

Honeoye Lake Macrophyte Management Plan

Final - April 30, 2008



Prepared by:
Honeoye Lake Watershed Task Force
Macrophyte Management Committee

For:
Honeoye Lake Watershed Task Force
Town of Richmond
Town of Canadice

Available at: http://www.co.ontario.ny.us/planning/honeoye_lk.htm

Problem Statement

Honeoye Lake is currently listed as “Impaired” on the NYS DEC Priority Waterbody List due to water supply concerns relating to excessive nutrients. These nutrients, primarily phosphorus and nitrogen, can cause heavy growth of aquatic macrophytes and can contribute to nuisance algae blooms. Excessive plant growth may negatively affect recreational opportunities including fishing, boating, swimming and water skiing.

The eleven Finger Lakes of New York State were formed by the erosive scouring action and subsequent deposition of damming moraines by continental ice sheets during the Pleistocene Epoch. These lakes have many things in common such as their north-south orientation and linear shape, but also have many differences especially with regard to their surface area, depth and volume. These differences play a major role in determining the underwater light environment, seasonal temperature patterns and length of growing season, all factors that contribute to macrophyte growth. In general, the shallow Finger Lakes are biologically more productive and this fact must be taken into account in lake management plans since sensible management cannot drastically change the natural morphometry of a lake. The relationship between total phosphorus, one measure of lake productivity, and depth and volume is shown in Figure 1 for all eleven Finger Lakes. As predicted based on depth and volume, Honeoye Lake should be one of the most productive Finger Lakes and, indeed, it is. Knowing this morphometric limitation, no management technique can or should attempt to change a Honeoye Lake into a Skaneateles Lake.

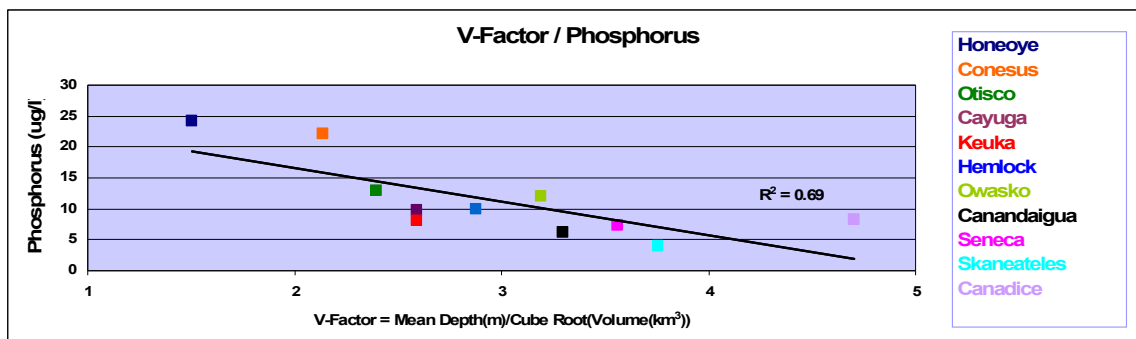


Figure 1- Relationship between Total Phosphorus and Lake Morphology for New York State Finger Lakes

The Honeoye Lake Watershed Management Plan summarizes the present state of the lake and watershed, including nutrient levels and their effect on the trophic state of the lake. Land uses commonly associated with nutrient enrichment, such as agricultural, industrial, commercial, and high density residential, are not common in the watershed, except for the high density shoreline residences. Most of the external sources of nutrients flow into the lake from streams or directly from the shoreline.

Honeoye Lake seldom stratifies in the summer and does so only temporarily and weakly due to its relatively shallow depth and exposure to wind-induced mixing. However, during periods of calm weather sufficient stratification occurs such that the deep waters have the potential to become anoxic, which can cause the release of internal phosphorus from sediments into the water column in deeper areas of the lake. Testing over the past five years has verified the summer anoxia and high concentrations of phosphorus in water collected from depths greater than seven meters. An

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alum application was completed in 2007 to reduce the release of phosphorus from the lake bottom sediment in an attempt to reduce the severity of late summer algae blooms.

The total annual phosphorus load in the lake is 70% from external sources and 30% from the lake's sediment related internal phosphorus load. However, this internal load is very seasonal in nature and peak internal loads often reach 90% during mid to late summer and are a major reason for an increase in a lake summer algae blooms. Macrophyte growth, however, is determined by sediment phosphorus levels in the shallower areas of the lake.

The watershed plan includes recommendations on steps to be taken to minimize nutrient flow into the lake. The highest priority action items are related to reducing erosion. These action items include stabilization of severely eroding streambanks and shoreline and the adoption of municipal practices and regulations that minimize erosion from development, highway maintenance, and timber harvesting.

The plant productivity of Honeoye Lake is a major reason for its highly regarded fisheries. Macrophyte stands provide excellent fish habitat, including spawning sites, feeding areas and protective refuge for juvenile fish from predators. Macrophytes also play an important role in stabilization of shorelines by holding bottom substrates in place thereby mitigating the erosive effects of waves, prop wash, and boat wake. Macrophytes also compete with algae for nutrients. For these reason, it is important that excessive macrophytes that interfere with recreational pursuits be managed but not eliminated.

Dr. Bruce Gilman of the Finger Lakes Community College has devoted more than twenty years documenting and analyzing the aquatic macrophyte communities of Honeoye Lake. His inventories during the fall of 1984, 1994 and 2004 were conducted along 20 different transects around the lake at distances of 10, 100, 200, 300 and 400 feet from shoreline for a total of 100 different sample locations each year. Figures 2-4 summarize the major results of these comprehensive studies:

Although variation in plant biomass exists around the lake, there is significant biomass at most locations along the shoreline to impact recreational opportunities (Figure 2 & Appendix A)

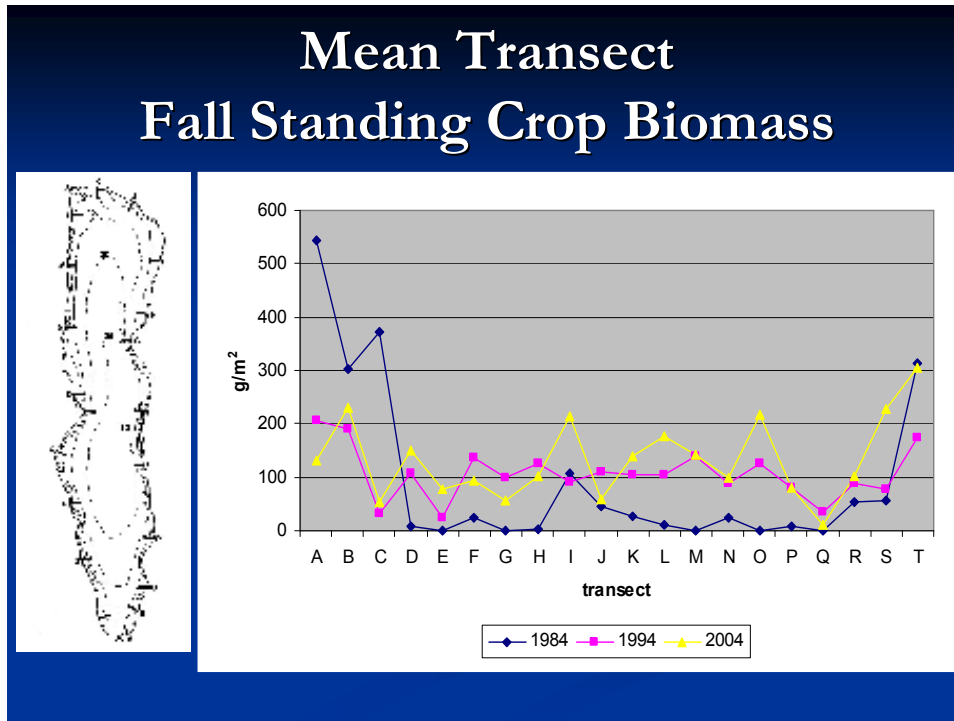


Figure 2- Fall Standing Biomass by Transect

Two common invasive macrophytes in Honeoye Lake are curly leaf pondweed and Eurasian milfoil. Since curly leaf pondweed dies off in early summer it was not commonly abundant in Dr. Gilman’s fall sampling. While there has been a shift in the most dominant species, eelgrass and coontail have remained in the top three over the 20 year period (Figure 3). Eurasian milfoil, an invasive species that is a major problem in many northeastern U.S. lakes, is also present in Honeoye Lake but its dominance has been reduced from a peak of 54% in 1994 to 13% in 2004.



Figure 3- Shift in Macrophyte Species Comparison

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The increase in transect plant biomass over the past 20 years has been primarily in the deeper waters due to increased water clarity (Figure 4). There has been little change in weedbed density in vegetated sites in the shallow areas. The increasing water clarity is related to the installation of a perimeter sewer system (1980) and the introduction of invasive zebra mussels (*Dreissena polymorpha*), first collected from the lake on May 30, 1998.

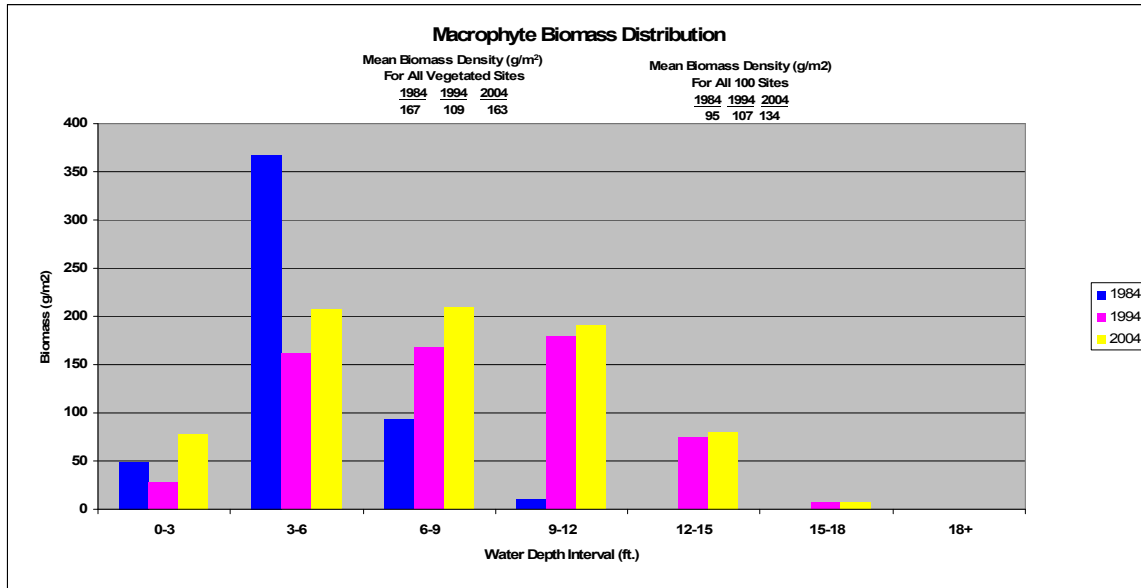


Figure 4- Macrophyte Biomass Distribution with Water Depth

The only known occurrence of a rare or endangered species is the water marigold (*Megalodonta beckii*), which commonly occurs only in the most southern portion of the lake, outside the area that is presently harvested. Isolated occurrences have occurred in a couple of other shallow water locations.

There are several wetland buffer zones located at the extreme northern and southern portions of the lake, which are also located outside the area that is presently harvested.

Management History

A near-shore aquatic macrophyte harvesting program to enhance recreational opportunities in the lake was initiated in 1987 and, through 2004, used a single mechanical harvester. A second machine was added in 2005, since there was the perception that a single harvester was not sufficient to maintain the conditions necessary for enjoyable recreational use. This change nearly doubled the total amount of vegetation harvested. Figure 5 provides the total wet tonnage and harvesting rate through this 20 year period. Nutrient removal rates per harvester are estimated to be 630 pounds (286 kg) of nitrogen and 99 pounds (45 kg) of phosphorus on an average annual basis. An ongoing aquatic macrophyte harvesting program may be of long term benefit because of the nutrients that are removed in the plant biomass.

While aquatic macrophyte harvesting may only temporarily reduce the current plant biomass, there is general support to continue harvesting to enhance recreational use of the lake by reducing vegetation in the upper portions of the water column. The cost of the aquatic macrophyte harvesting program has been shared between the towns of Richmond and Canadice, and New York State through funds from the Finger Lakes- Lake Ontario Watershed Protection Alliance program.

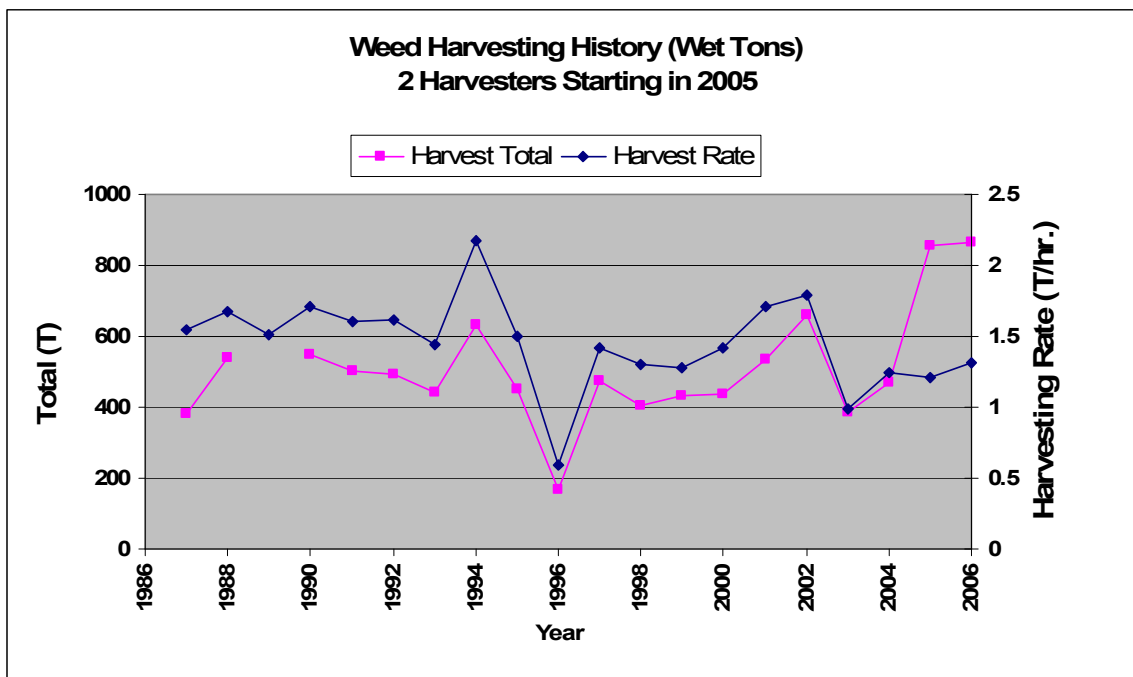


Figure 5- Weed Harvesting History

In addition, some residents have controlled aquatic macrophytes in the near shore area around their docks and beach by using benthic mats, hand pulling, raking, and small suction dredging units.

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Management Objective

The objective of this plan is to:

*Develop an **ecologically** and **scientifically** sound Macrophyte Management Plan (MMP) to facilitate **balanced recreational use** of Honeoye Lake including **boating, fishing, swimming and other uses**.*

This will result in the following benefits to lake users:

Enhancing recreational lake opportunities while protecting aquatic plant habitats for the functions and values they provide. This will be achieved by selecting aquatic macrophyte management strategies that are focused on providing biomass reduction in the top few feet of the water column in areas most frequented by recreational lake users.

Aquatic macrophyte management alternatives suited to the upper water column and especially the near shore lake environment will be evaluated here. Since the lake is not dominated by a single species, all techniques, not just those designed for invasive species, will be considered.

The macrophyte management techniques chosen are expected to be implemented during the summer season since the macrophytes die back each fall and the recreational opportunities affected by excessive macrophytes are primarily summer endeavors.

No management techniques will be implemented in the New York State protected wetlands (Appendix B) and their respective 100 foot buffer zones at the south and north ends of Honeoye Lake. All management techniques will be appropriately timed to avoid impacts on lake fisheries.

Management Alternatives

A consulting firm, Princeton Hydro, evaluated nearly all known macrophyte management techniques that have been used on other lakes. These included mechanical harvesting, lake level drawdown, benthic barriers, hand and suction harvesting, hydroraking / rotovating, dredging, herbivorous insects, grass carp, contact aquatic herbicides, systemic aquatic herbicides, shading (adding dye to the water), and treatment of the sediments with either a lime or alum slurry. The evaluation criteria used were:

Does it meet our management objective?

Is it fundable?

Are we likely to be able to get a NYS DEC permit?

Is it acceptable to lake stakeholders?

A meeting was held with NYS DEC personnel from both the Albany and Region 8 Offices on October 3, 2006 to understand their concerns and discuss their recommendations.

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Tables 1 and 2 summarize the ranking results of analyzing the efficacy of the various methods within each evaluation criteria identified above, for both local shoreline management that could be accomplished by individual residents and whole lake management that would be expected to be done by governmental entities. The color coding is as follows:

Green - This option is viable for this evaluation criterion

Yellow - This option is potentially viable for this evaluation criterion

Red - This option is rejected for this evaluation criterion

Table 1 - Evaluation of Shoreline Management Techniques

Techniques	Meet Objective	Fundable	Permittable	Acceptable to Stakeholders
Benthic Barriers	Yes	\$1/ft ²	Not Required	Yes
Weed Roller/ Lake Sweeper	Yes	\$1K-\$5K	Not Required	Yes
Hand Pulling	Yes	~\$0 -\$500/acre/yr	Not Required	Yes
Suction Harvesting	Yes	~\$500+/acre/yr	Yes	Yes

All of the above techniques are potentially practical for individual residents to use in fairly small areas around docks, beaches and swimming areas.

1. Benthic Barriers are a cost effective way to limit growth through the reduction in sunlight available for plant germination at the lake bottom. They also provide a physical barrier through which aquatic plants have great difficulty growing.
2. Weed Rollers/Lake Sweepers are a relatively new device used mostly to control weed growth in small areas by the repetitive gentle agitation of the surface sediments which impedes plant growth due to mechanical damage to the plants or the creation of a sediment habitat unsuitable for plant colonization.
3. Hand Pulling is largely restricted to small areas and is labor intensive. It is the ultimate selective plant management technique, however, since it removes individual plants one at a time.
4. Suction harvesting has many of the same advantages as hand pulling but involves a SCUBA diver using a flexible hose that is connected to a vacuum pump to dislodge plants which are then pumped to the surface into a container for proper off-lake disposal.

Table 2- Evaluation of Whole Lake Management Techniques

Techniques	Meet	Fundable	Permittable	Acceptable to Stakeholders
	Objective			
Mechanical Harvesting	Yes	\$60,000/yr	N/A	Mixed
Systemic Spot Herbicides	Mixed	~\$240,000+/3yr	2+ Years	Mixed
Hydroraking / Rotovating	Localized	~\$250+/acre/yr	2+ Years	Mixed
Herbivorous Insects	Mixed	~\$1,000/acre	Yes	Yes
Systemic Whole-Lake Herbicides	Mixed	~\$500,000/3yr	2+ Years	Mixed
Contact Spot Herbicides	No	~\$120,000/yr	Yes	Mixed
Grass Carp	No	~\$120,000+	No	Mixed
Lake Draw Down	No	\$\$	No	Mixed
No Management	No	\$0	N/A	No
Lime or Alum Slurry	No	?	No	Mixed
Shading (Adding Dye to Water)	No	?	No	Mixed
Dredging	No	~\$20,000+/acre	No	No

Viable whole lake management strategies are subdivided into physical/mechanical alternatives, biological control alternatives, chemical control alternatives and a no action alternative. Each technique is then discussed in detail as it relates to macrophyte management in Honeoye Lake.

Physical/Mechanical Control Alternatives

1. Continue to use mechanical harvesting as the center piece of the macrophyte management control program based on past performance related to removal of nutrients and reducing weeds in the upper levels of the water column. This technique is well suited when there is no dominant species that needs to be controlled.
2. Hydroraking could be considered as a supplemental management option to decrease weed densities in areas that are difficult for the harvesters to effectively operate. However, it is very costly and would be difficult to get NYS DEC permit approval.
3. Lake drawdown is not practical for a number of reasons: no dam or control structure, insufficient elevation differential, NYS protected wetlands at north and south ends of lake, possible exposure of residential water intakes during drawdown.
4. Dredging is not practical due to excessive cost, the inability to achieve sufficient depth change to preclude weed growth, and the detrimental ecological effects of significant bottom sediment disruption.

Biological Control Alternatives

1. Herbivorous Insects should continue to be investigated but at this time they don't appear to be a practical control method since, in most cases, they target a specific macrophyte species, some herbivorous insects are already present in the lake, their cost is excessive for treatment of large areas and have not proven to be unequivocally successful in neighboring small lakes.
2. Grass carp are not practical due to their high cost, they are not recommended where they may escape to adjacent waters, they re-suspend lake sediment and create turbid conditions, and

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their preference to eat desirable native macrophytes might lead to future infestations with the invasive curly leaf pondweed and/or Eurasian milfoil.

Chemical Control Alternatives

1. Contact herbicides should not be used primarily due to the fast acting nature of these chemicals in killing plants which then rapidly decay resulting in negative side effects including dissolved oxygen depression and the release of soluble reactive phosphorus. The significance of the phosphorus release is that the timing of the treatments, and the subsequent introduction of phosphorus from the dying plants into the water, often results in mid- and late-summer algae blooms, a condition that is counterproductive to the overall management of Honeoye Lake. Although it can be argued that contact herbicide treatments could be conducted on a localized scale, thereby minimizing the chance for these types of problems, the distribution of problem vegetation tends to be fairly uniform along the lakeshore.
2. Fluridone (SONAR) and 2-4D are two aquatic, systemic herbicides licensed for use in New York. NYS DEC restricts the use of both from the perspective of timing, allowable treatment area and dosage. Due largely to costs and regulatory restrictions, a whole lake application using either of these chemicals is not feasible.
3. Some consideration should be given to the use of pelletized versions of either 2-4D or SONAR as a supplementary means of controlling nuisance weeds where structures may impede effective weed harvesting. Its efficacy is greatly diminished in areas having very soft sediments where the pellets will settle into the mud. NYS DEC does restrict the use of 2-4D to treatments between late spring and mid-summer, and it cannot be applied in waters shallower than 2 feet. In addition, there is at least a 24 hour use restriction for the drinking of treated waters and irrigation may be prohibited for a much longer period of time. Unlike 2-4D, which is a fast acting systemic herbicide, SONAR is slow acting. This has a number of benefits in terms of avoiding or minimizing the aforementioned secondary water quality impacts associated with contact herbicides. However, the slow acting nature of this chemical necessitates that it remain in contact with the target plant(s) for a long period of time (usually 30-60 days). Water currents and wave action can result in the drift or dilution of the chemical and diminish its effectiveness. A large problem with SONAR is its water use restrictions. Treated waters cannot be used for irrigation for 60-90 days following treatment. Even more important is that areas within ¼ mile of potable water intakes cannot be treated. With the number of residential intakes on Honeoye Lake this presents a significant problem and would greatly restrict the areas in which this product could be used even with a spot treatment approach.
4. The use of alum or lime slurry to control weeds is not practical since it does not appear that the New York State will, at any time soon, be in a position to issue the SPDES permit needed to authorize such treatments. So although these techniques remain promising, they cannot be considered feasible at this point in time.
5. The use of dyes to darken the water thereby reducing the amount of light and hence reducing the growth of macrophytes is not practical. The cost-effectiveness of this control option is low and the aesthetic effect of making the lake look artificial is undesirable to stakeholders.

No Action Alternative

1. This alternative does not address the problem caused by excessive aquatic plant growth reducing the recreational enjoyment of the lake.

Recommendations

Based on the above research, analysis and evaluation, the recommendation is to continue to utilize Mechanical Weed Harvesting as our primary Macrophyte Management Control strategy with the following suggestions:

1. Continue to manage the Mechanical Weed Harvesting Program through the Ontario County Planning Department (OCPD).
2. OCPD Weed Harvesting Program Manager in conjunction with the Honeoye Lake Watershed Task Force (HLWTF) will develop an annual Macrophyte Management Plan based on maximizing the objective for recreational lake user's benefits while also maintaining the ecological services provided by the aquatic plant communities.
3. The OCPD Weed Harvesting Manager and HLWTF will develop an aggressive communication strategy (e.g., annual management strategy, periodic progress reports during the weed harvesting season, annual weed harvesting report at the end of the season, etc.) with the HLWTF, Town Boards, and the lake residents through the utilization of existing venues (e.g., local board meetings, OCPD & Honeoye Valley Association (HVA) web sites, and direct mail communication).
4. Refurbish the Town of Richmond Weed Harvester after the 2007 season. Cost estimated to be ~\$ 12,000.
5. Develop a funding strategy (e.g., State Member Line Item funding, County Funding support, local town five year funding reserve fund strategy, etc.) to buy two new mechanical harvesters by 2012.
6. Maintain the annual macrophyte management budget at its current level of \$60,000 (Richmond \$26,250, Canadice \$8,750 and FL-LOWPA \$25,000) for 2007.

Encourage private lake front property owners to take appropriate macrophyte management actions (benthic barriers, hand and suction dredging, hand pulling) to improve recreational lake usage for activities like fishing, boating, swimming, skiing, etc.

Continue to evaluate any new macrophyte management alternatives that are approved by the NYS DEC.

For example; continue to evaluate the potential of using new systemic aquatic herbicides for spot treatments to augment the mechanical harvesting program. For example, Renovate 3 is being evaluated by the NYS DEC. It has only a 36-48 hour water use restriction. This might address the most significant concern regarding using an aquatic herbicide for spot treatments.

Aquatic Plant Monitoring Program

Comprehensive diver conducted surveys performed by a professionally trained limnologist of the fall standing crop biomass will continue to be conducted on a ten year cycle, using the same procedures described in the earlier Problem Statement section.

In addition a volunteer monitoring program will be conducted each summer using a rake toss method. This program will be conducted twice each summer, once in late June and again in late August. The rake toss will be conducted along seven different transects at different sites around the lake at 10, 100, 200, 300 and 400 feet from the shoreline. Six of the sites are located in areas of the lake that are harvested and one in a location where no harvesting occurs. The species collected at each location

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will be identified to obtain an estimate of the distribution of the various species of macrophytes in the lake. Professional assistance will be available to identify some of the rarer species.

Lake Water Quality Monitoring

A lake water quality monitoring program performed using volunteers includes measuring temperature and dissolved oxygen profiles from the surface to the bottom in one meter intervals and taking water samples at the surface, 4 meters, and 8 meters at the deepest location in the lake. Water clarity will be measured using a Secchi disk. The water samples will be analyzed by a state-certified laboratory for total phosphorus (TP) and soluble reactive phosphorus (SRP). Chlorophyll-a will be measured for the surface water sample. These monitoring events will be performed on the following schedule.

February- 1 time through the ice

May- 1 time

June- 2 times

July- 2 times

August- 2 times

September- 1 time

Stream Water Quality and Flow Monitoring

Eight major tributaries will be monitored by a professionally trained limnologist once a month for a year to establish baseline data. In addition, at least six hydro meteorological events will be sampled for each tributary. The tributaries to be monitored will include the Inlet, Afolter, Bray, and Briggs streams, and four additional tributaries located at 159 West Lake Road, Cratsley Hill Road, Trident Marine, and Honeoye Lake Park.

Point discharge will be estimated for each tributary for each sampling date by the usual method of measuring the cross-sectional area of the tributary and tributary water velocity. Water samples for each sampling event will be analyzed for total phosphorus (TP), soluble reactive phosphorus (SRP), total Kjeldahl nitrogen, Nitrate + Nitrite, and total suspended solids (TSS). Chemical analysis will be performed by a state-certified laboratory.

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References

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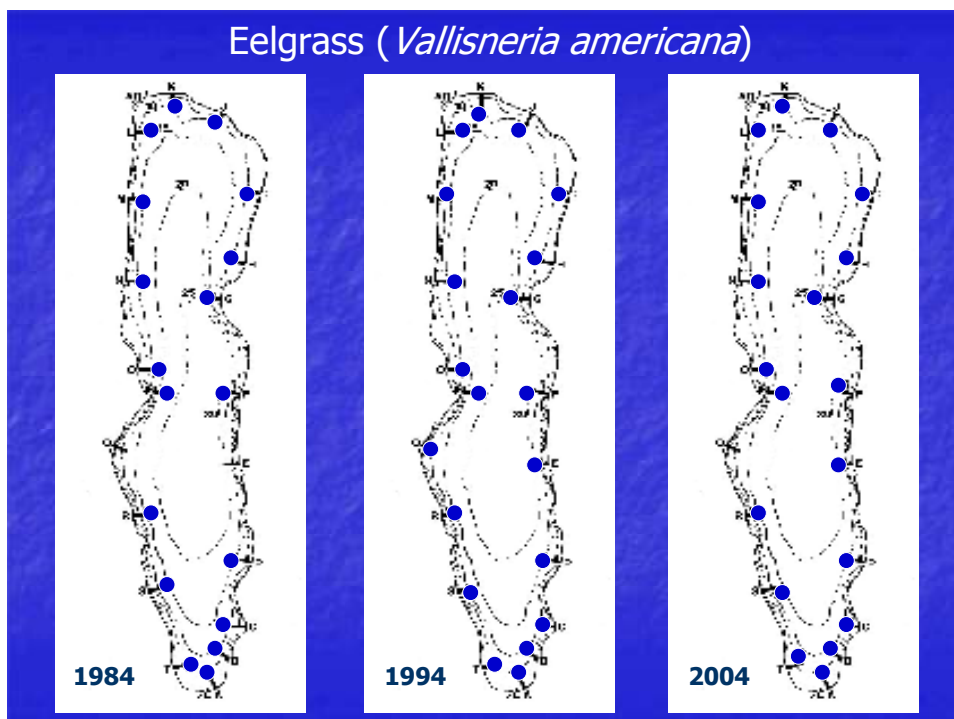
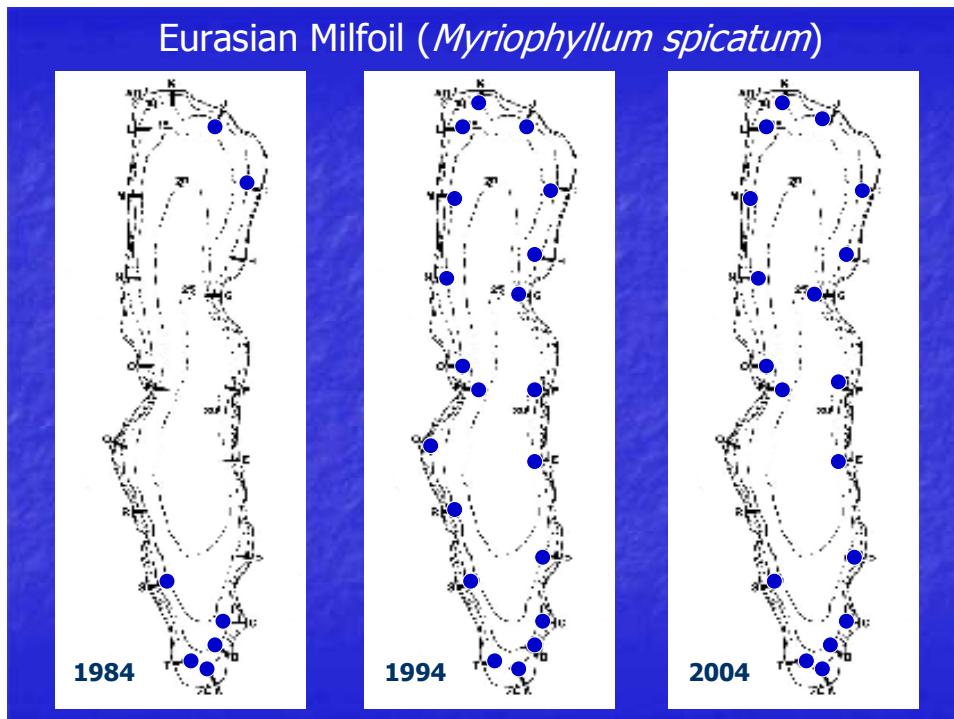
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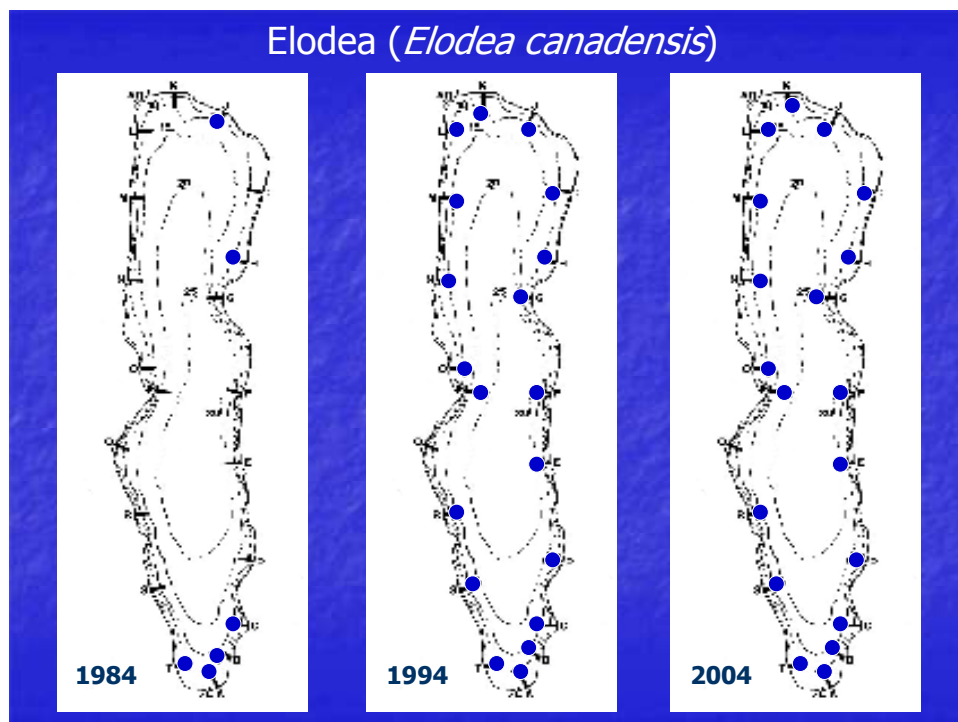
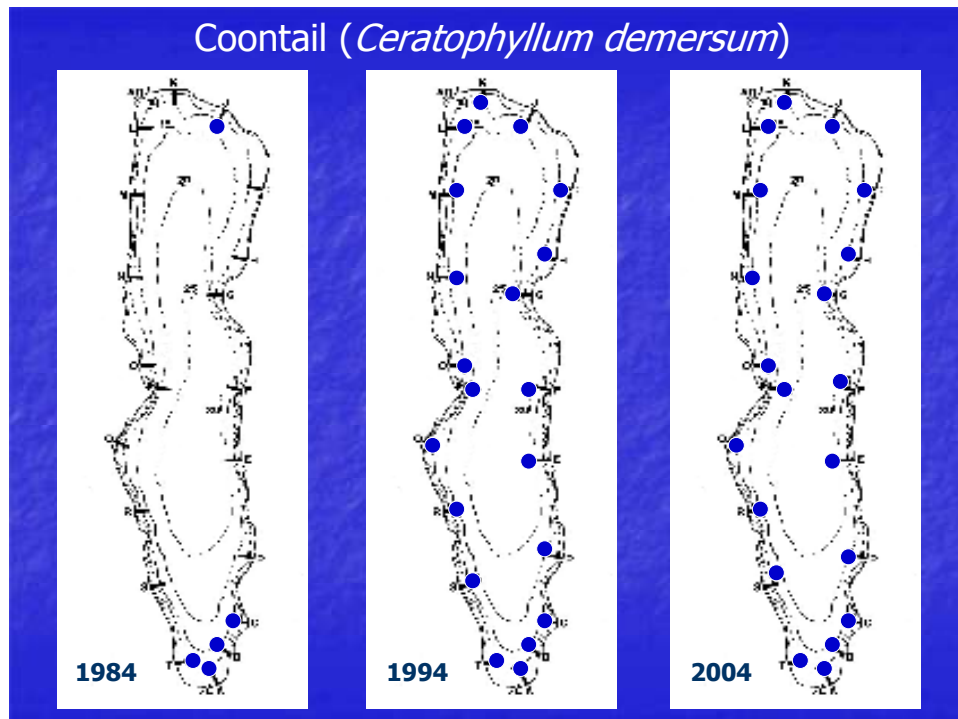
Meeting Notes from Honeoye Lake Macrophyte Management Plan Committee Meeting on October 3, 2006 with NYS DEC personnel from both the Albany and Region 8 Offices

Appendix A

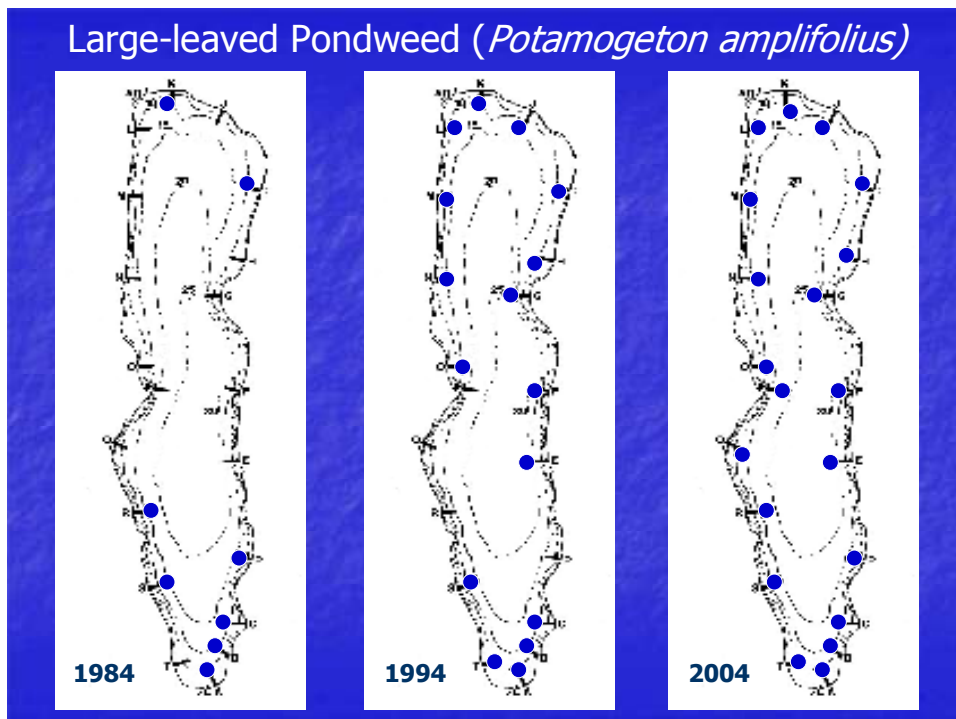
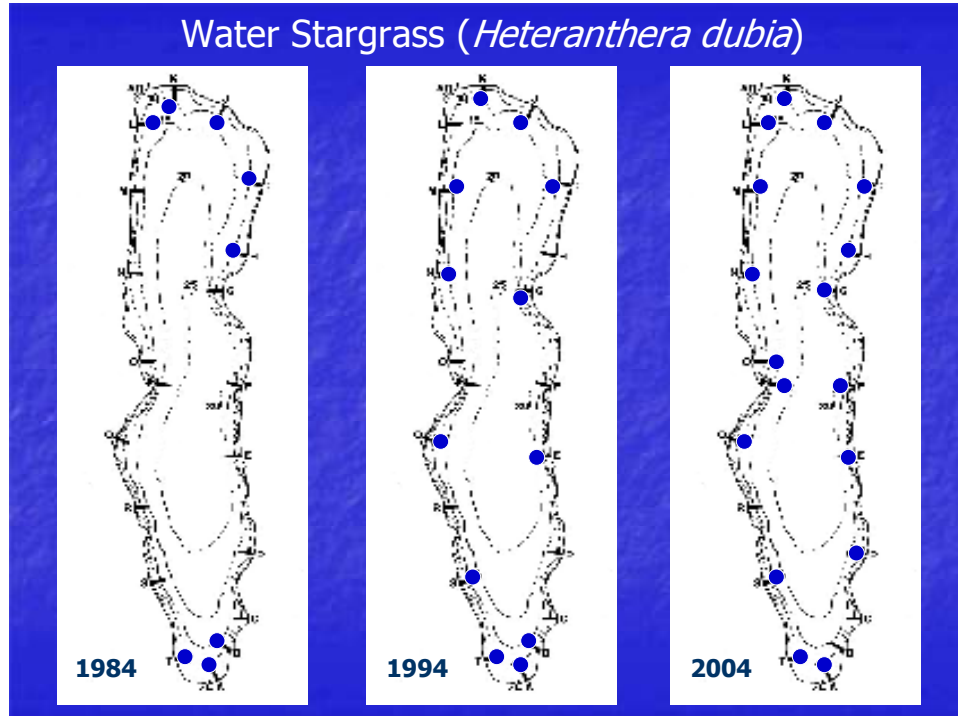
Maps Showing Distribution of the Most Commonly Found
Aquatic Plants in Honeoye Lake



Appendix A continued



Appendix A continued



Appendix B
Honeoye Lake Protected Wetlands

North End



South End

