Honeoye Lake Watershed Management Plan
Executive Summary

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Final Report
October, 2007

Honeoye Lake Watershed Management Plan
Full and Executive Summary
Available at **http://www.co.ontario.ny.us/planning/honeoye_lk.htm**

Prepared and Approved by the Honeoye Lake Watershed Taskforce

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INTRODUCTION

The Honeoye Lake Watershed Management Plan (HLWMP) focuses on the second smallest of the Finger Lakes of New York State. Honeoye Lake is located in the Western Finger Lakes region of New York State and considered part of the metropolitan area of the City of Rochester which is located 28 miles north of the lake (Figure 1).

FIGURE 1 – Location of Honeoye Lake in New York State

This document is divided into the following sections:

- INTRODUCTION
- WATERSHED CHARACTERIZATION
- WATER QUALITY CHARACTERIZATION
- RESTORATION AND MANAGEMENT RECOMMENDATIONS
- IMPLEMENTATION STRATEGIES
- SUMMARY CONCLUSION
- REFERENCE MAPS TABLES (Figures 2-5)

The major action items to implement the plan are included in the RESTORATION AND MANAGEMENT RECOMMENDATIONS section. The scientific data upon which these recommendations are based is included in the two previous sections. The HLWMP forms a framework to guide future decisions and provides a point of reference by which progress can be measured.

This document is a brief summary of the Full HLWMP of over 200 pages, which contains more extensive scientific information, an analysis of town regulations and best management practices as they relate to water quality protection, and a more detailed description of the implementation strategy.

Goals and Objectives

Users of the lake have consistently expressed their concern regarding the negative effects of excessive aquatic macrophytes and algae blooms on recreational opportunities. Consistent with this observation, Honeoye Lake is listed on the New York State Department of Environmental Conservation's (NYSDEC) Priority Waterbody List as impaired due to water supply concerns relating to nutrients.

The overall goal of this HLWMP is the protection, restoration, and enhancement of water quality and living resources in the Honeoye Lake Watershed. The specific objectives are:

- To improve the water quality of Honeoye Lake
- To improve the quality of water resources in the Honeoye Lake Watershed
- To protect the Honeoye Lake Watershed's natural resources
- To identify challenges and barriers to water quality protection and to suggest means to overcome them
- To protect the high quality of life enjoyed by residents of the Honeoye Lake Watershed
- To improve water-dependent recreational opportunities
- To retain and attract business and improve local economic development opportunities
- To consider economic, social, and other incentives for water quality protection

WATERSHED CHARACTERIZATION

Watershed Characteristics

The watershed extends throughout six towns in two counties: the Towns of Bristol, Canadice, Naples, Richmond, and South Bristol in Ontario County and the Town of Springwater in Livingston County. The Honeoye Lake shoreline lies entirely within the Towns of Canadice and Richmond. Figures 2-5 in the Reference section summarize characteristics of the watershed and lake.

Thirty-five streams, perennial and intermittent, are indicated on USGS Topographic Maps as tributaries to Honeoye Lake. The watershed of Honeoye Lake is divided into ten sub-watersheds. This subdivision of the watershed area is used to study the runoff into the lake in order to identify specific areas needing management. The Honeoye Inlet is by far the largest of these tributaries, draining 43% of the total Honeoye Lake Watershed. It is also more complex than the other streams, in that a number of branched streams pass through an 837 acre wetland before entering the lake at multiple locations.

Land Cover

Land cover consists of two types: natural community types (forests, swamps, ponds, etc.), and cultural community types (homes, roads, farms), in which the natural community has been modified for human use. Natural community types account for 82.2% of the total watershed land area. Of this the largest component is second-growth forests comprising 73.3% of the watershed. Cultural cover types total 17.8%.

Four wetlands of over a thousand acres are significant to the health and management of Honeoye Lake and its watershed, with the largest being an 837 acre freshwater wetland immediately south of the lake. Wetlands exist at the interface of aquatic and terrestrial ecosystems. They play important roles in protecting water quality and providing valuable fish and wildlife habitat. Wetlands are protected by both state (NYSDEC) and federal (US Army Corps of Engineers) regulations.

In addition to the protected wetlands, there are 4,638 acres (20.4% of watershed land area) that are in conservation ownership in Harriet Hollister Spencer State Park, Nature Conservancy properties, NYSDEC Wildlife Management Area, Finger Lakes Land Trust's Wesley Hill Nature Preserve, Cumming Nature Center, and Finger Lakes Community College Muller Field Station. Conservation ownership is often a partnership between the public and private sector, with a goal of wise resource management. Conservation ownership has been increasing in recent years.

Land Use

The Honeoye Lake Watershed is relatively sparsely populated with a population of 2,772 according to the 2000 census in a land area of 36.7 square miles. This produces a population density of about one person per 11 acres. The summer population has been estimated at 4,500.

Of the cultural cover types, which comprise only 17.8% of the watershed, the largest contributors are mowed residential lawns (5.9%), conifer plantations (5.2 %), and cropland (4.3%). The watershed land area used for agriculture, which can be a major contributor to water quality degradation, is quite low compared to the other Finger Lakes.

The Honeoye Lake shoreline is fully developed. The lot density produced by 650 cottages and homes on 10.6 miles of shoreline is an average of 86 feet per property. For comparison, on

Canandaigua Lake the overall average is 122 feet per property. In total there are about 1,000 structures near the shoreline (including 235 in the Honeoye Lake Park and 80 mobile homes at Honeoye Valley Park) that have direct lake frontage or lake access.

A 2002 survey identified about 1,100 power boats, including jet skis and a mix of inboard and outboard engines. Based on the fleet mix of other Finger Lakes, it is estimated that an additional 425 sailboats, canoes, and sailboards would also be based on Honeoye Lake—for a total of 1,525 resident boats. In addition visitors can launch up to 100 boats on busy days.

The value of lakefront and lake access parcels in the towns of Richmond and Canadice represent a significant portion of the two town's 2003 total residential property assessment (Table 1). Any real or perceived change in Honeoye Lake's water quality—for better or worse—will have major impact on the tax base of these towns.

Town	Lake and Lake Access Parcels Value	% of Town's Parcels	% of Towns Total Residential Land Value	% of Towns Total Residential Assessed Value
Richmond	$86.6 million	37	57	43
Canadice	$44.7 million	26	57	41

Table 1- Summary of 2003 Residential Property Assessment for Richmond and Canadice

Living Resources

Many fish and wildlife are influenced by the tributaries and wetland habitats in a watershed community. The Honeoye Lake Watershed provides a unique habitat that relates directly to the diversity of species found within it.

The watershed currently supports a large population of white-tail deer, muskrats, rabbits, and gray squirrels. Black bear are also present in the watershed. River otters and turkeys have been re-introduced, and the turkey population is increasing. Eagles sometimes visit Honeoye Lake from their nests near Hemlock Lake. Populations of red-tailed hawks, great horned owls, turkey vultures, snapping turtles, various ducks and Canada geese remain stable. Loons visit Honeoye Lake during migration but do not stay to reproduce. Relatively small populations of beaver remain in the vicinity of Honeoye Lake.

The fish population in Honeoye Lake includes 27 different fish species. It supports an excellent warm water fishery featuring walleye, largemouth and smallmouth bass, perch and other panfish. Large numbers of walleye fry have been stocked from 1953 to the present to maintain that fishery. The bass maintain their populations through natural reproduction.

FIGURE 6- Honeoye has a healthy and stable fish population

WATER QUALITY CHARACTERIZATION

Water Quality Classifications

The New York State Water Quality Standards are the foundation for the State's water pollution control and water quality protection efforts. These standards provide the specific criteria for the management and protection of New York's waters and for Honeoye are as follows:

- Honeoye Lake is classified as "AA" by the NYSDEC, appropriate for water supply
- The tributary streams to Honeoye Lake are classified as "C," appropriate for contact
- Honeoye Lake is currently listed on the NYSDEC Priority Waterbody List as impaired due to water supply concerns relating to nutrients

Thermal Stratification, Mixing and Dissolved Oxygen

Smaller lakes like Honeoye reach higher temperatures in the summer than the larger lakes but lose heat rapidly in the winter. Unlike most of the Finger Lakes, 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 (Figure 7). A strong wind is enough to mix the whole lake, which results in uniform water temperatures throughout.

Saturation levels of dissolved oxygen in Honeoye Lake depend on water temperature and are often near 100% at the surface (Figure 8). However, during periods of calm weather the deep waters have the potential to become hypoxic (low dissolved oxygen) or anoxic (no dissolved oxygen) which is important with respect to the release of internal nutrients and is discussed in a later section.

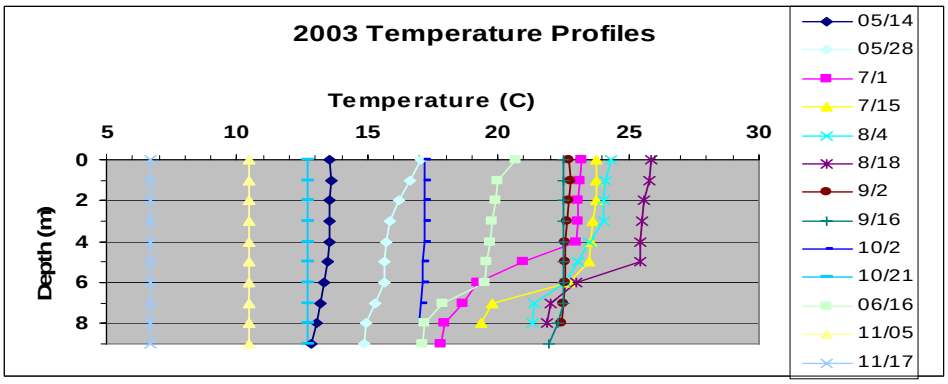

FIGURE 7- Water Column Temperature Profile

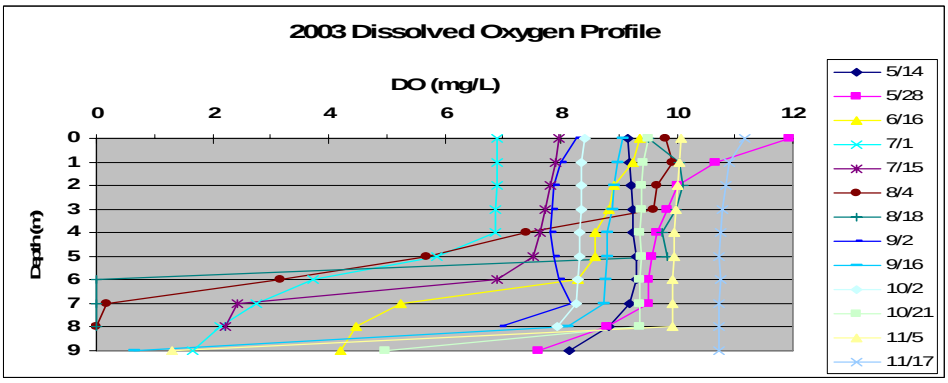

FIGURE 8- Water Column Dissolved Oxygen Profile

Water Clarity

The clarity of a waterbody is influenced by many factors, including true color and suspended particles. Honeoye Lake's average summer readings for clarity have historically ranged between 3 and 4 meters as measured with a Secchi disk. Honeoye Lake's water has become increasingly clear since the 1970's, first under the influence of the 1973 statewide phosphorus detergent ban, second the interception of nutrients bound for the lake by the 1978 perimeter sewer, and finally by the influence of filter feeding zebra mussels (first detected in 1998) who remove phytoplankton (microscopic aquatic plants) from the water column. Figure 9 illustrates the late summer reduction in clarity due to algae blooms followed by fall clearing.

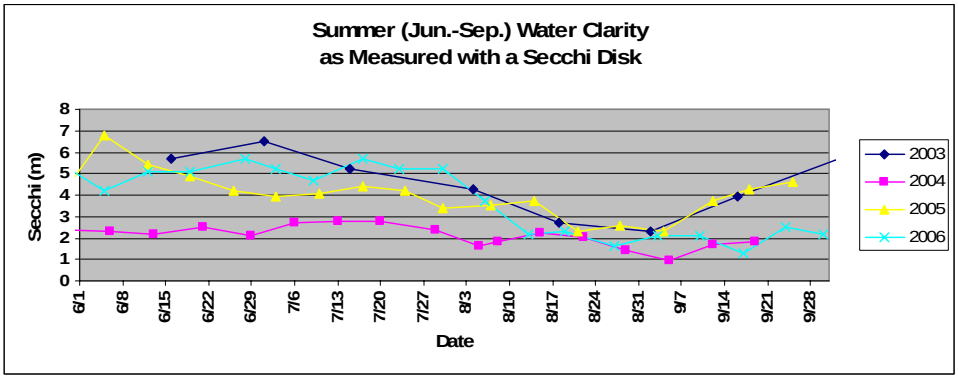

FIGURE 9- Summer Water Clarity

Chemical Characteristics

The growth of plants, either rooted macrophytes or phytoplankton, depends on many factors including nutrients, sunlight and temperature just as for land based plants. There are many different nutrients required for plant growth but nitrogen and phosphorus are two of primary importance. The primary productivity of Honeoye Lake, like that of most freshwater lakes in New York State, is usually limited by the supply of phosphorus.

External Sources of Macronutrients

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.

High phosphorus levels are to be expected during high flow events, since phosphorus binds with soil particles being carried in the stream flow. Generally, the highest in-stream nutrient concentrations occur during storm events which coincide with elevated concentrations of total suspended solids.

Internal Sources of Macronutrients

Phosphorus is released from lake's bottom sediments into the water column in deeper areas of the lake under conditions of low oxygen levels caused during periods of stratification discussed earlier. The following figures show that concentrations of total phosphorus are significantly higher in water collected from depths of greater than seven meters than those from the surface (Figure 10). Nearly half of the lake is over seven meters in depth. Anoxic conditions have been detected in the deeper waters of Honeoye Lake, especially during periods of summer calm. The

actual amount of phosphorus released from the lake's sediments and recycled into the water column is dependent on the duration of the anoxia and the extent of the affected bottom area. The effect of anoxic conditions on the two August dates is clearly shown with high levels of phosphorus near the bottom.

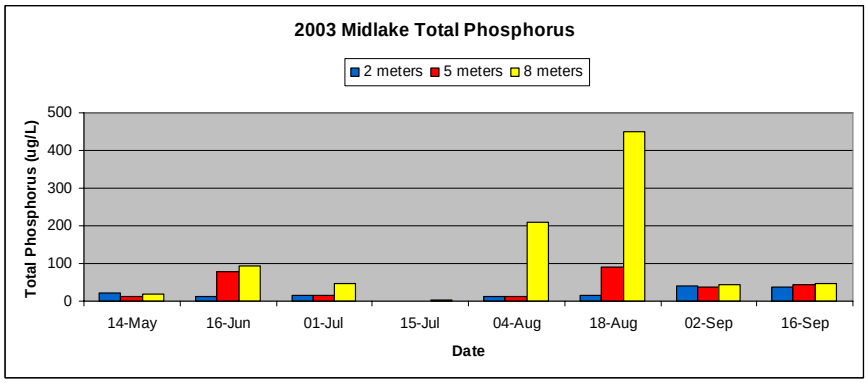

FIGURE 10- Mid-lake Phosphorus Level with Depth

Nutrient and Hydrologic Model

Since there is insufficient measured data to estimate inflow into the lake and the relative importance of external and internal sources of nutrients, a mathematical model was generated that estimated water inflow and the external and internal nutrient sources. Using precipitation and land cover data the model estimates that 43 % of the inflow on an annual basis comes from the largest subwatershed, Honeoye Inlet (Table 2). Using estimated inflow and characteristics of the lake bottom sediment, the sources of nutrients and suspended solids from both internal and external sources on an annual basis is summarized in Table 3.

Sub-Watershed Name	Sub-Watershed Area (Acres)	Annual Runoff Volume ($m^3 \times 10^6$) (%)
North Shore DD*	64	0.12 (0.2)
Times Union Creek	651	1.24 (2.7)
Pinewood Hill DD	832	1.58 (3.4)
Bray Gully	1,165	2.21 (4.7)
East Shore DD	2,387	4.53 (9.7)
Briggs Gully	3,140	5.96 (12.8)
Honeoye Inlet	10,676	20.30 (43.6)
Canadice Corners DD	1,273	2.42 (5.2)
Affolter Gully	1,585	3.01 (6.5)
West Shore DD	919	1.74 (3.7)
Precipitation on Lake	1,805	3.43 (7.4)
Grand Total	**24,497**	**46.54 (100.0)**

TABLE 2- Total Yearly Inflow by Subwatershed

External Loading Sources	**kg TP / year**	**kg TN / year**	**kg TSS / year**
Watershed Loading	2,546.7	32,450.5	5,606,506.9
Septic Loading	168.2	6,287.9	0.0
Atmospheric Over Watershed	182.6	7,304.8	298,848.4
Atmospheric On Lake Surface	20.0	177.8	22,091.9
Canada geese	324.0	5,640.0	0.0
Total External Load	**3,241.5**	**51,861.0**	**5,927,447.2**
Internal Loading Sources	**kg TP / year**	**kg TN / year**	**kg TSS / year**
Anoxic Sediment	1,652.0	0.0	0
Oxic Sediment	340.0	0.0	0
Plant Decomposition	110.0	512.6	0
Zebra Mussel Decomposition	116.0	1,039.0	0
Load Reduction Due to Harvesting	-45.7	-292.3	0
Total Internal Load	**2,172.3**	**1,259.3**	**0**
Total Annual Loading	**5,414.8**	**53,120.3**	**5,927,447.2**
Nitrogen : Phosphorus Ratio	**9.8 : 1**		

TP- Total Phosphorus TN- Total Nitrogen TSS- Total Suspended Solids

Table 3 – Summary of Internal and External Nutrient and Sediment Loading

Table 3 shows that internally generated phosphorus from the anoxic sediment accounts for about 30% of the total phosphorus loading on an annual basis. However, it can account for approximately 90% of the lake's summer total phosphorus load. This is because most of the lakes internal load comes from anoxic sediments that occur in the summer. This is due to a significant portion of the lake bottom becoming stratified and dissolved oxygen is depleted in the deeper reaches of the water column. At this same time of year stream flows and associated external phosphorus loadings are minimal. As a result, during the late summer the combination of minimal inflow from streams, low hydraulic flushing, a large influx of internally regenerated phosphorus, warm water temperatures and intensified sunlight, the lake's productivity peaks. These conditions consistently foster late summer algae blooms that vary in their intensity from year to year.

Biological Characteristics

Photosynthetic activity in the lake is important as a food source for other species and as a source of dissolved oxygen.

The summers of 2002 and 2006 produced a heavy crop of blue-green algae (cyanobacteria). Several factors including temperature, rainfall, and the presence of zebra mussels may be significant. Zebra mussels have been known to consume some species of algae while rejecting others, such as cyanobacteria.

Measurement of chlorophyll-a is used to estimate algal abundance. Algal abundance exhibits a large amount of variability dependent on location and time of year. However the data does show increasing algal blooms in late summer through early fall as shown in data collected by the NYSDEC (Figure 11).

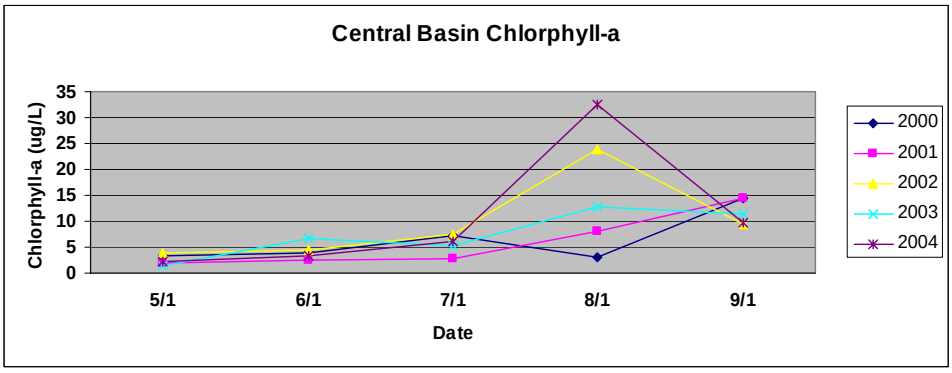

Figure 11- Estimate of Summer Algal Abundance

Aquatic Macrophytes

An inventory of the macrophytes in Honeoye Lake was performed in 1984, 1994 and 2004. The increase in water clarity in Honeoye Lake between 1984 and 2004 has allowed the expansion of weedbed communities into greater depths. All species have not increased at the same rate; plants able to colonize in deep water and grow fast in the early spring have been more successful.

This increase in weedbeds into deeper waters is apparent in Figure 12. There has been little change in weedbed density in vegetated sites, but the total weedbed biomass has increased due to the colonization of plants into deeper waters.

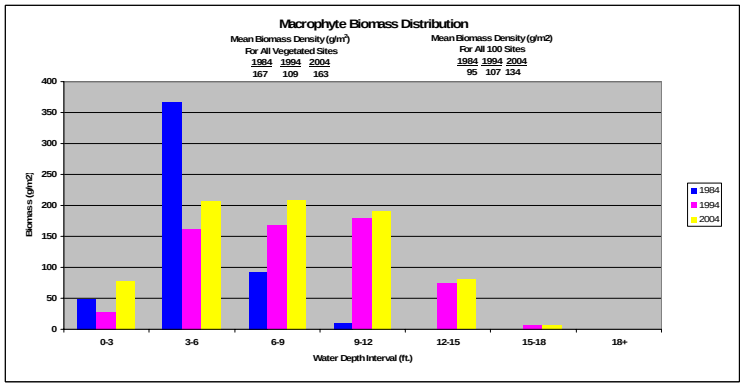

FIGURE 12- Macrophyte Biomass Distribution with Water Depth

Twenty-seven different species of plants have been identified in the three fall sampling events in 1984, 1994, and 2004. There is no single dominant species. Eelgrass and coontail have been in the top three in relative abundance in each of the years. Eurasian milfoil has shown the greatest variability with 2.9% relative dominance in 1984 increasing to 53.7% in 1994 and falling to 13.5% in 2004. In 2004, aquatic plant communities were rich in species, with no particular plant dominant in biomass.

Weed Harvesting Program

A near-shore weed harvesting program to enhance recreational access to the lake was initiated in 1987. Between 1987 and 2004, at the rate of about 450 wet tons per year, the harvesting program has removed 8,400 tons of weeds from Honeoye Lake, including the nutrients bound in their tissues. Lake researchers, while acknowledging that weed harvesting has not been effective by itself in diminishing the weedbeds, have recommended continuation and intensification of harvesting. The operation of the harvester is beneficial because it removes plants and nutrients

while providing improved recreational access to the lake for shoreline residents with no appreciable environmental risk

Zebra Mussels

The zebra mussel (Figure 13) is a small bi-valved mollusk originally from Eastern Europe that was brought first to the Great Lakes and subsequently colonized most of the Finger Lakes.

The first zebra mussel was discovered in Honeoye Lake in 1998. They first populated the near-shore areas with a substrate suitable for forming attachments. They subsequently moved into deeper waters where in many cases their only supports are the stems of rooted aquatic plants. The zebra mussels colonize depths down to 4 meters in Honeoye Lake, with larger mussels found in shallower water which have rockier substrates suitable for long term survival. Zebra mussels have likely contributed to the increase in water clarity observed during this period in Honeoye Lake. Due to their high densities and because they are filter feeders on phytoplankton, they can affect clarity in the short-term by removing plankton from the water column. The resulting reduction in a lake's primary production can have major negative impacts on a lake's food web.

It is believed that the presence of zebra mussels play a role in Honeoye Lake's internal phosphorus dynamics. The seasonal die-off and decomposition of large numbers of zebra mussels may provide a phosphorus boost to algae blooms. The bacterial decomposition of such organic material leads to the regeneration of organic forms of phosphorus readily usable by cyanobacteria. This "annual pulsing" of organic phosphorus may contribute to the intensification of blue-green algae blooms.

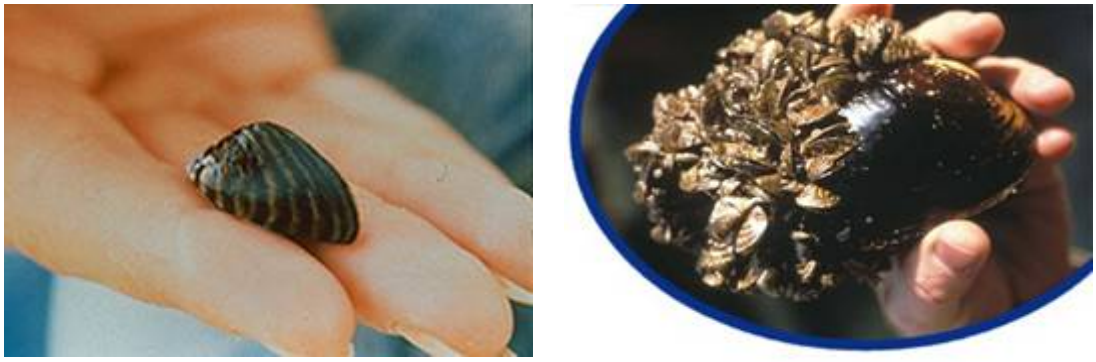

FIGURE 13- Zebra Mussels

RESTORATION AND MANAGEMENT RECOMMENDATIONS

Protection and management recommendation focus on measures that stakeholders of the watershed can implement to aid in reducing pollutant loads into Honeoye Lake. These recommendations include proactive measures that can be undertaken by community residents, municipal employees, and local organizations to reduce the pollutant loads generated on the lands within the watershed and reduce the need for intensive structural measures to remove pollutants.

An assessment of local laws of towns in the Honeoye Lake Watershed was performed as it relates to water quality protection. It included a review of town's comprehensive plan, zoning, subdivision regulations and a detailed assessment of "best management practices" (BMP). This assessment of local regulations and practices resulted in several recommendations to minimize erosion including:

- Incorporation of some aspects of recent changes in Federal and state laws with regard to Phase II Stormwater Regulations
- Review need for adoption of a Forestry Regulation
- Consider use of mandatory setbacks from streambanks and shorelines
- Identification and mapping of wetlands less than 12.4 acres and the need for special zoning to protect these areas
- Consider need for adoption of environmental protection overlay districts to protect environmentally sensitive aquatic areas

The protection and management recommendations described fall into the following categories:

- Habitat recommendations including wetland restoration and riparian zone management
- Educational and outreach recommendations including community outreach materials, homeowner stewardship programs, municipal employee educational programs, and school educational programs
- Point and non-point source management and pollution control recommendations including monitoring, structural control actions, non-structural actions, and land use regulations

Prioritization of action items is based upon placing the highest priority on action items focused on reducing the flow of nutrients into the lake. This is consistent with minimizing the two most serious problems of excessive macrophytes and algae blooms expressed by lake users in previous public opinion surveys and also that Honeoye Lake is listed on the NYSDEC Priority Waterbody List as impaired due to water supply concerns relating to nutrients. Since nutrient enrichment is highly correlated with erosion of soil particles into the lake, most of the action items ranked high are related to erosion prevention from a number of sources: streambanks, highways, major tributaries, development, and forestry. Other high priority action items are related to monitoring and scientific study into the source of nutrients and planning related to macrophyte management. It is hoped that high priority action items will be acted upon within five years, as funding allows. Medium priority is assigned to those action items which, while important, are not as vital as the high priority action items and may take longer to complete. Long Term priority action items are assigned to those action items that are ongoing and/or related to potential pollution problems that are not common in the Honeoye Watershed such as mines, landfills, bulk storage facilities, spills, and agriculture. Figure 14 shows some examples of sources of erosion common to Honeoye Lake.

Highway Maintenance Erosion

Streambank & Shoreline Erosion

Development Erosion

Forestry Erosion

Figure 14- Known Sources of Erosion Affecting Honeoye Lake

Table 4 is a list of all action items that have been identified to protect the Honeoye Lake watershed. For each action item a priority, estimated cost, source of funds and the agency with primary responsibility is identified. The section numbering is the same as in the Full Honeoye Lake Watershed Management Plan.

TABLE 4- Action Items

6.1 Habitat Protection and Management Recommendations

6.1 Habitat Protection and Management Recommendations

Pollution Prevention Actions	Priority	Feasibility	Estimated Cost ($)	Source of Funds	Responsible Agency
6.1.1: Wetland Restoration					
1. Inventory all wetlands in watershed to establish priorities. Restore degraded wetlands based on watershed-wide analysis of potential benefit to water quality, habitat, and hydrology.	Medium	Requires technical expertise.	20 acres per year at $5,000/acre	OCSWCD, NYSDEC	OCSWCD
6.1.2: Riparian Zone Management					
2. Conduct field survey to identify and prioritize the most severely eroding streambanks and shorelines.	High	Utilize agency staff to conduct field survey.	?	HLWTF	OCSWCD, HLWTF
3. Where feasible, restore severely eroding streambanks and shorelines.	High	Costly and difficult in many locations. Grants are possible.	?	MUNI, OCDPW	OCSWCD
4. Identify opportunities whereby stormwater management structures could be installed or stormwater biotreatment areas could be constructed.	High	Grants are possible.	?	MUNI, Grants	OCSWCD

6.2 Education and Outreach Recommendations

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Pollution Prevention Actions	Priority	Feasibility	Estimated Cost ($)	Source of Funds	Responsible Agency
6.2.1: General Watershed Education					
5. Educate residents on a "lake-friendly" lawn program to reduce nutrient input to	High	Cornell Cooperative Extension (CCE) and lawn care	$1,000	Grants, CCE	HVA, CCE, OCSWCD

Pollution Prevention Actions	Priority	Feasibility	Estimated Cost ($)	Source of Funds	Responsible Agency
the lake and perform survey of resident practices. Provide & promote use of zero phosphorus fertilizer.		professionals may be willing to assist in this program.			
6. Educate riparian property owners about proper management of streambanks and shoreline to minimize erosion.	High	Could be accomplished by volunteers.	$500	MUNI	OCSWCD, HVA
7. Provide education for municipal officials on erosion control and stormwater management options.	High	Use available OC SWCD and CCE programs.	<$500	Grants	OCSWCD, NYSDEC, HLWTF
8. Conduct training session for highway superintendents on recommended BMPs for road maintenance. Develop a written inspection and maintenance plan intended for use by highway department employees for the efficient management and maintenance of highway-related facilities.	High	Use available OC SWCD program.	<$500	OCSWCD	OCSWCD
9. Conduct training session for highway superintendents on recommended winter road de-icing practices.	High	Use available OC SWCD program.	<$500	OCSWCD	OCSWCD
10. Educate septic system owners and promote regular septic system maintenance.	Medium	Direct mailing of CCE Septic System Maintenance Guide and provide periodic seminars.	$1,000	OCSWCD	OCSWCD, HLWTF
11. Educate contractors, installers, and pumpers on NYS DOH design and construction standards.	Medium	Through OC SWCD and Code Enforcement Association seminars.	<$500	OCSWCD	OCSWCD, NYSDOH

12. Educate the public about the effect of development in floodplains.	Medium	Basic information is available but needs to be distributed.	?	?	FLCC, SUNYESF
6.2.2: Develop, Publish, and Distribute Materials					
13. Develop and promote a "lake-friendly" lawn pesticide program.	Medium	Educational materials are inexpensive and effective.	<$500	CCE	CCE, HVA

6.3 Point and Nonpoint Source Management and Control Recommendations

Pollution Prevention Actions	Priority	Feasibility	Estimated Cost ($)	Source of Funds	Responsible Agency
6.3.1: Nutrients					
14. Develop Macrophyte Management Plan according to DEC guidelines considering all forms of macrophyte management.	High	Use NYS defined guidelines.	<$1,000	Towns of Canadice & Richmond, Grants	HLWTF, Consultant
15. Manage excessive macrophytes with weed harvesting until the WMP is completed.	High	Existing program to be enhanced.	$75,000 per year	Towns of Canadice & Richmond, FL-LOWPA	Towns of Canadice & Richmond
16. Expand the tributary sampling program to assess the actual contribution of streams and direct drainage areas to the lake's overall nutrient budget under baseline and storm conditions.	High	This is a standard sampling program done on numerous Finger Lakes.	$6,000	HLWTF, Grants	HLWTF
17. Evaluate nutrient sources from highways, shoreline and streambanks.	High	The magnitude of nutrient loading from highways, shoreline, and streambanks is unknown and needs to be quantified.	$1,500	OC SWCD	OCSWCD, OCDPW, MUNI
18. Institute a monitoring program to evaluate the effectiveness and longevity of the alum treatment performed in 2006-2007.	High	Use standard water quality testing.	$1,000 per year for 5 years ($5,000)	Towns of Canadice & Richmond, HLWTF	HLWTF
19. Investigate the condition of the 450 private wastewater (septic) treatment systems in the watershed and their role as a source of nutrients.	Medium	A survey of septic system owners is required to determine type of action (educational/ regulatory).	$1,500	OCSWCD	OCSWCD, HLWTF

Pollution Prevention Actions	Priority	Feasibility	Estimated Cost ($)	Source of Funds	Responsible Agency
20. Investigate effect of zebra mussels and other invasive species on nutrient loading.	Long Term	Technical expertise required.	$1,000	HLWTF	HLWTF
21. Investigate potential point sources of nutrient discharge, such as SPDES permit holders and the perimeter sewer.	Long Term	NYS DEC supervision of SPDES permits is inadequate and should be augmented by local action.	<$500	OCSWCD	OCSWCD
22. Encourage farmers to participate in Agricultural Environment Management (AEM) programs.	Long Term	Participation in AEM is best achieved by farmers talking to one another.	<$500	OCSWCD	OCSWCD
6.3.2: Onsite Wastewater Systems (Septic)					
23. Develop a uniform and cooperative approach to septic system regulation and inspection in watershed municipalities.	Medium	Encourage towns to adopt model "Uniform Onsite Wastewater Treatment Regulation".	<$500	MUNI	MUNI, HLWTF
24. Develop a schedule of septic system inspections for those systems within 200 feet of a lake or stream.	Medium	Requires towns to adopt regulation.	Fee to owner	MUNI	MUNI, HLWTF
25. Develop local database of SPDES permits with the assistance of the NYSDEC.	Long Term	Feasible with volunteer effort.	<$500	HLWTF	HLWTF
26. Arrange more frequent inspections of SPDES permitted facilities.	Long Term	Work with the NYSDEC to enhance oversight efforts.	<$500	OCSWCD	NYSDEC, HLWTF
6.3.3: Forestry					
27. Adopt Timber Harvest Regulations at the town level. Require pre-harvest planning and project inspection by a trained inspector.	High	Requires adoption of regulation by towns.	Time	MUNI	MUNI, HLWTF
28. Promote participation in existing State and Federal Forest Stewardship Programs.	Medium	Promotional costs only.	<$500	HLWTF	HLWTF

Pollution Prevention Actions	Priority	Feasibility	Estimated Cost ($)	Source of Funds	Responsible Agency
29. Promote the use of Forest Harvest Best Management Practices (BMPs) by loggers.	Medium	Cooperation with NYS DEC to promote their BMPs via training sessions.	<$500	NYSDEC	NYSDEC, OCSWCD
6.3.4: Streambank/Shoreline Erosion					
30. Maintain lake outlet weir.	High	Standard construction project	$10,000	Towns of Canadice & Richmond	Towns of Canadice & Richmond
31. Adopt municipal land use regulations to minimize peak flows in watershed streams and avoid shoreline erosion.	High	Time-consuming but lasting once in place.	?	MUNI, Grants	MUNI
32. Encourage development or maintenance of vegetative filter strips to protect stream corridors and shorelines.	High	Costs to landowners involved but feasible.	?	MUNI, OCDPW, Property Owner	MUNI, OCDPW
33. Investigate lake drainage hydrology including effects of outlet width, weir, wetlands, and other downstream issues.	Medium	Will require hydrological study of the lake.	?	?	HLWTF, OCSWCD
6.3.5: Development					
34. Municipalities recognize Phase II Stormwater Regulations within local laws and/or adopt the full NYS Sample Local Law to minimize erosion.	High	NYS Model Local Law.	Time	MUNI	NYSDEC, G/FLRPC, OCSWCD
35. Planning boards review of the adequacy of municipal land use regulations to minimize erosion.	High	Requires action by towns in watershed.	Time	MUNI, Grants	MUNI, OCPD, HLWTF
36. Municipalities evaluate current minimum setback and bulkhead/breakwall standards for new structures along the shoreline.	High	Requires review of existing regulations by Planning Boards.	Time	MUNI	MUNI

37. Address the congestion of development within 200 feet of the shoreline by requiring appropriate building standards.	Medium	A difficult, time-consuming task without precedent in the Finger Lakes. Needs planning consultant.	$7,500	MUNI, OCPD	MUNI, OCPD
38. Watershed towns should work together on an Open Space Inventory to identify environmentally sensitive and undeveloped lands requiring protection.	Medium	Requires technical expertise.	$5,000	OCWRC, HLWTF	FLCC
39. The Towns of Richmond and Canadice should review their Comprehensive Plans to coordinate land use zoning for the protection of water.	Medium	Requires cooperation between towns.	$15,000	Grants, MUNI	MUNI, OCPD, HLWTF
40. Provide consistent, uniform enforcement of existing land use regulations.	Medium	Feasible, but training and educational needs are ongoing.	?	MUNI	OCPD, MUNI
6.3.6: Recreational Uses					
41. Provide community education on need for a docking and mooring regulation.	High	Could be used to control keyhole development and placement of docks.	Time	HLWTF	MUNI, HLWTF
42. NYS OPRHP connect existing restrooms to the sewer and determine needs for other improvements at the public boat launch.	Medium	Requires commitment from NYSOPRHD	?	Grant, NYSOPRHP	NYSOPRHP
43. Encourage use of fuel efficient low pollution boats.	Medium	Educational effort.	<$500	HLWTF, HVA	HLWTF, HVA
44. Promote increased enforcement of existing boating regulations.	Medium	Patrols by OC Sheriff and NYDEC are on-going.	Existing Additional cost unknown	OC SHERIFF, NYDEC	OC SHERIFF, NYDEC
45. Examine boat speed regulations, especially near-shore, to diminish shoreline disturbance.	Medium	Investigate need for special Navigation Laws such as those on Canandaigua and Keuka Lakes.	Time	HLWTF, HVA	HLWTF, OCSWCD, HVA
46. Determine impact of prop wash on bottom sediments.	Long Term	Feasible engineering study.	$1,500	HLWTF	FLCC, HLWTF

6.3.7: Agriculture					
47. Encourage farmers to participate in federal, state and local programs that use the principles of AEM.	Medium	Requires public relations efforts by the pertinent officials, OC SWCD, or HLWTF.	$50,000	EPF	OCSWCD, HLWTF
48. Use database of farmers in the watershed for contact on environmental issues.	Medium	Feasible with existing agency staff.	<$500	OCSWCD	OCSWCD
49. Cooperate with nonprofit organizations such as the American Farmland Trust, Finger Lakes Land Trust and The Nature Conservancy on programs to ensure future agricultural uses.	Long Term	Requires outreach to farmers in the watershed by municipal and county government.	<$500	MUNI	OCSWCD, MUNI
6.3.8: Pesticides					
50. Promote use of hazardous waste clean-up day, which already exists in Ontario County, for safe disposal pesticides and other toxic materials.	Medium	Expensive for the county but is an existing program.	<$500	OCDPW	OCDPW, HLWTF
51. Promote the use of Integrated Pest Management (IPM) for agriculture, homeowners, and institutions to target appropriate pest species, choose proper pesticides, and apply chemicals safely.	Long Term	Could develop appropriate standards.	<$500	CCE	CCE, OCSWCD, HLWTF
52. Institute periodic testing for pesticides as part of the stream sampling.	Long Term	Individual tests for very low levels of pesticides and their metabolites are expensive.	$3,000	Grant	HLWTF
53. If necessary, develop independent IPM standards for the watershed.	Long Term	The local CCE office can provide technical assistance.	<$500	Grant	HLWTF, CCE, MUNI
54. Investigate Cornell Cooperative Extension Home-A-System program for developing less toxic households.	Long Term	Has been used on Seneca Lake, with good results.	<$500	HVA	HLWTF, HVA

55. Encourage watershed farmers to use the Agricultural Environmental Management (AEM) program that offers technical and financial assistance to farmers working to utilize pesticides properly.	Long Term	Promote an already existing program.	<$500	OCSWCD	OCSWCD, HLWTF
6.3.9: Salt Usage and Storage					
56. Conduct annual survey of salt used in municipalities and publicize results.	Medium	Low cost and feasible but needs volunteer effort.	<$500	HLWTF	HVA, HLWTF, G/FLRPC
57. Towns store and use deicing materials in an environmentally sound manner.	Medium	Potential savings to towns.	?	MUNI	HLWTF, MUNI, OCDPW
58. Purchase and install sensible salting highway signs.	Medium	Feasible, cost of signs $50 each.	$1,000	Grants	MUNI, OCDPW, HLWTF
59. Monitor salt concentrations in tributaries during stream sampling program.	Medium	Small additional cost.	?	HLWTF	FLCC, HLWTF
60. Promote sensible winter driving with less salt.	Medium	Promotional effort.	<$500	MUNI	HLWTF, MUNI, OCDPW
6.3.10: Spills					
61. Purchase decals/magnets with Spills Reporting numbers listed and distribute to highway departments, truckers, and farmers.	Long Term	Feasible and effective in promoting reporting.	<$500	HLWTF, HVA	HLWTF, MUNI
62. Map the types and contributing factors to spills recorded in NYSDEC databases to identify pertinent preventive measures.	Long Term	Analysis of existing NYSDEC data	$1,500	Grants	NYSDEC, HLWTF
63. Use the maps and analysis to educate actual and potential spillers about prevention.	Long Term	Feasible, some costs for educational materials.	$2,000	?	HVA, HLWTF
64. Develop local notification procedure.	Long Term	Determine who in the watershed should be notified.	<$500	?	HLWTF, NYSDEC
65. Develop local database of spills with assistance of NYSDEC.	Long Term	Determine who would keep the database up to date.	$500	MUNI	HLWTF, NYSDEC

6.3.11: Bulk Storage Facilities					
66. Establish an inventory of bulk storage facilities by location, type and quantity of materials stored.	Long Term	Inexpensive and could be handled by county agency staff.	<$500	?	NYSDEC, OCPD
67. Create a spills notification procedure for notification of the appropriate local responder.	Long Term	Requires creating a procedure.	$1,000	?	NYSDEC
68. Determine the effect, if any, of natural gas storage wells.	Long Term	Will need technical expertise.	?	?	NYSDEC
69. Establish an inventory of bulk storage facilities by location, type, and quantity of materials stored.	Long Term	Inexpensive and could be handled by county agency staff.	<$500	?	NYSDEC, OCPD
6.3.12: Landfills, Dumps and Inactive Hazardous Waste Sites					
70. Survey landfill locations, dates of operation, types of material deposited, and vulnerability to water resources.	Long Term	May require specialized consultant assistance.	$10,000	EPF Grant	HLWTF
71. Investigate landfill leachate, if present, through an intensive engineering study.	Long Term	Technically difficult and may be expensive.	?	?	HLWTF, NYSDEC
72. Develop an engineering study for proper landfill closure.	Long Term	Technically difficult and would require an engineer experienced in landfill closures.	$25,000 / site	?	HLWTF
73. Conduct water quality tests in vicinity of landfills as part of the stream monitoring program.	Long Term	Requires chemical testing	$500	Grants	HLWTF
74. Develop local database on landfill sites with NYS DEC assistance.	Long Term	May require computer and software.	$1,000	?	NYSDEC, HLWTF
6.3.13: Mined Lands					
75. Create an inventory of permitted and non-permitted mines in the watershed. Prioritize and rank mines for potential to pollute surface and groundwater and share information with regulatory officials.	Long Term	Feasible and necessary first step.	<$500	?	HLWTF, NYSDEC

76. Share information on mines with regulatory officials (towns, NYS DEC).	Long Term	Develop procedure.	<$500	?	HLWTF

NYSDEC – New York State Department of Environmental Conservation
NYSDOS – New York State Department of State
FL-LOWPA- Finger Lakes/ Lake Ontario Watershed Protection Alliance
OCDPW – Ontario County Department of Public Works
OCPD – Ontario County Planning Department
CCE – Cornell Cooperative Extension of Ontario County
OCSWCD – Ontario County Soil and Water Conservation District
G/FLRPC – Genesee/ Finger Lakes Regional Planning Council
HVA – Honeoye Valley Association
HLWTF – Honeoye Lake Watershed Task Force
FLLT – Finger Lakes Land Trust
FLCC – Finger Lakes Community College
MUNI-Municipalities

IMPLEMENTATION STRATEGIES

Intergovernmental Coordination

Effective partnerships are based on good information and educational efforts. Cooperation requires that the parties have a knowledge of why, how, when and where to cooperate, which can only be gained from shared information and communication. Mutual trust is necessary to make partnerships work, and trust can only be earned. To even consider the management of a complex ecosystem like a watershed or lake, it is necessary to foster a cooperative partnership approach. No single entity manages Honeoye Lake or the watershed for its numerous stakeholders.

There could be no HLWMP without the support of town, county, and state governments. In the formation of the Honeoye Lake Watershed Task Force in 1998, municipal governments stepped forward to exercise their powers to regulate land use and perform other functions for the improved health, safety and general welfare of their citizens.

Land Use Regulations

Honeoye Lake and its watershed are located in six municipalities, each with its own set of land use regulations. Thus, for the sake of good management, it is necessary to foster cooperation, participation, communication, and, to the extent possible, uniform regulations. Management of Honeoye Lake and its watershed will require the efforts of many levels of government, agencies, organizations, groups, and citizens working together in partnership.

For the purpose of water quality protection, better coordination among the municipalities in land use regulations is important. Attention needs to be paid to the shoreline of Honeoye Lake, which is already densely populated and a likely source of water quality problems. Establishing a joint committee of planning board members from watershed towns to review land use regulations in their towns and make recommendations for improved water quality protection is recommended.

Education Approach

Many years of concentrated efforts have been spent to protect Honeoye Lake and improve its water quality. Many of these efforts concentrated on the necessary role of education in the process. Indeed, education is the motivating force for all sorts of social improvements including environmental protection. Educational efforts have been aimed at citizens and governmental officials.

Scientific Approach

Watershed management efforts must have a solid scientific basis, including the analysis of water quality problems, selection of remedial actions, and the analysis and evaluation of results. Before actions are recommended or taken, a scientific analysis of the problems must be performed. Solutions must be tailored to target problems as specifically as possible and to avoid unintended consequences. Comprehensive analysis is needed in complex systems, such as lakes and watersheds. Sufficient data and an accurate picture of the interrelationship of various factors must be researched.

The Honeoye Lake Watershed has been intensively studied for at least three decades, but information gaps exist. In recent years, scientific studies have intensified in certain areas of interest: sediments, internal and external nutrient loading, water chemistry, land use, macrophytes, phytoplankton and the impacts of various management options.

Monitoring

A final step in implementing a watershed management plan is assuring the quality of the actions by setting benchmarks to monitor success/failure. It is recommended that the HLWMP establish a "trophic target" like that used in the Irondequoit Basin. A trophic index is a measure of a lake's biological productivity and is determined from measurements of nutrient levels, water clarity, and chlorophyll-a levels. With it, the Honeoye Lake Watershed Task Force will be able to chart the lake's progress toward a better trophic state.

Monitoring progress is important for measuring the effectiveness of programs, selecting new directions, and ensuring accountability to the public. If goals are not being met, current priorities will have to be adjusted. Benchmarks set for the reduction in the priority pollutants are measurable steps on the way to the goal of improving the quality of Honeoye Lake's water.

Yearly reviews by the participating municipalities in the Honeoye Lake Watershed Task Force will be used in conjunction with reports from the monitoring program to ensure that public expenditures are having the proper effect. The HLWMP should be reviewed annually and amended as necessary.

Staffing

The watershed management plan is a compilation of technical information to guide future actions. The collection of tasks has various characteristics: stand-alone, sequential, immediate, long term, technical, educational, planning, discrete and continuing. In reviewing the list of actions, the project sponsors must decide the best means to accomplish them. In some cases, only agency employees, trained technicians or knowledgeable consultants can complete the tasks. In other cases, volunteers may be able to accomplish tasks if they are sufficiently trained and organized. If the HLWMP is to be carried out in a timely manner, it is clear from the list of tasks that it cannot be accomplished solely on a volunteer basis. A part-time employee acting as a Watershed Manager to work with the HLWTF may be a viable option

Financing

A sample budget has been constructed to show an approach to funding the highest priority actions items.

Project Financial Needs for Five Years	
Stream and Lake Sampling	100,000
Purchase New Harvester	120,000
Harvesting Operating and Maintenance	400,000
Part-time employee @ $20,000/ year for 5 years	100,000
Assorted remedial actions @ $10,000/year for 5 years	50,000
Total for 5 years	770,000

Potential Funding for Five Years	
Canadice and Richmond	370,000
NYS Aid to Localities- FL-LOWPA	125,000
Volunteer Services	55,000
Honeoye Lake Watershed Task Force	30,000
Ontario County Water Resource Council	20,000
Ontario County Board of Supervisors	20,000
Additional Grants	150,000
Total for 5 years	770,000

SUMMARY CONCLUSION

As described in this document there is extensive scientific data on Honeoye Lake and its watershed. This will be used to support scientifically sound measures to protect and improve the lake's water quality. There are a few gaps in the scientific data which will be addressed by instituting new monitoring programs such as a tributary sampling program and a survey of streambanks to determine the extent of their contribution in supplying nutrients to the lake. In addition, regular water quality monitoring will continue to measure the effectiveness of the implementation of the lake protection action items recommended in this watershed plan.

Over 70 action items are recommended to address all existing and potential threats to lake water quality. Of these 20 have been assigned a high priority and will be acted upon in the next couple of years, as funds allow. Most of the high priority action items are related to prevention of nutrient enrichment of the lake, which promotes weed growth and algae blooms. The techniques used to address all action items include education, land use regulations, and structural and non - structural control actions.

The magnitude of this effort over the next five years to implement the high priority action items is of the order of ¾ of a million dollars and will require a part time watershed manager, extensive volunteer efforts, governmental agency assistance, and contract work to accomplish the objectives of the plan.

Accomplishing the objectives of the plan will require the cooperative efforts of all towns in the watershed in addition to state and county agencies, educational institutions, and private non-profit organizations. The HLWTF will manage the process and on an annual basis review priorities and develop an annual workplan. It is expected that grants will be obtained to finance many of the action items, in addition to the financial support from the county and towns.

Working on the action items identified in this watershed plan will go a long way toward accomplishing the objectives of the Honeoye Lake Watershed Plan.

- To improve the water quality of Honeoye Lake
- To improve the quality of water resources in the Honeoye Lake Watershed
- To protect the Honeoye Lake Watershed's natural resources
- To identify challenges and barriers to water quality protection and to suggest means to overcome them
- To protect the high quality of life enjoyed by residents of the Honeoye Lake Watershed
- To improve water-dependent recreational opportunities
- To retain and attract business and improve local economic development opportunities
- To consider economic, social, and other incentives for water quality protection

REFERENCE MAPS & TABLES

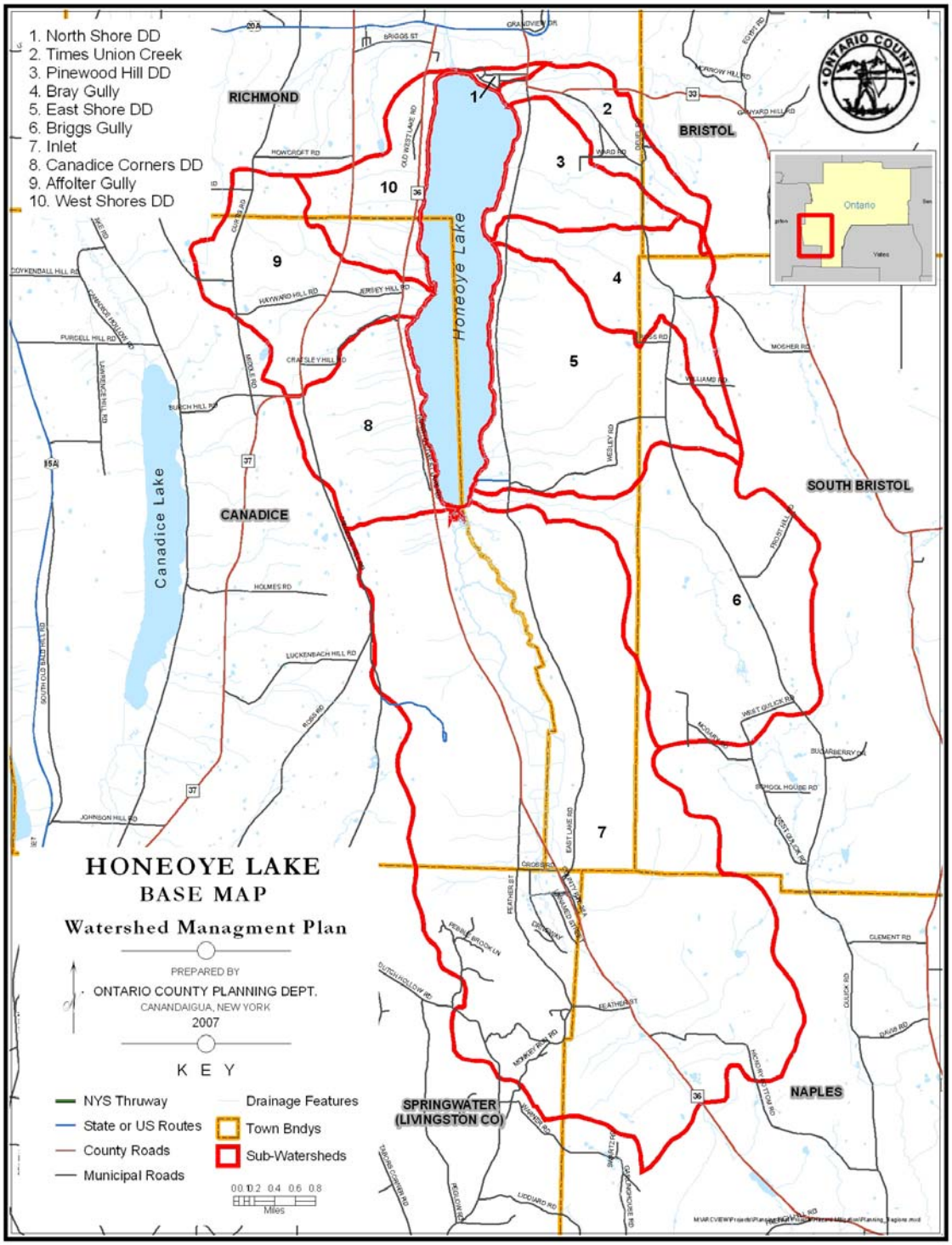


FIGURE 2 Honeoye Lake Subwatersheds

HONEOYE LAKE WATERSHED STATISTICS

Watershed Width	4.25 mi.	6.8 km.	
Watershed Length	10.9 mi.	17.4 km.	
Watershed Area	38.3 sq. mi.	99.1 sq. km.	24,497 acres

Sub-watersheds		Area (acres)	
1	North Shore DD	64	DD- Direct Drainage
2	Times Union Creek	651	
3	Pinewood Hill DD	832	
4	Bray Gully	1,165	
5	East Shore DD	2,387	
6	Briggs Gully	3,140	
7	Inlet	10,676	
8	Canadice Corners DD	1,273	
9	Affolter Gully	1,585	
10	West Shore DD	919	
Total Land Area			22,692
Lake Area			1,805
Total Watershed Area			24,497

Mean Annual Precipitation	34.6 in.	.	1993-2006
Mean Annual Temperature	47.7 F		1993-2006
Coldest Month (January)	24.5 F		1993-2006
Warmest Month (July)	69.8 F		1993-2006
Growing Season	140-170 days dependent on elevation		
Population	1930	823	
	1970	1276	
	1980	1837	
	2005	2772	

Major Public Lands	acres
▪ Cumming Nature Center (Rochester Museum and Science Center)	914
▪ NYS Parks' Harriet Hollister Spencer State Recreation Area	696
▪ NYSDEC Honeoye Inlet Wildlife Management Area	2454
▪ Finger Lakes Community College's Muller Conservation Field Station	50
▪ The Nature Conservancy's Muller Boy Scout Reservation	164
▪ Finger Lakes Land Trust's Wesley Hill Preserve	360
Total Public Lands	4,638

FIGURE 3- Honeoye Lake Watershed Statistics

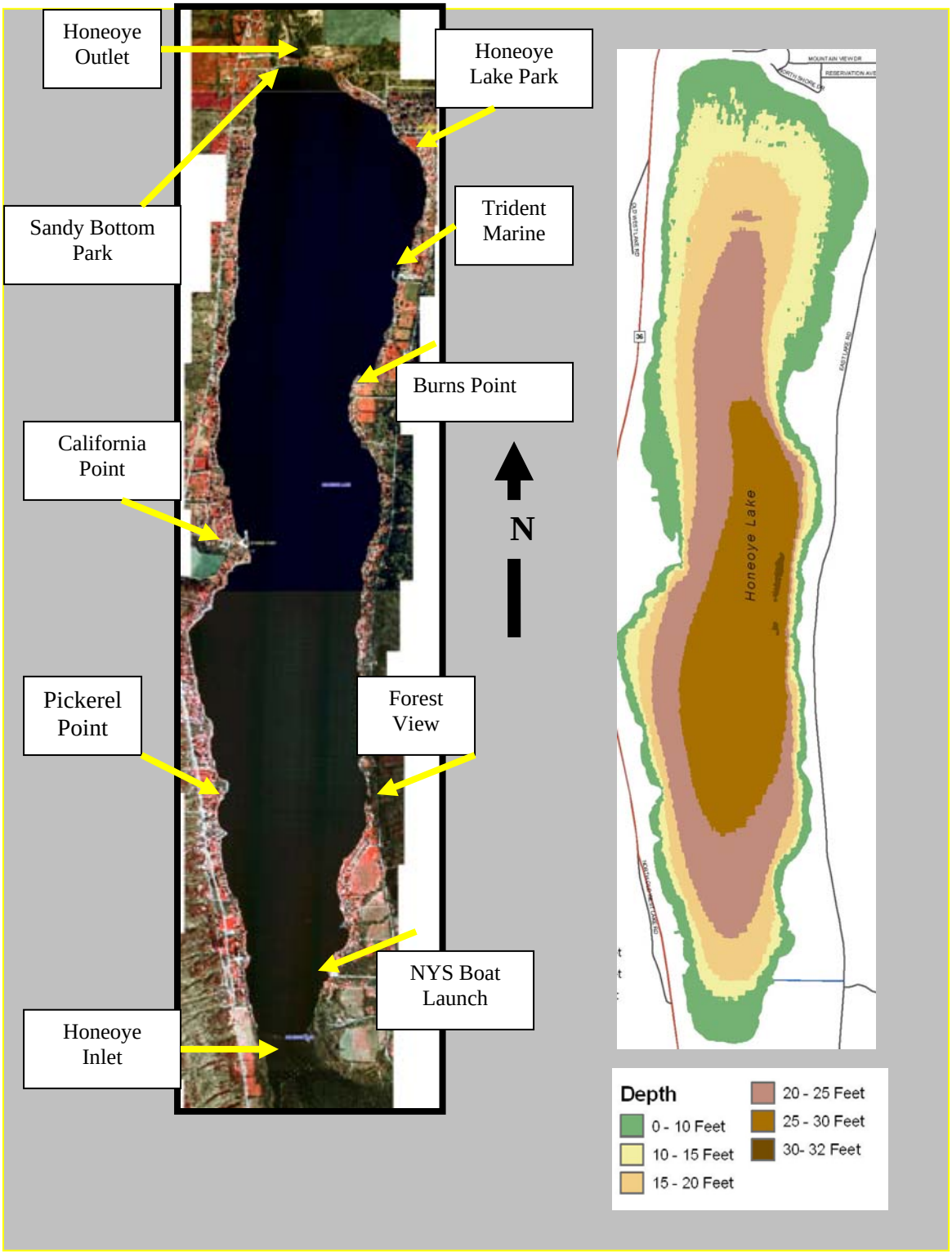
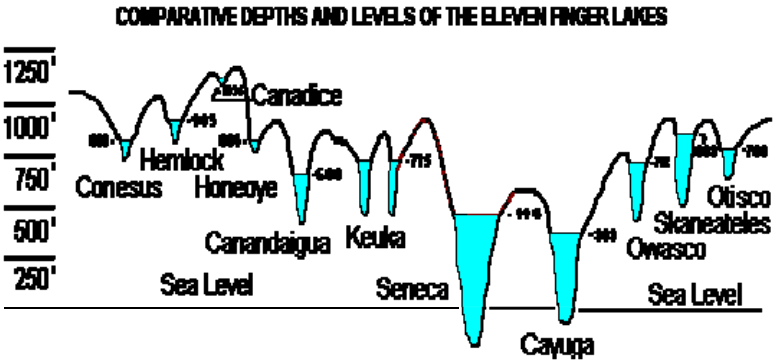


FIGURE 4- Honeoye Lake Infrared Photo and Bathymetric Map

Maximum length	4.1 miles	6.6 km	
Maximum width	0.88 miles	1.42 km.	
Mean width	0.67 miles	1.08 km.	
Shoreline length	10.6 miles	17.06 km.	
Surface area	2.82 sq. mi.	7.32 sq. km.	1,805 acres
Maximum depth	30.4 ft.	9.2 meters	
Mean depth	16.1 ft.	4.9 meters	
Volume	9.2 billion gal.	34.8 million m^3	
Hydraulic retention time	292-352 days		
Lowest level (1985)	802.20 ft.	244.51 m.	1971-2006
Mean annual minimum level	802.81 ft.	244.70 m.	1971-2006
Mean level	803.45 ft.	244.89 m.	1971-2006
Mean annual maximum level	804.68 ft.	245.27 m.	1971-2006
Highest level (1972)	806.49 ft.	245.82 m.	1971-2006
Major Tributaries	Honeoye Inlet Briggs Gully Bray Gully Affolter Creek		



Honeoye Lake Depth Contours

Depth	Lake Area inside depth contour (acres)
0	1805
5	1338
10	1245
15	1095
20	870
25	474
30	11

Deepest Location

Latitude: N42.75107 degrees
Longitude W77.50753 degrees

Finger Lake	Max Depth (m)	Area (km2)	Volume (10^6 m^3)
Conesus	18.0	13.7	156.8
Hemlock	27.5	7.2	105.9
Canadice	25.4	2.6	42.6
Honeoye	9.2	7.3	34.8
Canandaigua	83.5	42.3	1,640.1
Keuka	55.8	47.0	1,433.7
Seneca	198.4	175.4	15,539.5
Cayuga	132.6	172.1	9,379.4
Owasco	54.0	26.7	780.7
Skaneateles	90.5	35.9	1,562.8
Otisco	20.1	7.6	77.8

FIGURE 5- Honeoye Lake Statistics