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# Natural Features Survey and Management Recommendations for Walloon Lake Mesic Northern Forest



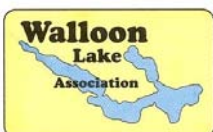
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MICHIGAN STATE  
UNIVERSITY  
EXTENSION



Cover photograph: Large-diameter hemlock, beech, and sugar maple dominate the canopy of the high-quality old-growth forest found along the shores of the Walloon Lake (All photographs by Joshua Cohen unless otherwise noted).

## INTRODUCTION

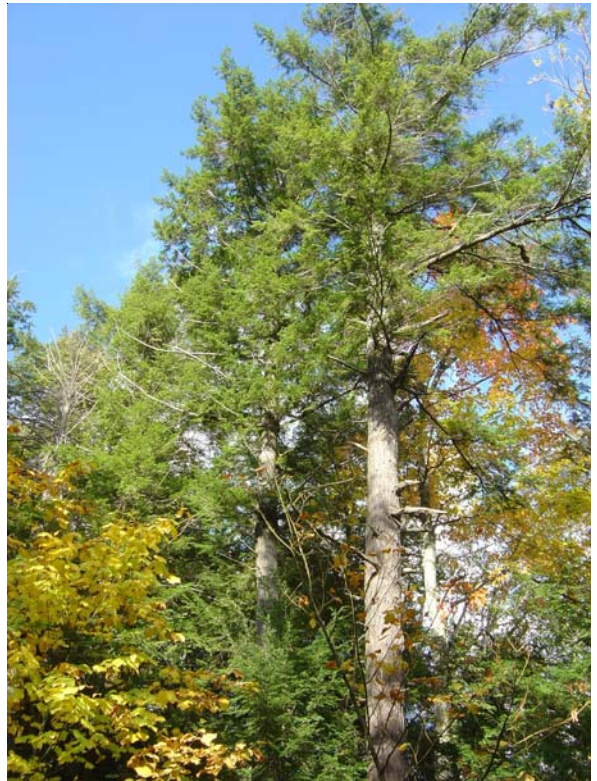
In the fall of 2005, the Walloon Lake Association commissioned Michigan Natural Features Inventory (MNFI) to conduct an ecological survey of forest on state land adjacent to Walloon Lake in Township 33N, Range 06W and sections 10 and 11. This area falls within the Gaylord Forest Management Unit, Compartment 38, Stand 1 (M9M5) and part of this area has been proposed by the Department of Natural Resources as a public boat launch. The purpose of the survey was to assess the quality of the forest adjacent to the lake to determine if the site qualified for consideration as a high-quality example of mesic northern forest as defined by MNFI's ranking criteria and standard Natural Heritage methodology.

Mesic northern forest is a forest type of moist to dry-mesic sites found mostly north of the transition zone in Michigan. This forested system is characterized by the presence of northern hardwoods, mainly sugar maple and beech, but conifers, such as hemlock, and white pine are frequently important canopy associates. Mesic northern forest is found chiefly on coarse-textured ground and end moraines and typically on loamy sand to sandy loam. The natural disturbance regime of these forests is characterized by gap-phase dynamics; frequent, small windthrow gaps allow for the regeneration of the shade-tolerant canopy dominants. Catastrophic windthrow occurs infrequently with several generations of trees passing between large-scale, severe disturbance events.

Historically mesic northern forests dominated vast areas of uplands of the Great Lakes and were multi-generational, with old-growth conditions lasting many centuries. Large contiguous tracts of



**Photograph 1. Old-growth mesic forest, especially along lakeshores have become extremely rare in Michigan. View of Walloon Lake old-growth forest from lake.**



**Photograph 2. Large-diameter hemlock are canopy dominants of the Walloon Lake forest. Hemlock old-growth is one of the rarest forest systems in the Midwest.**

old-growth and late-successional mesic northern forest provide important habitat for numerous plants, vertebrates, and invertebrates that are dependent on the diverse functional, structural, and composition attributes of mesic northern forest.

Intensive and pervasive anthropogenic disturbance during the past 150 years has altered the extent, landscape pattern, natural processes, structure, and species composition of mesic northern forest. Mesic northern forest, especially old-growth and late-successional forest with hemlock, has been drastically reduced in acreage. Large tracts of primary old-growth forest presently cover less than 0.2% of Michigan.

Mesic northern forest has become fragmented, with most old-growth and late-successional stands persisting as remnant patches enmeshed in a matrix of agricultural lands, early successional forest, and young northern hardwoods. Short rotation timber management has replaced gap-phase dynamics as the dominant disturbance factor impacting structure and composition. Structural alterations include the reduction of large-diameter trees, snags, and coarse woody debris. Therefore, it is imperative to maintain the integrity of old-growth mesic northern forest where remnant patches persist.

## METHODS

There are three factors to consider when applying Natural Heritage and MNFI methodology to assess a site's quality: size, landscape context, and condition. If a site meets defined requirements for these three criteria it is categorized as a high-quality example of that natural community type, given a ranking based on the consideration of its size, landscape context, and condition, and entered into MNFI's database as an element occurrence. A combination of ground surveys, aerial photographic interpretation, and Geographic Information System (GIS) analysis was employed to determine the size and the landscape context of the surveyed forest; fall and early growing season surveys were conducted to assess the condition of the forest. Surveys were conducted October 17 and 18, 2005 and June 9, 2006. Three MNFI ecologists participated in the inventory. Surveys included meander searches throughout the entire extent of the mesic northern forest, cataloging the native flora, describing the site's structural attributes and ecological processes, noting current anthropogenic disturbance, ground-truthing aerial photographic interpretation using a Garmin Global Positioning System (GPS), and surveying adjacent forest to assess landscape context.

## RESULTS

Based on the consideration of the site's size, landscape context, and condition, this mesic northern forest was determined to be a high-quality example of the mesic northern forest community and has been entered into MNFI's database as a B-ranked mesic northern forest.

### Size

The size of the high-quality forest was determined to be 31 acres based on aerial photographic interpretation, GIS analysis, and ground-truthing using GPS units. The area of high-quality forest was delimited using GPS points, which were overlaid in a GIS system to draw a polygon depicting the extent of the occurrence (Figure 1). According to MNFI ranking criteria, mesic northern forests that are 25-49 acres are classified as small. Compared to the historical extent of mesic northern forests and other high-quality examples of this system, especially in the Upper Peninsula, this site is small and merits a C rank for size.

### Condition

Though small in size, the forest is characterized by excellent condition and very good landscape context. The mesic northern forest occurs on drumlinized ground moraines formed in coarse-textured glacial till of ecological sub-subsection VII.5.2 (Figure 2). Soils within the site are acidic to slightly acidic sandy loam and loamy sand overlying sands. The mesic northern forest, which occurs on the slopes adjacent to Walloon

Lake, contains structural and compositional attributes of an uneven-aged old-growth forest driven by gap-phase dynamics. The forest, dominated by large-diameter hemlock, sugar maple, and beech, is characterized by numerous canopy gaps, high volume of large-diameter snags and coarse wood of varying species and states of decomposition, and pit and mound microtopography (Photographs 3 and 4). The well-developed pit and mound topography indicates that the site has supported forest cover for thousands of years. Diameters of canopy dominants, snags, and coarse woody debris ranged widely from 40 cm to 90 cm. Two canopy-dominant hemlocks were cored using an increment borer to estimate their age. A 62 cm hemlock was estimated to be 285 years old, while a 64 cm hemlock was estimated to be 254 years old. Old trees in the canopy, large-diameter coarse woody debris of late-successional species and advanced decomposition classes, and well-developed pit and mound topography from small-scale windthrow events suggest that old-growth conditions have existed at this site for several centuries.

In addition to hemlock and yellow birch occurring in the canopy, both species are represented in the seedling and sapling classes, growing on nurse logs and on tip-up mounds (Photographs 5 and 6). The presence of these species, in addition to Canada yew and cedar regeneration in a swamp finger that occurs within the site, suggests that deer herbivory is probably not limiting recruitment and species composition within this forest. The prevalence of old-growth trees, structures, and processes results in an excellent condition ranking for this site. The high volume of coarse woody debris along the lakeshore and the abundance of old hemlock, cedar, and yellow birch along the lake's edge are unique features of this site (Photographs 7-12). Over 0.6 miles of lakefront old-growth forest occur at this site.

The native flora for this site is typical of these systems. Surveyors noted 53 native species; all plant species documented during the surveys are listed in Appendix 1. The canopy and subcanopy were dominated by sugar maple, beech, and hemlock. A diverse array of canopy associates included yellow birch and cedar (concentrated along the lakeshore), and scattered basswood, white birch, white ash, and bigtooth aspen. The understory was dominated by shade-tolerant saplings of beech and sugar maple, with hemlock saplings also prevalent and ironwood common along the upper slopes. Characteristic ground cover species include blue cohosh, doll's eyes, wild leek, wild sarsaparilla, Canada mayflower, hairy sweet cicely, false spikenard, common trillium, maidenhair fern, Indian cucumber, sharp-lobed hepatica, yellow violet, blue-stemmed goldenrod, and downy solomon seal.

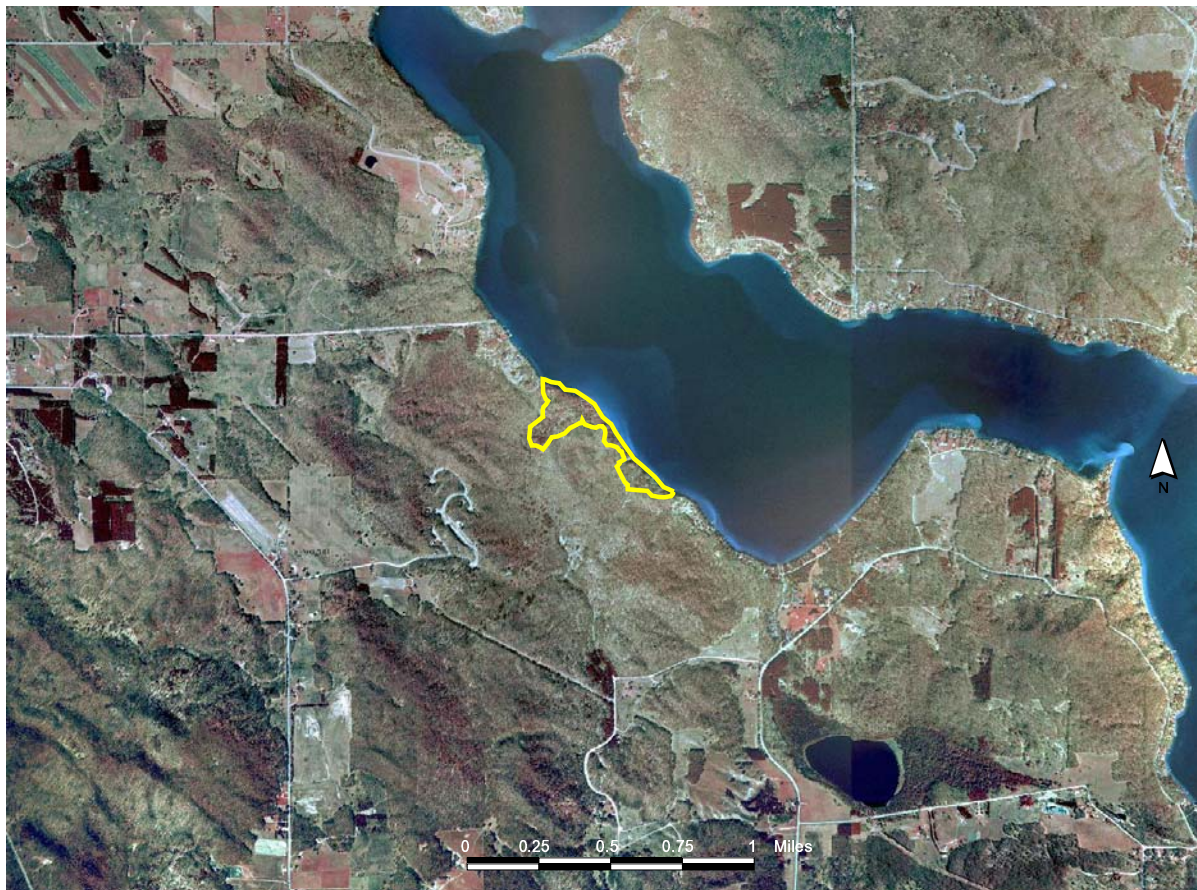
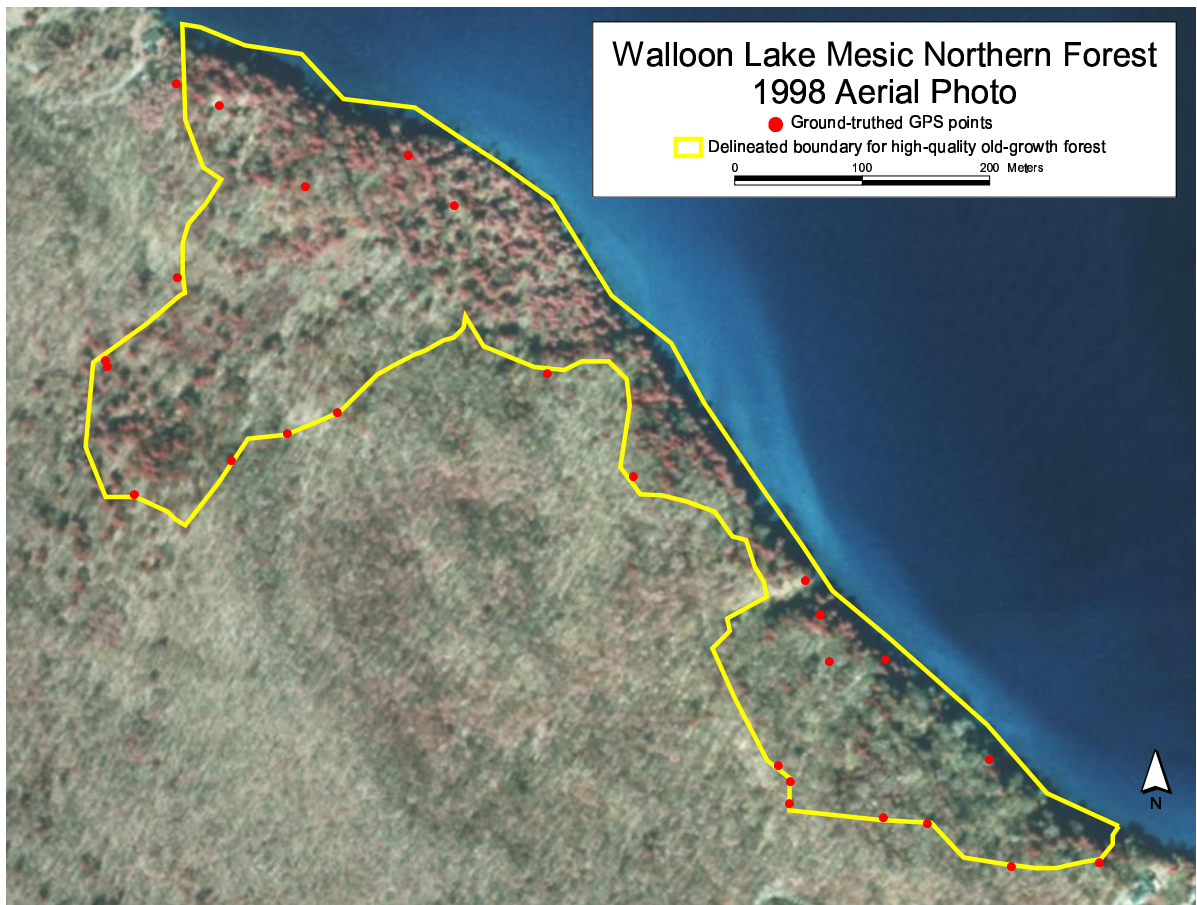
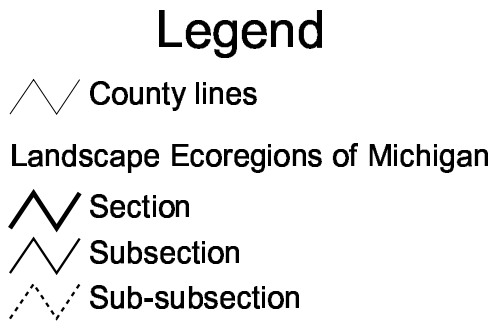
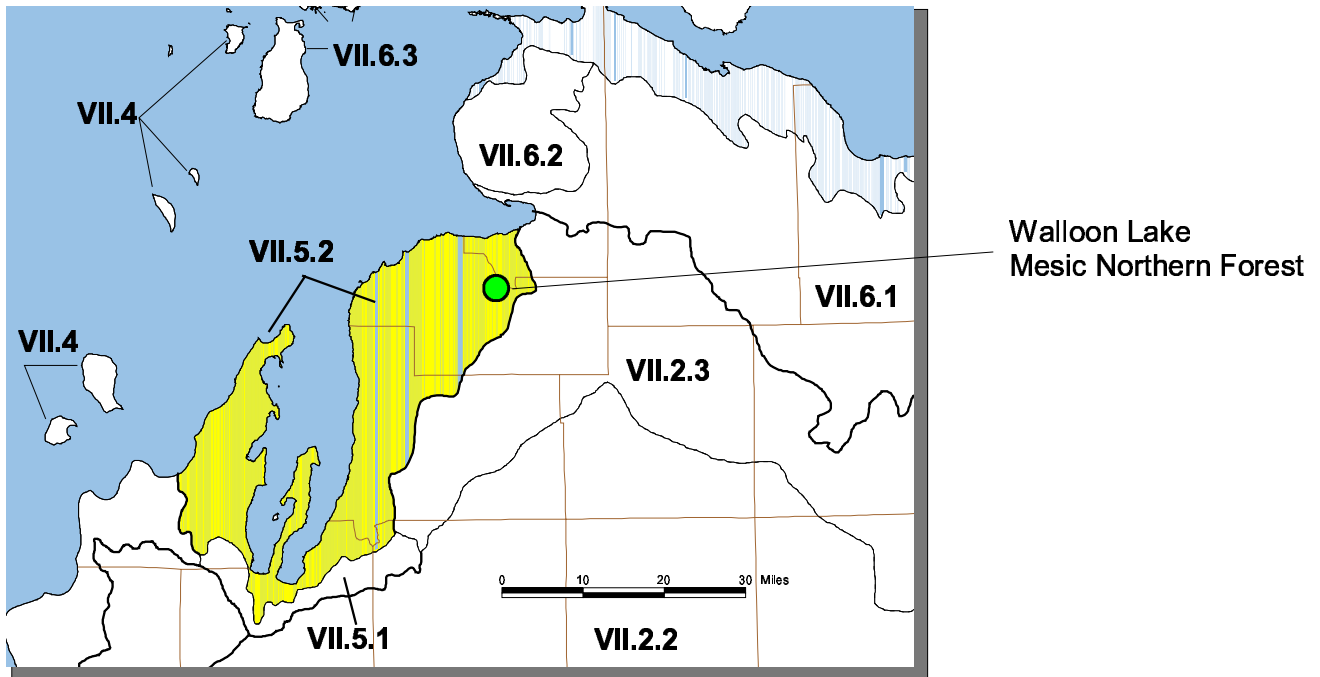


Figure 1. The acreage of the old-growth forest along Walloon Lake was calculated by combining aerial photographic interpretation of 1998 imagery, GIS analysis, and ground-truthing techniques with GPS units.



Data Source:  
 Albert, D. A. 1995. Regional Landscape Ecosystems of Michigan, Minnesota, and Wisconsin: A Working Map and Classification (Fourth Revision: July 1994). Lansing, MI: Michigan Natural Features Inventory. Report number 1995-01. 250pp.  
 GIS coverage approximate map scale 1:100,000.

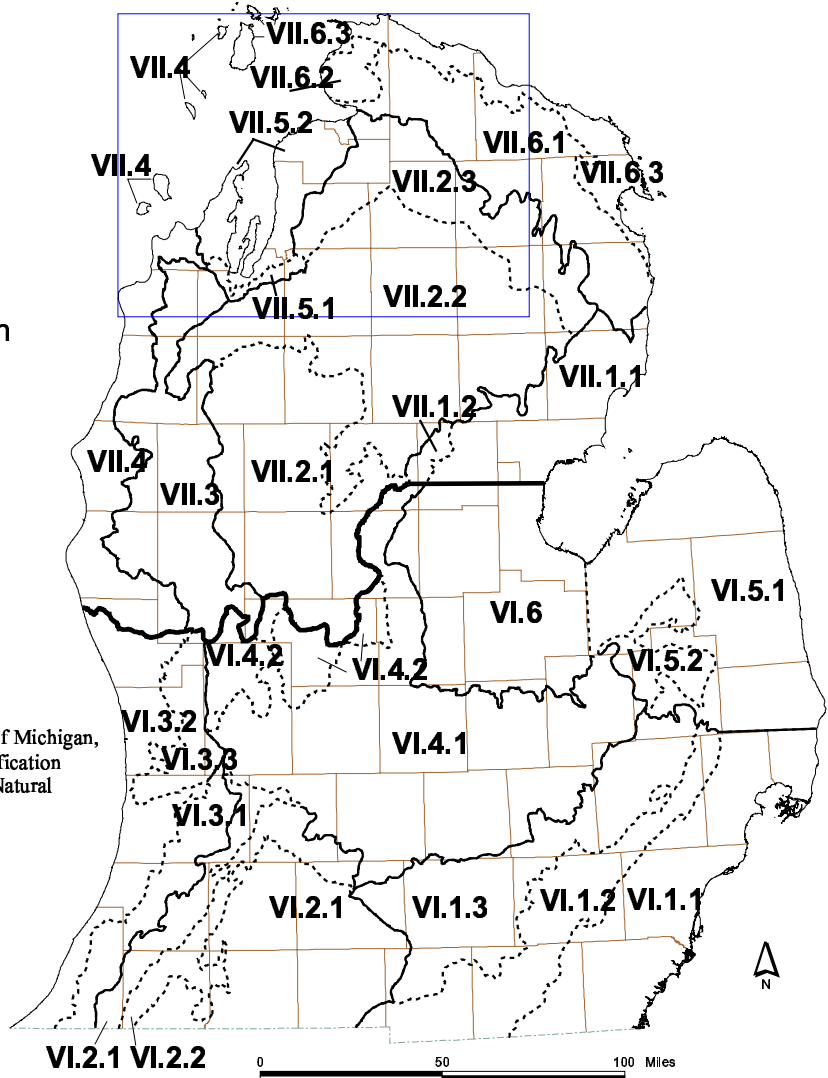


Figure 2. Ecoregions of Lower Michigan (Albert 1995).



**Photographs 3 and 4. Large-diameter hemlock (above left), sugar maple (above right), and beech (not pictured) dominate the canopy and range in diameter from 55 to 90 cm. Two cored hemlock were estimated to be 254 and 285 years old.**



**Photographs 5 and 6. Hemlock and yellow birch establish and thrive on nurse logs (above, photo by Mike Kost) and tip- up mounds (below).**



**Photograph 7. Recently windthrown cedar growing parallel to Walloon Lake.**



**Photographs 8-10. The high volume of coarse woody debris of diverse species composition and decay classes along the lakeshore (above and below left) and the prevalence of old hemlock (below right), cedar, and yellow birch along the lake's edge are unique ecological features of this site that provide important wildlife and fish habitat.**





## RESULTS

### Condition (continued)

Anthropogenic disturbance for this site is confined to two dispersed camping areas, the old road leading to the lake, and residential areas to the north and south. In the area surrounding the campsite in the northern portion of the forest, people have been harvesting wood for campfires and removing cedar and hemlock saplings and also coarse woody debris. Residents adjacent to the southern end of the forest have been dumping brush into the forest. Weedy native plants and non-native species are primarily confined to the road that passes through the forest to the lake, although there is a small cluster of periwinkle adjacent to the camping area in the southern portion of the forest. Based on the limited anthropogenic disturbance and the old-growth attributes of this forest, MNFI ecologists attributed an AB rank to this site for its current condition.

### Landscape Context

The landscape context of this old-growth remnant is very good. The majority of the area adjacent to the old-growth forest is either Walloon Lake to the east or mature northern hardwood forest to the west. The surrounding forest contains many features of late-successional forest (e.g., large-diameter trees, snags and coarse woody debris, and pit and mound topography). The prevalence of mid-tolerant species (white ash and basswood) as overstory dominants within this forest indicates that the forest adjacent to the old-growth band was historically logged. Cores from a sampling of these trees reveal that this forest was harvested approximately 80 years ago and has not been logged since. The residential areas located to the immediate north and south along the lakeshore slightly decrease the landscape context rank for this site. Based on these considerations, the site was given a B rank for landscape context.

### Overall Rank

As noted above, the consideration of the three factors of size (C rank), condition (AB rank), and landscape context (B rank) resulted in the overall rank of a B and the classification of this mesic northern forest as an element occurrence or a high-quality example of this community type. The Walloon Lake mesic northern forest has been incorporated in MNFI's database of high-quality communities.

As a B-ranked mesic northern forest, this forest qualifies for consideration as an Ecological Reference Area according to the Department of Natural Resources Conservation Area Guidance document and Work Instruction 1.4 on Biodiversity Management on State Forest Land. These documents indicate that high-quality natural communities that are A or B ranked and

are rare, imperiled or critically imperiled in the state or globally (G1, G2, G3, and/or S1, S2, S3; see Appendix 2 for definition of global and state element ranking criteria) qualify for consideration as Ecological Reference Areas.

## BIODIVERSITY MANAGEMENT RECOMMENDATIONS

The recommended primary management objective for this high-quality mesic northern forest is to allow ecological processes to operate unhindered. Management should be restricted to ecological stewardship. Stewardship activities within this site should focus on the removal of the small incursions of non-native plants that occur along the old road and near the informal camping areas. Maintaining the closure of the road will allow closed canopy forest to form across the road over the course of several decades. Gradual canopy closure along the old road will result in the eventual decrease of many of the non-native and native weeds that are limited to this area. Efforts should be made to prevent illicit camping and to prohibit collection of firewood, especially cutting of regenerating conifers, which can take decades to establish. In addition, landowners adjacent to the forest should be encouraged to refrain from dumping brush and yard waste within the forest. The total acreage of the high-quality forest could be increased over many decades by eliminating active management within the surrounding northern hardwoods and allowing these stands to naturally succeed to more mature conditions and eventually to old-growth forest (which can take several hundred years).

As stated in the DNR's Conservation Area Management Guidelines document, "Management activities or prescriptions in Ecological Reference Areas are highly restricted to those that maintain or enhance the defined attributes and values and protect the immediate natural resource values." Recreational development would likely impair the quality of this potential Ecological Reference Area. Road construction and increased human use resulting from the development would likely reduce the acreage of old-growth forest, decrease the amount of coarse woody debris on the site, and lead to increased encroachment by invasive species and native weeds. Recreational development would require the opening and expansion of the closed road to the lake. The area surrounding the old road is characterized by a concentration of non-native plants and weedy natives. Expansion of this road would probably result in the subsequent expansion of these invasive species and native weeds. This activity would likely have a



**Photographs 11 and 12. The recommended primary management objective for this high-quality site is to allow ecological processes such as input of coarse woody debris into Walloon Lake (above and below) to operate unhindered.**



negative impact on the old-growth forest in the immediate vicinity of the road, and the forest along the lakeshore would be negatively impacted by the increased level of anthropogenic disturbance.

Currently, anthropogenic disturbance is associated with two dispersed camping areas, the old road leading to the lake, and the residential areas to the north and south. In the area surrounding the northern campsite, people have been harvesting wood for campfires including cedar and hemlock saplings and coarse woody debris. Higher levels of human traffic associated with recreational development would increase this kind of human disturbance throughout the forest. Increased anthropogenic disturbance would most likely result in the demotion of the site's element occurrence rank from a B to a C. Considering the high quality of the mesic northern forest and the potential for negative impacts resulting from the further anthropogenic disturbance, the Walloon Lake site provides an excellent opportunity to protect an old-growth forest tract as an Ecological Reference Area.

## DISCUSSION

A discussion of the current status of high-quality mesic northern forests in Michigan and their distribution throughout Michigan will help elucidate the conservation importance of the Walloon Lake mesic northern forest. A total of 77 mesic northern forest element occurrences have been documented and are tracked within MNFI's database. Of these 77 forests, 38 are B-ranked or higher. Only 27 mesic northern forest element occurrences are known from the Northern Lower Peninsula and of those, only seven are B-ranked or higher. Of these seven high-quality mesic northern forests, three are found on islands within the Great Lakes. Of the five high-quality mesic northern forests occurring on the mainland of Northern Lower Michigan, only one has been documented on state forest land: the old-growth forest along Walloon Lake.

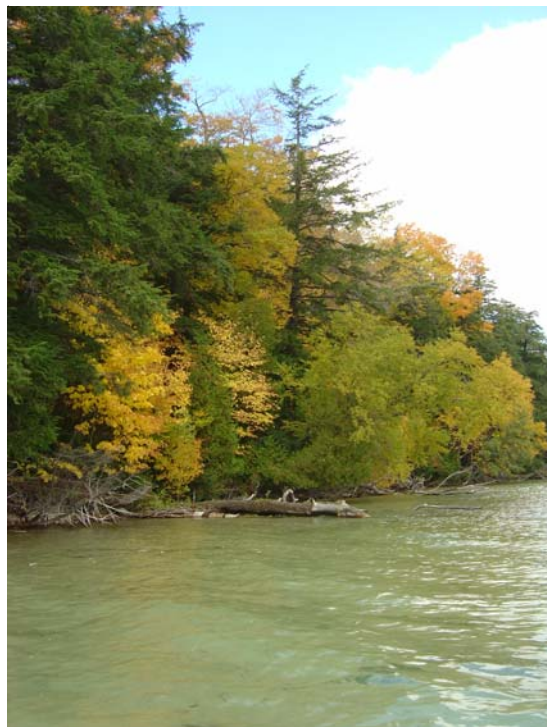
Within Charlevoix County, there are six documented mesic northern forests and only three of those are B-ranked or higher. Of these three occurrences, the Walloon Lake mesic northern forest is the only documented occurrence of high-quality mesic northern forest occurring on the mainland.

The Walloon Lake mesic northern forest falls within Subsection VII.5 (Leelanau and Grand Traverse Peninsula Subsection) and Sub-subsection VII.5.2 (Traverse City Subsection) of the regional landscape ecosystems of Michigan hierarchical landscape classification (Albert 1995, Figure 2). Within both Subsection VII.5 and Sub-subsection VII.5.2 there are only seven documented occurrences of mesic northern forest and only two occurrences that are B-ranked or

higher. Of these two, the Walloon Lake mesic northern forest is the only occurrence found on state land. In addition, the Walloon Lake site is the only documented occurrence of high-quality mesic northern forest found on drumlinized ground moraine within the Northern Lower Peninsula of Michigan.

Of the 77 mesic northern forest element occurrences, only 22 border or contain inland lakes. Half of these forests occur in the Upper Peninsula. Of the 11 mesic northern forests which border an inland lake in the Lower Peninsula, three occur on islands in the Great Lakes, two are found in the Southern Lower Peninsula, and six are found in the Northern Lower Peninsula. Of these six mesic northern forests, just two occur on state land and the Walloon Lake mesic northern forest is the only example of old-growth forest on the mainland found on state forest land and the only example on the mainland that is B-ranked. Such considerations emphasize the importance of the 0.63 miles of old-growth forest fronting the shores of Walloon Lake (Photo 13).

The above landscape-level analysis at different ecological and jurisdictional scales emphasizes the uniqueness of this site and the importance of maintaining the ecological integrity of this high-quality example of old-growth mesic northern forest by managing it as an Ecological Reference Area.



**Photograph 13. The old-growth forest along Walloon Lake provides a unique conservation opportunity in that it is the only B-ranked, old-growth mesic northern forest known to remain on state forest land on the mainland portion of the Northern Lower Peninsula of Michigan.**

## ACKNOWLEDGEMENTS

Funding for this project was generously provided by the Walloon Lake Association. Special thanks are due to Dr. Bill Hiesel (Photograph to the right) and Betsy Doody, who accompanied MNFI staff on field surveys, and to Ed Lapekas and Betsy Lieberman for administering the contract. In addition, Dr. Hiesel spearheaded efforts to fund the surveys and report. Numerous MNFI staff supported the project in many ways. In particular, Michael Kost and Rebecca Schillo assisted with field surveys; Helen Enander facilitated GIS analysis and report production; Patrick Brown, Lyn Scrimger, Sue Ridge, and Connie Brinson provided administrative support; and Rebecca Boehm and Kim Borland assisted with database management. Thanks to DNR staff for providing insight and management information about the site, especially Cara Boucher (Forest Management Division), Brian Mastenbrook (Wildlife Division), Ray Fahlsing (Parks Division), and Glen Palmgrenn (Parks Division). Finally, thanks to Pat Brown, Mike Kost, and Martha Gove for providing editorial assistance.



**Appendix 1. Plant species observed at Walloon Lake Mesic Northern Forest.** Capitalized scientific and common names indicate non-native species. Life form acronyms are as follows: Nt, native; P, perennial; Ad, adventive; B, biannual; A, annual. "C" is the Coefficient of Conservation for each species.

**Site:** Walloon Lake State Forest  
**Locale:** Charlevoix County  
**Date:** 09-Jun 2006 8 hours  
 17-Oct 2005 8 hours  
 18-Oct 2005 8 hours  
**By:** Joshua Cohen, Michael Kost, and Rebecca Schillo

FLORISTIC QUALITY DATA		Native	53	91.40%	Adventive	5	8.60%
53	NATIVE SPECIES	Tree	15	25.90%	Tree	0	0.00%
58	Total Species	Shrub	4	6.90%	Shrub	1	1.70%
4.8	NATIVE MEAN C	W-Vine	0	0.00%	W-Vine	0	0.00%
4.4	W/Adventives	H-Vine	0	0.00%	H-Vine	0	0.00%
35.2	NATIVE FQI	P-Forb	22	37.90%	P-Forb	2	3.40%
33.6	W/Adventives	B-Forb	0	0.00%	B-Forb	0	0.00%
2	NATIVE MEAN W	A-Forb	3	5.20%	A-Forb	0	0.00%
2.1	W/Adventives	P-Grass	0	0.00%	P-Grass	2	3.40%
	Fac. Upland (+)	A-Grass	0	0.00%	A-Grass	0	0.00%
		P-Sedge	3	5.20%	P-Sedge	0	0.00%
		A-Sedge	0	0.00%	A-Sedge	0	0.00%
		Fern	6	10.30%			

ACRONYM	C SCIENTIFIC NAME	W WETNESS	PHYSIOGNOMY	COMMON NAME
ACEPEN	5 Acer pensylvanicum	3 FACU	Nt Tree	STRIPED MAPLE
ACESAU	5 Acer saccharum	3 FACU	Nt Tree	SUGAR MAPLE
ACESPI	5 Acer spicatum	3 FACU	Nt Tree	MOUNTAIN MAPLE
ACTPAC	7 Actaea pachypoda	5 UPL	Nt P-Forb	DOLL'S EYES
ADIPED	6 Adiantum pedatum	1 FAC-	Nt Fern	MAIDENHAIR FERN
ALLTRI	5 Allium tricoccum	2 FACU+	Nt P-Forb	WILD LEEK
ARANUD	5 Aralia nudicaulis	3 FACU	Nt P-Forb	WILD SARSAPARILLA
ARITRI	5 Arisaema triphyllum	-2 FACW-	Nt P-Forb	JACK IN THE PULPIT
BETALL	7 Betula alleghaniensis	0 FAC	Nt Tree	YELLOW BIRCH
BETPAP	2 Betula papyrifera	2 FACU+	Nt Tree	PAPER BIRCH
BOTVIR	5 Botrychium virginianum	3 FACU	Nt Fern	RATTLESNAKE FERN
CXALBU	5 Carex albursina	5 UPL	Nt P-Sedge	SEDGE
CXPEDU	5 Carex pedunculata	5 UPL	Nt P-Sedge	SEDGE

Appendix 1, continued. Plant species observed at Walloon Lake Mesic Northern Forest.

Site:	Walloon Lake State Forest	W WETNESS	PHYSIOGNOMY	COMMON NAME
<b>ACRONYM</b>	<b>C SCIENTIFIC NAME</b>			
CXRADI	2 Carex radiata	1 FAC-	Nt P-Sedge	STRAIGHT STYLED WOOD SEDGE
CAUTHA	5 Caulophyllum thalictroides	5 UPL	Nt P-Forb	BLUE COHOSH
CORALT	5 Cornus alternifolia	5 UPL	Nt Tree	ALTERNATE LEAVED DOGWOOD
DACGLO	0 DACTYLIS GLOMERATA	3 FACU	Ad P-Grass	ORCHARD GRASS
DENDIP	5 Dentaria diphylla	5 UPL	Nt P-Forb	TWO LEAVED TOOTHWORT
DICCUC	7 Dicentra cucullaria	5 UPL	Nt P-Forb	DUTCHMAN'S BREECHES
DRYCAR	5 Dryopteris carthusiana	-2 FACW-	Nt Fern	SPINULOSE WOODFERN
EPIVIR	10 Epifagus virginiana	5 UPL	Nt P-Forb	BEECH DROPS
EPIHEL	0 EPIPACTIS HELLEBORINE	5 UPL	Ad P-Forb	HELLEBORINE
FAGGRA	6 Fagus grandifolia	3 FACU	Nt Tree	AMERICAN BEECH
FRAAME	5 Fraxinus americana	3 FACU	Nt Tree	WHITE ASH
FRANIG	6 Fraxinus nigra	-4 FACW+	Nt Tree	BLACK ASH
GALTRR	4 Galium triflorum	2 FACU+	Nt P-Forb	FRAGRANT BEDSTRAW
GERROB	3 Geranium robertianum	5 UPL	Nt A-Forb	HERB ROBERT
HEPACU	8 Hepatica acutiloba	5 UPL	Nt P-Forb	SHARP LOBED HEPATICA
HUPLUC	5 Huperzia lucidula	-1 FAC+	Nt Fern Ally	SHINING CLUBMOSS
IMPCAP	2 Impatiens capensis	-3 FACW	Nt A-Forb	SPOTTED TOUCH ME NOT
LYCANN	5 Lycopodium annotinum	0 FAC	Nt Fern Ally	STIFF CLUBMOSS
LYCAME	2 Lycopus americanus	-5 OBL	Nt P-Forb	COMMON WATER HOREHOUD
MAICAC	4 Maianthemum canadense	0 FAC	Nt P-Forb	CANADA MAYFLOWER
MEDVIR	10 Medeola virginiana	5 UPL	Nt P-Forb	INDIAN CUCUMBER ROOT
MONOUN	5 Monotropa uniflora	3 FACU	Nt P-Forb	INDIAN PIPE
ONOUSEN	2 Onoclea sensibilis	-3 FACW	Nt Fern	SENSITIVE FERN
OSMCLI	4 Osmorhiza claytonii	4 FACU-	Nt P-Forb	HAIRY SWEET CICELY
OSTVIR	5 Ostrya virginiana	4 FACU-	Nt Tree	IRONWOOD; HOP HORNBEAM
POAPRA	0 POA PRATENSIS	1 FAC-	Ad P-Grass	KENTUCKY BLUEGRASS
POLPUB	5 Polygonatum pubescens	5 UPL	Nt P-Forb	DOWNY SOLOMON SEAL
POPGRA	4 Populus grandidentata	3 FACU	Nt Tree	BIG TOOTHED ASPEN
PRUSER	2 Prunus serotina	3 FACU	Nt Tree	WILD BLACK CHERRY
PRUVIR	2 Prunus virginiana	1 FAC-	Nt Shrub	CHOKE CHERRY
RANREC	5 Ranunculus recurvatus	-3 FACW	Nt A-Forb	HOOKED CROWFOOT
RIBCYN	4 Ribes cynosbati	5 UPL	Nt Shrub	PRICKLY or WILD GOOSEBERRY
RUBSTR	2 Rubus strigosus	-2 FACW-	Nt Shrub	WILD RED RASPBERRY
SMIRAC	5 Smilacina racemosa	3 FACU	Nt P-Forb	FALSE SPIKENARD
SOLDUL	0 SOLANUM DULCAMARA	0 FAC	Ad P-Forb	BITTERSWEET NIGHTSHADE

Appendix 1, continued. Plant species observed at Walloon Lake Mesic Northern Forest.

Site:		Walloon Lake State Forest		
ACRONYM	C	W	PHYSIOGNOMY	COMMON NAME
SOLCAE	7 Solidago caesia	3 FACU	Nt P-Forb	BLUE STEMMED GOLDENROD
STRROS	5 Streptopus roseus	0 FAC	Nt P-Forb	ROSE TWISTED STALK
TAXCAN	5 Taxus canadensis	3 FACU	Nt Shrub	CANADIAN YEW
THUOCC	4 Thuja occidentalis	-3 FACW	Nt Tree	ARBOR VITAE
TILAME	5 Tilia americana	3 FACU	Nt Tree	BASSWOOD
TRIBOR	5 Trientalis borealis	-1 FAC+	Nt P-Forb	STARFLOWER
TRIGRA	5 Trillium grandiflorum	5 UPL	Nt P-Forb	COMMON TRILLIUM
TSUCAN	5 Tsuga canadensis	3 FACU	Nt Tree	HEMLOCK
VINMIN	0 VINCA MINOR	5 UPL	Ad Shrub	PERIWINKLE
VIOPUB	4 Viola pubescens	4 FACU-	Nt P-Forb	YELLOW VIOLET

## Global and State Element Ranking Criteria

### GLOBAL RANKS

- G1** = critically imperiled globally because of extreme rarity (5 or fewer occurrences range-wide or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.
- G2** = imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) 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 (e.g. a single western state, a physiographic region in the East) or because of other factor(s) making it vulnerable to extinction throughout its range; in terms of occurrences, in the range of 21 to 100.
- G4** = apparently secure globally, though it may 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.
- GH** = of historical occurrence throughout its range, i.e. formerly part of the established biota, with the expectation that it may be rediscovered (e.g. Bachman's Warbler).
- GU** = possibly in peril range-wide, but status uncertain; need more information.
- GX** = believed to be extinct throughout its range (e.g. Passenger Pigeon) with virtually no likelihood that it will be rediscovered.

### STATE RANKS

- S1** = critically imperiled in the state because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extirpation in the state.
- S2** = imperiled in state because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extirpation from the state.
- S3** = rare or uncommon in state (on the order of 21 to 100 occurrences).
- S4** = apparently secure in state, with many occurrences.
- S5** = demonstrably secure in state and essentially ineradicable under present conditions.
- SA** = accidental in state, including species (usually birds or butterflies) recorded once or twice or only at very great intervals, hundreds or even thousands of miles outside their usual range.
- SE** = an exotic established in the state; may be native elsewhere in North America (e.g. house finch or catalpa in eastern states).
- SH** = of historical occurrence in state and suspected to be still extant.
- SN** = regularly occurring, usually migratory and typically nonbreeding species.
- SR** = reported from state, but without persuasive documentation which would provide a basis for either accepting or rejecting the report.
- SRF** = reported falsely (in error) from state but this error persisting in the literature.
- SU** = possibly in peril in state, but status uncertain; need more information.
- SX** = apparently extirpated from state.