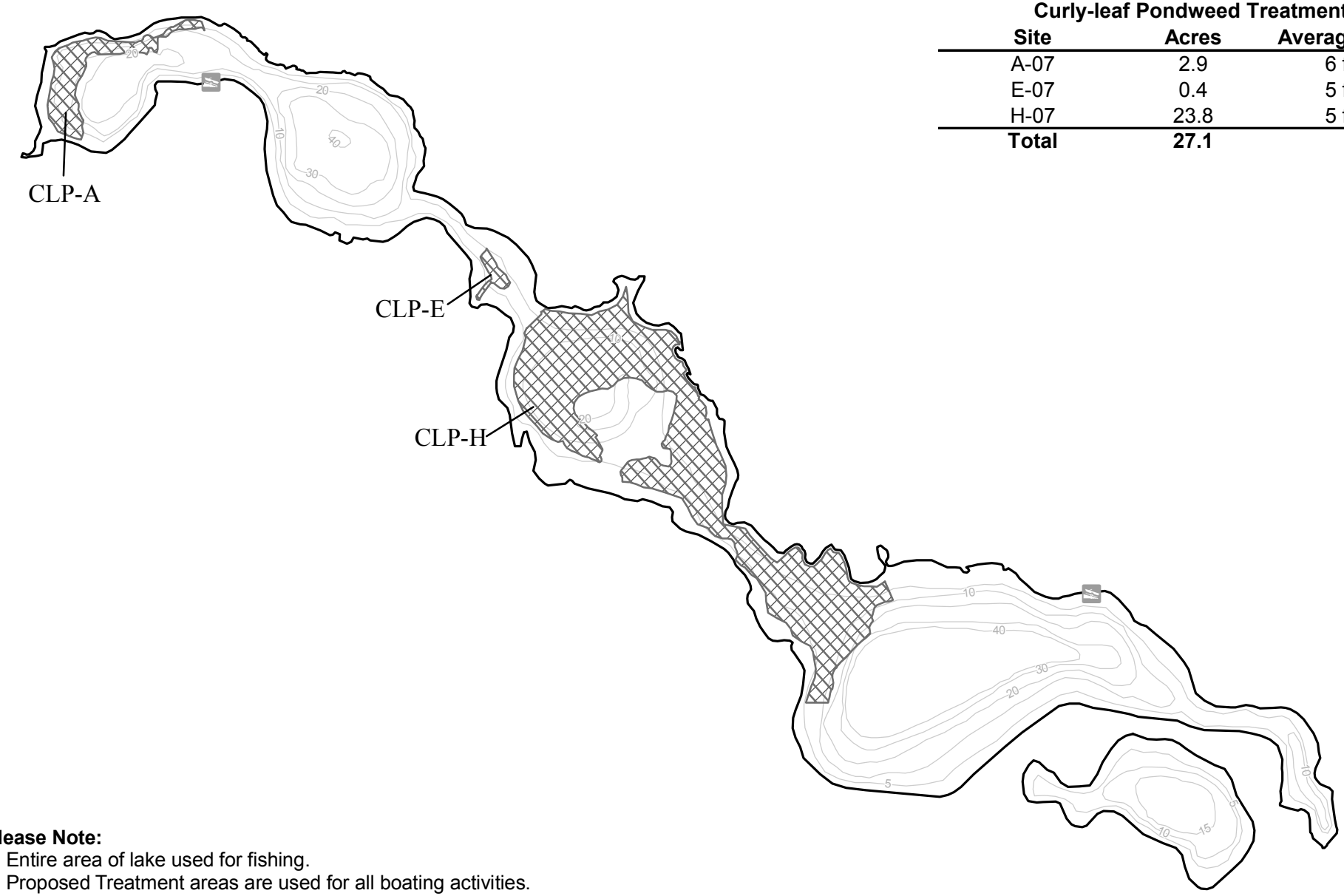


Curly-leaf Pondweed Treatment

Site	Acres	Average Depth
A-07	2.9	6 feet
E-07	0.4	5 feet
H-07	23.8	5 feet
Total	**27.1**	

Please Note:
1. Entire area of lake used for fishing.
2. Proposed Treatment areas are used for all boating activities.
3. Bathymetry does not truly represent lake depth in all areas.

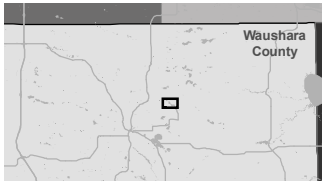
N W E S

800

Feet

Onterra LLC
Lake Management Planning
135 South Broadway Suite C
De Pere, WI 54115
920.338.8860
www.onterra-eco.com

Sources:
Roads & Hydro: WDNR
Aquatic Plants: Onterra, 2006
Bathymetry: WDNR (Digitized by Onterra)
Map date: April 26, 2007



Extent of large map shown in **black.**

Legend

Curly-leaf Pondweed Treatment Area

Boat Landing

Map 1

Mount Morris Lake
Waushara County, Wisconsin

2007 Curly-leaf Pondweed Chemical Treatment

INTRODUCTION

Mount Morris Lake is a 163-acre drainage lake with a maximum depth of 40 feet. In 2004, the Mount Morris Lake Management District (MMLMD) received Wisconsin Department of Natural Resources (WDNR) Planning Grant funds to complete a comprehensive management plan. This plan, completed in June 2006, focused primarily on water quality, watershed condition and impacts, aquatic plants, and educational issues. Also, as a part of this plan, an updated mechanical harvesting plan was created to allow navigation though nuisance levels of native aquatic plants which resulted in a significant decrease in harvesting activities (Map 1). Three main conditions were also incorporated into the mechanical harvesting plan: 1) harvesting should occur on an as-need basis, 2) harvesting activities should not be initiated until after curly-leaf pondweed treatments have occurred, and 3) areas where Eurasian water milfoil has been located should not be mechanically harvested. Currently, the foremost concern of the MMLMD is the impacts that non-native species such as curly-leaf pondweed (CLP) and Eurasian water milfoil (EWM) have on their lake.

A survey of the aquatic plant community in 2004 showed that curly-leaf pondweed was one of the top 10 most abundant plants in Mount Morris Lake. It is not known when curly-leaf pondweed first became established in the lake; however, it is likely that it started in a small area and subsequently has been unintentionally spread to every basin in the lake largely through the district's harvesting activities. In 2004 a small colony of a EWM was found near the north shore of Lake D (refer to individual basin names from Map 1). The occurrence was verified in 2005. Eurasian water milfoil, like curly-leaf pondweed has the potential to severely affect the native plant population. At the start of the project, no other occurrences were known, most likely reflecting a pioneer colony.

The original goals of this project were to:

- Reduce the occurrence of curly-leaf pondweed within the lake and as a result, minimize its spread by mechanical harvesting activities.
- Control the small amount of Eurasian water milfoil that was known to exist within the lake.
- Minimize the opportunities for additional introductions of these species through the lake's public access.
- Prepare the MMLMD to continue the management and control efforts past the initial five-year project.

Three management actions were proposed for the control of CLP within Mount Morris Lake: (1) chemical control using endothall (Aquathol-K®), (2) early season deep mechanical harvesting, and (3) hand-removal by divers in select areas utilizing scuba. Hand removal techniques were also proposed for the limited amount of EWM known to exist west of the boat landing in Lake D. Map 2 graphically displays the initial control plan. Mechanical harvesting was selected as a management tool to explore the ability of controlling CLP by disrupting its ability to produce reproductive turions by cutting the plant before turions are produced. Because CLP largely functions as an annual plant, long-term success will be achieved by exhausting the turion (asexual seed) base. The herbicide applications are also timed such that targeted CLP plants are controlled before they are able to produce turions

TREATMENT MONITORING

Determining the success or failure of chemical treatments on aquatic invasive plants is often a difficult task because the criteria used in determining success or failure is ambiguous. Most people involved with aquatic invasive species (AIS) management, whether professionals or laypersons, understand that the eradication of AIS from a lake, or even a specific area of a lake, is nearly, if not totally, impossible. Most understand that achieving control is the best criteria for success. During the surveys reported on here, two different methods of evaluation were used to understand the level of control that was achieved by the management action. A qualitative assessment was determined by comparing detailed notes of pre- and post treatment observations and spatial data were collected with a sub-meter geographic positioning system (GPS) data collector. A quantitative assessment of the treatment was also made by collecting data at 59 point-intercept sample locations on Mount Morris Lake (Appendix A-Map). At each location two rake-tows samples yielded data reflecting non-native and native plant presence, rake fullness ratings of each plant located, water depth, and substrate type. The pretreatment surveys are conducted annually by professionals to guide each year's control program. This will ensure that chemicals are used sparingly within the system and practical hand-removal areas will be selected. It also allows Onterra ecologists the opportunity to monitor and quantify the success of the previous year's management effort. Post treatment monitoring was conducted by volunteers to access short-term treatment effects. The same point-intercept locations were visited and curly-leaf pondweed presences was recorded as well as details reflecting it condition (health). Also at each location, a Ponar dredge was also used to extract 2 samples of the substrate; and by using a mesh screen, the sediment was sifted through until CLP turions could be isolated and counted. The collection of this data is aimed at determining if turion production is being stifled over time.

2006 Treatment

Pretreatment Survey – April 13, 18 & 26-28, 2006

The purpose of this survey was to refine the treatment areas used in the conditional permit to more accurately and effectively coordinate the control method. Because the control plan was based on survey data collected in 2004 and no surveys were conducted in 2005, ecologists visited Mount Morris Lakes on April 13 and 18, to review the areas proposed for control (Map 2). In these locations, young growth of CLP was observed and the extents were checked with the aid of a submersed aquatic video camera. After these field visits, ecologists felt confident that the chemical control plan wouldn't need drastic modifications to successfully target the CLP within the lake. Field visits later in April would be used to finalize the treatment areas and collect the pretreatment monitoring data.

The weather conditions on April 26-28 were sunny with a modest wind only on the first of these three days. The original control plan was derived based on CLP density where the densest areas were proposed to be treated with herbicide, the most widely accepted management action for CLP. Less dense areas were proposed to be controlled using an experimental mechanical harvesting method. Harvesting would begin in early May before turion production starts and continue until evidence of native plant growth appears. However, in late-April 2006, multiple occurrences of EWM were observed in the proposed harvesting areas. EWM is spread largely through fragmentation and mechanical harvesting of EWM would certainly aid in its spread. Due to the risk of spreading EWM to other parts of Mount Morris Lake, no early season mechanical harvesting was proposed. In some of the original mechanical harvest areas, only

limited amounts of CLP were observed and no management actions were proposed (Map 3). In other areas, CLP densities were greater than previously believed and therefore these areas were added to the chemical control plan (Map 3).

On April 27, ecologists visited 79 point intercept locations to be used in the monitoring of the chemical treatments. Because some areas were removed from the first year's control plan, the 20 point-intercept sample locations that were contained within these areas were not used in the subsequent analysis of the treatments (Appendix A-Map).

Hand Removal – April 28, 2006

Photo 1. Tim Hoyman (left), adorning cold-water scuba gear, transferring removed EWM to Rob Adams (right) near the boat landing in Lake D.

No chemical treatment was recommended for the afore mentioned EWM occurrences, but on April 28, Onterra ecologists and Rob Adams of the MMLMD conducted hand removal of EWM near the boat landing in Lake D (Map 4, EWM-C). High traffic areas such as this one can contribute to the spreading of this plant throughout the lake. As boats move through the EWM colony, they can cut the plant into fragments that have the potential of taking root in other locations of the lake. Using scuba, Tim Hoyman (Onterra) removed the EWM plants including the entire root, and brought them to the surface where they were loaded into the boat. It was presumed that this control method was largely effective, and later field visits verified its success.

Post Treatment Survey – May 20, 2006

On May 20, Rob Adams and Gary Wood (MMLMD) were trained to conduct the post treatment monitoring on the Lake. The volunteers were trained to make certain that proper protocols would be followed and reliable data would be collected. Volunteer involvement such as this is essential to raise awareness of the project and the value of responsible lake stewardship, while creating ownership in the project. Consistent with the goals of the project, this involvement also raises the capacity of the MMLMD to continue the management efforts in the future.

Photo 2. Rob Adams (left) navigating with the GPS while Gary Frank (right) conducts a rake-tow as part of the post treatment monitoring on Mount Morris Lake.

Onterra provided a handheld GPS unit loaded with the 59 point-intercept locations discussed above to the MMLMD volunteers for use in their surveys. They were trained how to use the provided GPS and navigate to the sample locations. Two rake-tow samples were taken at each location and data was collected on CLP occurrence and overall health of the plants (e.g. healthy, dead, or dying). Additionally, two Ponar dredge samples were taken at each

location to determine if the chemical treatments were affecting the turion counts from the sediments. Please note that during this survey, the rope to the Ponar dredge broke and left it at the bottom of the lake with 21 sample locations left to survey. On May 20, 2006, these locations were sampled for CLP occurrence and condition and a later field survey (with a new Ponar dredge) sampled these locations for turions.

2007 Treatment

Pretreatment Survey – April 23, 2007

All areas treated in 2006 (Map 3, 31.6 acres) were initially proposed for treatment in 2007 and were used to gain a conditional permit from the WDNR. Again, the purpose of this survey was to verify CLP occurrences and if necessary, refine the treatment areas used in the conditional permit. During this survey, the skies were overcast and a northwest wind made viewing plants in some areas of the lake difficult. An aqua scope and a submersed aquatic video camera aided in the viewing of CLP within the lake. Although a reduction in CLP density was qualitatively observed in many of the treatment areas compared to 2006, the proposed treatment areas seemed to accurately portrait the extents of the CLP within the lake and only a few modifications were necessary (Map 4). Lake D had the greatest amount of modifications as some areas exhibited low CLP densities and therefore did not warrant chemical treatment. The treatment area in front of the boat landing between Lakes A and B was also removed from the proposed treatment because almost no CLP was observed. All point-intercept locations were sampled regardless of whether they were contained within a treatment area or not (Appendix A-Map).

EWM focus areas were constructed based on locations mapped during the 2006 pretreatment survey (Map 4). During this survey, these areas were visited to determine if additional management actions were warranted. Limited amounts of EWM were observed within these focus areas, possibly due to the survey being too early in the growing season. However, water temperatures were approximately 58°F, widely accepted as being ideal for the timing of this survey. A chemical treatment was not proposed and a later field visit was planned to conduct a thorough survey of the lake in search of EWM.

Eurasian Water Milfoil Survey – May 29 & June 7, 2007

On May 29, 2007, Mount Morris Lake was surveyed and all occurrences of EWM were mapped (Map 5). The majority of the EWM observed was in Lakes C and E. The occurrences in Lake C were considerably dense, therefore a late-spring chemical treatment using broad-leaf specific 2-4,D (Navigate®) was proposed. Because Lake E exhibits high water clarity, the EWM locations in this basin were proposed for hand removal using scuba methods. On June 7, 2007, Kathy Dax, WDNR Aquatic Plant Management Specialist, visited the lake with Onterra ecologists to gain first-hand knowledge of the lake's EWM occurrences and the survey methods used to map them. Although she agreed that the proposed chemical treatment was warranted based on the occurrences of EWM, the application permit was denied based on the proposed treatment's effects on the spawning habitat of the longear sunfish, a threatened species in Wisconsin previously known to inhabit Mount Morris Lake. The water temperatures at the time of the proposed treatment (high 60°s F) correspond with spawning of this sunfish and although the treatment would not directly cause harm to the fish, the vegetation which the emerged fry would use to escape predation would be removed. Kathy Dax advised that subsequent chemical treatment should be timed when water temperatures were below these levels.

Hand Removal – June 22, 2007

Although the proposed chemical treatment of EWM did not occur, hand removal techniques were applied on June 22, 2007 (Map 5, Site C-07). Three certified scuba divers from Onterra removed EWM plants in Lake E. CLP plants were also observed during this survey and were removed. Because CLP turion formation had already occurred, additional attention was paid to these reproductive structures as they easily break off when the plant is being removed. Please note that coordinated CLP hand removal should occur before turion formation, but it is always advantageous to remove as many turions as possible as they will disperse on their own when the CLP dies back.

Post Treatment Survey – July 17, 2007

Onterra ecologists were used to conduct the volunteer post treatment survey on July 17, 2007. At each sample location, only data referring to turion counts using the Ponar dredge were collected. Examining the condition of CLP at this stage in its growing season is not valid whereas completely healthy CLP plants would be senescent at this time.

Water Quality Monitoring

The impacts of invasive species such as curly-leaf pondweed on a quality plant community such as Mount Morris Lake's could be devastating; however, the negative effects do not only appear in the plant community. In lakes with dense occurrences, the water quality of the lake can also be affected following the die-off of the curly-leaf pondweed and are most often seen in raised total phosphorus levels. Data collected in 2004 suggest such a trend occurs in Mount Morris Lake. Phosphorus is the limiting nutrient in more than 80% of Wisconsin Lakes, meaning an increase in phosphorus will cause an increase in plant biomass. A large spike in total phosphorus values can cause malodorous algal blooms and an increase in macrophyte (rooted plant) abundance.

Photo 3. Betty and Bob Mueller collecting water quality samples on Mount Morris Lake.

Stakeholders were solicited to help monitor the water quality in Mount Morris Lakes during the growing seasons of this 4 year project. In the first year, volunteers were trained to collect water quality samples from the deep holes of Lakes C and D. Near-surface and near-bottom samples were collected twice a month May – August and analyzed for total and soluble reactive (ortho) phosphorus by the Wisconsin State Laboratory of Hygiene.

On May 23, 2006, Bob and Betty Mueller, volunteers from the MMLMD, were trained by Eddie Heath (Onterra) on proper water quality monitoring protocols. Using a Van Dorn bottle, they were shown how to collect water samples from near-surface and near-bottom depths, take temperature profiles with a digital thermometer, and collect Secchi disk transparency values. Along with data collection, they were trained on preservation of the samples, completion of the State Laboratory of Hygiene Sample Request forms, and packaging and shipment of the samples.

The volunteer monitoring of the water quality on any lake is a large commitment, but combing the multiple locations with the high frequency of samples involved in this project, this commitment may feel more like an obligation. Bob and Betty have monitored the water quality in Mount Morris Lake since the inception of this project and possibly a new set of volunteers will be needed to alleviate some of the burden from the Muellers.

Annual Monitoring of Aquatic Invasive Species

In lakes without curly-leaf pondweed and Eurasian water milfoil, early detection of pioneer colonies commonly leads to successful control. Although both these AIS occur in Mount Morris Lake, monitoring for new colonies is essential to properly align management actions and maintain stakeholder awareness.

Photo 4. MMLMD volunteers looking at AIS and native look-a-likes during a training session.

In July 2006, Tim Hoyman (Onterra) conducted an informal volunteer training session on the monitoring of AIS. Five MMLMD members were trained on AIS identification including native look-a-likes from samples taken from Mount Morris Lake as well as *insitu* observation of these species during a trip on the water. While on the lake, they were shown how to systematically search their lake for AIS, and how to properly mark their locations using a handheld GPS unit.

Methods were devised to divide monitoring areas among participants. The data collected by the annual monitoring would be shared with Onterra to allow proper coordinating of management actions to occur. The MMLMD understands that AIS will always be present in their lake and the implementation of volunteer monitoring can relive some of the financial burdens borne from needing professionally conducted surveys as well as foster ownership and encourage lake stewardship among district members.

CONCLUSIONS AND RECOMMENDATIONS

During the 2006 pretreatment survey, 58.5% of the point-intercept locations contained CLP and 40.7% contained CLP during the 2007 pretreatment survey (Table 1). A rake fullness rating of 1-3 was used to determine abundance of the CLP at each location. Figure 1 displays the number of point-intercept locations exhibiting each of the rake fullness ratings within Mount Morris Lake. These data shows that along with the observed reduction in CLP occurrence (Table 1), a reduction in CLP density was also documented (Figure 1). During the 2006 pretreatment survey, 44.8% of the point-intercept locations that contained CLP exhibited a rake fullness rating greater than 1. The 2007 pretreatment survey data yielded only 21.7 % of the CLP occurrences displaying a rake fullness of greater than 1 (Figure 1).

Table 1. Percent occurrence of select aquatic plants from 2006-2007 pretreatment surveys. * = non-native plant species.

	% Occurrence	
Species	**2006 Pretreatment Results**	**2007 Pretreatment Results**
Curly-leaf pondweed*	58.5	40.7
Eurasian water milfoil*	0.0	2.5
Coontail	32.2	11.9
Muskgrasses	75.4	85.6
Elodea	44.9	35.6
Northern water milfoil	22.9	1.7

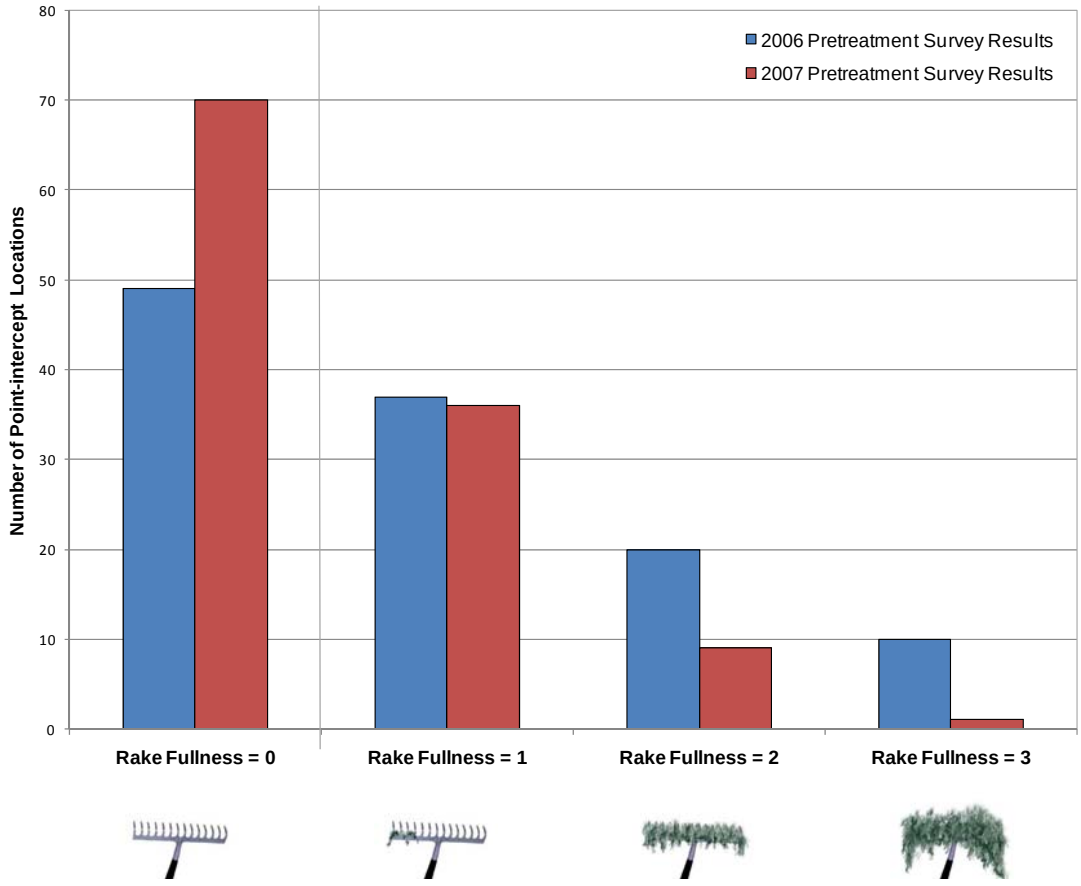


Figure 1. EWM rake fullness distribution from 2006-2007 pretreatment surveys on Mount Morris Lake. This data is based on the 59 point-intercept locations shown in Appendix A – Map.

The observed reductions in CLP occurrence and density may be a function of the reduction in turions from a single year of treatment (2006 treatment). The length of time that a turion remains viable in the sediment is unknown but it is thought to be between 2-5 years, perhaps longer if anoxic (void of oxygen) conditions exist. Bottom sediment disturbances such as carp or harvesting activities (both applicable to Mount Morris Lake) can expose buried turions where they are able to sprout. Table 2 shows a slight reduction in turion prevalence over the two years,

but an increase in the total number of turions (and therefore an increased average turion count) being collected in 2007.

Table 2. Analysis of CLP turion data collected in 2006 and 2007 after each year's chemical treatment occurred.

Year	Total	% Prevalence	Average	Range
2006	102	25.0	0.9	1-14
2007	135	23.2	1.2	1-23

This project is one of the first to attempt to quantify CLP turion base over time. The methodology devised has proven to be an accurate way to collect turions, some limitations have been discovered. One limitation is that two sample locations yielded 39% and 52% of the 2006 and 2007 turion samples, respectively. Please note that these sample locations were not the same between the two years. These data suggests that 'hot spots' of turion accumulation occur, most likely due to subtle differences in bathymetry, substrate type, and submersed aquatic vegetation, and have the potential to significantly influence the data. Also, many areas of Mount Morris Lake are covered with a carpet of *Chara* sp., a macro algae, which the Ponar dredge has difficulty 'cutting' through. Lastly, this method of collecting turions is a dirty process and may not be suitable for volunteer monitors (or their boats).

Most native plants should be at very low biomass (or not even started growing yet) during the pretreatment surveys. However, it is important to understand the effects of the contact herbicide on some of the lake's native plants. Table 1 shows a limited reduction in the percent occurrence of coontail and elodea. Because these plants are not rooted and are largely influenced by water movement, the observed reductions are not a concern, especially in light of their highly common status in this and many regional waterbodies. Actually, mechanical harvesting activities occur on Mount Morris Lake mainly to control coontail and elodea (Map 1). The reduction in northern water milfoil occurrence is perplexing, but may be more a product of discrepancies in survey timing than of the herbicide application.

These data also show that northern water milfoil may have been impacted by the treatment because its occurrence was significantly lower in the spring following the treatment. As stated above, plants like northern water milfoil are only beginning their growth at the time of the pretreatment survey and the data may be a reflection of each of the two surveys corresponding with different life cycle stages of the plant. Although every attempt is made to minimize the impacts on non-target species (accurate mapping, herbicide dosage, and treatment timing), it occasionally occurs. It is important to remember that these non-target impacts can only be considered in the context of the areas treated and not on a lake-wide basis. In other words, the impact of the treatments on northern water milfoil in the treatment areas cannot be extrapolated to the entire northern water milfoil population within Mount Morris Lake. The same cannot be said for CLP because by treating the majority of the CLP within the lake successfully, the CLP is being impacted on a lake-wide basis. The purpose of the treatment is to slow or stop CLP from displacing our native species. Without intervention, an argument could be made that over time, CLP would displace the northern water milfoil. In the end, the only way to truly determine the effects of the treatment on non-target species is to replicate the whole-lake point-intercept survey. This survey will be performed in the summer of 2010, the final year of the current project.

In 2004, surface total phosphorus values in Lake D spiked at over 40 µg/L during July. These concentrations coincide with the large-scale die off of CLP within the Lake. During July of 2006 and 2007, almost no such spike can be observed (Figure 2); especially at the magnitude that was observed in 2004 before treatments occurred (40 µg/L).

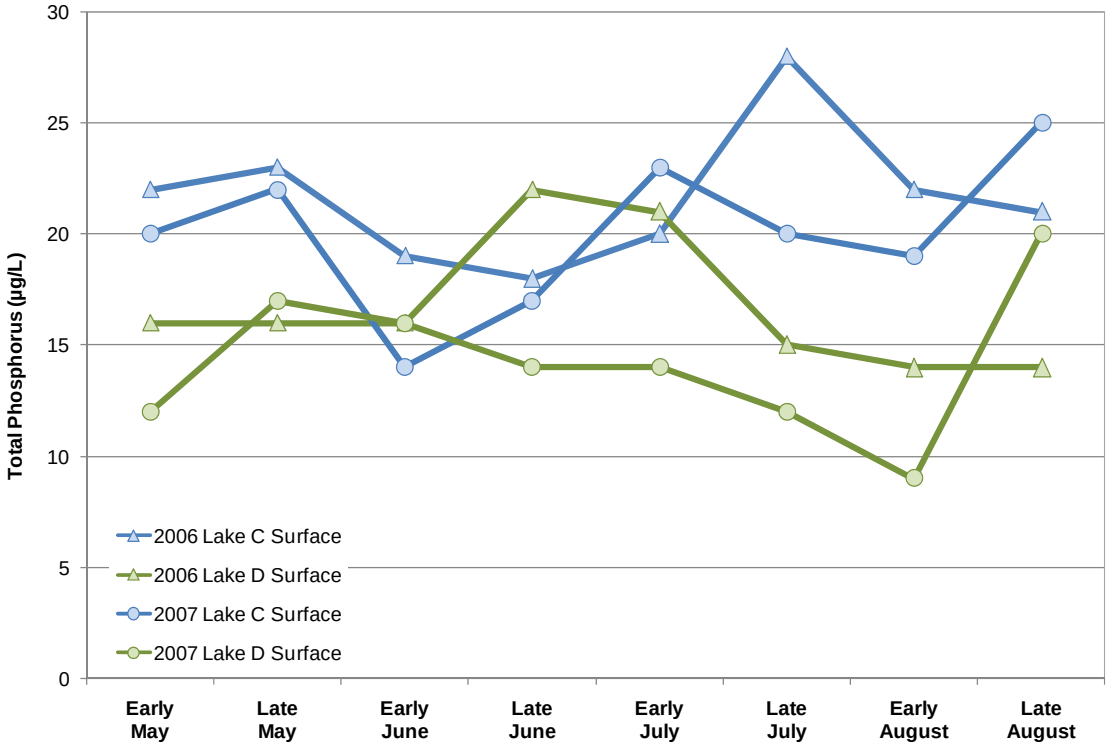


Figure 2. Surface total phosphorus values from Mount Morris Lake.

The volunteer water quality monitoring has been consistently completed as planned, however other aspects of volunteer monitoring on Mount Morris Lake have not. Without the aid of data reflecting the condition of CLP within the treatment areas (volunteer post treatment survey) and additional locations of CLP in Mount Morris Lake (volunteer annual AIS monitoring), the final 2007 CLP treatment areas must suffice as the proposed 2008 CLP treatment areas (Map 4). Additional field surveys may be needed by professionals during spring of 2008 to properly coordinate the annual management of CLP.

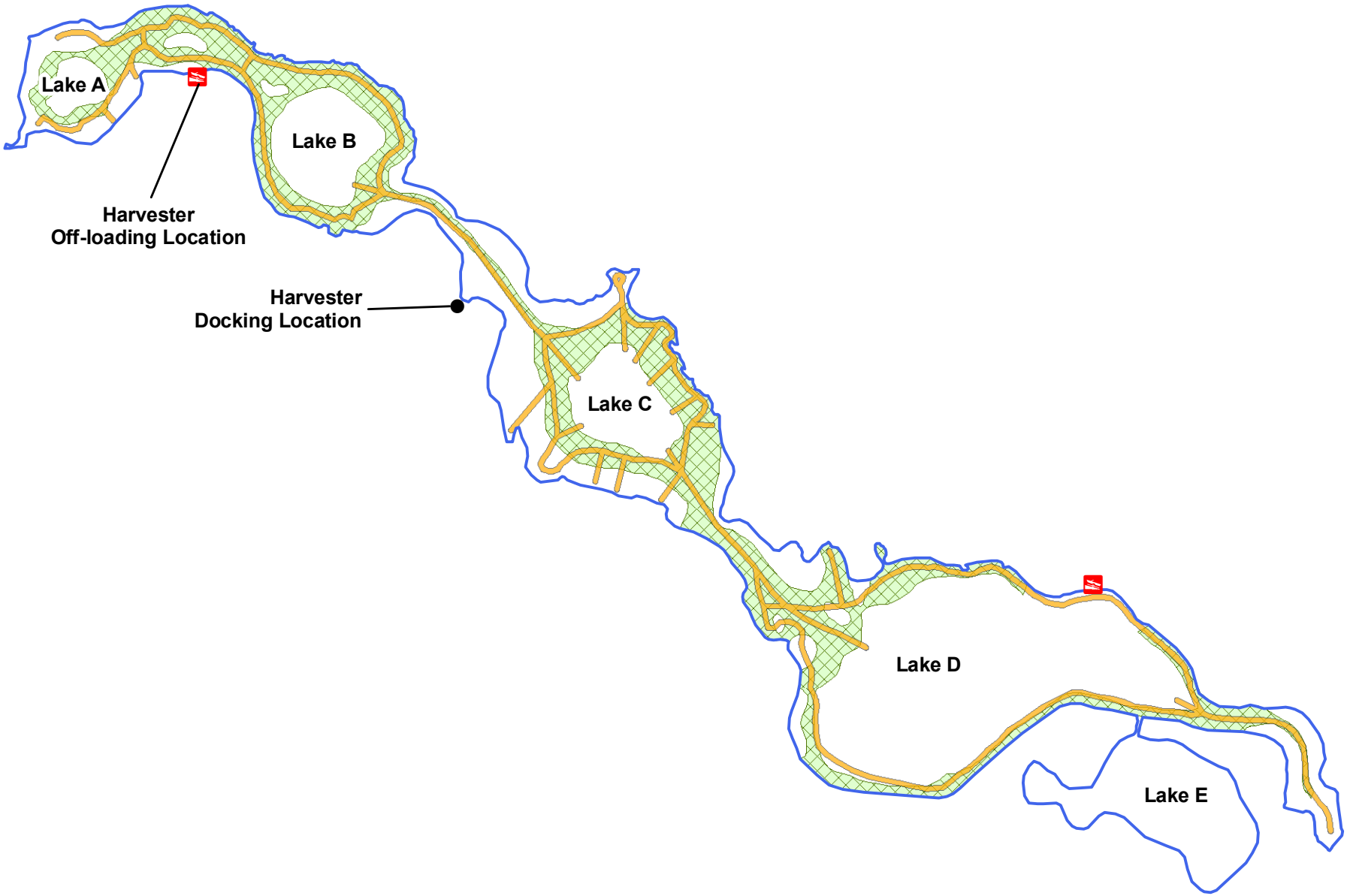
EWM occurrences within Mount Morris Lake have increased during this project. The perplexing aspect of EWM management in Mount Morris Lake is treatment timing. Many of the proposed EWM treatment areas overlap with the proposed CLP treatment areas. Aquathol K®, a contact herbicide, is applied on the CLP plants in early May to precede turion production. The life cycle of EWM is different from CLP and can be difficult to detect in late April and early May. Aquathol K® has the capacity 'knock back' the EWM biomass, but is not able to kill the plant entirely. New growth sprouts from the root crown and cannot be observed until later in the summer. In 2007, many EWM occurrences were already visible by the end of May (Map 5) but

water temperatures soon exceeded those that are consistent with the spawning of the threatened longear sunfish and therefore could not be treated.

Therefore, a new approach was devised to manage the two AIS in Mount Morris Lake. Numerous conversations initiated by Onterra with John Skogerboe, United States Army Corps of Engineers, and Schmidt's Aquatic Plant Control lead to an approach that used three different herbicide regimes to control the AIS (Map 6). Curly-leaf pondweed control has been successful on Mount Morris Lake using Aquathol K® at 1.5 mg/L. Areas that only contain this AIS would continue to be treated using this method. Areas that contain EWM and not CLP would be treated with Navigate® (granular 2, 4-D) at 100 lbs/acre, a common systemic herbicide used to control this species. Areas that contain EWM and CLP would be experimentally treated with a combination treatment of Aquathol K® at 1.5 mg/L and Weedar 64® (liquid 2, 4-D) at 1.0 mg/L. The dose of Weedar 64® proposed is less than would be suggested if it were the only chemical being used, but in this case should be adequately high due to the synergistic effects caused by the chemical's use along with Aquathol K®.

It is perceived that the management of CLP during 2006 and 2007 has yielded some significant strides in achieving lake-wide control. Quantitative monitoring suggests that CLP occurrence and density is decreasing within the survey locations. Also, the herbicide application is having a favorable affect on the lake's total phosphorus levels by keeping CLP from achieving significant biomass that would cause elevated phosphorus spikes, as seen in the past. The methodology of monitoring CLP turions from the bottom sediment has proven to be successful and once more data are collected, determinations of turion exhaustion will be allowed. Aside from the hand removal of EWM near the boat landing in Lake D and along the eastern shore of Lake E, no EWM management has occurred (Map 5). The occurrences of this plant greatly exceed that which can be controlled using hand removal-methods. It is believed that the proposed treatment strategy will continue to yield successes in CLP management along with combating mixed stands of EWM and CLP.

The largest concern of the current project is the lack of volunteer involvement from the MMLMD. It was originally thought that after the current project is completed, the MMLMD would be able to coordinate major portions of the AIS management of their lake. If this is not the case, the MMLMD will need to prepare financially to have professionals aid in the management of Mount Morris Lake.



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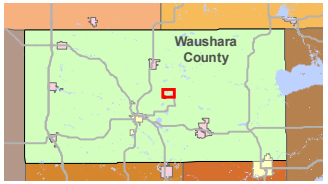
Sources:
Roads & Hydro: WDNR
Harvest Areas: Onterra
Bathymetry: WDNR (Digitized by Onterra)
Map date: December 27, 2007



Extent of large map shown in red.

Legend

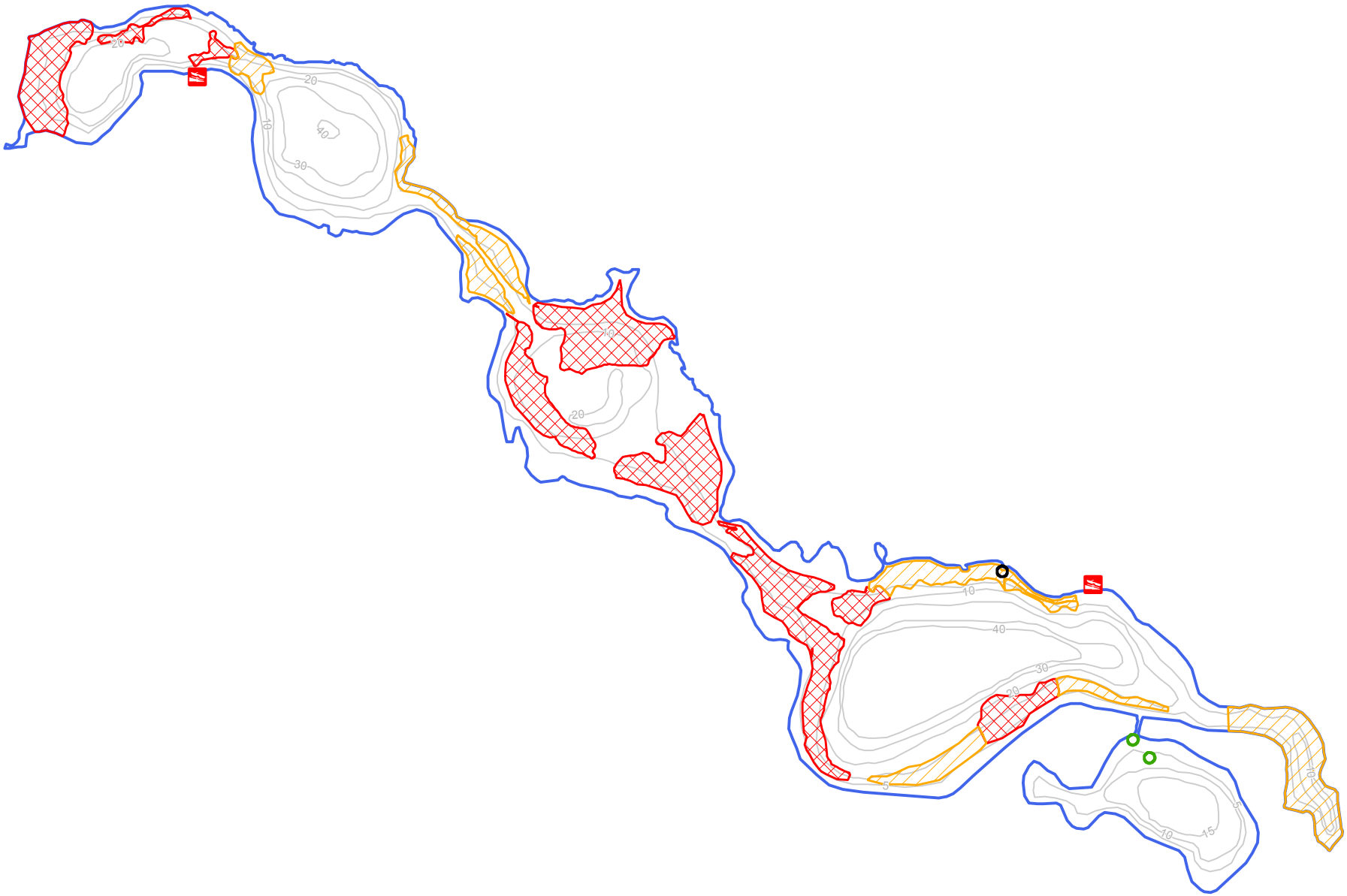
- Harvest Lane (Approx. 30 feet wide)
- Previous Harvesting Plan

Map 1

Mt. Morris Lake

Waushara County, Wisconsin

Mechanical Harvest Plan & Basin Names



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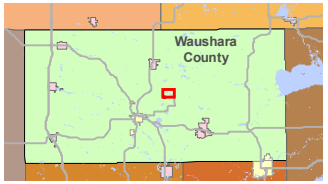


Extent of large map shown in red.

Legend

CLP Control Method

- Mechanical Harvest Area
- Chemical Treatment Area

Hand Removal Areas

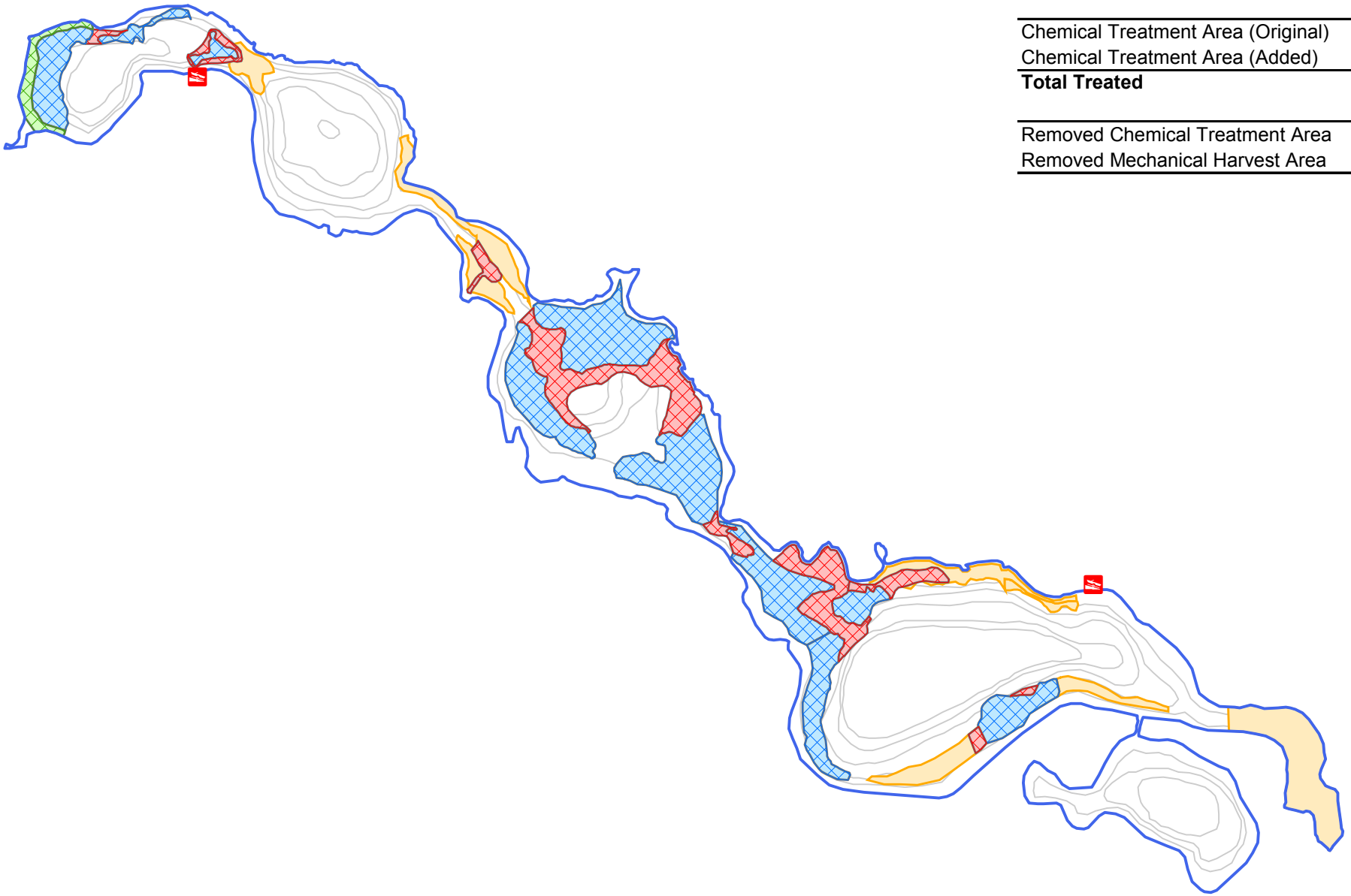
- Curly-leaf Pondweed
- Eurasian Water Milfoil

Map 2

Mt. Morris Lake

Waushara County, Wisconsin

Exotics Control Plan From 2006 Managment Plan



	Acres
Chemical Treatment Area (Original)	22.3
Chemical Treatment Area (Added)	9.3
Total Treated	**31.6**
Removed Chemical Treatment Area	1.0
Removed Mechanical Harvest Area	12.4

N W E S

800

Feet

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Sources:
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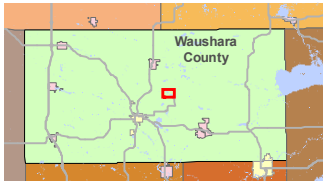


Extent of large map shown in red.

Legend

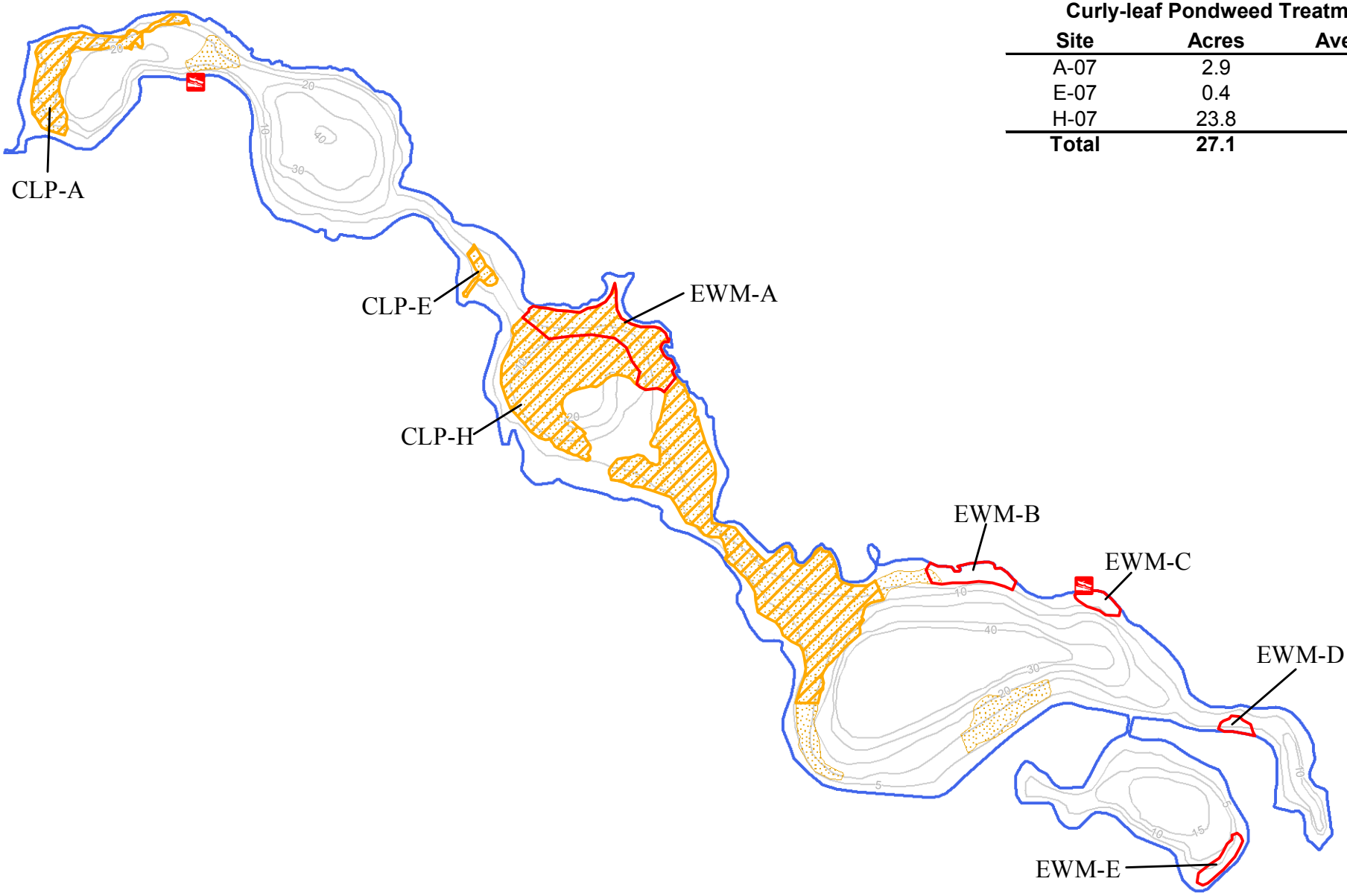
- Chemical Treatment area (Original)
- Chemical Treatment Area (Added)
- Removed Chemical Treatment Area
- Removed Harvest Area

Map 3

Mt. Morris Lake

Waushara County, Wisconsin

2006 Final
Curly-leaf Pondweed
Treatment Areas



Curly-leaf Pondweed Treatment

Site	Acres	Average z
A-07	2.9	6
E-07	0.4	5
H-07	23.8	5
Total	**27.1**	

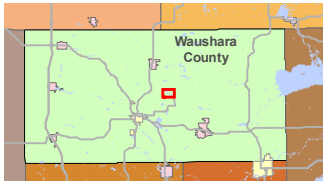
N W E S

800

Feet

Onterra LLC
Lake Management Planning
135 South Broadway Suite C
De Pere, WI 54115
920.338.8860
www.onterra-eco.com

Sources:
Roads & Hydro: WDNR
Aquatic Plants: Onterra, 2006, 2007
Bathymetry: WDNR (Digitized by Onterra)
Map date: December 28, 2007



Extent of large map shown in red.

Legend

- Preliminary CLP Treatment Area Used in Conditional Permit
- Final CLP Treatment Area
- Eurasian Water Milfoil Focus Area

Map 4

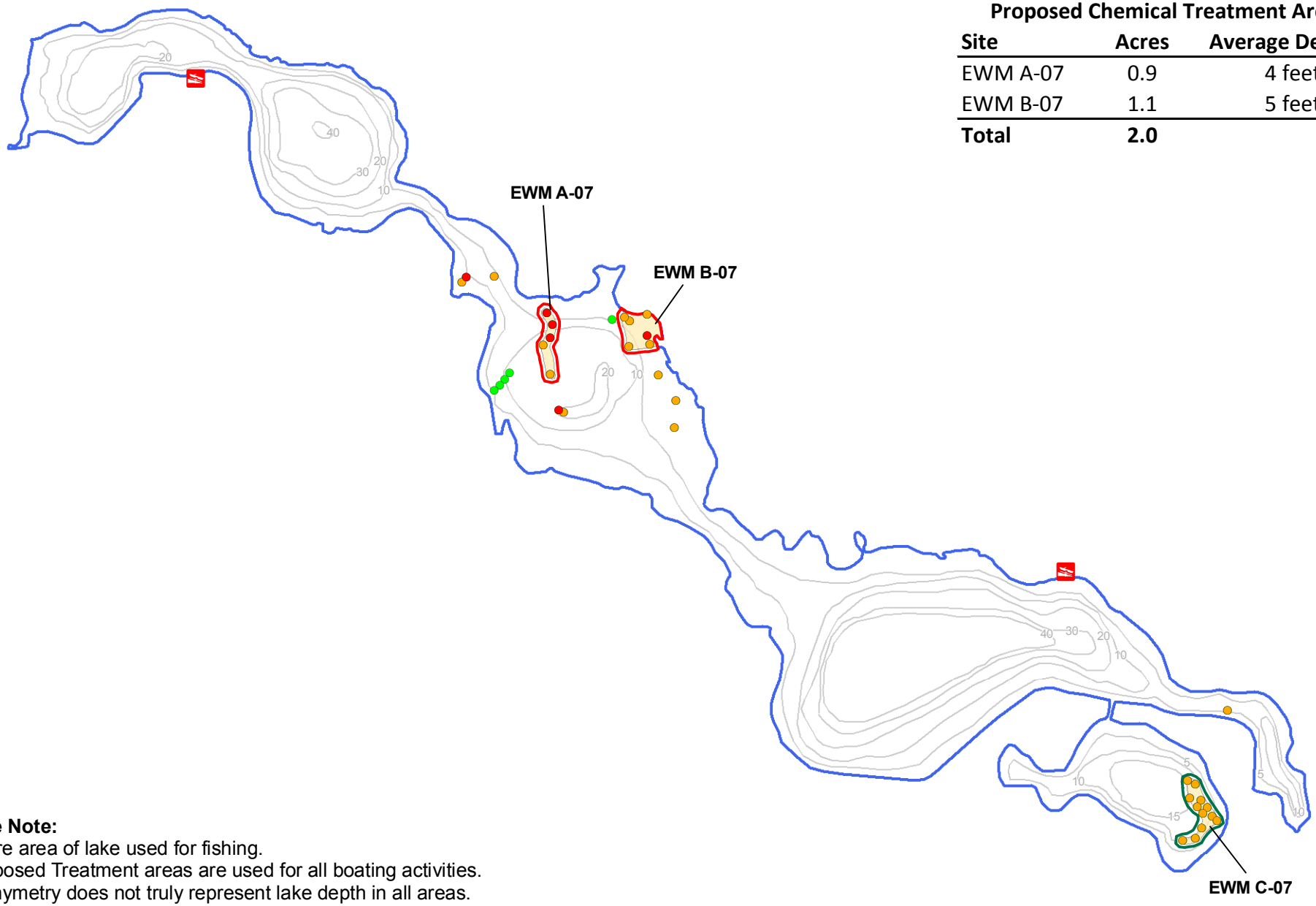
Mt. Morris Lake

Waushara County, Wisconsin

2007 Final CLP Treatment Areas & EWM Focus Areas

Proposed Chemical Treatment Areas

Site	Acres	Average Depth
EWM A-07	0.9	4 feet
EWM B-07	1.1	5 feet
Total	**2.0**	



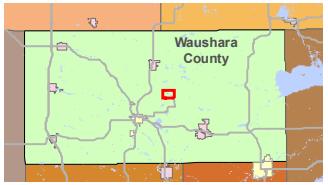
Please Note:
1. Entire area of lake used for fishing.
2. Proposed Treatment areas are used for all boating activities.
3. Bathymetry does not truly represent lake depth in all areas.

N
W E
S

800
Feet

Onterra LLC
Lake Management Planning
135 South Broadway Suite C
De Pere, WI 54115
920.338.8860
www.onterra-eco.com

Sources:
Roads & Hydro: WDNR
Aquatic Plants: Onterra, 2007
Bathymetry: WDNR (Digitized by Onterra)
Map date: June 1, 2007



Extent of large map shown in red.

Legend

May 07 Field Survey
- Single or Few EWM Plants
- Many or Clumps of EWM
- Scattered EWM Colony

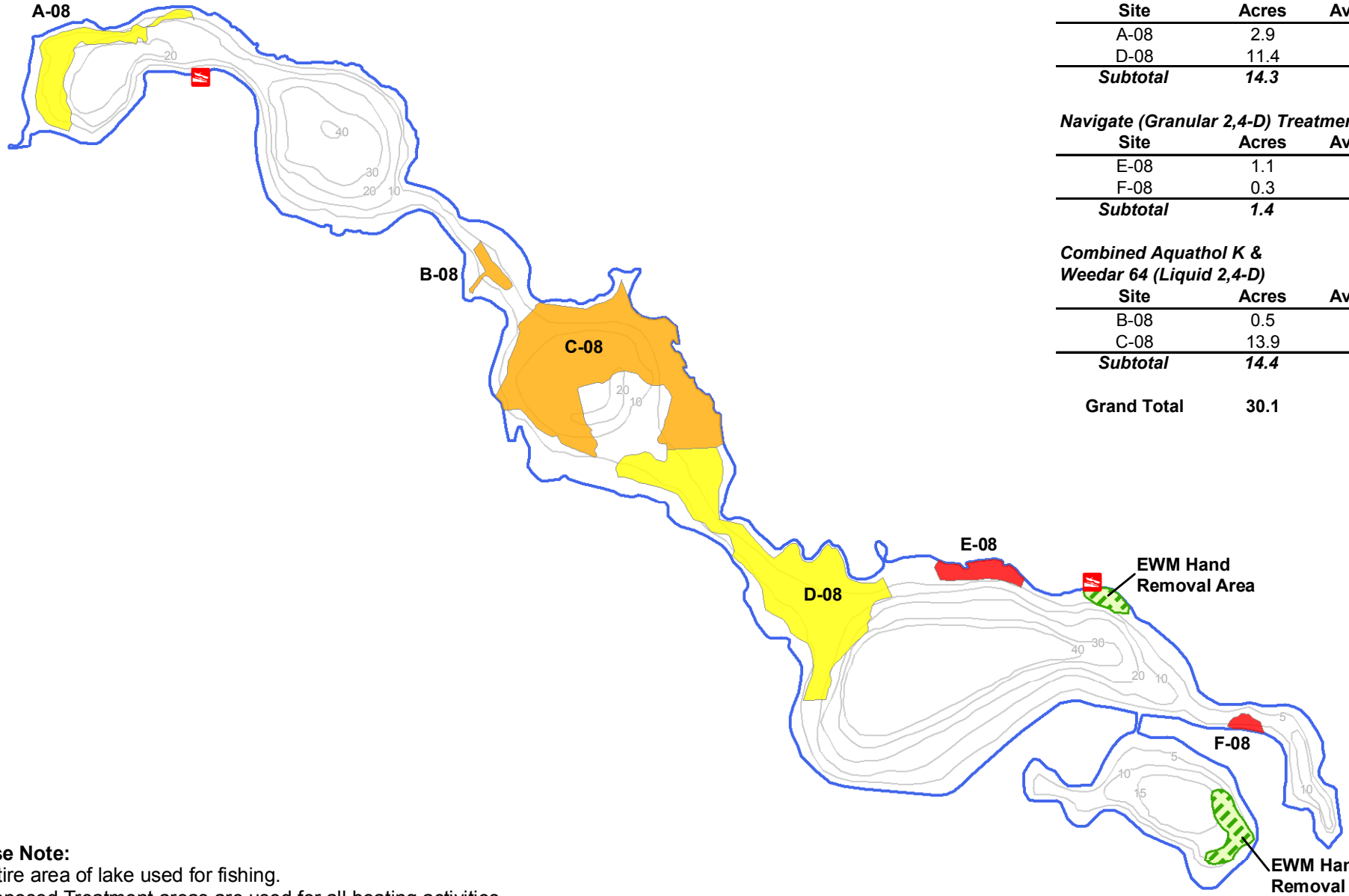
- Chemical Treatment Area (2.0 Acres)
- Hand Removal Area (1.2 Acres)
- Additional EWM Locations Mapped August '07

Map 5

Mt. Morris Lake

Waushara County, Wisconsin

2007 Proposed Eurasian Water Milfoil Treatment Areas



Aquathol K (Endothall) Treatment Areas

Site	Acres	Ave Depth
A-08	2.9	4 feet
D-08	11.4	5 feet
Subtotal	***14.3***	

Navigate (Granular 2,4-D) Treatment Areas

Site	Acres	Ave Depth
E-08	1.1	5 feet
F-08	0.3	5 feet
Subtotal	***1.4***	

Combined Aquathol K & Weedar 64 (Liquid 2,4-D)

Site	Acres	Ave Depth
B-08	0.5	5 feet
C-08	13.9	5 feet
Subtotal	***14.4***	
Grand Total	**30.1**	

Please Note:
1. Entire area of lake used for fishing.
2. Proposed Treatment areas are used for all boating activities.

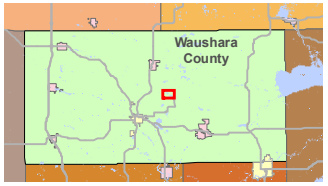
N W E S

800

Feet

Onterra LLC
Lake Management Planning
135 South Broadway Suite C
De Pere, WI 54115
920.338.8860
www.onterra-eco.com

Sources:
Roads & Hydro: WDNR
Aquatic Plants: Onterra, 2007
Bathymetry: WDNR (Digitized by Onterra)
Map date: March 10, 2008



Extent of large map shown in red.

Legend

2008 Proposed Treatment Areas

- Aquathol K (1.5 mg/L)
- Combined Aquathol K (1.5 mg/L) & Weedar 64 (1.0 mg/L)
- Navigate (100 lbs/acre)

Map 6

Mt. Morris Lake

Waushara County, Wisconsin

2008 Proposed CLP & EWM Treatment Areas

Number	Longitude (Decimal Degrees)	Lattitude (Decimal Degrees)	Depth (ft)	Sediment type (M=muck, S=Sand, R=Rock)	Rope (R); Pole (P); Visual (V)	*Myriophyllum spicatum*	*Potamogeton crispus*	*Nuphar variegata*	*Nymphaea odorata*	*Ceratophyllum demersum*	*Chara sp.*	*Elodea canadensis*	*Myriophyllum sibiricum*	*Ranunculus aquatilis*	*Potamogeton natans*	*Potamogeton praelongus*	*Potamogeton zosteriformis*	*Lemna trisulca*	*Spirodela polyrhiza*
1	-89.21927	44.12510	1	M	P			1		1	3								
							2			1	2								
2	-89.21878	44.12510	3	M	P		1	1			1		1						
							1	1			3		0						
3	-89.21928	44.12474	3	M	P			1		2	2								
							2	1			1	1		1					
4	-89.21978	44.12438	1	M	P					2	2								
								1			2								
5	-89.21928	44.12438	8	M	P		1			1		1				1			
										2	2		1				1		
6	-89.21979	44.12402	1	M	P			1		2	2								
								1		1	3								
7	-89.21929	44.12402	4	M	P		1			1	2	1							
							1			2	2	1							
8	-89.20746	44.12116	1	M	P		1												
										1		1	1	1					1
9	-89.20897	44.12081	2	M	P			1			3								
											3								
10	-89.20847	44.12081	2	M	P			1		1									
								1		1									
11	-89.20797	44.12081	1	M	P			1		2									
										2		1							
12	-89.20747	44.12080	1	M	P					1									
										1									
13	-89.20956	44.12054	3	M	P		1	1		1	2	1							
							1	1		1	2	1			1				
14	-89.20847	44.12045	2	M	P		2			1	2	1							
							3				2	1	1						
15	-89.20797	44.12045	2	M	P			1		1			1						
							1				3		1						
16	-89.20747	44.12044	2	M	P		1	1		1	2			1					
							1			1	1	1		1					
17	-89.20697	44.12044	2	M	P		2					1							
							1				2	2							
18	-89.20647	44.12044	4	M	P		1				2	1	1						
							1				1	1	1						
19	-89.20956	44.12018	3	M	P		1			1	2	1							
							3			1	2	1							
20	-89.20848	44.12009	3	M	P		3												
							3	1				1							
21	-89.20798	44.12009	3	M	P		2	1											
							2	1		2	2	1	1						
22	-89.20748	44.12008	3	M	P		2				1	1		1					
							3												

Number	Longitude (Decimal Degrees)	Lattitude (Decimal Degrees)	Depth (ft)	Sediment type (M=muck, S=Sand, R=Rock)	Rope (R); Pole (P); Visual (V)	*Myriophyllum spicatum*	*Potamogeton crispus*	*Nuphar variegata*	*Nymphaea odorata*	*Ceratophyllum demersum*	*Chara sp.*	*Elodea canadensis*	*Myriophyllum sibiricum*	*Ranunculus aquatilis*	*Potamogeton natans*	*Potamogeton praelongus*	*Potamogeton zosteriformis*	*Lemna trisulca*	*Spirodela polyrhiza*
23	-89.20698	44.12008	5	M	P		2				2	1							
							2				2	1							
24	-89.20957	44.11982	3	M	P		3				1								
							2				1								
25	-89.20907	44.11981	7	M	P		3					1							
							2					2							
26	-89.20957	44.11946	1	M	P			1		1								1	
							1	1		1									
27	-89.20907	44.11945	6	M	P		3			1		1							
							3					1							
28	-89.20908	44.11909	2	M	P					1	1		1	1			1		
							1	1		1				1				1	1
29	-89.20858	44.11909	2	M	P		1					3							
							2				2	2							
30	-89.20648	44.11891	5	M	P		1				2	1	2						
							1				1	1							
31	-89.20598	44.11890	5	M	P		3				1	1							
							1				2	1	1						
32	-89.20808	44.11872	2	M	P		1				2	2							
							2				2								
33	-89.20748	44.11855	4	M	P						3					1			
							1				3								
34	-89.20698	44.11855	3	M	P						3								
											3								
35	-89.20648	44.11855	6	M	P		1			1	1								
											2								
36	-89.20598	44.11854	6	M	P						2	1							
							1				2		1						
37	-89.20548	44.11854	3	M	P						2		1						
										1	2		2				1		
39	-89.20649	44.11819	2	M	P			1			2	1	1	1					
							1	1		1			1	1					
40	-89.20599	44.11818	5	M	P		1				2	1	1						
							2				1		1						
41	-89.20549	44.11818	2	M	P					1	2	1					1		
											2						1		
42	-89.20599	44.11782	3	M	P						2						1		
							1				2		1						
43	-89.20549	44.11782	2	M	P						3								
											3								
44	-89.20482	44.11738	3	M	P		1				2								
							1				2								
45	-89.20483	44.11702	3	M	P		2				2	1							
							1					1	1			1			

Number	Longitude (Decimal Degrees)	Lattitude (Decimal Degrees)	Depth (ft)	Sediment type (M=muck, S=Sand, R=Rock)	Rope (R); Pole (P); Visual (V)	*Myriophyllum spicatum*	*Potamogeton crispus*	*Nuphar variegata*	*Nymphaea odorata*	*Ceratophyllum demersum*	*Chara sp.*	*Elodea canadensis*	*Myriophyllum sibiricum*	*Ranunculus aquatilis*	*Potamogeton natans*	*Potamogeton praelongus*	*Potamogeton zosteriformis*	*Lemna trisulca*	*Spirodela polyrhiza*
46	-89.20433	44.11702	4	M	P						1	1							
							1				1	1							
47	-89.20433	44.11666	5	M	P		2			1	2	1	1			1			
							1				2	1							
48	-89.20383	44.11666	4	M	P		2				2	1							
							2				2								
49	-89.20333	44.11665	1	M	P			1			3								
								1			3								
50	-89.20434	44.11630	3	M	P		1				2	1	1						
							1				2	1	1						
51	-89.20384	44.11630	5	M	P		1				1	1							
							2				2	1	1						
52	-89.20384	44.11594	1	M	P						3								
											3								
53	-89.20334	44.11593	4	M	P						2								
											3								
54	-89.19958	44.11488	6	M	P						2								
											2					1			
55	-89.19908	44.11487	6	M	P						2								
											2								
56	-89.19858	44.11487	5	M	P						3	1							
											2		1						
57	-89.19959	44.11452	6	M	P						3					1			
											3					1			
58	-89.19909	44.11451	4	M	P		2		1		1	1							
											2	1							
59	-89.20004	44.11442	12	M	P					2		1							
							1			1		2							

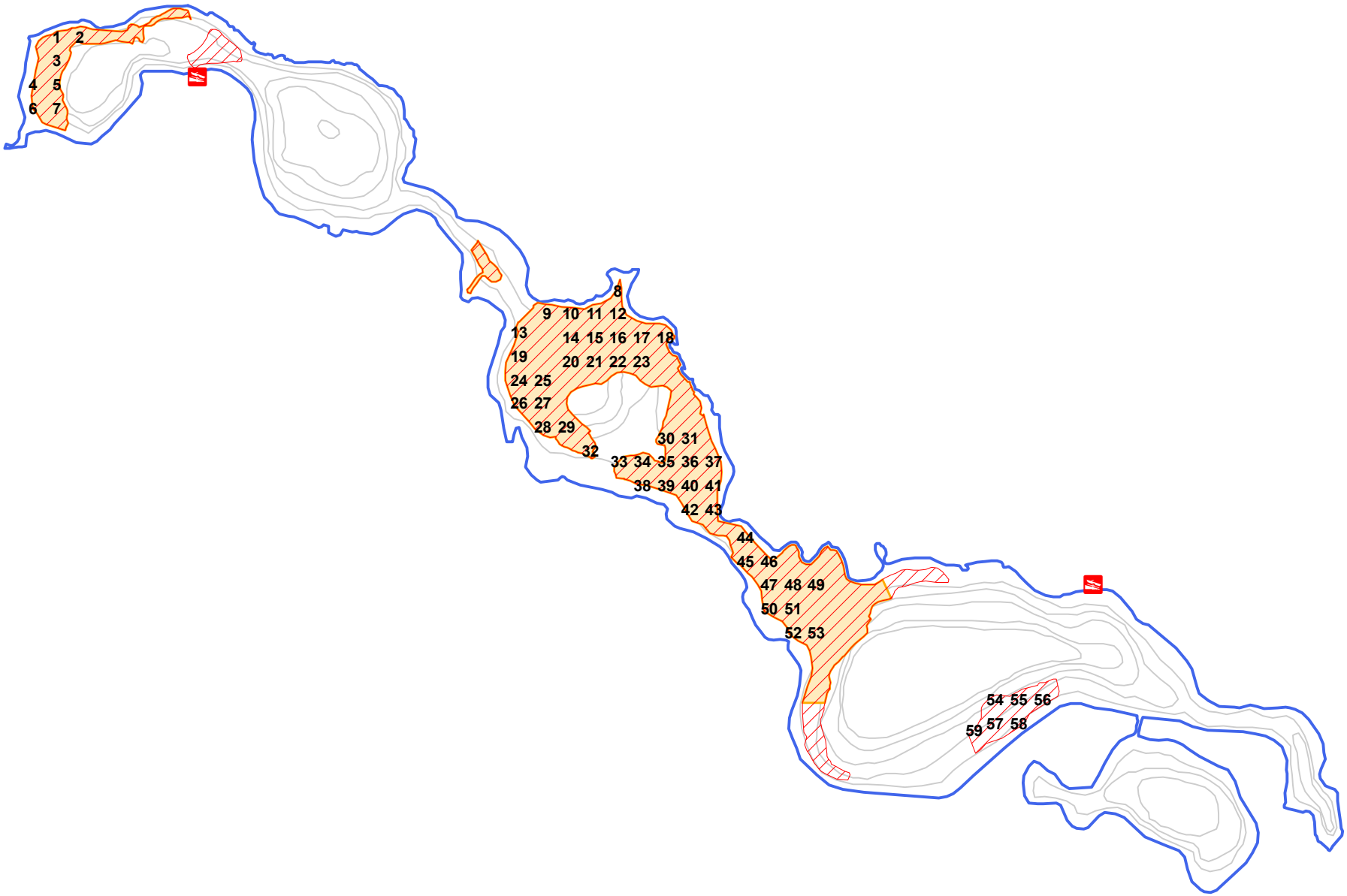
Number	Longitude (Decimal Degrees)	Lattitude (Decimal Degrees)	Depth (ft)	Sediment type (M=muck, S=Sand, R=Rock)	Rope (R); Pole (P); Visual (V)	*Myriophyllum spicatum*	*Potamogeton crispus*	*Nuphar variegata*	*Nymphaea odorata*	*Ceratophyllum demersum*	*Chara sp.*	*Elodea canadensis*	*Myriophyllum sibiricum*	*Ranunculus aquatilis*	*Potamogeton natans*	*Potamogeton praelongus*	*Potamogeton zosteriformis*	*Lemna trisulca*	*Spirodela polyrhiza*
1	-89.21927	44.12510	2	M	P						3								
							1				3								
2	-89.21878	44.12510	3	M	P			V			3								
							V				3								
3	-89.21928	44.12474	3	M	P		1	1		1	3								
							1				3	1							
4	-89.21978	44.12438	2	M	P		2	1		1	3								
							2				3								
5	-89.21928	44.12438	8	M	P						3								
											3								
6	-89.21979	44.12402	1	M	P					1	1								
											1								
7	-89.21929	44.12402	4	M	P					1	2								
											3	1							
8	-89.20746	44.12116	1	M	P		1				1								
							1												
9	-89.20897	44.12081	2	M	P					1	3								
											3	1							
10	-89.20847	44.12081	4	M	P		1			1	2								
											3	1							
11	-89.20797	44.12081	3	M	P						2	1							
											3								
12	-89.20747	44.12080	2	M	P		1				2								
							2				1	1							
13	-89.20956	44.12054	1	M	P						2	2							
											2	2		V					
14	-89.20847	44.12045	4	M	P		1	V				1							
								V			1	2							
15	-89.20797	44.12045	3	M	P		1	V			2	1							
								V			3								
16	-89.20747	44.12044	3	M	P		1	1		1	3	1							
								V			3	1							
17	-89.20697	44.12044	4	M	P		1			1	3	2							
											3	2							
18	-89.20647	44.12044	5	M	P	1	2				3	1							
							2			1	3								
19	-89.20956	44.12018	4	M	P		1				3	1				1			
							V	V			3								
20	-89.20848	44.12009	5	M	P		1				2	2							
											2	2							
21	-89.20798	44.12009	5	M	P			V		1	3	1							
								V			3	1							

Number	Longitude (Decimal Degrees)	Lattitude (Decimal Degrees)	Depth (ft)	Sediment type (M=muck, S=Sand, R=Rock)	Rope (R); Pole (P); Visual (V)	*Myriophyllum spicatum*	*Potamogeton crispus*	*Nuphar variegata*	*Nymphaea odorata*	*Ceratophyllum demersum*	*Chara sp.*	*Elodea canadensis*	*Myriophyllum sibiricum*	*Ranunculus aquatilis*	*Potamogeton natans*	*Potamogeton praelongus*	*Potamogeton zosteriformis*	*Lemna trisulca*	*Spirodela polyrhiza*
22	-89.20748	44.12008	5	M	P		1	1			3	1				1			
							1				3	1				1			
23	-89.20698	44.12008	5	M	P		1				2	1	1						
							1				2		1						
24	-89.20957	44.11982	3	M	P	1	2				2			1					
						1	1				2	1		1					
25	-89.20907	44.11981	6	M	P							3							
												3							
26	-89.20957	44.11946	4	M	P		1	1		1		2							
								V			1	2							
27	-89.20907	44.11945	4	M	P		V	V		1		2							
												3							
28	-89.20908	44.11909	3	M	P		1	1		1	1	1		1					
								V		1	1	1							
29	-89.20858	44.11909	3	M	P		1		1		1	2							
							1				1	2							
30	-89.20648	44.11891	6	M	P		2				1								
							3												
31	-89.20598	44.11890	4	M	P		1				2								
							1					2							
32	-89.20808	44.11872	4	M	P						2	1				1			
											2					1			
33	-89.20748	44.11855	4	M	P						2					1			
											2					1			
34	-89.20698	44.11855	5	M	P		1				2	1							
							1				2	1							
35	-89.20648	44.11855	5	M	P		1				2	1							
											2	1							
36	-89.20598	44.11854	5	M	P		1				2								
							2				1								
37	-89.20548	44.11854	2	M	P						2								
											3								
38	-89.20698	44.11819	too shallow																
39	-89.20649	44.11819	3	M	P						3								
												2							
40	-89.20599	44.11818	5	M	P		2				2								
							1				2								
41	-89.20549	44.11818	2	M	P			1			3								
								V			3								
42	-89.20599	44.11782	2	M	P		1	1			2								
								1			1								

Number	Longitude (Decimal Degrees)	Lattitude (Decimal Degrees)	Depth (ft)	Sediment type (M=muck, S=Sand, R=Rock)	Rope (R); Pole (P); Visual (V)	*Myriophyllum spicatum*	*Potamogeton crispus*	*Nuphar variegata*	*Nymphaea odorata*	*Ceratophyllum demersum*	*Chara sp.*	*Elodea canadensis*	*Myriophyllum sibiricum*	*Ranunculus aquatilis*	*Potamogeton natans*	*Potamogeton praelongus*	*Potamogeton zosteriformis*	*Lemna trisulca*	*Spirodela polyrhiza*
43	-89.20549	44.11782	3	M	P						3								
											3								
44	-89.20482	44.11738	3	M	P						3								
											3								
45	-89.20483	44.11702	2	M	P						3								
											3								
46	-89.20433	44.11702	4	M	P						2								
											3								
47	-89.20433	44.11666	4	M	P						3								
											3								
48	-89.20383	44.11666	4	M	P		1	V			2								
							1	V			2								
49	-89.20333	44.11665	2	MM	P						3								
											3								
50	-89.20434	44.11630	3	M	P						3								
											3								
51	-89.20384	44.11630	5	M	P	NV													
							1												
52	-89.20384	44.11594	2	M	P						3								
											3								
53	-89.20334	44.11593	5	M	P	NV													
											1								
54	-89.19958	44.11488	10	S	P						1								
											1								
55	-89.19908	44.11487	7	S	P						3								
											3								
56	-89.19858	44.11487	4	S	P						2								
											2								
57	-89.19959	44.11452	8	S	P						2								
											0								
58	-89.19909	44.11451	3	S	P						3								
											3								
59	-89.20004	44.11442	too deep																

Point Number	Longitude (Decimal Degrees)	Lattitude (Decimal Degrees)	Turion Count Dredge 1	Turion Count Dredge 2	Notes
1	-89.21927	44.12510			
2					
3	-89.21928	44.12474	1		
4					too shallow
5	-89.21928	44.12438			
6					too shallow
7	-89.21929	44.12402			
8					
9	-89.20897	44.12081			
10					
11	-89.20797	44.12081			
12					Clump of small plants observe
13	-89.20956	44.12054	2		
14					
15	-89.20797	44.12045			
16			2	5	
17	-89.20697	44.12044	1	7	Bluegill in dredge
18					
19	-89.20956	44.12018	1		
20			6	1	
21	-89.20798	44.12009	5	2	
22			12	10	
23	-89.20698	44.12008	14	4	
24			2	4	
25	-89.20907	44.11981			
26			3		
27	-89.20907	44.11945	4	2	
28			2	1	
29	-89.20858	44.11909	2	1	
30			2		
31	-89.20598	44.11890		1	
32					
33	-89.20748	44.11855	1		
34			4		Lost Dredge
35	-89.20648	44.11855			
36					
37	-89.20548	44.11854			Crayfish in dredge
38					
40	-89.20599	44.11818			
41					
42	-89.20599	44.11782			
43					
44	-89.20482	44.11738			
45					
46	-89.20433	44.11702			
47					
48	-89.20383	44.11666			
49					
50	-89.20434	44.11630			
51					
52	-89.20384	44.11594			
53					
54	-89.19958	44.11488			
55					too deep
56	-89.19858	44.11487			
57					
58	-89.19909	44.11451			
59					

Point Number	Longitude (Decimal Degrees)	Lattitude (Decimal Degrees)	Turion Count Dredge 1	Turion Count Dredge 2	Notes
1	-89.21927	44.12510			
2			1		CLP plant right by boat
3	-89.21928	44.12474	4		
4			1		
5	-89.21928	44.12438			
6					
7	-89.21929	44.12402	1		
8				1	5 turions floated up with dredg
9	-89.20897	44.12081			CLP around boat
10					CLP around boat
11	-89.20797	44.12081	1		
12			23	9	
13	-89.20956	44.12054		1	
14			1	3	
15	-89.20797	44.12045		2	
16					
17	-89.20697	44.12044		1	
18					
19	-89.20956	44.12018		7	
20					
21	-89.20798	44.12009		3	
22			4	3	
23	-89.20698	44.12008	5		
24				6	
25	-89.20907	44.11981		9	
26			3	4	
27	-89.20907	44.11945	19	19	
28				3	
29	-89.20858	44.11909			
30					
31	-89.20598	44.11890			
32			1		
33	-89.20748	44.11855			
34					
35	-89.20648	44.11855			
36					
37	-89.20548	44.11854			
38					
40	-89.20599	44.11818			
41					
42	-89.20599	44.11782			
43					
44	-89.20482	44.11738			
45					
46	-89.20433	44.11702			
47					
48	-89.20383	44.11666			
49					
50	-89.20434	44.11630			
51					
52	-89.20384	44.11594			
53					
54	-89.19958	44.11488			
55					
56	-89.19858	44.11487			
57					
58	-89.19909	44.11451			swim area
59					



800

Feet

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Lake Management Planning
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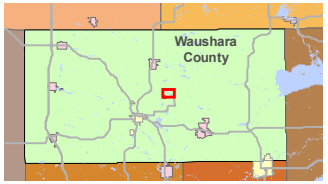
Sources:
Roads & Hydro: WDNR
Aquatic Plants: Onterra, 2006, 2007
Bathymetry: WDNR (Digitized by Onterra)
Map date: April 26, 2007



Extent of large map shown in red.

Legend

\# Point-intercept Sample Location

2007 Chemical Treatment Area (27.1 Acres)

2006 Chemical Treatment Area (31.5 Acres)

Appendix A

Mt. Morris Lake

Waushara County, Wisconsin

Curly-leaf Pondweed & Turion Monitoring Locations

2006 Water Quality Data

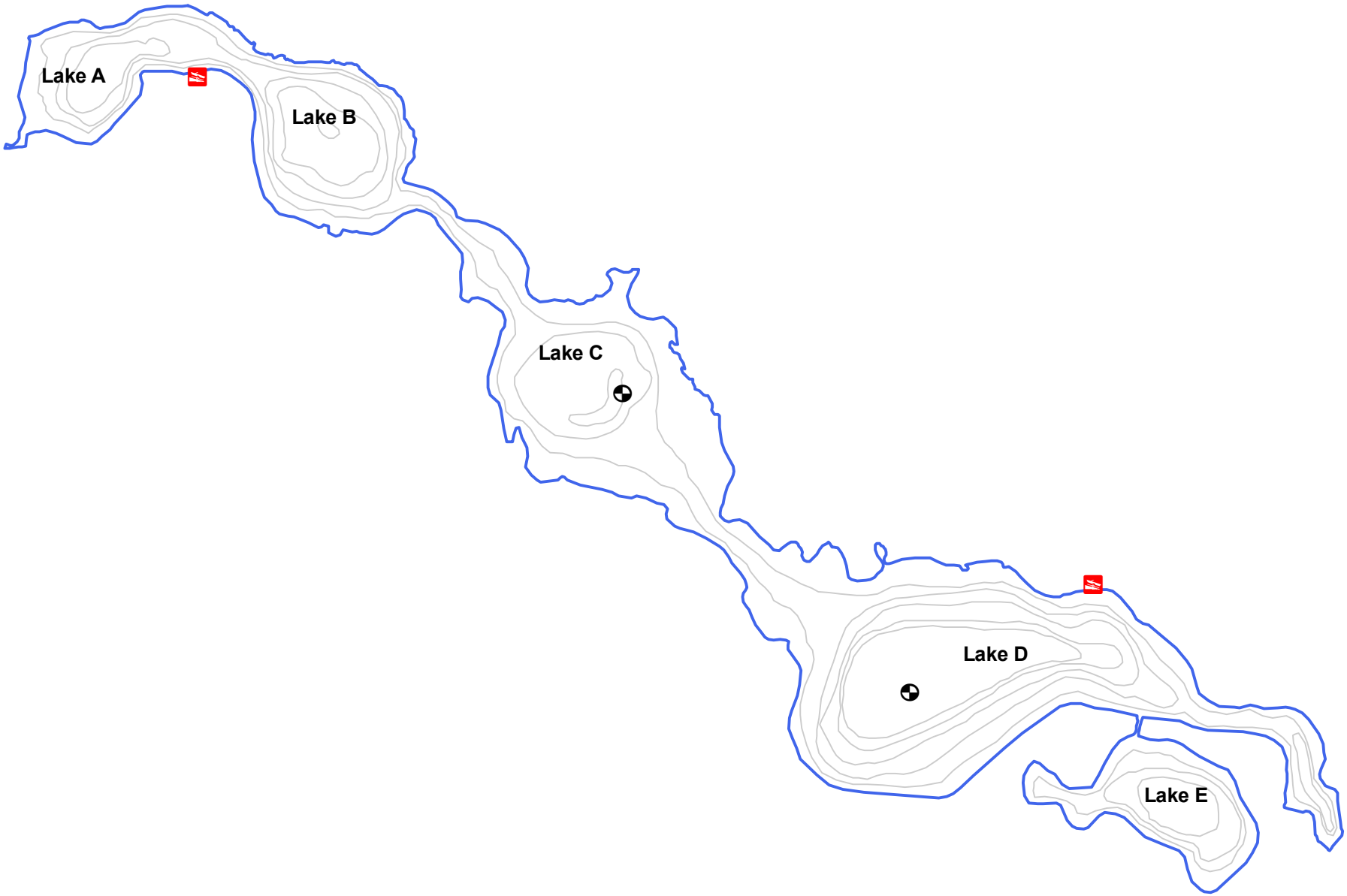
	Lake C Surface		Lake C Bottom	
Date	TP	SRP	TP	SRP
5/23/2006	22	4	95	29
5/30/2006	23	ND	260	27
6/13/2006	19	5	230	15
6/26/2006	18	ND	181	ND
7/18/2006	20	ND	220	3
7/27/2006	28	3	142	26
8/8/2006	22	ND	113	3
8/21/2006	21	ND	274	2

	Lake D Surface		Lake D Bottom	
Date	TP	SRP	TP	SRP
5/23/2006	16	3	164	120
5/30/2006	16	2	221	26
6/13/2006	16	5	227	162
6/26/2006	22	ND	156	ND
7/18/2006	21	ND	93	27
7/27/2006	15	2	174	63
8/8/2006	14	ND	82	8
8/21/2006	14	ND	396	253

2007 Water Quality Data

	Lake C Surface		Lake C Bottom	
Date	TP	SRP	TP	SRP
5/14/2007	20	ND	68	ND
5/29/2007	22	ND	66	2
6/12/2007	14	3	34	3
6/26/2007	17	ND	53	ND
7/11/2007	23	ND	53	ND
7/23/2007	20	ND	97	2
8/7/2007	19	3	154	3
8/28/2007	25	3	146	46

	Lake D Surface		Lake D Bottom	
Date	TP	SRP	TP	SRP
5/14/2007	12	ND	46	3
5/29/2007	17	ND	25	3
6/12/2007	16	3	15	9
6/26/2007	14	ND	49	ND
7/11/2007	14	ND	23	5
7/23/2007	12	ND	21	ND
8/7/2007	9	ND	14	ND
8/28/2007	20	ND	24	8



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Feet

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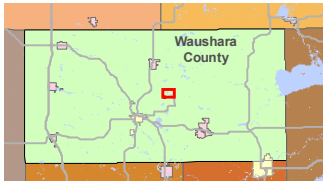
Sources:
Roads & Hydro: WDNR
Water Quality Sample Locations: WDNR
Bathymetry: WDNR (Digitized by Onterra)
Map date: April 26, 2007



Extent of large map shown in red.

Legend

Volunteer Water Quality Sample Location

Appendix B

Mt. Morris Lake

Waushara County, Wisconsin

Volunteer Water Quality Sample Locations