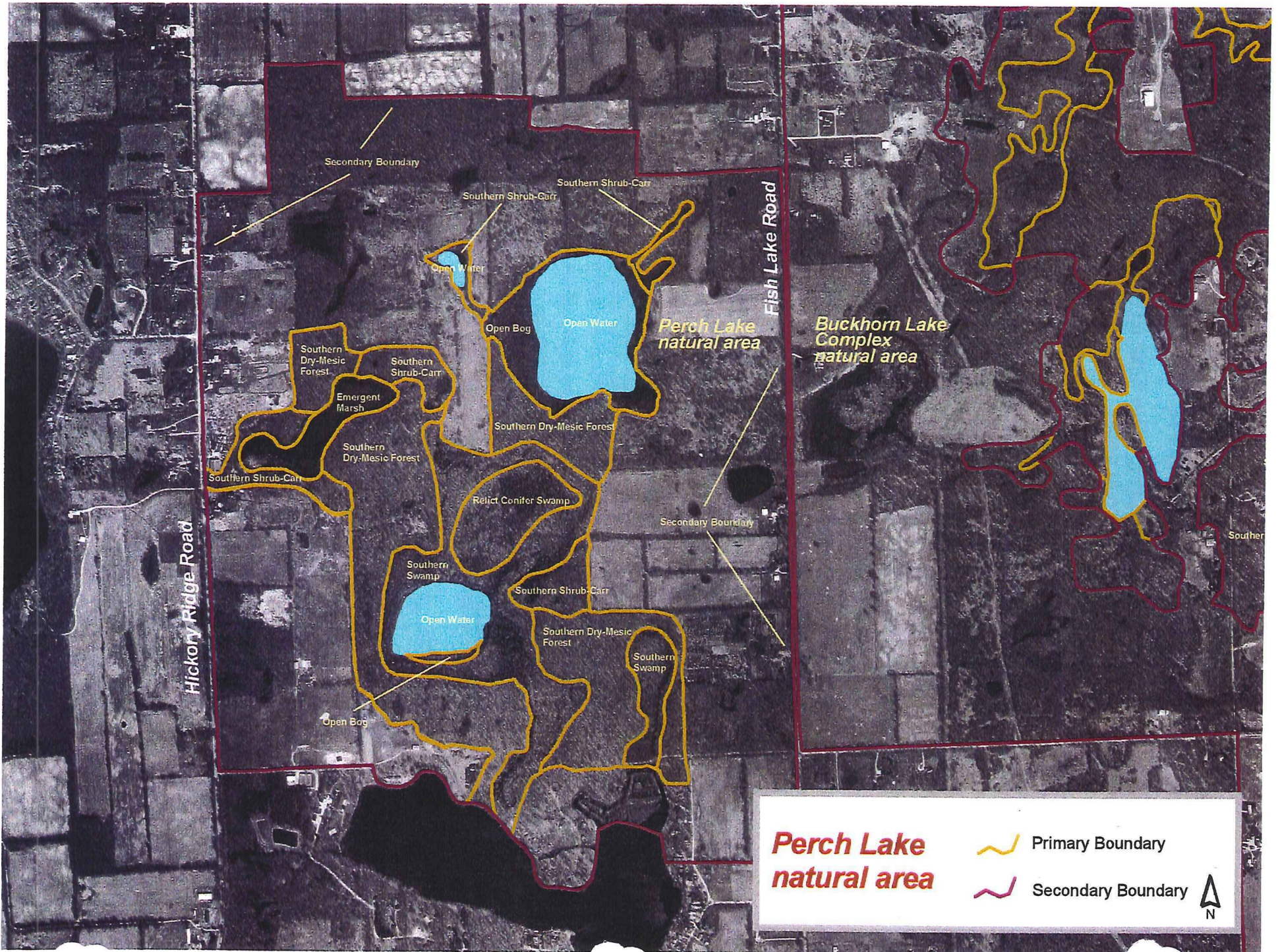
**Stewardship – Primary Boundary:**

1. Remove glossy buckthorn and Japanese barberry from the hardwood conifer swamp and relict conifer swamp.
2. Thin red maple and other broad-leaved tree species within the hardwood conifer swamp
3. Remove red maple from the relict conifer swamp.
4. Remove common buckthorn, multiflora rose, and Norway maple from the southern dry-mesic forest
5. Conduct prescribed burns and tree thinning in the southern dry-mesic forests to stimulate oak regeneration as well as herbaceous plants.
6. Conduct prescribed burns to control the spread of exotic species.
7. Protect the upland and wetland forests in the southern portion of the site to maintain a direct link to Fish Lake, and the natural corridor between Fish Lake, the unnamed lake, and Perch Lake.

**Stewardship – Secondary Boundary:**

1. Allow existing vegetated areas to remain open space and serve as a buffer for the natural communities within the primary area and as wildlife corridors.
2. Manage old fields surrounding Perch Lake for southern dry-mesic forest or oak barrens to connect Perch Lake and its adjacent natural communities to nearby forests and wetlands.
3. Encourage residential areas surrounding the site to provide a native plant buffer between high use areas and the swamp.
4. Other considerations for residential areas include maintaining septic systems, minimizing lawn areas, landscaping with native plants, and designating an area for lawn clippings that is a safe distance from the natural buffer area.







## Legend for Element Occurrences

In 1985, the Michigan Natural Features Inventory (MNFI) initiated comprehensive and systematic inventories to identify all communities of high natural quality and condition on a county or regional basis. Because the results are comprehensive, it is possible to design conservation plans which ensure protection of each county's natural diversity. The MNFI used this systematic inventory approach to identify the areas of highest natural integrity in Oakland County. To organize the MNFI data and set conservation priorities, each natural feature (an element) is ranked using factors of rarity and threat on a state-wide (state element ranking) and range-wide basis (global element ranking).

The following is the legend to the element occurrence charts

### State Status

- SC Species that is of special concern
- T Species that is threatened
- N/A Not available

### Global Rank

- G1 Critically imperiled globally because of extreme rarity or because of some factor(s) making it especially vulnerable to extinction
- G2 Imperiled globally because of rarity or because of some factor(s) making it very vulnerable to extinction throughout its range
- G3 Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (a single state or physiographic region of a country) or because of other factors making it vulnerable to extinction throughout its range
- G4 Apparently secure globally, though it might be quite rare in parts of its range, especially at the periphery
- G5 Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery

### State Rank

- S1 Critically imperiled in state because of extreme rarity or because of some factor(s) making it especially vulnerable to extirpation from the state
- S2 Imperiled in state because of rarity or because of some factor(s) making it very vulnerable to extirpation from the state
- S3 Rare or uncommon in the state
- S4 Apparently secure in state, with many occurrences
- S5 Demonstrably secure in state and essentially ineradicable under present conditions

### Element Occurrence (EO) Rank

Represents a comparative evaluation summarizing several factors including:

- 1 Quality - the representativeness of the occurrence especially as compared to Element Occurrence specifications and including maturity, size, numbers, etc.
- 2. Condition - how much has the site and the Element Occurrence itself been damaged or altered from its optimal condition and character.
- 3. Viability - the long-term prospects for continued existence of the occurrence
- 4 Defensibility - the extent to which the occurrence can be protected from extrinsic human factors that might otherwise degrade or destroy it.

- A = Excellent
- B = Good
- C = Marginal
- D = Poor
- E = Extinct (exists but population viability is unknown)
- X = Destroyed, bland
- U = Unknown



