Honeoye Lake Watershed Management Plan

This document was prepared for the New York State Department of State, Division of Coastal Resources with funds provided under Title 11 of the Environmental Protection Fund.

GENESEE/FINGER LAKES
Regional Planning Council

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Honeoye Lake Watershed Management Plan

Final Report

In Association with the
Honeoye Lake Watershed Task Force

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Mission Statement

The Genesee/Finger Lakes Regional Planning Council (G/FLRPC) will identify, define, and inform its member counties of issues and opportunities critical to the physical, economic, and social health of the region. G/FLRPC provides forums for discussion, debate, and consensus building, and develops and implements a focused action plan with clearly defined outcomes, which include programs, personnel, and funding.

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EXECUTIVE SUMMARY

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 ES-1). 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.

Figure ES-1: Location of Honeoye Lake in New York State

The HLWMP is a document that identifies major action items needed to protect and improve the water quality of Honeoye Lake. The HLWMP characterizes the natural resources, habitats, and environment of the watershed, identifies water quality and living resource impairments, recommends actions to protect the watershed from further degradation, and develops a strategy to restore the watershed. The plan also forms a framework to guide future decisions and provides a point of reference by which progress can be measured.

Section 2, *Watershed Characterization*, reviews the geographic setting of the Honeoye Lake and its watershed, including the physical characteristics, flora and fauna, human characteristics, and history.

Section 3, *Water Quality Characterization*, includes the examination of water quality classifications broken down by physical, chemical, and biological characteristics and trophic indicators.

Section 4, *Subwatershed Prioritization,* identifies the existing drainage infrastructure and connectivity within the watershed and examines water inflow, pollutant loading, sources of nutrient loading, and the combined effects of both the hydrologic and nutrients budgets within the ten (10) subwatershed areas of Honeoye Lake.

Section 5, *Assessment of Local Laws and Practices,* includes analysis of land use regulations from the watershed municipalities and prioritizes recommendations for improved water quality protection.

Section 6, *Protection and Management Recommendations,* identifies recommendations for habitat protection, public watershed knowledge, and point and nonpoint sources of pollution prevention. The recommendations are contained in a matrix and grouped by description, a list of prioritized action items, feasibility of the action, cost estimate, and the agent with primary responsibility. Pollution sources have been broken down into 14 different categories.

Section 7, *Implementation Strategies,* identifies coordination efforts, revisions to existing policies and programs, and sources of funding necessary to execute the proposed actions and recommendations. As an example, a prioritized plan with potential financing has been included.

In order to advance the HLWMP's goals and objectives, this document recommends that a number of measures be undertaken. These recommendations are summarized as follows:

- *Habitat protection and management recommendations* including wetland and fish habitat restoration measures such as wetlands restoration, riparian zone management, invasive species removal, hydrologic improvements, improvements to fish passage, and instream habitat research.
- *Educational and outreach recommendations* including increasing knowledge of pollution impacts to homeowners, boaters, and commercial establishments, expanding watershed and tributary identification signage and providing interpretive exhibits, and expanding school watershed educational programs.
- *Point and nonpoint source pollution management and control recommendations* to include increasing monitoring programs and educational efforts and implementing programs for road maintenance, pest management, and sanitary system review to reduce pollution loads generation.

Several priority actions and target projects have been identified as having the greatest potential individual impacts on the water quality in the Honeoye Lake Watershed. The priority actions include:

- Adoption of a model forestry regulation to minimize detrimental effects of logging operations;
- Create a macrophyte management plan to manage excessive macrophyte growth in Honeoye Lake;
- Conduct field surveys to identify the most severely eroding streambanks and shorelines and implement, where feasible, a program to minimize sediment loading to Honeoye Lake; and,
- Adopt municipal land use regulations to minimize erosion.

1. INTRODUCTION

Human activities in the Honeoye Lake Watershed have the potential to degrade the water quality within the lake and watershed. Point-source pollutants in surface water and groundwater are usually found in waters produced by various types of business, industry, agricultural, and urban sources. Nonpoint-source pollution occurs as water moves across the land or through the ground and picks up natural and human-made pollutants which are then deposited into waterbodies. Predominately, the creation of impervious services has led to increased surface runoff. Pollutant-laden runoff surface flows into tributaries and wetlands where it discharges into the larger waterbody. The runoff carries automotive oils, lawn fertilizers and pesticides, animal wastes, sediments, and garbage.

The polluted runoff and heavy flows discourage native vegetation in the creeks, increase algae growth, suffocate wildlife species, reduce aesthetics, and erode the shorelines. The pollutants are carried into the waterbody where the negative effects continue on a larger scale.

The waterfront plays a vital role in the Honeoye Lake Watershed communities. The topography and lake views are a fantastic backdrop for residents, anglers and boaters enjoy the local waters, and naturalists peacefully observe the wildlife. Reducing the pollutant loads in the Honeoye Lake Watershed through the enactment of the recommendations outlined in this plan will improve the water quality for many stakeholders.

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.

Watershed management plans guide the long-term management of a community's land and water resources with the ultimate goal of protecting and improving both water quality and living resources. The Honeoye Lake Watershed Management Plan (HLWMP) is consistent with the objectives of the Honeoye Lake Watershed Task Force (HLWTF) formed in 1998 to prevent further degradation of Honeoye Lake and to improve water quality. The HLWTF provides a forum for all stakeholders to participate, with the ultimate goal to develop a strategic plan for the protection of water quality throughout the Honeoye Lake Watershed while enhancing and preserving its natural resources. The HLWMP addresses point and nonpoint source pollution reduction, habitat protection and restoration, and education, outreach and stewardship.

Through its eight years of efforts, the HLWTF has gained a greater understanding of the complexities of the watershed and the effects of human activity on water quality. Using a process of public and municipal education, data collection, and implementation of best management practices and model regulations, the foundation for a watershed management plan for Honeoye Lake gradually evolved. The first version of the Honeoye Lake Watershed Management Plan was adopted by the HLWTF on November 21, 2005.

This document has been prepared by the Genesee/Finger Lakes Regional Planning Council (G/FLRPC) under the direction of the HLWTF for the New York State Department of State (NYSDOS) with funds provided under Title 11 of the Environmental Protection Fund Act. Adopted by the HLWTF on October

16, 2007, this document functions as a comprehensive plan or "road map" to protect Honeoye Lake and lists the necessary steps to save this beautiful watershed for future generations.

1.1 Goals and Objectives

The Honeoye Lake Watershed Management Plan (HLWMP) is a document that identifies major action items needed to protect and improve the water quality of Honeoye Lake. The overall goal of this watershed management plan is the protection, restoration, and enhancement of water quality and living resources in the Honeoye Lake Watershed. The specific objectives of this plan 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; and,
- To consider economic, social, and other incentives for water quality protection.

1.2 Sponsors / Partners

Important sponsors and partners in the HLWMP include:

Honeoye Valley Association (HVA)
Founded in 1986, the HVA is a membership based organization whose goals are to advocate for responsible use and enjoyment of the lands and resources of the Honeoye Lake area.

Honeoye Lake Watershed Task Force (HLWTF)
Formed in 1998, the HLWTF is an association of the watershed municipalities, agencies providing technical support, and the HVA. The task force is structured with one voting member from each town in the watershed and one from the HVA. It is supported by permanent non-voting professionals from Ontario County Planning Department, Ontario County Soil and Water Conservation District, and Finger Lakes Community College Conservation Department. In addition, other professional support is solicited from New York State Department of Environmental Conservation (DEC), Ontario County Water Resources Council, and Cornell Cooperative Extension (CCE).

Municipalities of the Watershed
Six municipalities fall within the Honeoye Lake Watershed. The Towns of Bristol, Candice, Naples, Richmond, and South Bristol are partially in the watershed in Ontario County, as is the Town of Springwater in Livingston County. The Honeoye Lake shoreline lies entirely within the Towns of Canadice and Richmond.

Ontario County
Ontario County Soil and Water Conservation District, Ontario County Planning Department, Ontario County Water Resources Council, and Cornell Cooperative Extension have provided technical assistance in creating this plan.

Finger Lakes Community College (FLCC)
FLCC is an important partner in efforts to protect water resources in the Honeoye Lake Watershed. The recent establishment of the FLCC Muller Conservation Field Station just south of Honeoye Lake was an important step in engaging a multi-disciplinary faculty, staff, and student body to conduct research of Honeoye Lake and its watershed.

New York State Department of State (NYSDOS)
As part of the Coastal Zone Reauthorization Amendments of 1990, Congress enacted a new Section 6217 entitled "Protecting Coastal Waters." This provision requires states with coastal management programs to develop and implement Coastal Nonpoint Pollution Control Programs. This document was prepared for the New York State Department of State with funds provided under Title 11 of the Environmental Protection Fund Act.

New York State Department of Environmental Conservation (NYSDEC)
The NYSDEC represents the State's concerns and interests in water quality. Biologists, engineers, and permit administrators from the NYSDEC have significant roles in research, technical assistance, and regulatory efforts to protect the water resources of Honeoye Lake and its watershed.

Genesee/Finger Lakes Regional Planning Council (G/FLRPC)
G/FLRPC is a public organization created to foster coordination among neighboring counties and to provide a regional approach to those concerns crossing local boundaries. It serves a grouping of counties whose residents are joined as a unit economically, socially and geographically. The local governments representing these counties have joined together voluntarily to address common economic and social concerns through the efforts of Regional Councils.

2. WATERSHED CHARACTERIZATION

The characterization of the watershed examines the existing conditions of the Honeoye Lake Watershed. Watershed character is a composition of the natural and developed environments. Changes in the character of the Honeoye Lake Watershed over the past half century have been significant. The growth in the use of private automobiles and the construction of good roads in the 1920s and 1930s added to the desirability of Honeoye lakefront cottages. By the mid-twentieth century, undeveloped lake frontage had mostly disappeared and summer cottages filled the shoreline. The years after World War II also signaled the end of agriculture as a principal use of the watershed land and the rapid residential development in the hills of Richmond and Canadice overlooking the lake. The reduction of agriculture resulted in the natural re-forestation of inactive agricultural lands, which was beneficial in reducing erosion. However, increased residential development resulted in the loss of native vegetation and an increase in impermeable surfaces. These historical changes in the watershed have impacted the watershed character and the water quality—both for better and worse.

The watershed characterization describes the following aspects of the study area:

- watershed boundaries through delineation of the lands that drain to the surface waters, with further subwatershed analysis provided in Section 4, Subwatershed Prioritization; and,
- geographic setting including physical conditions, wildlife, land use, and human and cultural characteristics.

2.1 Watershed Study Area Delineation

The Honeoye Lake Watershed is determined by beginning the watershed boundary at the lake's outlet at the eastern edge of Sandy Bottom Park and using topographical elevations to determine the extent of drainage into Honeoye Lake. For further information on watershed boundaries and statistics, refer to Map 1: Honeoye Lake Subwatersheds and Map 2: Honeoye Lake Subwatershed Statistics. It is topographically separated from the Honeoye Creek watershed to the north including Mill Creek as a tributary to Honeoye Creek, the Canandaigua Lake watershed to the south, the Mud/Ganargua Creek watershed to the east, and the Canadice/Hemlock Lake watershed to the west.

The hamlet of Honeoye and Mill Creek do not drain into the lake. Mill Creek joins Honeoye Creek about half mile north of the lake. Mill Creek carries drainage westbound from the Towns of Bristol and South Bristol. A major constraint to drainage from Honeoye Lake through Honeoye Creek is the lack of drop in elevation, resulting in little hydraulic head to move the water downstream, between the lakes outlet and the extensive marshes (HO-4) which begin about a hundred yards north of NYS Route 20A. The waters of the Honeoye Lake Watershed flow downstream through Honeoye Creek into the Genesee River and then into Lake Ontario. The numerous inflows to Honeoye Lake will be discussed in greater detail in Section 4. Subwatershed Prioritization.

2.2 Geographic Setting

The geographic setting of the Honeoye Lake Watershed includes a description of the watershed topography, hydrology, soils, climate, land use, development patterns, parks and public lands, natural resources and cultural and historic resources.

2.2.1 Topography

Modern Honeoye Lake occupies the bottom of a broad U-shaped valley that was scoured into the native sedimentary rocks by glacial action. Honeoye Lake Watershed is part of the hilly, flat-topped, eroded Appalachian Plateau that transitions to the Great Lakes Plain immediately to the north. Because of the scale and topography, Honeoye Lake gives the impression of being a small lake occupying a much larger setting. Honeoye Lake is unique among the Finger Lakes because its shoreline does not become progressively steeper to the south; rather, steep banks at the lakeshore occur at the northern corner on the west side and toward the center of the east side. The topography in close proximity to the lake along both the east and west shorelines have many steep slopes with the potential for significant erosion, delivering significant amount of sediment and nutrients to the lake. This detail can be viewed in Map 3: Honeoye Lake Steep Slopes.

Though modern seismic investigations have not been conducted on Honeoye Lake, it is presumed that Honeoye Lake, like the other Finger Lakes, rests on a substantial amount of sediment infill over the bedrock that occurred immediately following deglaciation about 11,500 years ago. Nearby Canadice and Hemlock Lakes rest upon an average of 250 and 400 feet of sediment infill, respectively. All the Finger Lakes contain two to three times as much of this infill at their southern ends as at their northern ends (Mullins, 1989).

Honeoye and Canandaigua Lakes share a common Valley Heads moraine at their southern ends made up of gravel outwash from the last deglaciation. Honeoye Valley once drained to the Canandaigua Valley during the Glacial Lake Naples stage. For further details, refer to Map 4: Honeoye Lake Topography.

2.2.1.1 Bedrock/Surficial Geology

The origin of the nearly horizontal bedrock that appears in the Honeoye Lake Watershed took place during the Upper Devonian Period (360-375 million years ago) when eroded sediment was washed into the area while it was covered by the ocean. The northern end of the watershed rests on dark shale, gray silty shale and fossiliferous limestone known as the Genesee Group. The harder limestone is responsible for small waterfalls that occur in gullies flowing to the lake. The foundation of the central portion of the watershed is light to dark gray shale inter-bedded with siltstone known as the Sonyea Group. The southern end of the watershed rests on the West Falls Group of inter-bedded gray shales, siltstones and sandstones. Resistant sandstone usable as “flagstones” caps the highest elevations to the south.

Normal weathering of this bedrock was interrupted 2.5 million years ago by an Ice Age brought about by global cooling. Many successive retreats and advances of the continental ice sheet over 2.5 million years deepened, then blocked, and eventually reversed the flow to northerly in north-south valleys that had previously flowed south. Deposits of glacial till were left on the hilltops, hillsides and valley bottoms,

depending on the depth of ice, slopes, sequences of retreat/advance, and water impounded against the glacier. All features of the topography and soils should be considered geologically "young" since the end of the Ice Age was only 11,500 years ago. Kames (mounds or hummocks), strandlines (abandoned shorelines) and outwash deltas are visible on the valley floor as part of the recessional moraine left from the last glacial retreat. For further information, refer to Map 5: Honeoye Lake Bedrock Geology and Map 6: Honeoye Lake Surficial Geology and Table SUP-1: Bedrock Geology by Subwatershed (acres) and Table SUP-2: Surficial Geology by Subwatershed (acres).

2.2.1.2 Soils

A mantle of glacial till (material detached, transported, processed and deposited by the glaciers) covers the Devonian bedrock of the watershed area. The most recent glacial period (Wisconsin Stage 65,000-11,500 years ago) featured many advances and retreats of the ice in response to global climate, and only ended about 11,500 years ago. Most of the modern soil was has developed in the intervening time.

The dominant soil associations of the Honeoye Lake Watershed include Lordstown-Manlius on the hillsides at the south end of the lake. These strongly acid soil types are relatively new soils, on steep slopes, containing particles or "channers" of the shale and sandstone bedrock. Lordstown-Manlius is not well suited to crops because of slopes and limited fertility but can support forests or pastures.

On the east and west sides of the watershed, the hilltops are categorized as Mardin-Volusia soils. These strongly acid soils also contain channers, and Volusia is known as a "problem" soil because of its high clay content and poor internal drainage. Mardin-Volusia is categorized as fair to poor for crops and probably better suited to pastures and forest.

At the immediate south end of Honeoye Lake is a wetland of 837 acres containing muck soils in the northern portion and Fulton silt loam and Wayland silt loam on the valley bottom to the south. Fulton silt loam is a lake-laid, high clay soil that represents an extended period of higher water levels in Honeoye Lake than at present. Wayland silt loam is a recent alluvium, a soil still developing from sediments deposited by annual flooding. None of the muck soils had been drained for agricultural use, and all are covered with forest. Some of the higher ground at the south end of the watershed had been drained for agricultural use before the 1930s but has been largely abandoned and is in various successional stages.

The northwest corner of the watershed is dominated by the Lansing-Darien association considered fair for crops. Lansing soils are medium-textured, well-drained, and neutral which developed in glacial till. Darien soils are imperfectly drained, neutral soils derived from glacial till high in calcareous shale.

The north end of watershed is dominated by the Odessa-Schoharie association, lake-laid, silty clay loams that, like the muck and Fulton at the south end, represent an extended period of higher water levels in Honeoye Lake (Glacial Lake Honeoye) than at present. For greater detail, refer to Map 7: Honeoye Lake Soils and Table SUP-3: Soil Type by Subwatershed (acres).

2.2.2 Hydrology

The hydrology of the Honeoye Lake Watershed includes a description of the methods used to determine the tributary inputs, groundwater seepage, direct precipitation, and overland runoff.

2.2.2.1 Surface Hydrology

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, being branched and passing through an 800-acre wetland on its way to the lake. For further information on watershed boundaries and statistics, refer to Map 1: Honeoye Lake Subwatersheds and Map 2: Honeoye Lake Subwatershed Statistics.

Because of the topography, streams oriented east-west will be of higher gradient (steeper). Though higher gradient streams will develop greater erosive and transporting energy, they will also empty out more quickly. The overall gradient of Briggs Gully, for example, is 6% over 2.4 miles. Streams oriented north-south, such as the Honeoye Inlet, will be lower gradient, generating less energy and emptying slowly. The overall gradient of the Inlet is 0.7% over 7.8 miles, and the two miles immediately south of the lake are so flat that flow is very diffuse and water level in the stream is determined by that of the lake. Map 8: Honeoye Lake Environmental Features shows many small streams entering the lake, particularly on the west side.

Stream types identified in the southern Honeoye Lake Watershed include:

- rocky headwater stream;
- confined river; and,
- intermittent stream and spring.

Rocky headwater streams are differentiated from other types by the presence of brook trout, an indicator of very high water quality. All three stream types provide habitat for mayflies, stoneflies and caddisflies, typically indicators of high water quality. Spring streams are often small, very cold, flowing with diverse and unique assemblages of animal and plant species such as spreading globeflower (*Trollius laxus*), an Ice Age relict.

2.2.2.2 Groundwater Flow

Honeoye Lake is categorized by the New York State Department of Environmental Conservation (NYSDEC) as a Class “AA” waterbody. The lake is approximately 4 miles long and has a maximum width of 0.88 miles. It has a total surface area of 2.82 square miles. The long, narrow lake is in general deeper towards its southern end than it is at its northern end. The lake’s maximum depth is 30.4 feet and its total volume is estimated at 9.2 billion gallons. For further details on lake characteristics, refer to Map 9: Honeoye Lake Infrared Photo and Bathymetric Map and Map 10: Honeoye Lake Statistics.

The Honeoye Lake Watershed is largely undisturbed and forested. During the spring, when soils tend to be saturated and the groundwater elevations are close to the surface, there will be a greater tendency for precipitation to accumulate and runoff from even non-developed lands. During the summer, groundwater elevations recede and the soils become increasingly drier as will forest duff and leaf litter.

2.2.2.3 Climate

The region is marked by a highly variable climate and the possibility of rapid, frequent and extreme weather changes. Winter temperatures are sufficiently cold to support a complete ice cover of Honeoye Lake nearly every year. Because winter precipitation arrives as snow and ice stored in the watershed, there is often a strong pulse of runoff to the lake in the early spring of each year.

The actual annual evapotranspiration is measured at the Canandaigua Water Treatment Plant, which is about the same elevation as Honeoye Lake. The evapotranspiration is 21.5 inches per year—with a majoring occurring in the summer.

The closest recording meteorological station to the Honeoye Lake Watershed is located at the sewage treatment plant in the hamlet of Honeoye, approximately ½ mile north of the lake outlet. The average monthly temperature, precipitation, and snowfall are summarized in Figures 2-1 and 2-2, below:

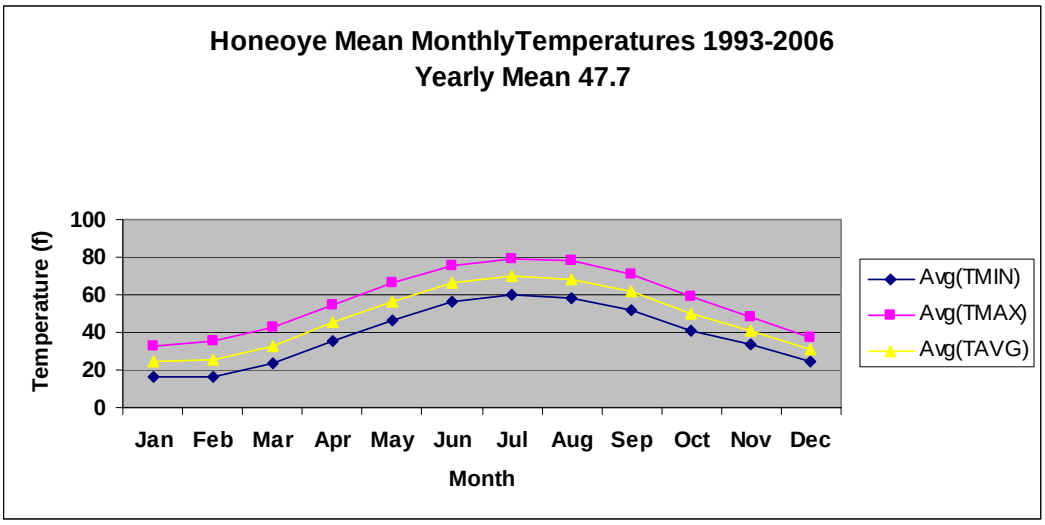

Figure 2-1: Honeoye Monthly Temperatures

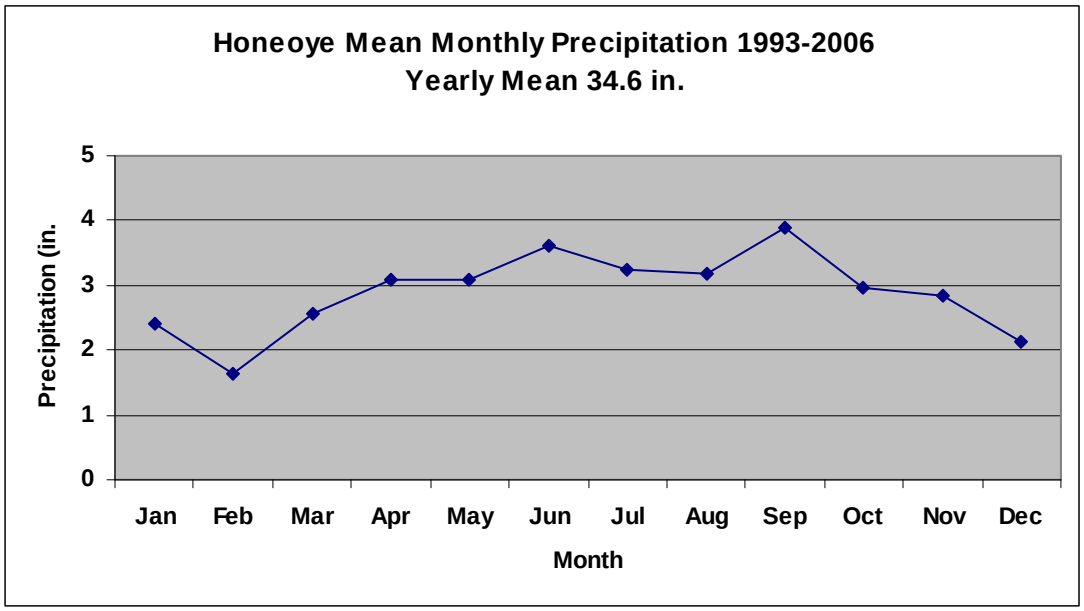

Figure 2-2: Honeoye Monthly Precipitation

2.2.2.4 Precipitation Chemistry

The most detailed study of precipitation chemistry in the Finger Lakes was conducted by Likens (1972) in 1970-71. Likens attempted to interpret results to be able to understand atmospheric acid inputs through the 20th century. Significant findings include increases in inorganic nitrogen and sulfur concentrations in precipitation since 1915. Samples from early in the century were characterized by high sulfate (4-8 mg/L) and ammonium (nearly 4 mg/L) and low nitrate concentrations.

After 1950, however, changes appear, probably as a result in changes of types of fossil fuels being combusted regionally. In the Finger Lakes, increases in the nitrate content of precipitation may represent increasing gasoline consumption and shifts from coal and wood to natural gas. Changes in the seasonal pattern of sulfate concentrations were also observed, away from higher concentrations during the winter months (presumably as a result of heating fuels) and toward higher summer concentrations. Mean concentration of phosphates in precipitation during this period was 52.6 ug/L or 515 gm. /hectare. The most well known finding of Likens research was acid precipitation. Likens discovered that precipitation was dominated by stronger, un-buffered, mineral acids which produce lowered pH's.

2.2.2.5 Lake Retention Time and Level

The length of time required to completely replacing the total volume of water in the lake by stream flow and groundwater is known as the lake retention time. Calculations of the runoff rate from tributaries into the lake can be estimated using precipitation figures, roughness of streambeds, vegetative cover, permeability of the land, and evapotranspiration losses. Water that percolates into the soil and enters the groundwater will arrive at the lake more slowly. There is no indication (such as high concentrations of dissolved solids) that groundwater makes up an important part of the flows into Honeoye Lake. The retention time of Honeoye Lake has been calculated by several researchers including (Bloomfield (1978)

and Souza (2007) to be 1 +- .25 years by determining how long the combined volume of runoff and groundwater will take to totally displace the 9.2 billion gallons of lake water.

Because of its relatively small volume and relatively large watershed, Honeoye Lake has the shortest retention time of any of the Finger Lakes. It has been computed by various researchers as approximately a year (as compared to neighbor Canandaigua Lake's 13.4 years). This means that dissolved substances will be flushed from the lake in a relatively short time.

The water level in Honeoye Lake depends on the amount of water lost through evaporation and the amount entering and leaving the lake. The amount of water entering the lake depends on seasonal weather conditions in the watershed. A normal, seasonal fluctuation of Honeoye Lake level is about two feet. Water flows from the lake and when it reaches a height of 803.5 feet it flows over the top of the concrete weir constructed in 1999 just north of the Sandy Bottom Park Lagoon.

The weir was designed as a passive system, so as to not obstruct high flows but to maintain water levels at 803.5 during dry times and low flows (Figure 2-3). No gates or dams can be manipulated to affect flows, so lake levels fluctuate naturally around 803.5 feet.

Figure 2-3: Honeoye Outlet Weir

The lowest daily average lake elevation occurred in the summer of 1985 when the lake reached 802.2 feet, 1.3 feet below normal. This condition was caused by peak evaporation of lake water in the summer and limited tributary inflow from the watershed. The highest recorded water level occurred during Hurricane Agnes in late June, 1972. Honeoye Lake reached 806.5 feet because of excessive inflows and lack of outflow capacity at the outlet, which caused significant flooding.

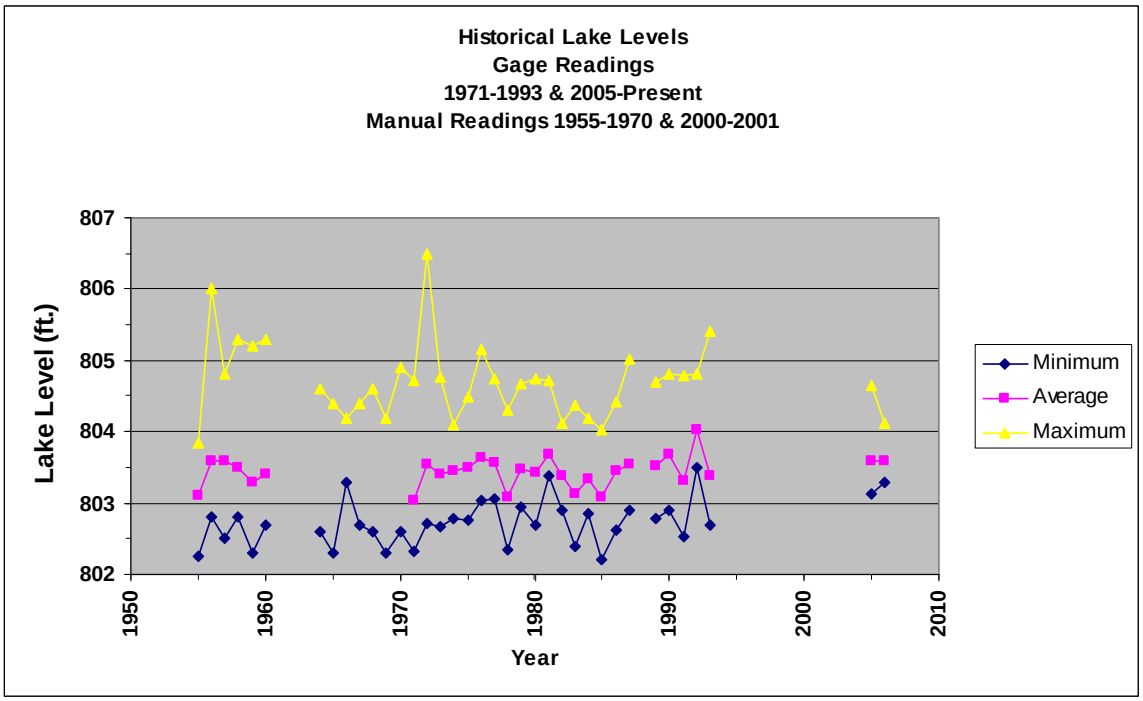

Figure 2-4: Honeoye Historical Lake Level

A gauge set up by US Geological Survey at Trident Marine monitored Honeoye Lake water levels for many years, but the gauge was abandoned by USGS in the late 1990s (Figure 2-4). As of September 2004, the Honeoye Valley Association has installed a gauge which continuously monitors lake levels at Sandy Bottom Park lagoon.

Management concerns related to low lake levels include boating access problems and the possibility of frozen intake pipes if foot valves are located in shallow water. High levels prompt concerns about flooding of low-lying cottages and boating access problems.

2.2.2.6 Sanitary System Disposal

Shoreline septic loading can be an important contributor of pollutants, in particular phosphorus and nitrates. However, the magnitude of the septic load to any lake is widely variable and dependent on a number of factors The magnitude of this load increases with the age of the system, the topography of the watershed and specifics related to the prevailing soils such as depth to seasonal high water, depth to bedrock and soil composition and make-up. Development density and septic system design also affect the loading. Obviously, malfunctioning systems that discharge poorly treated effluent either below ground or on the surface will dramatically increase the magnitude of the load.

The most serious problem with cesspools and improperly functioning septic tank systems is the introduction of nitrates into groundwater. On-site sanitary systems also have the potential for improper disposal of organic compounds including paint thinners, petroleum products, grease cutters and household chemicals that can leach into groundwater and subsequently discharge to surface waters.

A large portion of the Honeoye Lake Watershed is serviced by a sewer system district installed in 1978. It services all shoreline residences, including the majority of the lands immediately adjacent to the lake. However, there are numerous septic systems within the watershed. For further information, refer to Map 11: Honeoye Lake Sewer District.

2.2.2.7 Water Supply

The Town of Richmond maintains a public drinking water system serving the hamlet of Honeoye and some surrounding areas. The sources of the drinking water are wells located north of NYS Route 20A in the vicinity of wetland HO-4. The Town of Richmond supplies 710 water services, some of which lie in the Honeoye Lake Watershed. Public water is available as far south on East Lake Road as Oxford Street, serving all 235 parcels in the Honeoye Lake Park and about 50 parcels south of the hamlet on C.R. 36 (West Lake Road) to the Richmond town line.

Two water systems in the Honeoye Lake Watershed using wells under the influence of surface water (Honeoye Lake) are those serving the Honeoye Valley Park and Trident Marine. Because these systems are considered to be under the influence of surface water and serve water to the public or multiple private users, they have been required by the New York State Department of Health (NYSDOH) to install filtration and treatment equipment.

About 300 shoreline residences on Honeoye Lake are served by individual water systems that pump water from the lake. It is not known to what extent these private systems filter or treat the water. Often resident use is for non-potable activities like toilet flushing.

About 500 households on the shoreline in the Honeoye Lake Watershed are not served by the water district. They are instead dependent on private wells dug or drilled on their properties or use water directly from the lake. Wells are commonly dug or drilled into the water table. Artesian wells occur in the Gulick Valley.

About 500 households in the Honeoye Lake Watershed, either not located at the shoreline or served by the water district, are dependent on private wells dug or drilled on their properties. Wells are commonly dug or drilled into the water table. Artesian wells occur in the Gulick Valley.

2.2.3 Land Cover and Land Use

The land use and cover section of the Watershed Management Plan includes a description of the predominant land uses in the Honeoye Lake Watershed and the role that impervious cover plays in the generation of storm runoff and pollutant load calculations.

2.2.3.1 Land Cover-Permeable

In 1600 the Honeoye Lake Watershed was—apart from clearings made by Native Americans and natural causes such as fire, steep slope landslides, wind or ice—completely forested. The watershed's primeval forest contained massive trees, some covering as much as a half-acre of ground.

Early settlers found these forests useful. Probably the first product to be transported to market was barrels of potash, made from ashes of the burned trees. As sawmills were erected, lumber from the trees cut from 1830 to 1890 were used in the construction of urban centers such as Rochester, Buffalo, and Syracuse. Efforts to bring logs down from the inaccessible area between East Lake Road and Gulick led to the construction of a rail line in the bottom of Briggs Gully. In 1885, maximum deforestation and agricultural land use arrived in New York State, often on lands that would not support these practices. Since 1885, there has been a slow decline of farming in the watershed, accelerated by the Great Depression from 1929 to1943 and a gradual re-establishment of the area's forests.

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%. The community types ranked as "Significant" by the New York Natural Heritage Program (NYNHP) include a winter stratified monomictic/polymictic lake, the floodplain forest, silver maple-ash swamp along the Inlet, and the shale talus slope woodland in Briggs Gully.

More than a thousand acres bear restrictions due to their wetland status and 4,638 acres (20.4% of watershed land area) are in conservation ownership in Harriet Hollister Spencer State Park, Nature Conservancy properties, NYSDEC properties, 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.

The watershed lies at the juncture of two major forest types: hardwoods and softwoods. The north end of the forest is dominated by hardwoods such as oaks, hickories, tulip-poplar, and American chestnut. At the south end, the forest consists of sugar maple, beech, yellow birch, hemlock, and white pine.

The American chestnut and American elm have recently succumbed to disease. Oak regeneration is limited by the intensity of large deer herds of browsing white-tail. White pines do not obtain their former size or shape because of weevils that kill their terminal (growth) shoots and deform the trees.

No old-growth or virgin forest has been identified in the Honeoye Lake Watershed. Much of the watershed land is now covered with second-growth forests. Timber harvest continues to be an important source of income for landowners. A survey of the vegetative cover of the Honeoye Lake Watershed is further detailed in Map 12: Honeoye Lake Land Cover and in Table SUP-4: Honeoye Lake Land Cover Type by System, Table SUP-5: Honeoye Lake Land Cover by Subsystem, and Table SUP-6: Honeoye Lake Land Cover Type.

2.2.3.2 Land Cover-Impervious

The conversion of land underlain by permeable soils to impervious surfaces (such as streets, sidewalks, roofed areas, and parking lots) significantly reduces infiltration of precipitation to the water table and creates large volumes of street runoff. The runoff flows into storm-sewer systems that discharge either to recharge basins and leaching structures, which allow groundwater infiltration, or directly to the tributaries

and lake. Stormwater does not replenish the groundwater system. Pollutants that wash off lawn and landscape areas and from impervious surfaces are carried directly into surface waters.

No State Highways pass through the watershed, although NYS Route 20A skirts the northern edge of the watershed through the hamlet of Honeoye. The watershed is served by County Road 36, which bisects the watershed along its 11.8-mile north-south axis, C.R. 33 on the east and C.R. 37 on the west, and numerous local roads. Altogether, approximately sixty-eight miles of roadway and private drives exist in the Honeoye Lake Watershed. Since road and driveways and their associated ditches have the potential to be a source of sediment and nutrients to Honeoye Lake, a summary will be provided in Section 4, Subwatershed Prioritization.

2.2.3.3 Land Use

The Honeoye Lake Watershed is relatively sparsely populated. A population of 2,772, according to the 2000 census, in a land area of 36.7 square miles 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.

Overall, the Honeoye Lake Watershed is lightly populated and contains a large quantity of "protected" land. The Honeoye Lake Watershed can be categorized as "rural-residential," demonstrated by Map 13: Honeoye Lake RPTS Property Class Codes and Table SUP-7: Real Property Land Use.

At present the only multi-unit residential or large-scale commercial developments in the Honeoye Lake Watershed is Country Colony Estates, unlike the extensive development at the north end of Canandaigua Lake. Though the hamlet of Honeoye area is outside the watershed proper, any discussion of real property values of the area must include it. In the past decade, "large-scale" commercial and residential development has occurred east of the historic hamlet on NYS Route 20A, generally in the Mill Creek watershed.

Honeoye Lake shoreline is fully developed (Figure 2-5). The lot density produced by 650 cottages and homes on 8.5 miles of shoreline is an overall average of 86 feet per property. For comparison, Canandaigua Lake averages 122 feet per property. There are about 1,000 structures at or near Honeoye Lake shoreline (including 235 in the Honeoye Lake Park and 80 mobile homes at Honeoye Valley Park) that have lake access or direct lake frontage.

Figure 2-5: Honeoye Lake Shoreline

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 2-1). 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 Town's Total Residential Land Value	% of Town's Total Residential Assessed Value
Richmond	$86.6 million	37	57	43
Canadice	$44.7 million	26	57	41

Table 2-1: Summary of 2003 Residential Property Assessment for Richmond and Canadice

2.2.4 Development Trends

The views at the south end of Honeoye Lake near Hunt Hollow are some of the most beautiful in the Finger Lakes. They remain uncluttered with subdivisions or telecommunication towers. Looking north into the valley where the lake is set provides a gorgeous view. Looking south into the valley bestows a mini-history in glacial geology. Looking either east or west from the opposite sides of the valley, one views steep and wooded green hillsides with very few indicators of human activity. The landscape south of the lake is typical of glacial activity with its recessional moraine and hanging valleys with their gorges and kames (Figure 2-6).

The question facing the Honeoye Lake Watershed community is the same one that puzzles all the Finger Lakes: how to use the great natural beauty of the area without destroying it? Development and tourism trends are contingent upon the natural resources in the Honeoye Lake Watershed.

Figure 2-6: Honeoye Lake Summer and Winter

2.2.4.1 Zoning

Based on 2002 data from the Genesee/Finger Lakes Regional Planning Council report, *Regional Development Analysis*, there are five standard zoning classifications in the Honeoye Lake Watershed. The north side of Honeoye Lake is zoned primarily agricultural/residential. Commercial/business districts are located just north of the top of the lake. The east side of Honeoye Lake is zoned for mixed residential/commercial/institutional. The south and west sides of the watershed are mostly unzoned, since much of it lies in the Towns of Canadice and Springwater that do not have zoning. However, Canadice does use site plan review for erosion and sediment control. The shoreline of Honeoye Lake is largely residential.

2.2.4.2 Population

The population of the Honeoye Lake Watershed based on census data is provided below in Table 2-2:

Year	Population	Acreage per person
1930	823	27.6
1970	1,276	17.8
1980	1,837	12.4
2000	2,772	8.2
*Current figures added		

Table 2-2: Honeoye Lake Watershed Population

Appendix C: Towns Demography summarizes population data of the towns in the Honeoye Lake Watershed.

The estimated number of housing units in the watershed is 1,790, including 970 located on the shores of Honeoye Lake. Most of the homes on Honeoye Lake are not primary residences, so their count is not included in the census figures. Assuming 2.5 residents per housing unit, a summertime population of approximately 4,500 is a reasonable estimate, which is over 60% greater than the census data.

2.2.4.3 Tourism

There is no extensive infrastructure to support tourism in the Honeoye Lake Watershed such as attractions, restaurants, hotel/motels, and conference centers. Most tourism experienced in the watershed is weekend or day-trips from local population centers and during the summer months.

Greater economic benefits are possible should the tourist visit and seasonal attractions be extended. For example, Bristol Mountain sells ski packages that involve several days of skiing plus accommodations in Canandaigua. There is potential for skiers at Bristol to make use of bed and breakfasts or other accommodations closer to the ski centers. This strategy would lengthen both overnight stays via a larger selection of accommodations and the winter tourism season, as opposed to the enormously popular summer months.

In 1962, the Honeoye Chamber of Commerce organized a first Winter Carnival. The event became so popular that in 1971 over 50,000 visitors arrived—tying up traffic for miles. After considerable success, the Winter Carnival was discontinued due to lack of tourist infrastructure. Recent studies by the Ontario County Tourism Bureau have documented the major economic benefits of special festivals and occasions to Ontario County communities.

2.2.5 Parks, Preserves, and Lands in Public Ownership

Efforts to protect watershed land have been very active and successful in recent years with the acquisition of lands important to Honeoye Lake's water quality and to the natural integrity and beauty of the area. In addition, other parcels provide recreational uses and opportunities to access the water. Municipal and preserved parcels are listed in Table 2-3.

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	2,454
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 Land	4,638

Table 2-3: Lands in Public Ownership

The Rochester Museum and Science Center's Cumming Nature Center is a nature preserve and recreation area covering 914 acres in the Gulick area. The Center offers groomed trails for cross country skiing, snow shoeing and hiking.

The Finger Lakes Community College operates a Conservation Field Station for research and education purposes, which it received from the Muller Estate.

The NYSDEC Honeoye Inlet Wildlife Management Area of 2,454 acres consists of the former Muller estate and the large wetlands along the outlet.

The Nature Conservancy is an international organization whose focus is on the protection of biological diversity and integrity through the protection of land and owns the Muller Boy Scout camp with 164 acres on the Honeoye Lake Inlet.

The Finger Lakes Land Trust is a regional organization dedicated to the preservation of the Finger Lakes landscapes. The Land Trust has recently consolidated several holdings into the Wesley Hill Preserve with 360 acres that includes parts of Briggs Gully.

Two New York State parks are also located in the watershed: the Honeoye Lake Boat Launch State Park and Harriet Hollister Spencer Recreation Area. Honeoye Lake Boat Launch provides a boat launch site and fishing access. It is located on the southeast corner of the lake and has 23 car-and-trailer-parking spaces available. The parking capacity of the State Boat Launch is exceeded on holidays and weekends, and the State has purchased more land to increase the size of the facility. As many as 100 boats per day have been launched at the current facility. Harriet Hollister Spencer Recreation Area includes trails and natural lands on 696 acres on the eastern slope of Canadice Hill and provides picnic tables, hiking, cross-country skiing, and biking trails. Deer hunting is permitted in season. Small game hunting is not permitted at any time.

The Honeoye Creek Wildlife Management Area, although not in the watershed, is a NYSDEC Fish and Wildlife Management area that emphasizes habitat conservation for wildlife, compatible public use and enjoyment of the area's attributes, and serves as an educational demonstration area for land management techniques. The area offers passive activities such as birdwatching and nature trails in addition to hunting, trapping, and fishing. Other recreational activities include snowshoeing, cross country skiing, and hiking.

Private lands are used for other recreational opportunities such as snowmobiling, hunting and trapping (Figure 2-7). Hunt Hollow Ski Center is a private 110-acre ski club located near the southern end of the watershed. Snowmobilers have organized into clubs and associations to police themselves and to gain orderly access to private properties for riding. Though snowmobiles have some potential to disturb wildlife populations they also have benefits beyond the pleasure of riding: emergency transportation and grooming cross country ski trails.

Figure 2-7: Hunt Hollow Ski Center

Other private recreation consists of boating and docks along the shoreline. A comprehensive survey yielded 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 about 425 sailboats, canoes, and sailboards would also be based on Honeoye Lake—for a total of 1,525 resident boats.

Sources of non-resident boats include the Honeoye Lake Boat Launch and Trident Marine. Trident Marine is the only full-service marine dealership on Honeoye Lake. It is located on East Lake Road. The private marina provides various boat services, dock and hoist, parts department, slip rentals, and a restaurant. It can accommodate about 70 boats in wet or dry storage.

Otherwise, public access is provided by Sandy Bottom Park which is maintained and operated by the Town of Richmond. The park features 600 feet of beach, which is heavily used from June until September, and a small seasonal boat launch. Lifeguards are provided by the Town of Richmond.

The Honeoye Lake Watershed is heavily hunted by resident landowners and visitors. The principal game species are white-tail deer, turkey, ducks and geese, grouse, and small game for eating and sport. Evidence in the watershed's vegetation and records of car/deer collisions, however, would indicate that some species, such as white tail deer, are not being adequately controlled by hunting, and the number of hunters statewide has been steadily declining. The wetlands at the north and south ends of Honeoye Lake provide considerable opportunities for trappers pursuing muskrat, mink, fox, raccoon and beaver.

In a survey of lake fishing habits quoted in Chiotti (1980), fishermen revealed that boat fishing was their principal means of access (43%) but that a sizable percentage (28%) fished through the ice. In the same survey, it was discovered that Honeoye Lake is fished more intensively than any other Finger Lake, partly because its extensive winter use (Figure 2-8). In addition, the harvest of perch, walleye and bass is considered excellent, supporting the overall productivity of the lake. Issues concerning Honeoye Lake's fishery include increasing the abundance of walleye, improving fishermen's access to the lake during all seasons, protecting fish habitat, and maintaining the productivity of the fishery.

Figure 2-8: Year-Round Use of Honeoye Lake

In total, 4,638 acres or 20.4% of the watershed land area is protected. The large proportion of protected land is an asset both for water quality protection and for recreational uses. At present, there are several local suppliers of outdoor equipment and supplies, including bait and tackle and gun shops. The protected lands support greater hunting, fishing, hiking, and cross country skiing use, which altogether provides a variety of open space to improve quality of life. Refer to Map 14: Honeoye Lake Protected Lands to see further details.

Despite the presence of 1.1 million people within a 60 minute drive of Honeoye Lake, few can actually use the lake through the limited public facilities. Public access is only available through Sandy Bottom Park, Trident Marine, and Honeoye Lake Boat Launch State Park.

2.2.6 Natural Resources

2.2.6.1 Wetland Habitats

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 New York State Department of Environmental Conservation (DEC) and US Army Corps of Engineers regulations.

Four large wetlands are significant to the health and management of Honeoye Lake and its watershed. An 837-acre freshwater wetland immediately south of Honeoye Lake is designated SP-3 and ranked as a Class 1 wetland by the NYSDEC. Mostly wooded, it extends south along the Honeoye Lake Inlet for two and a half miles. SP-3 is a Class 1 (most valuable) wetland because of its importance to the Honeoye Lake ecosystem, filtering out sediments and nutrients, absorbing flood water, and providing important fish spawning habitat. Channelization of the Inlet in the 1960's for agricultural purposes disrupted the function of SP-3. Time heals such wounds, and the donation of the wetland and adjacent properties to The Nature Conservancy and the Finger Lakes Community College assures that the healing will take place.

Wetland BS-8 is a long, narrow wetland immediately west of and paralleling County Road 36 from near the Hunt Hollow Ski Center south to French Hill Road. It is two and a half miles long but seldom exceeds 500 feet in width. Water flows both north and south from BS-8, south to Grimes Creek and the Canandaigua Lake watershed and north to the Inlet of Honeoye Lake. This Class II wetland at the headwaters of the Honeoye Lake Watershed includes emergent marsh, wooded swamp, shrub swamp and open water. Wetland BS-8 buffers and protects the stream which becomes the Inlet.

Wetland BS-2 lies in the West Gulick area at the headwaters of Briggs Gully, which drains west to Honeoye Lake. As with BS-8, the southern part of BS-2 drains to Grimes Creek and Canandaigua Lake. BS-2 is predominantly a wooded wetland with a small amount of shrub swamp and also has open water habitat for rare species. BS-2 is a high profile wetland because it is visible from trails maintained by the Cumming Nature Center and the Finger Lakes Land Trust's Wesley Hill Nature Preserve.

Though Wetland HO-4 is technically outside the Honeoye Lake Watershed (its southern edge is the northern edge of Sandy Bottom Park), it has a major influence on the lake because of its size (800 acres) and location (four miles along the Honeoye Creek to the north). HO-4 is composed primarily of emergent

marsh (cattail) habitat with lesser amounts of wooded and shrub wetland. HO-4 is another high profile wetland and can be viewed from a boardwalk and nature trail constructed in 1993. It performs important functions in flood storage and control, wildlife habitat (much used for hunting, trapping, nature study and bird watching), erosion control and water filtration.

Smaller wetlands existing in the watershed cumulatively provide important water quality protection. Vernal pools for woodland salamanders and breeding of other amphibians are protected as federally-designated wetlands (Figure 2-9). Refer to Map 15: Honeoye Lake NYSDEC Wetlands for more information.

Figure 2-9: Small Wetlands Provide a Variety of Benefits

2.2.6.2 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.

Judging by the archaeological record of pre-European colonization times, the Honeoye Lake Watershed supported populations of black bear, timber wolves, red-tailed hawk, turkey vulture, great blue heron, grey fox, cottontail rabbits, gray and red squirrels, muskrats, mink, raccoon, river otter, white-tail deer, eagles, great horned owls, turkey, Canada geese, loons, snapping turtles, beaver, brook trout, mountain lion, bobcat, and timber rattlesnakes.

The watershed currently supports a large population of white-tail deer, muskrats, rabbits, and gray squirrels. Mountain lions and wolves have been gone for some time. In the absence of larger predators, coyotes have begun to prosper, as have red foxes. Bobcats were present within living history but not today. Black bears have recently re-established themselves in the area and are successfully reproducing. River otters and turkeys have also been re-introduced, and the turkey population is increasing. Several small populations of timber rattlesnakes are said to have survived on the south-facing slopes. Eagles sometimes visit Honeoye Lake from their nests near Hemlock Lake. Populations of red-tailed hawks,

great horned owls, turkey vultures, snapping turtles, 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 and occasionally spread into the watershed, but few property owners are pleased with their habit of felling all the nearby trees and damming the streams.

The fish population in Honeoye Lake during pre-European colonization times is not well-known. Today, there are 27 different fish species inhabiting the lake. Honeoye Lake supports an excellent warm-water fishery featuring walleye, largemouth and smallmouth bass, perch and other panfish (Figure 2-10). Walleyes were first stocked in the lake in 1897, and muskellunge (absent today) were added in 1910. 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. Though the walleyes require extensive stocking (8.6 million fry per year), reproduction is not successful (Foust 2005).

Alewives were accidentally introduced into Honeoye Lake as forage fish to improve the quality of the food base for walleyes. With their significant decline and perhaps extirpation in 1996 due to a winter thermal event and increased predation (due to increased walleye stocking), water quality in Honeoye Lake improved significantly. Some of the poorest readings for water clarity in 1996 (1.8 -4.1 m.) were followed by some of highest in 1997 (2.8-6.8 m.). Though other factors, such as the arrival of zebra mussels, may have contributed to this change, the change is striking, and the most probable cause is the increased survival and health of communities of large herbivorous zooplankton (such as *Daphnia* and *Diaptomus*) which had previously been suppressed by alewife predation (Pearsall and Richardson, 2001).

In tributaries brook trout have largely been replaced by brown trout, which are more tolerant of the conditions caused by humans, though some remnant brook trout remain in tributaries.

Figure 2-10: Honeoye Lake Has a Stable Fish Population

A study of the biodiversity of the southern watershed area (Gilman 2004) lists the common snapping turtle, midland painted turtle, eastern spiny soft-shell turtle, coal skink, northern black racer, northern ring

neck snake, black rat snake, eastern milk snake, northern water snake, smooth green snake, northern brown snake, northern red belly snake, ribbon snake, common garter snake, and timber rattlesnake.

2.2.6.3 Rare, Threatened, and Endangered Species

New York State Natural Heritage Program (NYNHP) suggests that the Spreading Globeflower (*Trollius laxus)* is a rare plant that has been observed within the last 17 years in the Honeoye Lake Watershed. Observed before 1950 are the Hooker's Orchid (*Platanthera hookeri)*, Green Gentian (*Frasera caroliniensis),* Northern Wild Comfrey (*Cynoglossum virginianum var. boreale*), and Water Marigold (*Megalodonta (Bidens) beckii*). All but the Green Genetian (listed as Threatened) are Endangered.

In addition, four communities are listed as Significant on the NYNHP list: Silver maple-ash swamp, Appalachian oak-hickory forest, Floodplain forest, and Shale talus slope woodland. The 763-acre silver maple-ash swamp is a hardwood forest occurring in poorly drained depressions along the borders of lakes and rivers. Often, this forest type contains American elm, black ash and swamp white oak and an understory that contains spicebush, winterberry, alder, and various dogwoods and viburnums.

The New York Natural Heritage Program considers Appalachian oak-hickory forests "matrix forests." Matrix forests blanket large regions of the state and include patches of other natural communities. Appalachian oak-hickory forests are usually embedded with other communities such as lakes, bogs, and swamps.

The 58-acre floodplain forest is defined as a hardwood forest occurring in mineral soils on low terraces of river floodplains and deltas. The understory of the floodplain forest often contains spicebush, speckled alder, and various dogwoods and viburnums. The 10-acre shale talus slope woodland occurring in Briggs Gully is a forest type developing on unstable talus (fallen stone) slopes with very well drained soils. Characteristic trees of this forest type are chestnut, red and white oaks, white pine, pignut hickory and eastern red cedar. The understory often includes smooth sumac, scrub oak and poison ivy.

The coal skink (*Eumeces anthacinus*) and the spiny soft shelled turtle (*Trionyx spinifera*) are the only animal species listed as Significant. For more information regarding rare, threatened, and endangered species, refer to Appendix D: Natural Heritage Ranking System.

2.2.6.4 Living Resources Use Impairments

Impairments to waterbodies can often be described in terms of their effects on the fish population of the waterbodies. The New York State Department of Health (NYSDOH) issues health advisories concerning the consumption of sport fish caught in New York State waters. The general health advisory for sportfish is that you eat no more than one meal (one-half pound) per week of fish taken from the state's freshwaters. The NYSDOH has issued no specific advisories for Honeoye Lake, such as that covering Keuka Lake (DDT) and Canadice Lake (PCB).

2.2.6.5 Habitat Loss

Habitat loss can be attributed to a number of conditions. Development along the highly-prized shoreline has likely included the filling of wetlands to increase buildable land and the hardening of the shoreline through the construction of bulkheads. This density has also put pressure on the municipal infrastructure and local resources. Local groundwater supplies have been compromised by the increase in impervious cover. Groundwater levels decrease with demand and affect stream flow, and untreated stormwater flows directly into surface waters.

2.2.6.6 Invasive Species

Invasive species are non-native species that can cause harm to the environment or to human health. Many of New York's species of plants and animals are non-native. Most experts agree, for example, that about one-third of our plants are native to places other than New York. However, only a small fraction perhaps ten to fifteen percent—of these cause the harm necessary to be deemed invasive.

Invasive species are a form of biological pollution and in this capacity have caused and continue to pose many problems for the Honeoye Lake Watershed. Invasive species have implications upon the ecosystem and additionally harms recreation and human health.

Many species have been in New York for so long that many have forgotten that they are not native. Such species as the Norway Rat, Water Chestnut, Eurasian Watermilfoil, Carp, Mute Swans, Dutch Elm Disease, House Sparrow, Starling, and the Golden Nematode are familiar to most. More newsworthy have been those invasive species coming to New York in recent decades such as Zebra and Quagga Mussels, the Fishhook and Spiny Waterfleas, Round Goby, and Hemlock Woolly Adelgid—all are causing millions of dollars in damages each year. Ecological threats include the Bighead and Silver Carps, Sudden Oak Death, and Chinese Mitten Crabs. Chronic Wasting Disease has been found in 2005. A more in-depth discussion about invasive species can be found in Section 3, Water Quality Characterization, 3.4 Biological Characteristics.

2.2.6.7 Historic and Cultural Resources

Some of the older cottages on the shoreline of Honeoye Lake were built in a classic cottage style that emphasizes natural materials, open views to the lake, seasonal use, and storage for recreational equipment. Graveyards provide a great deal of information to local historians, in addition to the Vital Records maintained by Town Clerks. Several rural graveyards in the Honeoye Lake Watershed contain important information about past inhabitants (Figure 2-11).

Clusters of development such as hamlets of Honeoye, Hunt's Hollow, and Canadice Corners exemplify historic residential structures distinctive to the period and the background of the early settlers. Agricultural pursuits are also displayed in the distinctive farm buildings used for storage and processing of domestic animals and crops.

The earliest inhabitants of the Honeoye Lake Watershed discovered by archaeologists were named the Point Peninsula culture (for the area where distinctive features of this culture were first identified) and

dated to about 3,000 years ago. They are thought to have been nomadic people, though they resided in a village at the northeast end of the lake at the Morrow Site. On the west side of Honeoye Lake, remains of several small villages have been discovered, probably related to the Owasco culture of 1,500 years ago. Both cultures depended on gathering, hunting and fishing for food.

About 1,000 years ago, the *Onundawaga* (people-of-the-great-hill) or Seneca built villages in the watershed and introduced domesticated plants to their agricultural fields and gardens. The Seneca were one of the five founding nations of the Iroquois Confederacy. The word *Honeoye* apparently derives from a Seneca word, *Hannayaye,* meaning "finger lying there." The Seneca cleared flat land north of the lake to plant corn, beans, squash, and fruit trees. They constructed seasonal fishing villages at the lake shore and temporary hunting camps in the hills. The village at *Hannayaye* was destroyed in September, 1779 by the Sullivan-Clinton Expedition sent by General George Washington to eliminate the Seneca Indians allied with the British.

Over 2,000 soldiers from New England accompanied Sullivan and returned home to praise the quality of the land they had seen. After the cessation of hostilities in 1781, peace treaties signed in 1783 contained no provision for the Native Americans who had remained neutral or had taken the English or Continental sides. In 1788, speculators Oliver Phelps and Nathaniel Gorham purchased development rights to two million acres of what became western New York. The subsequent Deighton Purchase led to the settling of the present Towns of Bristol and South Bristol (divided from Bristol in 1838).

By lottery, Captain William Pitts drew rights to purchase 3,000 acres at the north end of Honeoye Lake, and on May 31, 1789 Pitts' sons Gideon and William became the first settlers of the area. Other Pitts family members arrived later and for three years were the only inhabitants. By 1795, other settlers from New England and New Jersey began to arrive in the area, including Aaron Hunt of Hunt's Hollow and Jacob Holdren, the first settler of the Town of Canadice.

Initially called Pittstown, then Honeoye, and finally Richmond in 1815, the town originally encompassed present-day Richmond, Canadice, Livonia and part of Conesus. Livonia became a separate township in 1808 and Canadice in 1829. From the earliest days, the main occupation of settlers was farming. Clearing land produced potash from ashes of the trees, and roads were improved to allow crops to move to markets.

Mills were set up at waterpower sources to allow the processing of grain, fiber and timber. The first millrace in the area was set up on Mill Creek. In 1812, a millrace was dug from the north end of the lake to the hamlet of Honeoye, which became the commercial trade center of the region. Hunt's Hollow at the south end of Honeoye Lake and Canadice Corners to the west was the only other concentrated residential areas of the watershed, but they never grew beyond hamlets.

Watershed population peaked in 1840, and then began a long decline. Young family members were lured by reports of good land in the Old Northwest and preferred to seek their fortunes there. The early families who stayed added to their holdings and became substantial landowners. Several attempts were made to lure railroads to the Honeoye area to boost development, but they were unsuccessful. For most of the nineteenth century, travel and transport to and from Honeoye were difficult and residents remained relatively self-sufficient and predominately native-born.

Some recreational use was made of Honeoye Lake by the local residents. For example, Bray's Point at the northeast corner was popular for outings to fish, boat, and picnic. By the early 1900s, a scattering of summer cottages appeared at the lakeshore, but most of the land at the shoreline continued to be undeveloped or in agricultural use.

In 1924, a syndicate known as the C.L.B. Corporation, which owned the Rochester *Times-Union* newspaper, purchased extensive property off East Lake Road at the northeast corner of the lake. A subdivision, comprised of hundreds of 20 x 50 foot lots with lake rights, was established. The cost of a lot was a six-month subscription to the Times-Union at $15-17.50. In 1925, Dr. Claude Burdette developed another subdivision on the southwest shore called the California Ranch.

Interest in the residential and recreational development of Honeoye Lake received a shock when, on July 17, 1926, the City of Rochester announced its intention to acquire the lake to increase its water supplies. Erection of a large new dam at the north end would create a sixteen mile-long reservoir, submerging the hamlet of Honeoye and the lake's shoreline. Though Rochester gained State approval for the project in 1935 over local objections and litigation, the City decided to turn elsewhere for increased water supply. Despite the general economic depression of that period, there was an upsurge of demand for Honeoye Lake property that continued until the outbreak of World War II.

The growth of the use of private automobiles and the construction of good roads in the twenties and thirties added to the desirability of Honeoye lakefront cottages. Honeoye Lake shoreline was marketed in Rochester twenty-eight miles to the north. By the mid-1950s, undeveloped lake frontage had mostly disappeared and summer cottages filled the shoreline. In the hills of Richmond and Canadice overlooking the lake, impressive homes and lodges were built.

The years after World War II also signaled the end of agriculture as a principal use of the watershed land. A booming economy and industrial expansion lured younger residents away from farms to higher paying jobs in the cities. Mortgaged farms were abandoned, and descendants of the first settlers began selling off their holdings. Purchasers were usually from urban or suburban communities in the Rochester area. In 1966, Harriet Hollister Spencer State Recreation Area in Canadice opened to the public, offering a remarkable view of Honeoye Lake and "primitive" recreational opportunities. The Honeoye Lake Boat Launch State Park was developed at the southeast end of the lake and the town-owned Sandy Bottom Park at the north end. Sandy Bottom Park continues to provide public access for boating and swimming in the lake. The state-wide ban on phosphorus in detergents in 1973 and the completion of a perimeter sewer around Honeoye Lake in 1978 reduced the water pollution that had become a constant problem.

Since the 1980s, conversion of cottages to year-round homes, demolition and rebuilding of shoreline structures, and the construction of hillside residences in areas more difficult to access has accelerated. An estimated 50% of shoreline cottages have been converted from seasonal to year-round use.

Figure 2-11: A Local Graveyard

2.2.6.8 Prior Studies

Over the years, concerned citizens have formed organizations to improve the environment of Honeoye Lake and its surrounding lands. Some of those groups include the Honeoye Lake Watershed Association (1950-66), Genesee Valley Trappers (late 1950s to present), Honeoye Fish and Game Club (1947-present), Honeoye Lake Cottagers Association (1966-67), and the Honeoye Environmental Action League (1970-88). These organizations often focused on specific areas of interest such as: weeds in the lake, bacterial contamination, hunting, fishing, flooding, etc. Their efforts resulted in major improvements.

Two organizations currently working to maintain and improve the water quality in the Honeoye Lake Watershed are the Honeoye Valley Association (HVA) and the Honeoye Lake Watershed Task Force (HLWTF). Formed in 1986, the HVA has nearly 400 members in the watershed and was formed to act as an advocate for the responsible use of the natural resources of the Honeoye Lake area. It has been active in lake level control, boating safety, water testing, lake weed control, stream clean-up, and public education.

Formed in 1997, the HLWTF brings together watershed stakeholders to prevent further degradation of the lake and to improve water quality throughout the watershed. HLWTF is comprised of a voting member from each watershed town appointed by their Town Boards and a voting member from the HVA. In addition, HLWTF includes professional staffs from the Finger Lakes Community College, Ontario County Soil and Water Conservation District, Ontario County Planning Department, NYS Department of Environmental Conservation, and others who from time to time offer their professional advice. HLWTF advocates a uniform approach to management of water quality through voluntary cooperation and education.

3. WATER QUALITY CHARACTERIZATION

Water quality means different things to different people depending on their use of the waterbody, whether it is for recreation, scenic beauty, consumption, or any other use. Limnology is the scientific study of natural freshwater bodies (lakes, ponds, streams, wetlands, etc.). Limnological studies are generally divided into sections which describe the physical, chemical, and biological characteristics—which is how this section is organized. The data presented in this section will combine research findings from the past forty years by Kenton Stewart, S. J. Markello, Raymond Oglesby, R. T. Schaffner, Gregory Crego, Edward Mills, Bruce Gilman, John Foust, S. J. Souza, Webster Pearsall, Denise Richardson, and Clifford Callinan on Honeoye Lake.

"Water quality" is a qualitative term which cannot be completely defined with a limited set of parameters. However, the physical, chemical, and biological properties that can be measured provide a quantitative set of parameters related to what is meant by "water quality." Water quality is often specified by limnologists by the trophic status of a waterbody. Trophic status is simply a measure of nutrient levels which affects the primary productivity of the waterbody and its water clarity, which correlates with people's perception of quality. The three indicators of trophic status generally used are: 1. winter total phosphorus as a measure of nutrient levels which influences algae growth, 2. summer chlorophyll-a as a measure of phytoplankton (algae) levels, and 3. water clarity as measured using a Secchi disk.

Any parameter used to characterize the lake will vary throughout the year and from year to year, dependent on weather conditions and other environmental factors. Gilman (2003) has performed extensive testing on the seasonal variability of measured parameters and his findings are reported in the physical, chemical, and biological sections that follow. The year to year variability from various researchers over the many years is reported in Section 3.5 Trophic Indicators and Status.

3.1 Water Quality Classifications

The New York State Water Quality Standards, found in greater detail in Appendix E: NYSDEC Surface Water Classification, 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 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; and,
- Honeoye Lake is currently listed on the NYSDEC Priority Waterbody List as impaired due to water supply concerns relating to nutrients.

3.2 Physical Characteristics

Most of the physical characteristics of the lake and watershed are summarized in Section 2, Watershed Characterization. The physical characteristics that have a significant effect on nutrient level are discussed further in this section.

3.2.1 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 (Figures 3-1 and 3-3). Honeoye is a cold monomictic (mixing once a year) lake that is often stratified beneath complete ice cover, then mixing in a spring turn-over driven by water density differences. 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. 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 3-2). However, during periods of calm weather the deep waters have the potential to become hypoxic (low dissolved oxygen) or anoxic (no dissolved oxygen) which can cause the release of internal nutrients and is discussed in a later section on *Internal Loading*. This phenomenon is apparent in testing done in 2003 by Gilman (2003) and 2004-2006 by Starke (2006), which show numerous instances of low oxygen levels in deeper waters in late summer. In-lake testing by Pearsall and Robinson (2001), in the summers of 1995-1997, show similar results regarding deep water hypoxia / anoxia. Fairly uniform summer temperature from surface to bottom and sporadic instances of hypoxia/anoxia at the bottom are apparent (Figure 3-4 and Table 3-1).

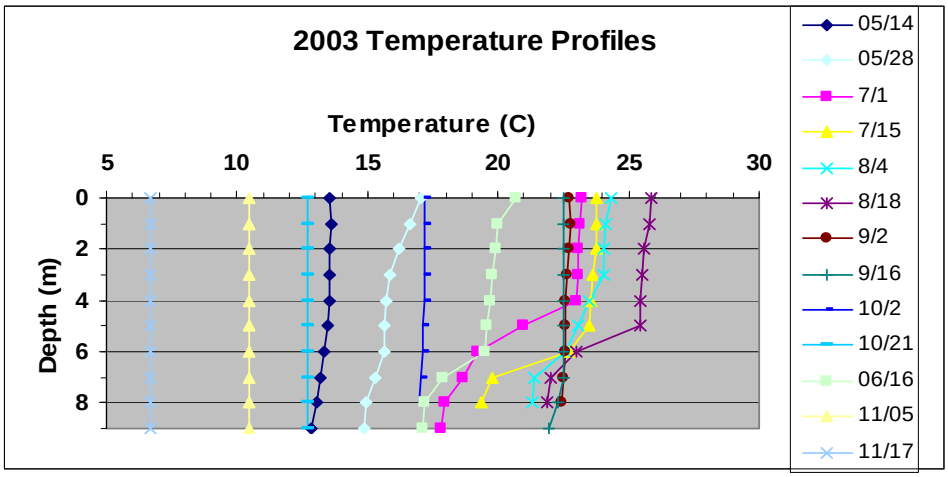

Figure 3-1: Lake Temperature Profile

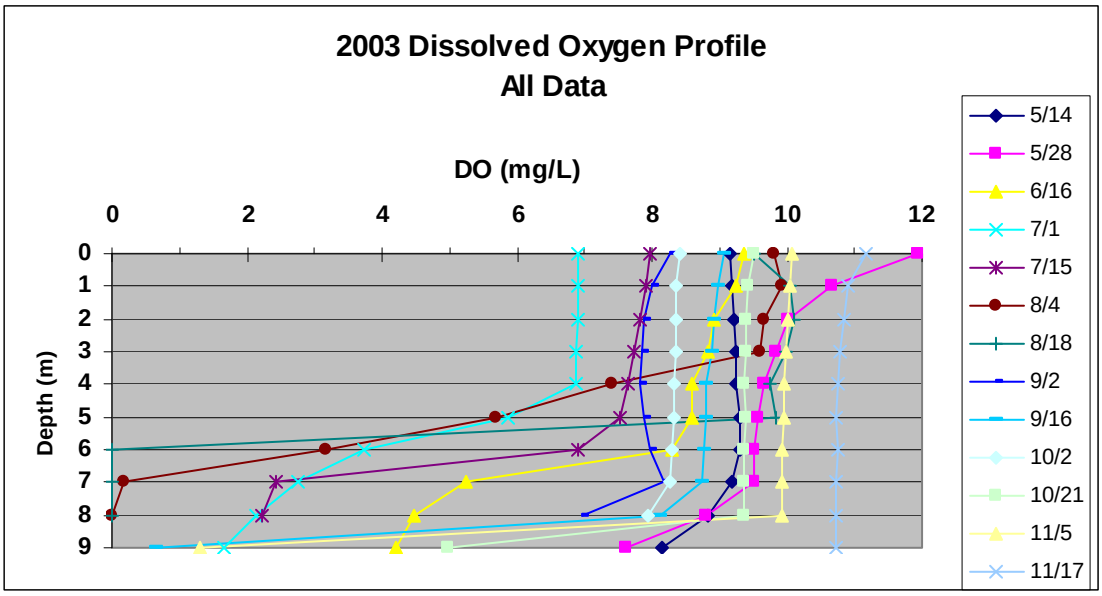

Figure 3-2: Lake Oxygen Profile

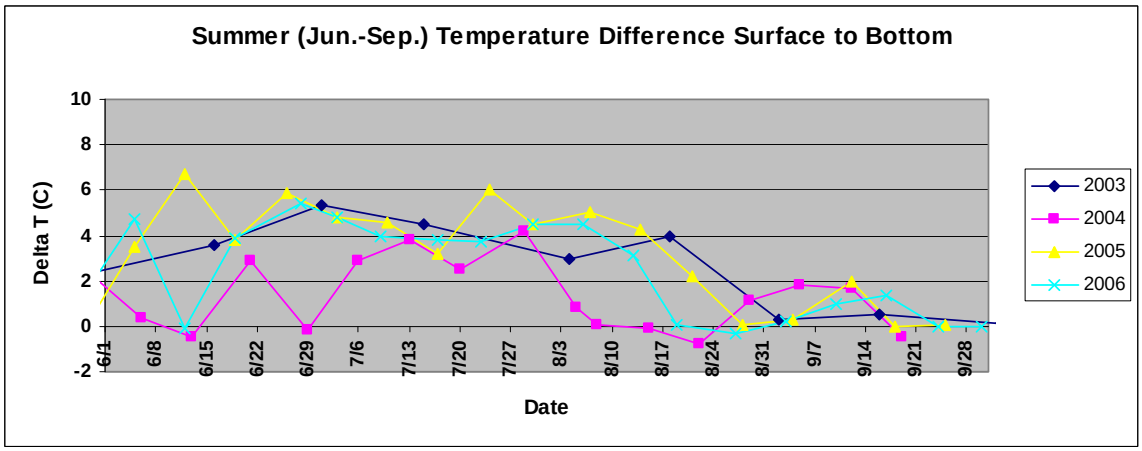

Figure 3-3: Summer Temperature Differential - Surface to Bottom

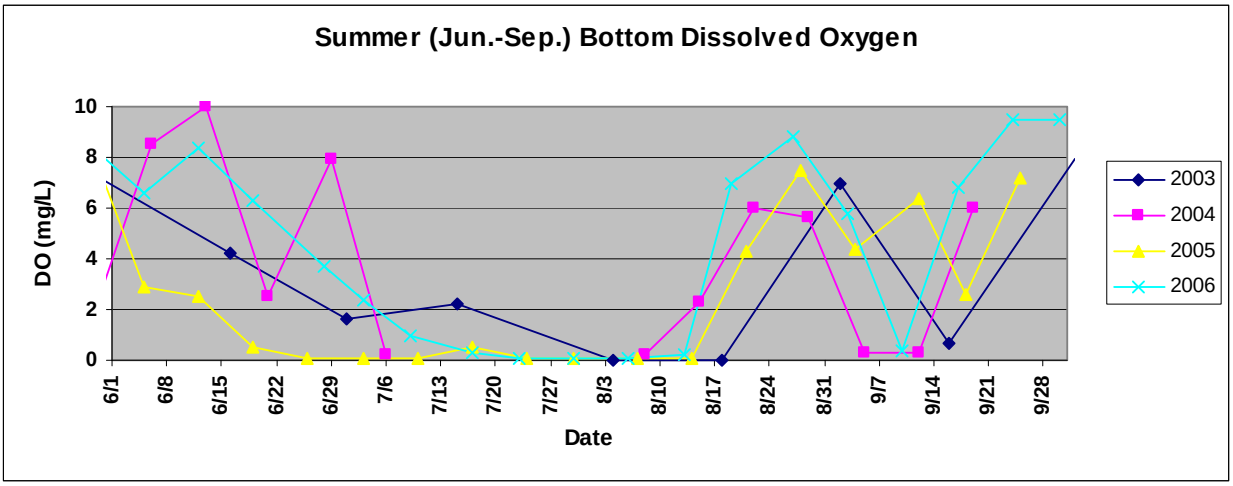

Figure 3-4: Bottom Dissolved Oxygen

	9m	8m	7m	6m
2003	56	28	28	14
2004	56	?	?	?
2005	63	63	49	7
2006	49	28	0	0
Average	56	40	26	7

Table 3-1: Summer Days with DO<2 mg/L

3.2.2 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. 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) removing phytoplankton (microscopic aquatic plants) from the water column. For more discussion of zebra mussels' role in the Honeoye Lake ecosystem, see Section 3.4.7 Zebra Mussels of 3.4 Biological Characteristics. Gilman (2003) measured water clarity (Figure 3-5) during the summer of 2003 and illustrates the late summer reduction in clarity due to algae blooms followed by fall clearing.

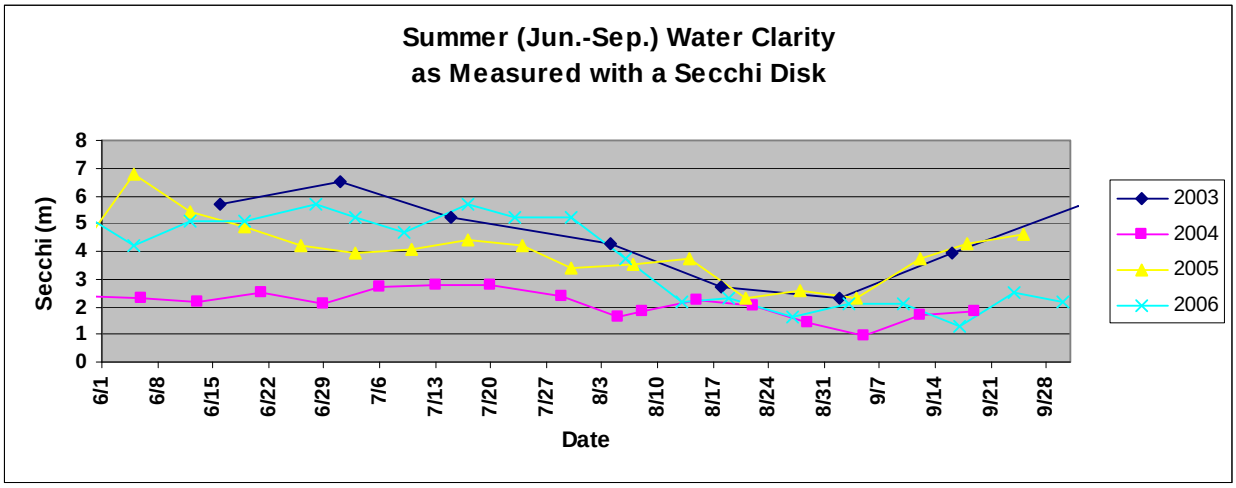

Figure 3-5: Water Clarity

3.3 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. The actual production of the lake, however, depends on many factors, including the ratio of carbon to nitrogen to phosphorus. In a typical aquatic plant, the C: N: P ratio is 40:7:1. Though plants need little phosphorus, its usable form in most freshwater lakes is relatively rare (measured in parts per billion). Usually, in fresh water, there are plenty of carbon sources, and as a result the balance between nitrogen and phosphorus becomes crucial.

Honeoye Lake's mean N:P ratio is 9.8:1, indicating phosphorus is the overall limiting nutrient. However, there are times when Honeoye's N: P ratio falls as low as 9:1, possibly making nitrogen the limiting nutrient. At these times, the low N: P ratio offers an advantage to nitrogen-fixing algae (such as Anabaena and other cyanobacteria) over other species (Callinan 2001). In general, phosphorus is considered the limiting nutrient for plant growth in Honeoye Lake.

3.3.1 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. While the lake experiences heavy recreational use, it is not commonly associated with nutrient sources. Honeoye Lake benefited immensely from the 1973 statewide ban on phosphorus in laundry detergents and the 1978 perimeter sewer. Most of the external sources of nutrients flow into the lake from streams or directly from the shoreline.

Tributary sampling and flow measurements were conducted on 8 tributaries by volunteers in the summer of 2003 (Starke 2003) (Figure 3-6). Three of the streams, Affolter, Bray and Briggs, had flow most of the

summer, although at times during mid-summer the flow was less than 2 cf/second. The results for these three streams are the only ones reported here. Most of the other streams sampled had significantly lower flow and dried up completely during July and August. Due to the diffuse nature of the Inlet its flow was not measured, but chemical analysis to measure nutrient levels was done. Figures 3-7 to 3-10 summarize the results of these tests. On May 11, due to a mini storm event, high flows (5–26 cfs), high levels of total suspended solids (2-750 mg/L) and total phosphorus concentrations greater than 300 ug/L were measured. These high phosphorus levels are to be expected during high flow events, since phosphorus binds with soil particles being carried in the stream flow. Soluble reactive phosphorus levels are more uniform and do not correlate as strongly with high flow conditions. Generally, it would be expected that highest in-stream nutrient concentrations would occur during storm events which coincides with elevated concentrations of total suspended solids.

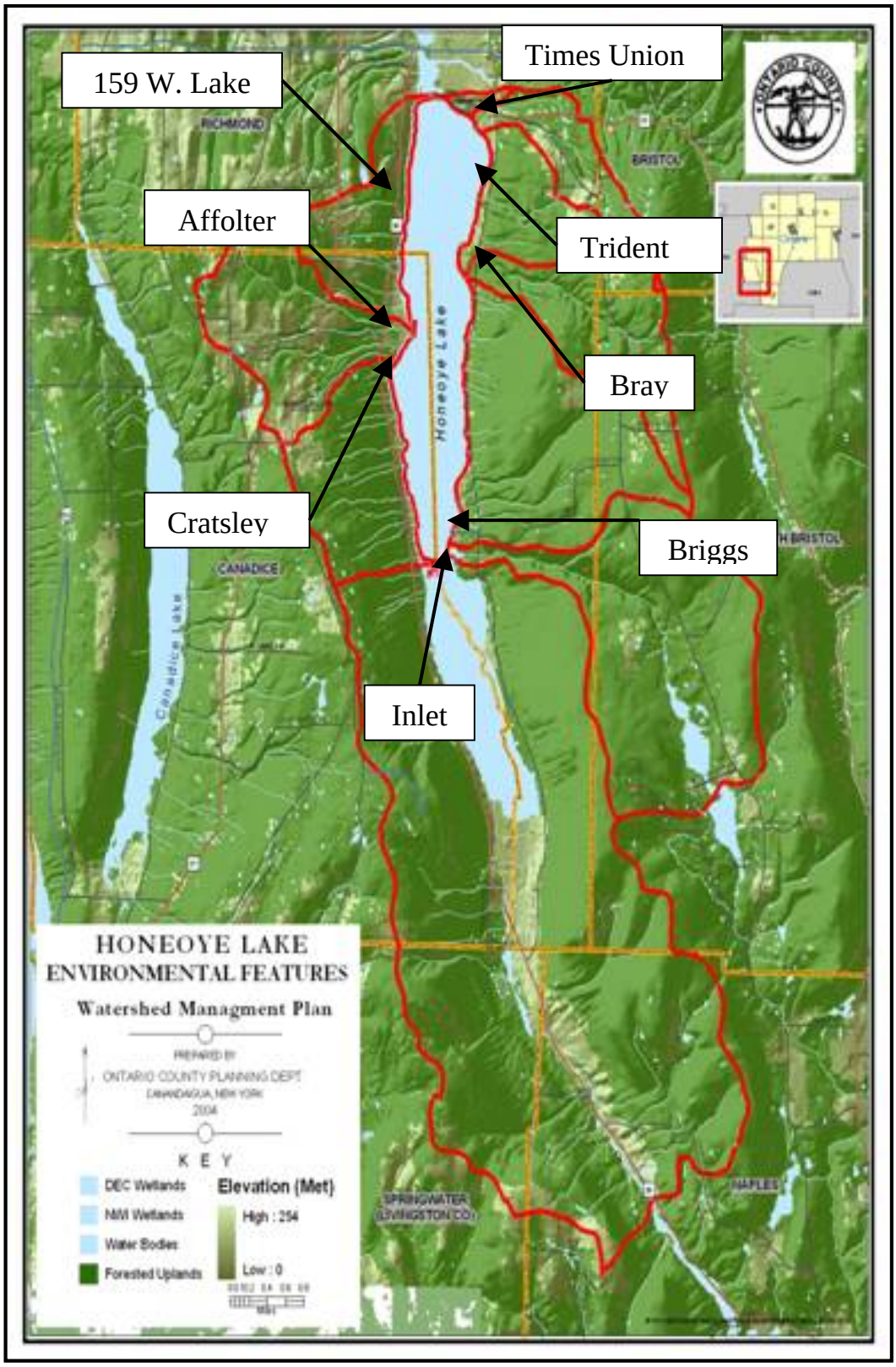

Figure 3-6: Tributary Monitoring Sites

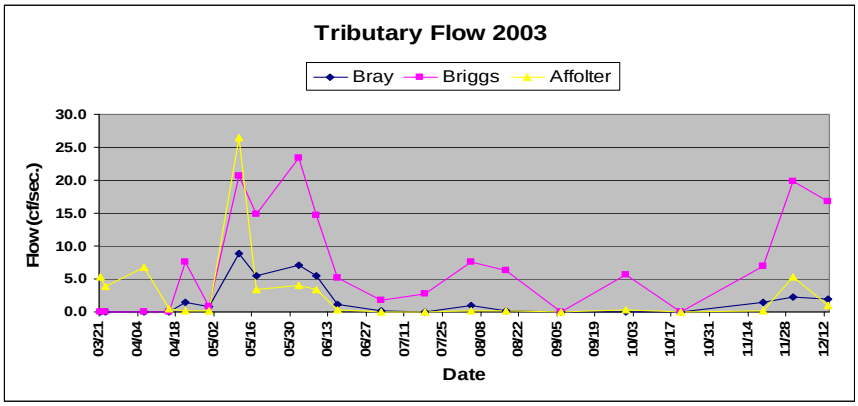

Figure 3-7: Tributary Flow 2003

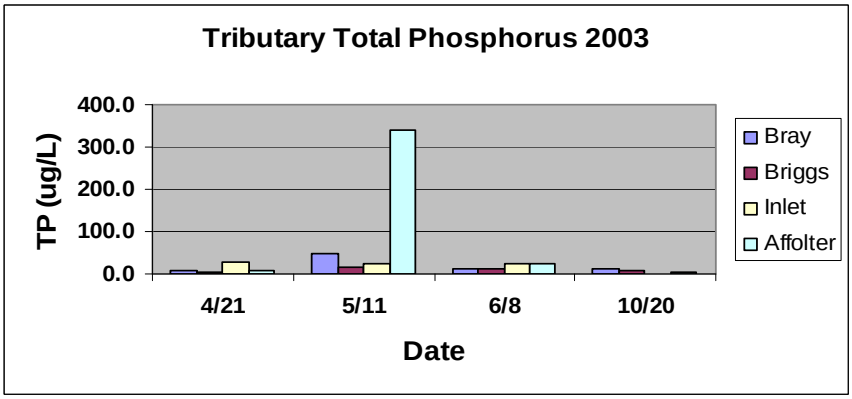

Figure 3-8: Tributary Total Phosphorus

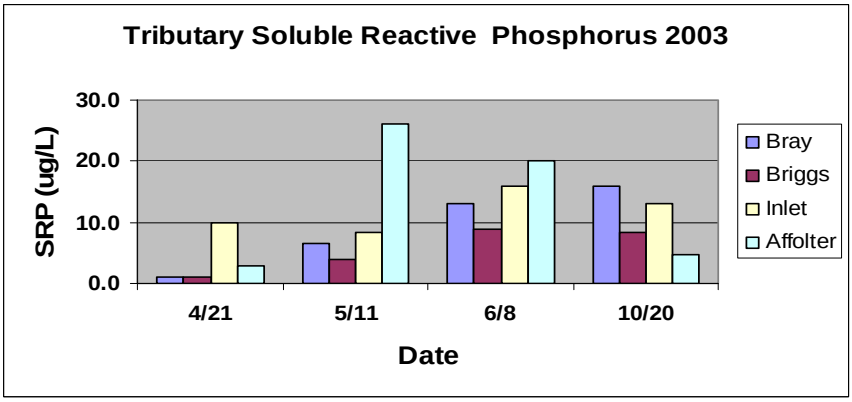

Figure 3-9: Tributary Total Suspended Solids 2003

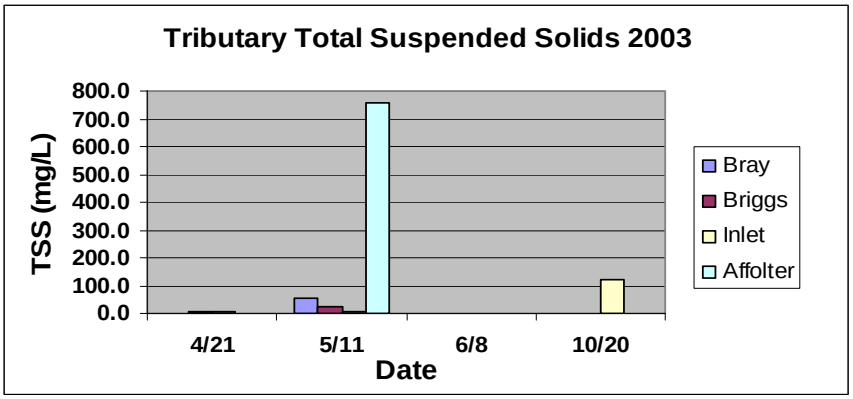

Figure 3-10: Tributary Total Suspended Solids 2003

Stream flow was also monitored on a regular basis in 2004 and 2005, but no stream sampling and chemical analysis was done (Figure 3-11). Data shows that other than a few storm events the streams dry up during the summer months.

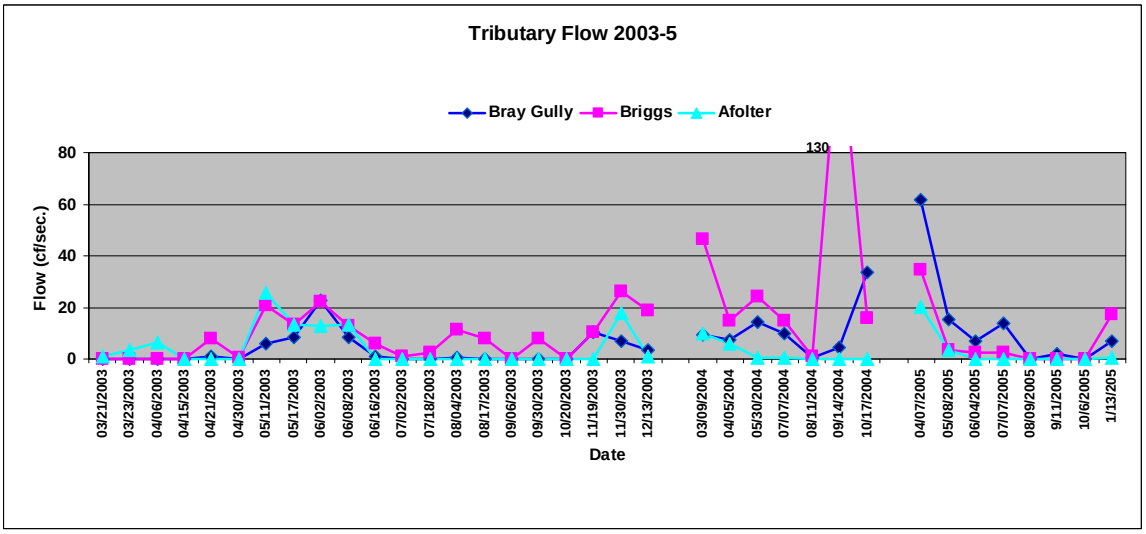

Figure 3-11: Tributary Flow 2003-2005

Lewandowski (2005) assessed the water quality in tributaries by sampling the organisms found in the streams, using a technique described by (Bode 1991). Since different organisms can tolerate varying levels of dissolved oxygen and pollution, an estimate of water quality can be made by determining which organisms are found living in a stream. Sampling biological indicators of water quality is not intended to replace more rigorous chemical testing but does serve as a rough indicator of water quality problems. Aquatic macroinvertebrates are influenced by habitat considerations as well as water quality, and some of the variation in these results may be attributable to the varying quality of habitat in the sampling areas. The results of sampling 14 Honeoye Lake tributaries in April, 2005 showed good to excellent water quality.

3.3.2 Internal Sources of Macronutrients

Based on important testing by Gilman (2001) and Callinan (2001) the following discussion suggests that phosphorus is released from sediments into the water column in deeper areas of the lake under conditions of low oxygen levels. Testing by Gilman (1993) showed that concentrations of total phosphorus are significantly higher in water collected from depths of greater than seven meters than those from the surface (Figures 3-12 and 3-13). 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 (Souza, 2003). It is clearly shown that the effect of anoxic conditions on the two August dates with high levels of phosphorus near the bottom.

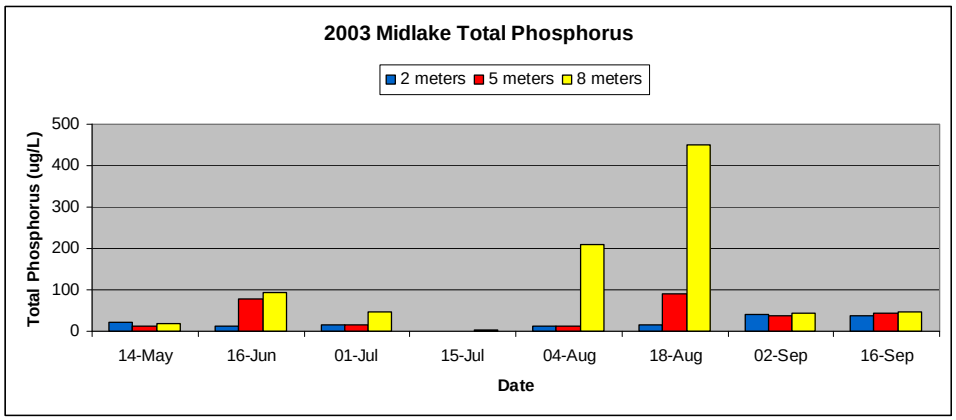

Figure 3-12: Phosphorus Levels 2003

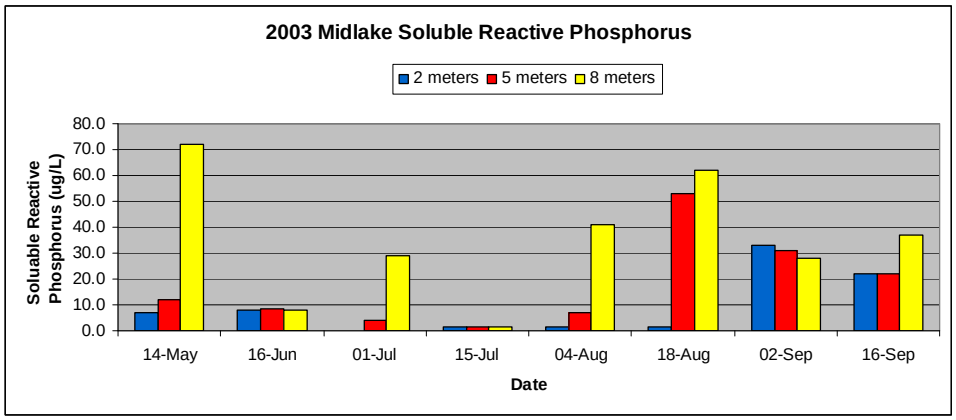

Figure 3-13: Soluble Reactive Phosphorus

3.3.2.1 Phosphorus Cycle

Gilman (2001) describes Honeoye Lake's phosphorus cycle as involving six steps:

1. Phosphorus is taken from lake water by macrophytes when plants are growing most rapidly in the spring and early summer.

2. Phosphorus is liberated into the upper waters of the littoral zone when macrophytes decay during late summer and fall.
3. Liberated phosphorus is taken up by phytoplankton, often producing a fall algal bloom of cyanobacteria.
4. Phytoplankton, seston (suspended fine particulate matter, organic and inorganic) and macrophytes age, die and fall into deeper waters where their phosphorus is temporarily bound to iron in the sediment.
5. Phosphorus is released and diffused into the water at those depths where the sediment lacks an oxidized micro zone
6. Phosphorus may also be released from seston before reaching the bottom if dissolved oxygen is low.

Knowing the proportion of nutrients derived from external sources in the watershed versus internal sources from the lake bottom is important in understanding lake dynamics and designing remediation techniques.

The lake and watershed modeling effort recently initiated by Princeton Hydro (Souza 2005) reports that the lake's sediment related internal phosphorus load represents approximately 30% of the lake's total annual phosphorus load. However, this internal load is very seasonal in nature and peak internal loads often reach 90% during mid to late summer when conditions are right and algae growth is at its peak. Better measurement of flows and more accurate nutrient testing of tributary waters as well as closer investigation of water quality at the sediment/benthos interface is required. The ratio of nitrogen to phosphorus also needs further evaluation because a low N:P ratio, even when phosphorus concentrations are relatively low, can favor the nuisance growth of cyanobacteria.

3.3.3 Other Lake Chemistry Parameters

Callinan (2001) presents an extensive discussion of the water chemistry of all of the Finger Lakes, including Honeoye.

3.3.3.1 Major Ions

Many elements found in Honeoye Lake are important to life in the lake. An ion is an atom, or molecule, that has gained or lost one or more electrons and acquired a net negative or positive charge. Positively charged ions are termed cations, while negatively charged ions are termed anions. The major ion species present in freshwater lakes are as follows: (1) cations: calcium [Ca], magnesium [Mg], sodium [Na], and potassium [K]; and (2) anions: bicarbonate [HCO_2], carbonate [CO3], sulfate [$SO4^-$], and chloride [Cl]. The ionic composition of a lake is of importance to both human use of the resource and ecosystem dynamics within the lake. High profile issues such as lake acidification, zebra mussel infestation, and drinking water quality can all be influenced by the ionic composition of the lake. Of particular concern in freshwater systems within the northeastern United States is the fact that calcium may play an important role in the establishment of zebra mussel (*Deissena polymorpha*) populations within lake systems. The levels of Ca, Mg, Na, K, SO4, and Cl are reported in (Callinan 2001).

3.3.3.2 Specific Conductivity, pH and Alkalinity

Specific conductivity is a measure of the flow of electrons through the water, related to total dissolved solids, and is quite consistent throughout the water column at 0.2 mS/cm. The pH indicates the relative acidity (or hydrogen ion content) in the water column. Gilman (2005) did bi-weekly tests during 2003 which measured a range of pH from 7.21 to 8.75. Previous Gilman data dating back to 1985 showed similar results, with the pH always greater than 7. The pH and buffering capacity of the lake are important parameters if an alum application is chosen as a remediation technique to control excessive algae bloom. Souza (2005) performed a bench test of water samples from the deepest part Honeoye Lake on 20 July, 2004. His results measured a pH of 7.6 and fairly uniform alkalinity of 65 mg/L to 69.5 mg/L of $CaCO_3$. These results are consistent with those reported by Callinan (2001). These results provide a large margin of safety in using alum in Honeoye Lake to reduce the release of phosphorus from the bottom sediment.

3.3.4 Sediment Phosphorus

Gilman (2001) studied bottom sediment in the summer of 2000 where he took thirty-three 50-centimeter (19.7-inch) sediment cores from the deepest region of the basin. The sediment cores were split into three sections representing one current and two historic conditions and were found to be fairly consistent in total and available phosphorus concentrations. Mean organic matter was slightly more than 9%, mean pH was 6.9, and mean phosphorus concentrations were very high, averaging 855.3 mg/L for total phosphorus and 2.9 mg/L for available phosphorus. Chironomid (midge) larvae were frequently discovered and annelid worms were occasionally found in the tops of cores.

In 1997-8, a 62 cm. (24.4 inch) core was extracted from the sediment in 26 feet of Honeoye Lake water off California Point by Callinan (2001). Surface layers were described as brown and gray and deep layers were described as dark gray. Tests for Total Organic Carbon (TOC) revealed 2-3% TOC in the top 30 cm. Callinan noted, "Honeoye Lake, which is relatively productive, showed somewhat lower Total Organic Carbon levels than might have been expected. Findings for Honeoye Lake might be the result of the relatively short retention time of Honeoye Lake, which may limit the accumulation of organic matter; and relatively shallow depths and limited stratification which may keep finer materials in suspension for longer periods."

3.3.6 Sedimentation Rate

Callinan (2001) reports a sedimentation rate of 0.54 cm/year for Honeoye Lake, based on the core sample previously discussed, which is somewhat greater than most of the Finger Lakes. He also reports on levels for Organic Chemicals such as DDT and PCBs and a variety of inorganic chemicals such as arsenic, cadmium, calcium, chromium, copper, lead, manganese, mercury, nickel, and zinc.

Two other known attempts at dating core sediments using radiometric techniques were done by Proctor (1978) and Lajewski (1999). Proctor determined an accumulation rate of 0.16 cm/year. Lajewski was unable to determine an accumulation rate due to uniform levels of the radioactive isotopes throughout the core sample, suggesting that at the chosen site the sediments had been uniformly mixed. These three attempts to measure sedimentation rates have not yielded consistent results.

3.4 Biological Characteristics

Photosynthetic activity in the lake is important as a food source for other species and as a source of dissolved oxygen. The history of Honeoye Lake's primary productivity is not well-known. Early mention of the lake in scientific literature almost always records its eutrophication and contrasts Honeoye with the other Finger Lakes. It seems likely that heavy algal growth spurred by the lake's nutrient enrichment is the source of these comments.

Major changes have affected Honeoye Lake in the past thirty years and seem to have changed the lake from an ecosystem dominated by algal growth to one dominated by rooted aquatic macrophytes. The phosphorus detergent ban of 1973, Honeoye Lake perimeter sewer installed in 1978, extirpation of alewives in 1996, and zebra mussels discovered in 1998 have all contributed to increased water clarity and sunlight penetration down to about 5 meters of water depth to support macrophyte growth.

The summer of 2002 produced a heavy crop of blue-green algae (cyanobacteria). Several factors may have contributed to this, including the presence of zebra mussels, which have been known to consume some species of algae while rejecting others, such as cyanobacteria. Additionally, Souza (2003) has pointed out that the decaying zebra mussel flesh and waste pellets seem to produce exactly the form of phosphorus most readily usable by cyanobacteria. Finally, 2002 had an unusually wet spring with high runoff and a usually hot dry summer with over twenty days above 90 degrees, a pattern that may have triggered the algae explosion.

3.4.1 Phytoplankton

Gilman (2004) and Schaffner (1978) contain lists of the microscopic plant life of Honeoye Lake. Appendix F: NYSDEC Algae Species List summarizes the 57 different species of phytoplankton and their frequency of occurrence for samples collected by the NYSDEC from Honeoye Lake (Figure 3-14).

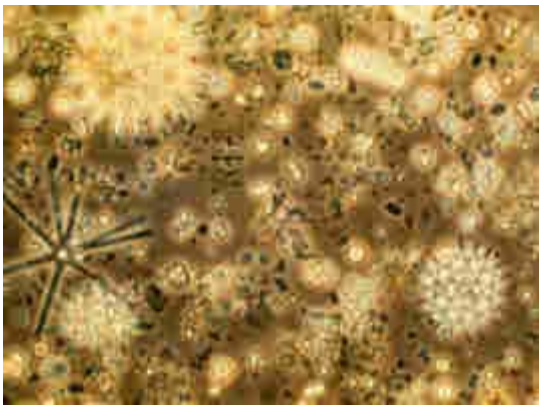

Figure 3-14: Variety of Phytoplankton Occur in Honeoye Lake

Measurement of chlorophyll-a is used to estimate algal abundance and during the summer of 2003 measurements were made at 5 shoreline locations and 3 deep water locations. They exhibited a large amount of variability dependent on location and time of year (Gilman 2003). However the data does show increasing algal blooms in late summer through early fall (Figure 3-15).

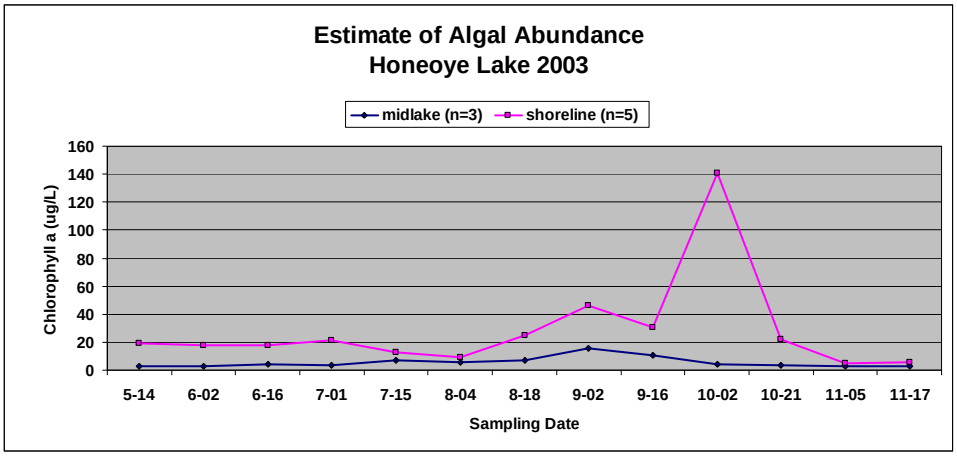

Figure 3-15: Algal Abundance Monitoring

The NYSDEC has done regular summer monitoring of Chlorophyll-a in the deep water central basin which also shows increased algal abundance in late summer (Figure 3-16).

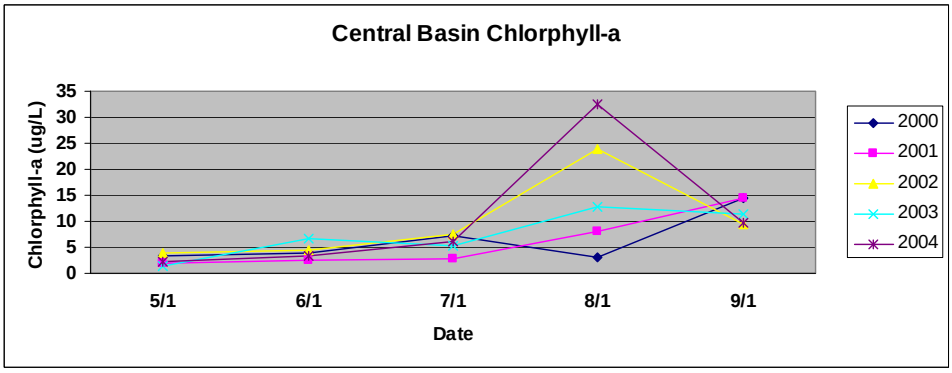

Figure 3-16: Chlorophyll-a Monitoring Data

3.4.2 Aquatic Macrophytes

Dr. Bruce Gilman of the Finger Lakes Community College has devoted more than twenty years to documenting the aquatic macrophyte communities of Honeoye Lake. He has done an inventory of macrophytes in Honeoye Lake in 1984, 1994 and 2004. Weedbed sampling was performed along 20 different transects around the lake at distances of 10, 100, 200, 300, and 400 feet from shore for a total of 100 different sample locations. Gilman was able to distinguish between species that dominate the northern and southern portions of the lake, those whose primary growth is achieved in spring-summer and summer-fall, and species that are dominant at various depths. Gilman observes that greater water clarity in Honeoye Lake has allowed "expansion of weedbed communities into greater depths." All species have not increased at the same rate; plants able to propagate, colonize deep water and grow fast in the early spring have been more successful.

This increase in weedbeds into deeper waters is apparent in Figure 3-17. 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. There is also a spatial variation in weedbed density dependent on location (Figure 3-18).

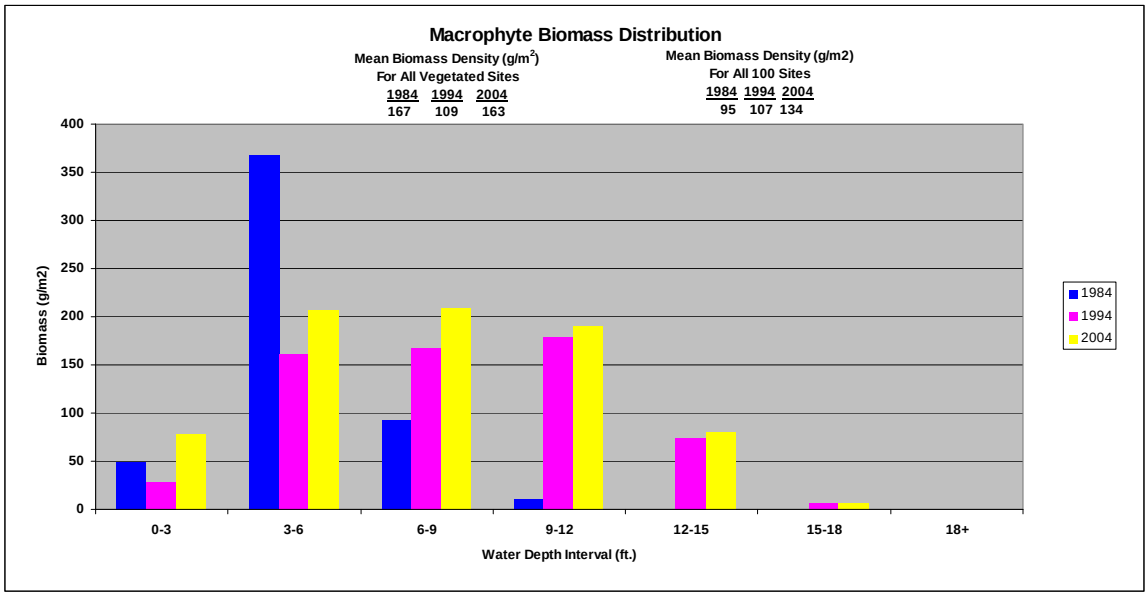

Figure 3-17: Macrophyte Biomass Distribution

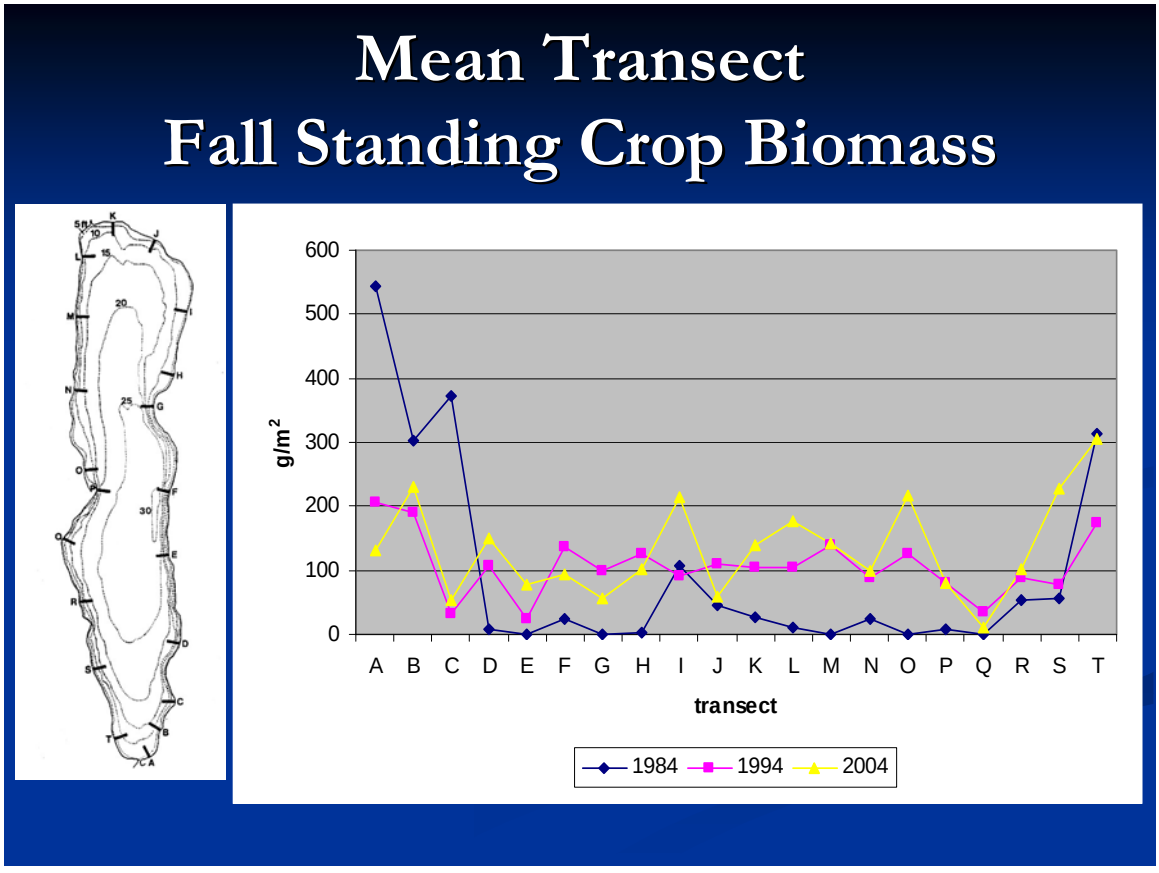

Figure 3-18: Spatial Variation in Weedbed Density

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. Pictures of the more common species are shown in Figure 3-19. 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. Table SUP-8: Weedbed Survey Macrophyte Species Composition summarizes the relative dominance, relative frequency of occurrence, and relative importance of each species over the 100 sites. The column "relative importance" is the average of "relative dominance" and "relative frequency."

Figure 3-19: Honeoye Lake Macrophytes

3.4.3 Weed Harvesting Program

A near-shore weed harvesting program to enhance recreational access to the lake was initiated in 1987 (Figure 3-20). 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 (Figure 3-21). Nutrient removal rates are estimated to be 630 pounds (286 kg) of nitrogen and 99 pounds (45 kg) of phosphorus on an average annual basis. Lake researchers, Souza (2003) and Gilman (1994), while acknowledging that weed harvesting has not been effective by itself in diminishing the weedbeds, have recommended continuation and intensification of harvesting. Both researchers feel that proper

operation of the harvester is beneficial because it removes the plants and nutrients and maintains access to the lake for shoreline residents for recreational purposes.

Figure 3-20: Weed Harvester

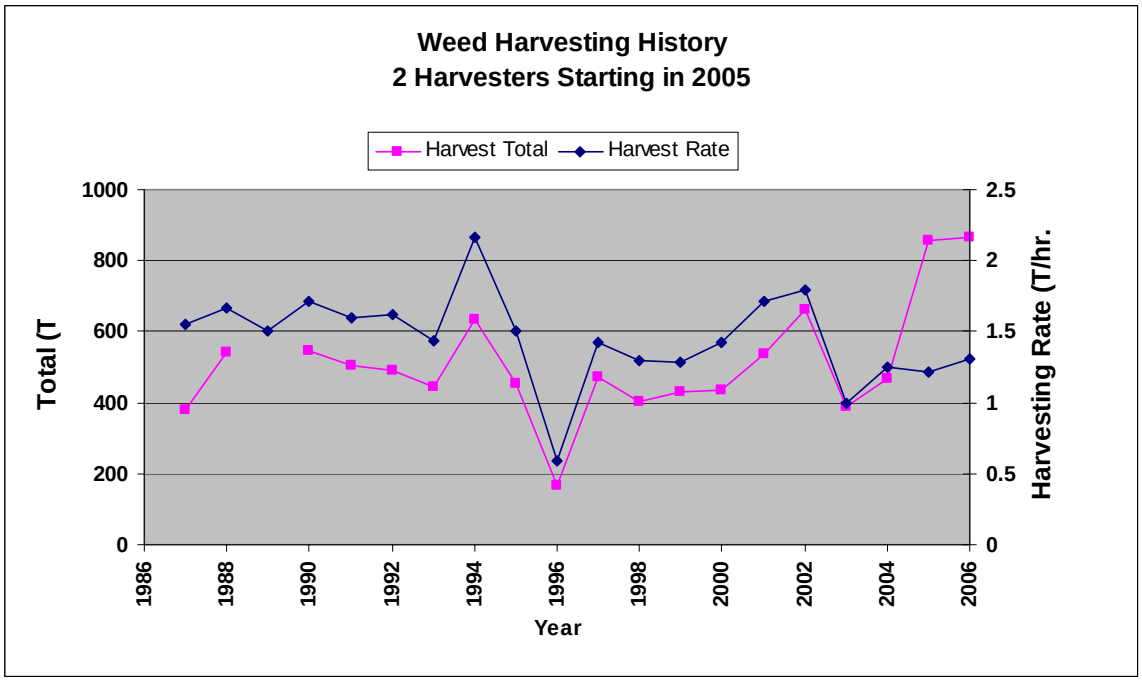

Figure 3-21: Weed Harvesting Rates over the Past Two Decades

3.4.3.1 Macrophyte Management Alternatives

Princeton Hydro (2007), evaluated nearly all known macrophyte management techniques that have been used on other lakes including Mechanical Harvesting, Lake Level Draw Down, Benthic Barriers, Hand & Suction Harvesting, Hydroraking/Rotovating, Dredging, Herbivorous Insects, Grass Carp, Contact Aquatic Herbicides, Systemic Aquatic Herbicides, Shading – Adding Dye to the Water, Treatment of the Sediments with Either a Lime or Alum Slurry for their potential effectiveness in Honeoye Lake. The management objective was to: *Develop and write an ecologically and scientifically sound Macrophyte*

Management Plan (MMP) to facilitate balanced recreational use of Honeoye Lake including: boating, fishing, swimming and other uses. The evaluation criteria used was:

- Does it meet our management objective?
- Is it fundable?
- Are we likely to be able to get a NYSDEC permit?
- Is it acceptable to lake stakeholders?

The following tables summarize the results of analyzing the efficacy of the various methods against the evaluation criteria identified above for both local shoreline management by residents and whole lake management that would be expected to be done by governmental entities. The color coding is as follows:

Green – No reason to preclude this option for this evaluation criterion
Red – This option is rejected for this evaluation criterion
Yellow – This option is potentially viable for this evaluation criterion

Management Alternatives	Meet Objective?	Necessary Funding	Require Permitting?	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

Table 3-2: Shoreline Management Alternative Evaluation

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

1. Benthic Barriers are a cost effective way to limit growth through the reduction in sunlight penetration and also provide a physical barrier to growth for small areas.
2. Weed Rollers/Lake Sweepers are a relatively new devices 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 very labor intensive.
4. Suction harvesting has many of the same advantages as hand pulling but is more efficient and involves a diver using a flexible hose that is connected to a vacuum pump to extract plants which are then pumped to the surface into a container for disposal.

Management Alternatives	Meet Objective?	Necessary Funding	Require Permitting?	Acceptable to Stakeholders?
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	$$	Yes	No
No Management	No	$0	N/A	No
Lime or Alum Slurry	No	?	No	No
Shading -- Adding Dye to Water	No	?	N/A	?
Dredging	No	~$20,000+/acre	No	No

Table 3-3: Whole Lake Management Alternative Evaluation

1. Continue to use the harvesting program 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 lake water.
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 costly and may be difficult to get permit approval.
3. Herbivorous Insects should continue to be investigated but at this time don't appear to be a practical control method since in most cases they target a specific macrophyte species and their cost is excessive for large areas and have not proven to be unequivocally successful.
4. Grass carp are not practical due to high cost, are not recommended where they may escape to other water bodies, and their preference for desirable native macrophytes over invasive species
5. Contact herbicides should not be used primarily due to the fast acting nature of these chemicals in killing plants whose rapid decay results in negative side effects including dissolved oxygen depression and the release of reactive phosphorus. The significance of the phosphorus release is that it often results in mid- and late-summer algae blooms; a condition that is counterproductive to the overall management of Honeoye Lake.
6. Fluridone (SONAR) and 2-4D are two aquatic, systemic herbicides licensed for use in New York. Due largely to costs and regulatory restrictions, a whole lake application using either of these chemicals is not feasible.
7. 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.

3.4.4 Zooplankton and Benthos

Several lists of species in Honeoye Lake help to define the community, but further work remains to describe their population dynamics and interrelationships with the ecosystem. Crego (1993) shows a lake highly dominated by *Rotifera*, especially *Keratella crassa, Keratella cochlearis, Polyarthra remata, Polyarthra vulgaris* and *Synchaeta* sp.

Pearsall and Richardson (2001) commented on the significant discovery of *Daphnia pulex* in their 1995-1998 studies of Honeoye Lake, a species not appearing in earlier records. They feel that its presence may indicate a rebounding population after the extirpation of alewives in 1996 which favor *Daphnia pulex* as food. Since the alewife die-off, the average size of the largest zooplankton increased 30-33%. Honeoye Lake has large zooplankton populations which are consumers of phytoplankton. This is a benefit to fisheries, since the zooplankton is the food of forage fishes. A complete listing of the zooplankton surveys is included in the two references (Crego 1993) and (Pearsall and Richardson 2001). Refer to Appendix G: NYSDEC Zooplankton Data for further detail.

3.4.5 Deepwater Macrobenthic Survey

Benthic macroinvertebrates are large organisms that live in aquatic sediments, including worms, insects, snails, clams and crustaceans. They have brief aquatic stages in their life history, usually between one and two years. They are ideal indicators of environmental quality due to their sensitivity to habitat conditions like dissolved oxygen levels and nutrient concentrations. (Gilman (2005) sampled the deepwater macrobenthic community in July, 2005.)
Sediment samples were collected by standard Ponar dredge from Honeoye Lake on July 22 and July 25, 2005. Three transects were established, each beginning in the deepest area of the lake and then extending into shallower water (Figure 3-22). The northern and southern transects (A and C, respectively) extended westward while the middle transect (B) extended eastward. Along each transect, three replicates were collected at each of the following depths: 5 m, 7 m and 9 m, resulting in a grand total of 27 samples.

Figure 3-22: Ponar Dredge Sites

The deepwater macrobenthos of Honeoye Lake sampled in this study contained at least 19 different taxa of macroinvertebrates. Midge fly larvae (Chirononus sp., Procladius sp. and Tanypodinae sp.) and annelid worms (Branchiura sowerbyi) were present in all 27 dredges. Less frequently encountered were

finger nail clams (Pisidium sp. and Sphaerium sp.), statoblasts of the bryozoan, Pectinatella magnifica, adult zebra mussels (Dreissena polymorpha), banded mystery snails (Viviparous georgianus), two other snails (Valvata tricarinata and Physa sp.), a species of leech (Hirudinea), aquatic sowbugs (Asellus sp.), scuds (Gammarus sp.), alder fly larvae (Sialis sp.), phantom midge fly larvae (Chaoborus punctipennas), true fly pupae (Dixa sp.), and a species of roundworm (Nematoda). Another annelid and a second Diptera pupae were collected but could not be identified. Pelagic organisms accidentally captured as the dredge traveled through the water towards the bottom included two species of water flea (Leptodora kindtii and Daphnia pulicaria), veligers of zebra mussels (Dreissena polymorpha), water mites (Hydrachna sp.) and a fish fry (Centrarchidae). Distributional patterns and statistical summaries are provided in Appendix H: Macrobenthic Survey.

Abundance of organisms varied within replicates but pooled community data suggested patterns in structure and composition along a water depth gradient (Figures 3-23 and 3-24). Sediment at deep sites (9 m) had the lowest richness (6 taxa) with a density of 960 individuals/m^2. Midge fly larvae (*Chironomus* sp.) and annelid worms (*Branchiura sowerbyi*) dominated while phantom midge larvae (*Chaoborus punctipennas*) were frequent. Sediment from moderately deep sites (7 m) had intermediate richness (9 taxa) with a density of 833 individuals/m^2. These samples also contained abundant midge fly larvae and annelids, as well as finger nail clams (*Pisidium* sp.) and statoblasts of the bryozoan, *Pectinatella magnifica*. Sediment of shallow sites (5 m) had the highest richness (17 taxa) with a density of 1528 individuals/m^2. In addition to midge fly larvae and annelids, these sites also contained adult zebra mussels (*Dreissena polymorpha*), banded mystery snails (*Viviparous georgianus*), two other snails (*Valvata tricarinata* and *Physa* sp.), a leech (Hirudinea), aquatic sowbugs (*Asellus* sp.), scuds (*Gammarus* sp.), alder fly pupae (*Sialis* sp.) and a roundworm (Nematoda).

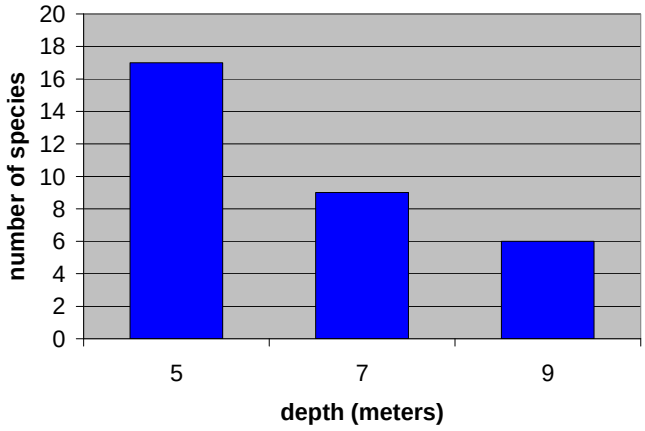

Figure 3-23: Benthic Species Abundance with Depth

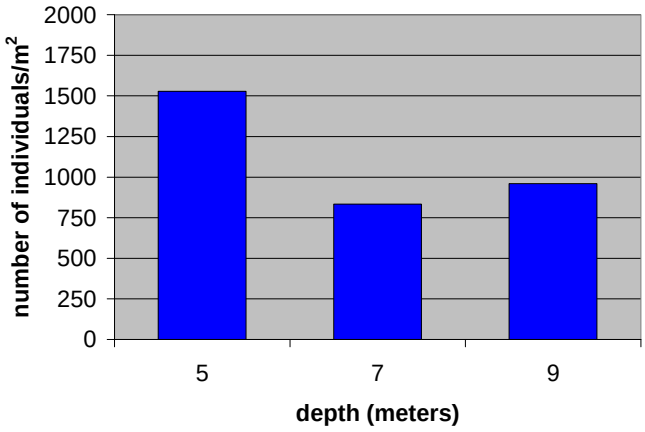

Figure 3-24: Benthic Species Richness with Depth

3.4.6 Mollusks, Amphibians, and Reptiles

Gilman (2004) lists the snails, clams, mussels, snakes and turtles present in the southern Honeoye watershed based on previous research by Tokinen (1992).

3.4.7 Zebra Mussels

The zebra mussel 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 (Figure 3-25). Mussel spawning can take place any time of the year when water temperatures are 54-63°, and millions of eggs are released. 70-micron long larvae called veligers hatch from the eggs and swim away. When they grow to adults, they attach themselves to hard surfaces with elastic fibers and filter as much as a liter of water per day for their planktonic food. After introduction in North America, their populations have grown exponentially in the absence of any controls.

Though the first zebra mussel was discovered in Honeoye Lake in 1998; it is likely they were present for more than a year. Gilman (2002) has been tracking the progress of their colonization of the lake, first populating near-shore areas with substrate suitable for forming attachments. They then moved into deeper waters where in many cases their only supports are the stems of rooted aquatic plants. His research revealed that 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 phytoplankton from the water column. The resulting reduction in a lake's primary production can have major negative impacts on a lake's food web.

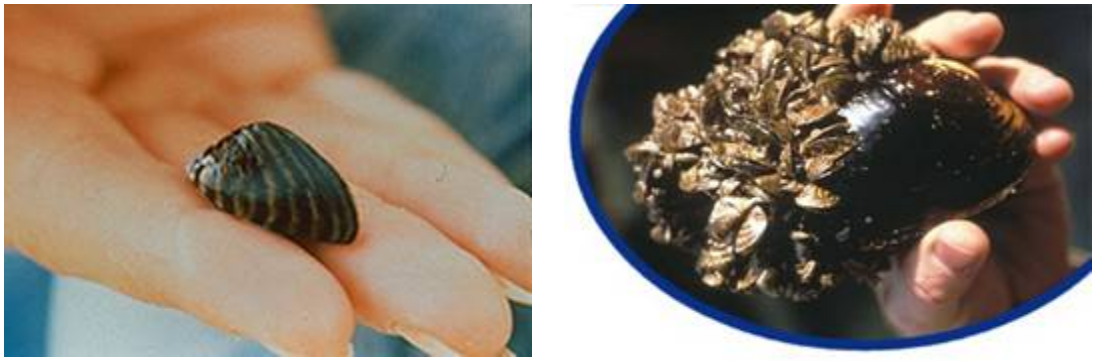

Figure 3-25: Zebra Mussels

Souza (2003) believes that the presence of zebra mussels, including those attempting to colonize aquatic macrophytes, 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.

Zebra mussel populations in the other Finger Lakes, where they were introduced earlier, have tended to boom and bust, especially in the early age-classes. The die-off of large numbers of the early age-classes of zebra mussels may have led to foaming in several of the other Finger Lakes. The exact mechanism is not fully known, but one theory is that either the decomposing zebra mussel fecal pellets or zebra mussel flesh produces a surfactant that, with wind agitation of lake water, causes rafts of standing foam.

3.4.8 Pathogens

Perhaps because Honeoye Lake is not a public water source, it has not been tested frequently for bacterial contamination. In 1999, because of concerns about State standards for bacterial contamination at bathing beaches, four samples were taken for analysis at Sandy Bottom Park. None of the samples approached State standards for contact of 200 colonies/100 ml. for fecal coliform bacteria. On September 9 and 29 and October 4, samples were taken Sandy Bottom Park, State boat launch, and the Inlet. They were analyzed for total and fecal coliform and *Escherichia coli.* On September 9, the results for all three parameters were positive at the Inlet and in the vicinity of the State boat launch, but again tested low on September 29 and October 4.

No outbreaks of illness have been traced to contact with or consumption of Honeoye Lake water. This is not to imply that Honeoye Lake water is safe in its raw form for either contact or consumption. Naturally occurring pathogens are prevalent in wildlife. For example, *Giardia lamblia* is a flagellate that can cause severe intestinal distress. The most common sources include transference from human populations through improper sanitation and transmission through water from rodents in whose population is prevalent. Another pathogen, the enterobacteria *Escherichia coli*, cannot survive long outside the mammalian digestive system but can be transmitted through contaminated water. Other microbial pathogens responsible for cryptosporidium, typhoid and amoebic dysentery may be transmitted through untreated water.

Gilman and Stone (1987) and Gilman (1988) reported some coliform bacteria in the streams. They concluded, "Some of our coliform data suggests gross contamination of tributary waters with fecal materials," an assertion repeated in 1987 and 1988. Coliform counts seem especially high from July through September in 1987, near Honeoye Lake Park, State Boat Launch, 518 East Lake Road and 104 and 475 West Lake Road sampling sites. The number of coliform colonies counted in the 1988 report was less than those reported in 1987.

3.5 Trophic Indicators and Status

Trophic state is a primary measurement tool used to assess the relative health of freshwater lakes. Trophic state refers to the level of primary productivity of a waterbody, defined as the mass of algae produced by the waterbody as estimated by measuring summer chlorophyll-a. Lakes undergo a normal "aging" progression usually measured in geologic time, but cultural eutrophication can speed the process by adding nutrients and spurring algal growth.

Several indicators are used to classify the trophic status of a lake (Table 3-4). The conventional system uses four indicators (winter total phosphorus, summer chlorophyll-a, water clarity, and hypolimnetic dissolved oxygen to establish a range of values defining oligotrophic, mesotrophic and eutrophic waterbodies.

Indicator	Oligotrophic	Mesotrophic	Eutrophic	Honeoye Lake
Winter Total phosphorus (ug/L)	<10	10-20	>20	13-48
Summer Chlorophyll-a (ug/L)	<4	4-10	>10	1-35
Water Clarity Secchi (m)	>4	2-4	<2	1.8-6.8
Hypolimnetic oxygen (% saturation)	>80	10-80	<10	0-100

Table 3-4: Conventional Trophic Status Indicators

Callinan (2001) reported the change in trophic state of Honeoye Lake since the 1970's, which has been influenced by a 1973 statewide phosphorus detergent ban, interception of nutrients bound for the lake by the 1978 perimeter sewer, and the influence of filter feeding zebra mussels removing phytoplankton from the water column (Table 3-5). The table below shows a reduction in Chlorophyll-a and increased Secchi water clarity. However, there was an increase in phosphorus.

Parameter	1970's	1996-1998
Mean Phosphorus (ug/L)	19.0	24.2
Mean Chlorophyll-a (ug/L)	25.7	8.4
Mean Secchi Reading (m)	3.0	3.7

Table 3-5: Historical Change in Trophic Indices

Another index, the Carlson Trophic State Index (TSI) provides a numerical system with a greater number of classes. The TSI can be determined from any of the three previously mentioned indicators, phosphorus, chlorophyll-a, or Secchi water clarity (Table 3-5). The TSI is based on a unit-less scale of 0 to 100 with each 10 point increment representing a doubling of the biomass.

Parameter	1970's	1996-1998
TSI-phosphorus	42	50
TSI- Chlorophyll-a	62	51
TSI- Secchi	44	41

Table 3-6: Historical Change Carlson's TSI

Sources: 1970s figures from Schaffner (1978) and 1990s from Callinan (2001)

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. The Finger Lakes have many commonalities, such as their north-south orientation and linear shape, but also have many differences especially with regard to 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 of these factors contribute to macrophyte and algae growth. In general, the shallow Finger Lakes are biologically more productive. Cooke (2001) postulated that the trophic status of a lake is highly correlated with its relative depth. Using the data from Callinan (2001), Figure 3-26 shows a high degree of correlation between total phosphorus—one of the trophic indicators—and the relative depth of the eleven Finger Lakes. A similar correlation is found with chlorophyll-a or Secchi water clarity.

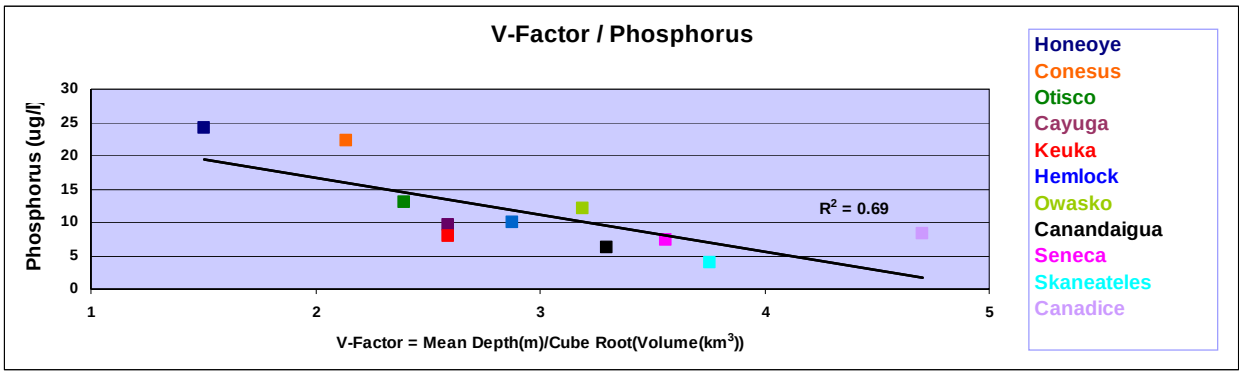

Figure 3-26: Correlation of Trophic Status of 11 Finger Lakes with Relative Depth

As predicted based on depth and volume, Honeoye Lake should be one of the most productive of the Finger Lakes—and indeed it is. Knowing this morphometric limitation, no management technique can or should attempt to try to change Honeoye Lake into a Skaneateles Lake.

3.5.1 Total Phosphorus

New York State has adopted a guidance value for total phosphorus of 20 ug/L, and Honeoye Lake currently exceeds this guidance value. Callinan (2001) states that "while external loading to the Finger Lakes have likely declined over the past 30 years, internal phosphorus loading within the smaller

eutrophic lakes may be acting to offset these declines." He also believes that the colonization by zebra mussels acts to mimic the effects of nutrient reductions and the resultant decrease in algal productivity." Figure 3-27 shows historical summer total phosphorus levels over the past 20 years. It would be better to have winter phosphorus data, but minimal winter data exists.

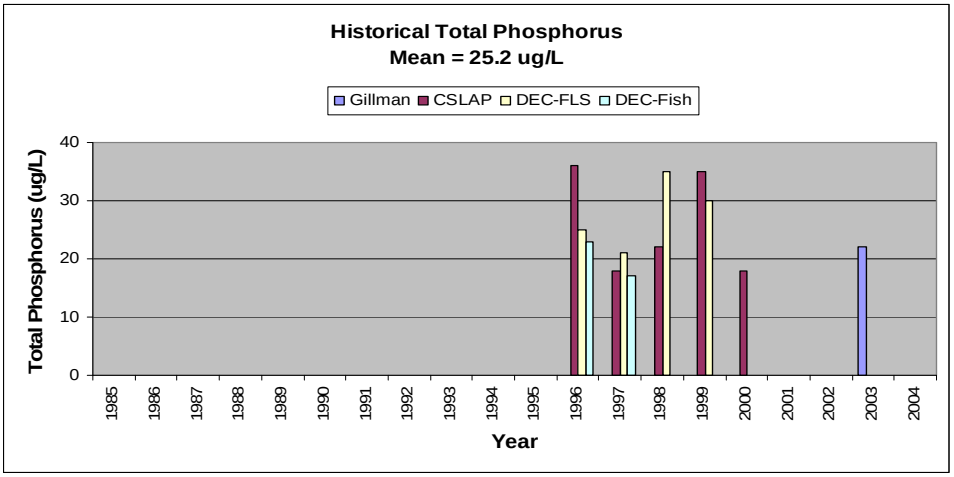

Figure 3-27: Historical Total Phosphorus

3.5.2 Chlorophyll-a

Honeoye Lake's chlorophyll-a values for the late 1990s are the highest of the Finger Lakes.
There are significant differences in chlorophyll-a magnitude dependent on location and time of year as evidenced from Gilman's (2003) extensive summer measurements in the summer of 2003. Figure 3-28 summarizes historical summer chlorophyll-a levels over the past 20 years.

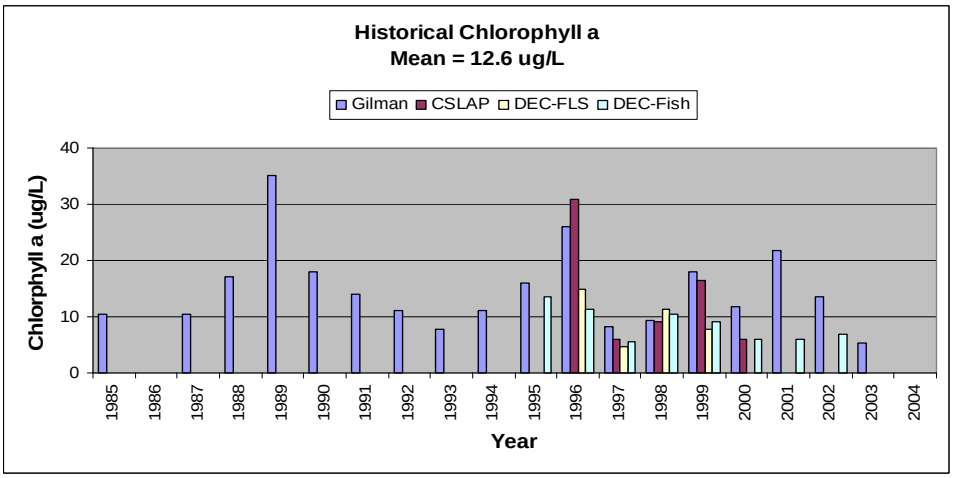

Figure 3-28: Historical Chlorophyll-a

3.5.3 Water Clarity Secchi Disk Depth

Honeoye Lake's clarity has improved since the 1970s, partly attributable to the presence of zebra mussels. Figure 3-29 summarizes the historical water clarity over the past twenty years.

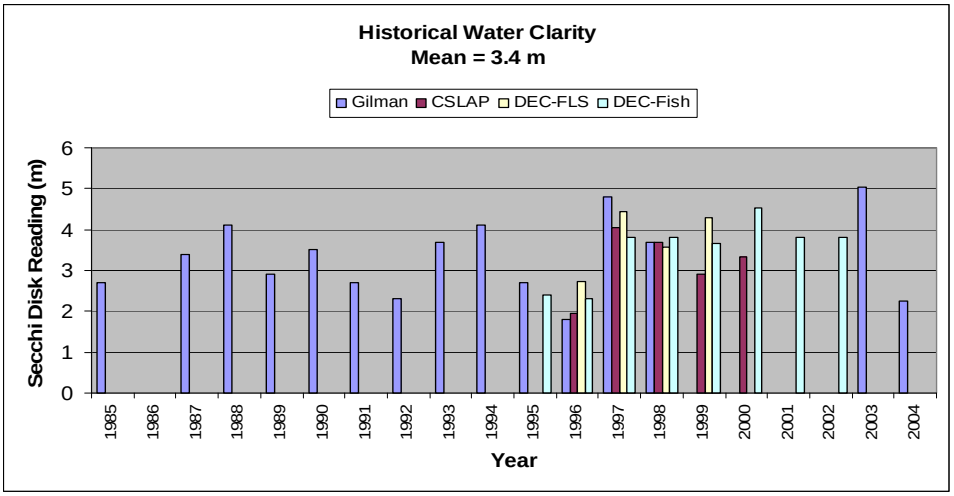

Figure 3-29: Historical Water Clarity

3.5.4 Bottom Waters Dissolved Oxygen

Eutrophication can lead to decreasing dissolved oxygen in the lake bottom. Dissolved oxygen demand in a lake bottom results from several factors: lake stratification (which creates a barrier to oxygen transfer), algal senescence (which results in the settling of organic matter to the bottom where its decay exerts demands on the dissolved oxygen), benthic sediment oxygen demand, and the shape of the lake basin (which results in different volume ratios between the hypolimnion and epilimnion, or upper waters).

Honeoye Lake regularly exhibits a clinograde curve for dissolved oxygen levels, which indicates dissolved oxygen decreasing with depth—despite temperature differences. There is not an abundance of historical data on dissolved oxygen profiles in Honeoye Lake. However, data from 2003-2005 shows that during late summer, the bottom water is anoxic / hypoxic over half of the time.

3.5.5 Summary Trophic Status

- By various tests and standards, Honeoye Lake currently wavers at the boundary of eutrophic and mesotrophic states, which probably represents an overall improvement of its eutrophic status of the pre-1970s.

- The indices discussed here could be used to construct a target to track Honeoye Lake's improvements in water clarity, total phosphorus loading, and chlorophyll-a. Irondequoit Bay researchers used a trophic index to track their progress during the implementation of bay restoration projects (Irondequoit Creek Watershed Collaborative, 1999).

4. SUBWATERSHED PRIORITIZATION

Much of the information presented in this section is taken from the *Honeoye Lake Nutrient and Hydrologic Budget* prepared by Princeton Hydro, LLC for the Honeoye Lake Watershed Task Force.

4.1 Introduction

To better understand and prioritize management efforts of the Honeoye Lake Watershed, each of the subwatershed areas are described and evaluated. A subwatershed analysis helps identify specific areas of concern and potential opportunities for significant pollution reduction. The data presented in this section can be used to investigate the factors affecting water inflow, pollutant loading, the sources of nutrient loading, and the combined effects of both the hydrologic and nutrients budgets on the overall water quality of Honeoye Lake

Although there are numerous inflows to the lake, as illustrated in Figure 4-1, the majority are small, intermittent or ephemeral. In total there are ten (10) subwatersheds, but only four (4) major tributaries draining to the lake: Honeoye Inlet, Briggs Gully, Bray Gully, and Affolter Creek (Table 4-1). The various drainage areas in the Honeoye Lake Watershed can be viewed in greater detail on Map R-C: Honeoye Lake Subwatersheds in the References section of this report.

The largest contributing watershed is associated with the drainage entering the lake via the Honeoye Inlet—the mouth of which is located at the far southern end of the lake. The much smaller ditches, swales, and unnamed sloughs that convey runoff and flow into Honeoye Lake tend to be important only during the spring or immediately following periods of intense or prolonged rainfall.

The tributaries and waterways that flow into Honeoye Lake are classified by the NYSDEC as category "C" waters of the state. As per 6 NYCRR Part 701:

"Class C waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes."

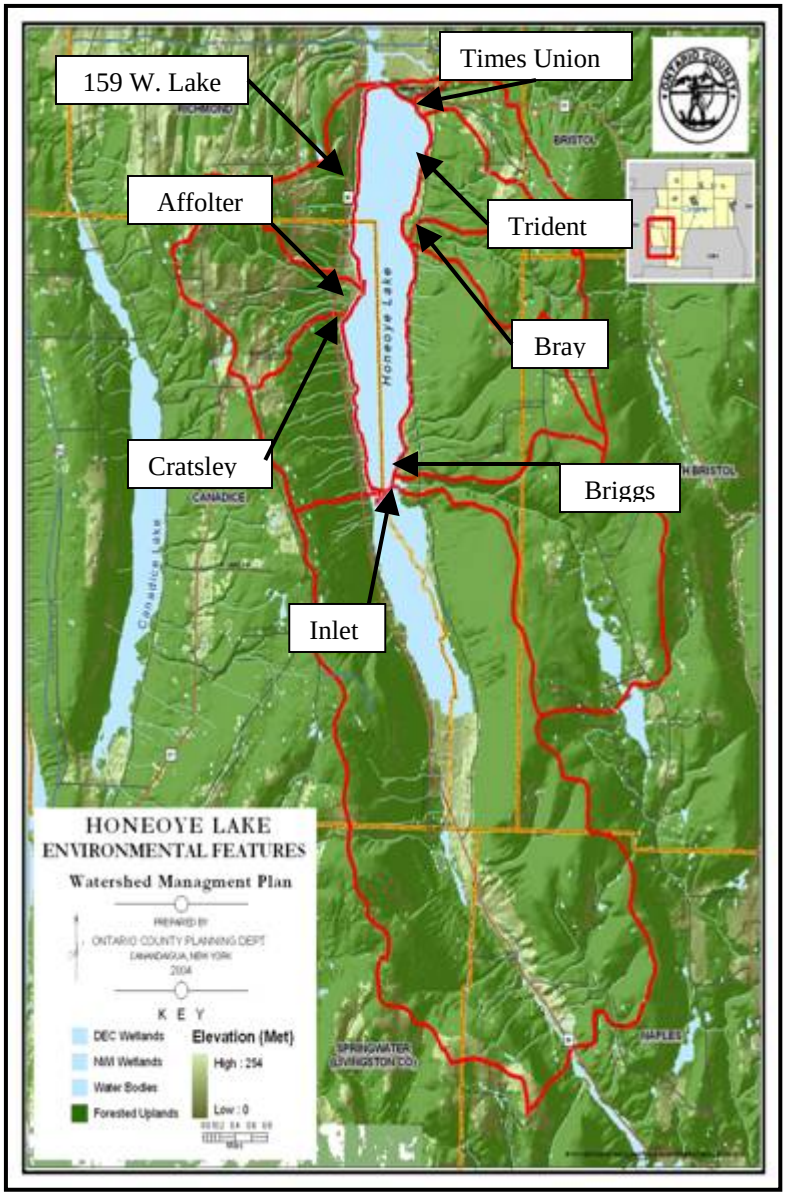

Figure 4-1: Inflows to Honeoye Lake

Drainage Area Name	Size of Contributing
North Shore DD*	64
Times Union Creek	651
Pinewood Hill DD	832
East Shore DD	2,387
Briggs Gully	3,140
Honeoye Inlet	676
Canadice Corners DD	1,273
Affolter Gully	1,585
West Shore DD	919
Lake Area	1,805
Total	**24,497**

Table 4-1: Honeoye Lake Subwatershed Areas

4.2 Hydrology Methodology

The hydrologic budget of Honeoye Lake is essentially its water balance. In effect, it is the cumulative volume of all water inflow to the lake (sources) and all water outflows from the lake (losses). The primary factors affecting the hydrology of Honeoye Lake are:

- Climate (precipitation, temperatures, evaporative losses);
- Watershed area;
- Watershed area land use and land cover; and,
- Lake volume.

The methodology employed makes use of empirical data in conjunction with runoff coefficients selected to best represent land use and land cover attributes broken down by sub-watersheds. Geographic Information System (GIS) software was used to delineate the watershed, further divide it into the sub-watersheds, and then label and quantify the land use and land cover (LU/LC) attributes of each polygon. A key component of modeling the lake's hydrology was to accurately map land use / land cover (LU/LC) and use that data together with GIS data layers on geology, soils, and slope. This was done both cumulatively and individually for each of Honeoye Lake's sub-watersheds. Hydrologic datasets were also valuable in developing the nutrient model.

Four sources for the lake's hydrologic budget were investigated and quantified:

1. Direct precipitation;
2. Tributary inflow;
3. Overland runoff; and,
4. Groundwater seepage.

Long-term precipitation data were obtained from the National Oceanic and Atmospheric Agency's (NOAA) 30-year historical rainfall records. An adjustment to account for the evaporative loss of water from the surface of the lake and similar adjustments were made to the precipitation falling within the watershed to account for photosynthetic related evapotranspiration.

Groundwater related interflow to the lake and its tributaries were estimated using a modification of the United States Geologic Service GSR 32 methodology. This component represents the precipitation that passes through the upper soil horizon and root zone, but then flows laterally into the lake's streams and then into the lake's littoral zone. This component of groundwater flow is what is responsible for a large percentage of each stream's "base flow."

The storm related runoff entering the lake via tributaries or as direct discharge was quantified using a modification of the USDA's Rational Method (USEPA, 1990; Maidment, 1993). This semi-deterministic model is widely used to compute the monthly or annual amounts of inflow directly resulting from rainfall and the associated stormwater runoff. The computations involved the application of runoff coefficients for each LU/LC occurring within each sub-watershed. The coefficients were selected from a standardized array developed by the USDA, then modified accordingly to more appropriately match the LU/LC, slope and soil types unique to the Honeoye Lake Watershed.

4.3 Hydrology Results

Although the summer (June-August) months are among the wettest in terms of rainfall, they actually generate the least amount of runoff and inflow due to soil infiltration and plant cover conditions and seasonal evapotranspiration rates

The total yearly inflow by subwatershed is shown in Table 4-2:

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 4-2: Total Yearly Inflow by Subwatershed

The breakdown of the monthly inflow is shown in Table SUP-9: Estimate of Inflow Displayed by Subwatershed Monthly Inflow 10^6 m3. The fall, winter, and early spring are the periods of the year when the greatest amount of runoff is generated. Low runoff typifies the summer season.

4.4 Nutrient Loading Methodology

The methodology employed in preparing the lake's nutrient budget was a mass-balance approach similar to the hydrology analyses. Essentially an effort was made to account for all major nutrient sources, apply factors for conditions unique to Honeoye Lake, and consider factors that could limit the assimilation of available nutrients. This was achieved for Honeoye Lake by using a variety of mathematical models to analyze specific components of the lake's loads. The results of each model yielded a cumulative load. The models used in this project are based on empirical data collection, that is, they are based on actual field studies. Although the loading coefficients specific to each model can be considered generalized, they were rectified to the fullest extent possible to account for conditions specific for Honeoye Lake and its watershed.

Both the external (watershed generated) and internal (biota and sediment recycled) components of the nutrient budget were investigated and quantified, and include the following:

1. External Watershed Based Loading;
2. External Loading from On-site Wastewater Systems (Septic Systems);
3. External Loading due to Precipitation Falling Directly on the Lake's Surface;
4. Internal Loading from Anoxic Sediments;
5. Internal Loading from Oxic Sediments;
6. Internal Loading Due to the Decomposition of Aquatic Plants; and,
7. Internal Loading Due to the Decomposition of Zebra Mussels.

All of the above nutrient sources were quantified using loading coefficients derived from the scientific literature, but applied to, or used in concert with information and data derived specifically through the study of Honeoye Lake and its watershed.

The ArcView Globalized Watershed Loading Functions (AVGWLF) Model was used to quantify the nutrient and sediment sources entering Honeoye Lake from each of the lake's main sub-watersheds and tributaries. The AVGWLF nutrient and sediment loading modeling approach is based on the premise that different land uses and land covers contribute different quantities of nutrients and sediment largely through stormwater runoff. A number of land use and land cover data sources were used in this project: mapped delineations of the watershed completed by FLCC, United States Geological Survey (USGS) digital elevation model (DEM) data, and the National Land Cover Dataset (NCLD 1992) published by the Multi-Resolution Land Characteristics Consortium (MRLCC). With the land use and land cover data digitized, it was then possible to assign the appropriate loading coefficients and compute the watershed derived nutrient and sediment loads.

4.5 Nutrient and Sediment Loading Results

Using the methodology described above the external nutrient and sediment loading of total phosphorus (TP), total nitrogen (TN), and total suspended solids (TSS) were calculated for each subwatershed and are summarized in Table 4-3.

As would be expected, the larger sub-watersheds generate the bulk of the lake's nutrient and sediment load. However, this does not mean that these subwatersheds (e.g. Honeoye Inlet) should be prioritized for nutrient and sediment load reduction management. A more meaningful assessment of the data is to examine the loading per unit area for each sub-watershed (Table 4-4). Data shows the highest areal nutrient loading is within the North Shore Subwatershed, which is the smallest subwatershed comprising only 0.3% of the entire watershed, and is composed of high density residential. In spite of North Shore having the highest loading on a areal basis, it should not be considered a priority watershed since it contributes only 0.4% of the total watershed phosphorus loading, Since nutrient loading across all of the other subwatersheds is fairly uniform, there is no evidence to suggest any priority watershed based on nutrient loading.

Subwatershed	Area (Ac)	TP	TN	TSS
North Shore DD[1]	64	11.88	160.76	21,825.13
Times Union Creek	651	73.44	960.42	163,853.71
Pinewood Hill DD	832	96.17	1,207.94	197,623.66
Bray Gully	1,165	112.35	1,362.78	249,648.41
East Shore DD	2,387	242.81	2,926.16	520,369.44
Briggs Gully	3,140	352.56	3,784.55	759,974.66
Honeoye Inlet	10,676	1,177.61	15,279.27	2,581,387.68
Canadice Corners DD	1,273	132.26	1,639.05	288,821.93
Affolter Gully	1,585	219.07	3,334.86	537,509.41
West Shore DD	919	128.56	1,794.68	285,492.88
Atmospheric over watershed	24,497	182.6	7,304.8	298,848.47
Atmospheric on lake surface	1,805	19.97	177.57	22,091.90
Total		**2,749.28**	**39,932.84**	**5,927,447.28**
DD = Direct Drainage				

Table 4-3: Summary of Subwatershed Loading Kg/yr

The breakdown of monthly nutrient loading is shown in Table SUP-10: Total Annual Phosphorus Loading to Honeoye Lake by Contributing Subwatershed, Table SUP-11: Total Annual Nitrogen Loading to Honeoye Lake by Contributing Subwatershed, and Table SUP-12: Total Annual Suspended Solids Loading to Honeoye Lake by Contributing Subwatershed.

Watershed	Area (Ac)	TP	TN	TSS
North Shore DD	64	0.19	2.51	341.02
Times Union Creek	651	0.11	1.48	251.70
Pinewood Hill DD	832	0.12	1.45	237.53
Bray Gully	1,165	0.10	1.17	214.29
East Shore DD	2,387	0.10	1.23	218.00
Briggs Gully	3,140	0.11	1.21	242.03
Honeoye Inlet	10,676	0.11	1.43	241.79
Canadice Corners DD	1,273	0.10	1.29	226.88
Affolter Gully	1,585	0.14	2.10	339.12
West Shore Direct DD	919	0.14	1.95	310.66
Bold- Largest Areal Contributors				

Table 4-4: Summary Areal Subwatershed Loading Kg/ac/yr

In contrast to external loads, internal loading in waterbodies results mostly from the regeneration or liberation of nutrients bound in the sediment. One of the largest drivers of internal nutrient loading in lake systems results from the dynamic relationship between dissolved oxygen depletion (anoxia) and the liberation of phosphorus from lake sediments. Loading coefficients were selected for both oxic and anoxic conditions: the phosphorus loading rate from oxic sediments (sediments overlaid by waters having a DO concentration of > 1 mg/L) is 0.6 mg TP/m^2/d, while loading rates from anoxic sediments is 6.0 mg anoxic TP/m^2/d. These coefficients were selected for regional fitness and are considered representative for lakes located in the Mid-Atlantic and Great Lake regions.

Table 4-5 summarizes both the internal and external nutrient loading estimates for total phosphorus (TP), total nitrogen (TN) and total suspended solids (TSS) for the lake. This data was also generated on a monthly basis which shows that although the internally generated phosphorus from the anoxic sediment accounts for about 30% on an annual basis it can account for approximately 90% of the lake's late summer TP 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, low hydraulic flushing, a large influx of internally regenerated phosphorus, warm water temperatures and intensified sunlight, causes the lake's productivity to peak. These conditions consistently foster late summer algae blooms that vary in their intensity from year to year.

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, corrected for harvesting	**2,172.3**	**1,259.3**	**0**
Total Annual Nutrient and sediment Loading	**5,414.8**	**53,120.3**	**5,927,447.2**
Calculated Nitrogen : Phosphorus Ratio	**9.8 : 1**		

Table 4-5: Summary of Internal and External Nutrient and Sediment

4.6 Hotspots

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. Heavy recreational use is made of the lake but this is not commonly associated with nutrient sources. Honeoye Lake benefited immensely from the 1973 statewide ban on phosphorus in laundry detergents and the 1978 perimeter sewer. Most of the external sources of nutrients flow into the lake from streams or directly from the shoreline.

However, a number of different sites with a variety of uses have been identified within the watershed that have the potential to be significant pollution contributors. Many of these sites are no longer in use. A more detailed analysis of these hotspots will need to be made to determine if any have a potential for significant pollution.

These sites are identified on Map 16: Honeoye Lake Hotspots and include:

4.6.1 Possible Hydrocarbon Pollution

H-1 Bill Frost Garage and Storage, Pinewood Hill Road
H-2 Coye Airport and Former Tire Shop, Curtis Road
H-3 Former Skippers Store, 5361 CR 36 (gas station, status of underground tank(s) unknown)
H-4 Former Honeoye Lake Marine, 5159 CR 36 (status of underground tank(s) unknown)
H-5 Trident Marine

H-6 New York State Boat launch
H-7 Sandy Bottom Park boat launch
H-8 FLCC Muller Field Station, County Road 36
H-9 California Ranch maintenance barn
H-10 Any underground or aboveground fuel or heating oil tanks

4.6.2 Possible Chemical Pollution

C-1 3M Plant Site (remediated former leach fields and ponds)

4.6.3 Possible Nutrient Pollution

N-1 Horse Farm, East Lake Road
N-2 Country Colony Estates Apartments, Curtis Road (has SPDES permit)
N-3 Any active agricultural operations
N-4 Sites exhibiting severe flooding and erosion during heavy rains

4.6.4 Former Landfills/Mining

M-1 Former Canadice Landfill, Old West Lake Road
M-2 Wohlschelegel Gravel Pit, County Road 36
M-3 Former Gravel Pit, East Lake Rd. (presently Richmond brush pile)

4.6.5 Other Possible Hot Spots

O- 1 Hunt Hollow Ski Lodge, County Road 36
O- 2 Cell Tower, Ross Road off Gulick Road

See Map P: Hot Spots in Honeoye Watershed in the Reference section for the location of these sites.

4.7 Road Crossings

As impervious surfaces, roads and driveways have the potential for increased runoff of pollutants into the lake. Table SUP-13: Estimate of Road and Driveways in Watershed (miles) provides the length of roads broken down by subwatershed. On an areal basis, the North Shore DD has the highest number of roads per unit area and hence the potential for greatest runoff. However, this is a very small subwatershed and only contains a total 1.7% of the total roads and driveways in the watershed, and hence its potential for significant pollution is negligible.

4.8 Subwatershed Prioritization

An attempt was made to evaluate and rank subwatersheds according to impairments and/or threats to water quality and habitat. This attempt to identify priority subwatersheds for nonpoint source pollution management action included an evaluation of the following:

1. Percentage of Impervious Cover, Forest Cover, Turf Cover, and Riparian Cover: Discussion has been included in the previously cited Nutrient and Hydrologic Model.
2. "Hotspot" Density: Discussion has been included in the previous section on Hotspots.. Hotspots are dispersed throughout most of the subwatersheds.

3. Number of Road Crossings: Discussion has been included in the previous section on Road Crossings. Road crossings are dispersed throughout most of the subwatersheds.
4. Industrial Land: There is no industrial land in the watershed
5. Development Potential: Development in the Honeoye Lake Watershed is significantly less than in the larger Finger Lakes. In addition, the potential for future development is fairly uniform across the ten subwatersheds.
6. Public Ownership: There is a significant amount of public protected lands in the Inlet and Briggs Subwatersheds, which are the two largest subwatersheds comprising 47.0% and 13.8% of the watershed respectively. These lands are protected from future private development.
7. Sewer system condition: Although there are no known major problems, a more detailed survey of the sewer system should be done.
8. Violations of Water Quality Standards: There are no known violations of water quality standards in the watershed.

Based on the above analysis, there is no priority subwatershed identified for a focused nonpoint source pollution management action. This is not surprising due to fairly uniform land use characteristics across the watershed. Many of the other Finger Lakes have a high concentration of agriculture which has the potential to cause high nutrient loadings that are subwatershed dependent. Since the Honeoye Lake Watershed has very little agriculture and uniformity throughout its subwatersheds, it does not appear that nutrient pollution is highly subwatershed dependent.

5. ASSESSMENT OF LOCAL LAWS AND PRACTICES

The assessment of local laws in the Honeoye Lake Watershed began with a general land use regulation inventory which focused on the three primary building blocks of land use control in New York State: the comprehensive plan, zoning, and subdivision regulation. After the general land use regulation inventory was complete, a much more detailed assessment was conducted using a "best management practices" (BMP) assessment tool. In some instances, additional local laws and ordinances were found to be present within a number of municipalities and were included within the detailed assessment if and when applicable. Stand-alone laws that pertain to subjects such as onsite wastewater treatment systems, timber harvesting, or erosion and sediment control are notable examples.

5.1 Basic Land Use Law Inventory

Town of	County	Comprehensive Plan?	Date	Zoning?	Date	Subdivision?	Date
Bristol	Ontario	No	--	Yes	2000	Yes	2000
Canadice	Ontario	Yes	1999	No*	1998	Yes	1999
Naples	Ontario	Yes	2002	Yes	1997	Yes	1992
Richmond	Ontario	Yes	2004	Yes	2006	Yes	2000
South Bristol	Ontario	Yes	2000	Yes	2003	Yes	1994
Springwater	Livingston	No	--	No	--	No	--
Average Age of Document (in years since 2007)			*5.75*		*6.2*		*10*

**Site Plan Review in place*

The entire assessment process was conducted in order to gain a thorough understanding of existing local laws, ordinances, and practices, many of which impact land use and ultimately water resources. The BMP assessment form lists 151 individual BMPs which are divided into six primary categories and relevant sub-categories:

1. **Development**
   - Existing Development
   - New Development and Substantial Redevelopment
2. **Forestry and Agriculture**
   - Forestry
   - Agriculture
3. **Waterways and Wetlands**
   - Modified Waterways
   - Wetlands and Riparian Area Management and Restoration
4. **Marinas**
   - Existing Marinas
   - New Marinas
   - All Marinas
5. **Roads and Bridges**
   - Existing Roads and Bridges
   - New Roads and Bridges
   - All Roads and Bridges (existing and new)
6. **Onsite Wastewater Treatment Systems (OWTS)**
   - (No sub-categories)

The existing local laws of the 6 municipalities were reviewed and evaluated according to these 151 best management practices. The following analysis has been prepared based on this assessment, which is separated into two sections. Section 5.2 General Overview of Local Laws and Practices provides a general overview and analysis of local laws within the Honeoye Lake Watershed and addresses the primary gaps that were found to be present throughout most (if not all) of these municipalities. Practical recommendations have been advanced therein. Section 5.3 Assessment of Local Laws and Practices provides major findings and other relevant issues or conditions identified within each of the six individual municipalities. The specific local laws that were reviewed are provided with proper citations. Observations here should be considered ***in addition to*** those cited within the first section.

5.2 General Overview of Local Laws and Practices

5.2.1 Development

While many of the procedures detailed within the local codes reviewed herein were found to provide basic protections from impacts stemming from erosion and sedimentation, no local code was found to acknowledge recent changes in Federal and state laws with regard to Phase II Stormwater Regulations.[1] Under Phase II Stormwater Regulations, all operators of construction sites disturbing one acre or more of land must file a Notice of Intent (NOI) with the appropriate DEC regional office and prepare a Storm Water Pollution Prevention Plan (SWPPP) that is to be followed by developers throughout the duration of the construction activities. SWPPPs are comprehensive documents addressing all aspects of pre- and post-construction stormwater runoff control practices and procedures. Among the six Honeoye Lake Watershed municipalities reviewed for this study, no local law or construction specification document was found to address all of the components that are contained within a SWPPP.[2]

Stormwater Phase II represents the latest and most comprehensive system of rules to prevent the discharge of pollutants into area waterways stemming from construction activities. In order to assist municipalities with integrating Stormwater Phase II rules and regulations with local municipal laws, the NYS Department of State (NYSDOS) in conjunction with the NYSDEC developed the NYS Sample Local Law for Stormwater Management and Erosion and Sediment Control (referred heretofore as the NYS Sample Local Law). Local officials are encouraged to consider incorporating certain aspects of the NYS Sample Local Law into current zoning and subdivision language in an effort to promote statewide consistency and to ensure comprehensive protection from erosion and sedimentation emanating from new construction activities.

It is important to note that, while the local laws of municipalities within urbanized areas in NYS are required to prove equivalency with this law by January 8th, 2008, municipalities within the Honeoye Lake Watershed are not currently subject to this requirement. Meeting equivalency with the NYS Sample

[1] Refer to Appendix A: Evaluation of Government Roles, New York State Programs, NYSDEC, Office of Administration, Division of Environmental Permits: "11. Stormwater" for more information on Phase II Stormwater Regulations and permitting requirements.

[2] SWPPPs contain 16 specific components relevant to construction site erosion and sediment controls, which are listed under §2.2 ("Contents of Stormwater Pollution Prevention Plans") in the *NYS Sample Local Law for Stormwater Management and Erosion and Sediment Control*.

Local Law simply reinforces local protection from erosion and sedimentation and encourages statewide consistency.

Thorough information and instruction regarding Stormwater Phase II Regulation implementation in NYS, as well as the text of the NYS Sample Local Law, can be found within the Stormwater Management Guidance Manual for Local Officials, available for download through the NYSDOS Division of Local Government "Publications" webpage.[3] Integrating the NYS Sample Local Law into current local law will require significant revisions of current law and should therefore be considered carefully by local officials, with cooperation and oversight from the municipal attorney, code enforcement officials, and zoning and planning board members. If the full sample law is integrated into local law, municipalities will also be responsible for designating a local Stormwater Management Officer to accept and review SWPPPs, forward the plans to the applicable municipal board and inspect stormwater management practices implemented in the field.

In the absence of conducting major revisions to local laws, local officials may want to consider simply referencing the importance of and requirements associated with the Statewide Phase II Construction Permit (GP-02-01) within their local zoning, site plan approval and subdivision regulations, thereby requiring developers to provide proof of compliance with the Phase II Construction Permit in advance of the commencement of land-disturbing activities. As stated in the Stormwater Management Guidance Manual for Local Officials, "State law does not presently provide for the review of SWPPPs in the building permit process, but a municipality may direct the Building Inspector [or CEO] to require a SWPPP when application is made for another land use permit (site plan, subdivision, zoning change, special use permit)."[4] This approach, therefore, provides an amenable alternative to adopting the full NYS Sample Local Law. Enforcement of the SWPPP and other Phase II-related procedures would then fall to the regional DEC office in the absence of a local law stating otherwise. Given the limitations of DEC resources, a municipality may choose to designate their county SWCD as an appropriate reviewing agent; however, SWCD offices should be consulted before such an approach is pursued. The negotiation of a contract will likely be necessary in order to ensure that the SWCD office has the resources to commit to inspections.

Further information and instruction on integrating stormwater management into existing municipal programs can be found within the Stormwater Management Guidance Manual for Local Officials.

In addition to making considerations regarding Phase II Stormwater Regulations, local officials should assess the training, knowledge, and capability of Planning and Zoning Board members and the CEO and his or her staff and seek additional or supplemental training as necessary. Town officials should evaluate the preparedness and capability of the CEO, ensuring that adequate training and resources are made available. Given that Planning Board members are responsible for reviewing and approving development proposals, they should also be familiar with local stormwater management goals and the intent and mechanisms currently within local regulations.

[3] NYS DOS Division of Local Government Publications, *Stormwater Guidance Manual for Local Officials.* Last viewed 6/06/07 at http://www.dec.ny.gov/chemical/9007.html
[4] NYS DOS Division of Local Government Publications, *Stormwater Guidance Manual for Local Officials.* p 14.

5.2.2 Agriculture and Forestry

5.2.2.1 Agriculture

Given the nature of agricultural protection laws in NYS, an assessment of local municipal laws will rarely identify local ordinances pertaining to agricultural activities. Many agricultural issues are regulated at the State level by the Department of Agriculture and Markets and the Department of Environmental Conservation. It is important to note, however, that local municipal knowledge and encouragement of good agricultural practices can greatly assist water quality efforts. Local government is the level of government that the agricultural community is closest to, and often feels the most comfortable with. A municipality's position on good farming practice can therefore help to further water quality efforts. Furthermore, watershed organizations and local boards should strive to include members of the local agricultural community in land use and water quality planning initiatives in order to gain insight and knowledge regarding their attitudes and concerns related to the challenges associated with implementing agricultural environmental BMPs.

Agriculture Environmental Management (AEM) is New York State's voluntary, incentive-based program for addressing the environmental impacts associated with all types of agricultural activities. Within the Honeoye Lake Watershed, AEM programs are administered by the Soil and Water Conservation Districts (SWCDs) in Livingston and Ontario Counties. AEM Five-Year Strategic Plans for those counties should be consulted in order to assess local AEM priorities and the implementation status within individual watersheds.

5.2.2.2 Forestry

Considerations for timber harvesting practices contained within the Local Timber Harvesting Law enacted by the Town of Bristol in 2005 were among the most comprehensive of those reviewed within this study. The local law applies to all individuals or businesses harvesting timber, with the exception of timber intended for personal use (i.e. fewer than twenty-five standards cords within a twelve-month period for firewood or fewer than 20,000 board feet within a twelve month period for lumber). As stated in Article V of the law, "No person, firm, partnership, corporation or other entity…shall engage in commercial timber harvesting as defined in this Law without a permit issued in accordance with Part VI herein." Permits are issued by the Town Code Enforcement Officer and must comply with six specific "standard operating procedures." Among those include: the installation of necessary or appropriate best management practices recommended in the NYS Forestry BMP Field Guide; no skidding within stream channels; maintaining fifteen-foot stream buffers; clear, well designated skid landings outside of the public right of way; and the implementation of appropriate site-reclamation procedures.

The Law makes distinctions between "basic" and "full" timber harvesting permit applications depending on the sensitivity of site conditions. Article VIII of the Law ("Violations and Enforcement") provide local officials with appropriate mechanisms to enforce the law, including provisions for site inspections, stop-work orders, and fines up to $250 or imprisonment for each separate violation.

Municipalities that identify timber harvesting to be a potential threat to water quality within their jurisdiction are recommended to review and adopt this local law, portions thereof, or the equivalent thereof, to ensure the adequate protection of local water resources from erosion and sedimentation.

5.2.3 Waterways and Wetlands

Practical recommendations with regard to waterways and wetlands that the municipalities within the Honeoye Lake Watershed might want to consider include: the use of mandatory setbacks from streambanks and shorelines in order to minimize disturbance of land within such areas; recognition of the NYS Wetlands Preservation Act (Article 24 of the NYS Environmental Conservation Law) directly within local law and the importance of upholding that law; and the identification and mapping of wetlands smaller than 12.4 acres and special zoning considerations that protect those areas. In a variety of instances cited below, adequate stream setback rules have already been implemented by several municipalities.

In addition, other environmentally-sensitive aquatic areas may also warrant further consideration. Municipalities can protect sensitive areas through several means. These include adoption of environmental protection overlay districts (EPODs) as part of their zoning law. Riparian protection can be implemented through setback requirements in the zoning code, the site plan review process (for individual sites), and subdivision regulations (for larger developments). Refer to the individual approaches used by local municipalities that have been cited in Section Two below. Alternatively, municipalities can also protect wetlands and riparian areas through provisions within their sediment and erosion control laws. Finally, careful administration of a flood prevention ordinance can restrict development within flood hazard areas, which also happen to be environmentally sensitive and/or riparian areas.

5.2.4 Marinas (applicable to the Towns of Richmond and Canadice only)

Boating activities on Honeoye Lake are generally limited to smaller recreational vessels. Considering that the lake is landlocked, unlike other Finger Lakes which are connected to the NYS Canal System, the environmental impacts stemming from recreational boating activities – while not insignificant – are likely to be limited.

The two primary environmental risks associated with recreational boating activities pertain to vessel waste and invasive species from transient vessels. Local regulations that address vessel waste and other sources of pollution related to boating should be considered if local residents and officials recognize a specific threat therein. Vessel pump-outs at marinas and other public facilities is a key provision in this regard. Grants are available for pump-out facilities at public and private marinas from the New York State Environmental Facilities Corporation through the Federal Clean Vessel Act.

Invasive species can begin to be addressed through the implementation of basic BMPs at public launch sites. Signage identifying species of concern as well as procedures that should be taken as vessels are launched and removed from the water (hull washing and scraping, for example) are among those recommended. All practices must be implemented in a uniform manner in both Richmond and Canadice, however, if they are to be effective.

Other areas for consideration may include standards for dock construction (including materials for construction), steep-slope construction provisions, and standards for dry-storage facilities. Provisions should designate an enforcement entity, such as a harbor master or local code enforcement officer.

Further instruction and guidance regarding docks and moorings and other harbor management issues can be found in the NYSDOS publication entitled Guidelines for the Preparation of Harbor Management Plans.[5]

5.2.5 Highways

While highway departments within most municipalities typically practice basic best management practices on an unofficial, voluntary basis, it is rare to see specific practices and procedures written directly into local code. The Town of Canadice Code (§106, "Streets and Sidewalks") presents a clear framework for addressing a variety of best management practices that pertain to highway maintenance. This section of the Code can be used as a valuable model for neighboring municipalities in the watershed as well as for rural towns throughout the region, as it sets clear priorities and expectations regarding the local roads and facilities therein.

The code contains directives and procedures that guide conscientious and consistent maintenance of local facilities. Guidelines are included for surface and roadside facilities such as bridges, drainage, road repair, and slopes. Several aspects of these guidelines appear to have erosion and sedimentation prevention specifically in mind. Given the town's rural nature, a distinction is made between low-volume roads and those that otherwise receive moderate or high traffic volumes. Article III of §106 states that a major reason for setting such standards is to decrease overall costs by reducing unnecessary maintenance on low-volume roads. Roads designated as "low-volume" are posted with signs intended to advise motorists of the need to exercise due diligence when traveling on such roads.

This feature of local law is generally unique to the region and worthy of mention for several reasons. Codifying highway maintenance procedures adds a degree of transparency to the operation and management of public assets, which lends significant credence to the department and the municipality as a whole. Furthermore, these specific procedures have the *potential* to work in conjunction with environmental best management practices (although it is important to note that this is not the intent of this section of code). Low-volume roads can have the potential to have a low-impact on local water resources. The recommended reduction of salt and sand usage and implied decrease in impervious surface area can have a positive impact on local water resources if done in accordance with other basic roadside provisions (such as check dams, vegetative swales, or other types of low-maintenance stormwater structures). Furthermore, interpretative signage can be designed to accompany low-volume road signs that are already in place, thereby acting as an information tool, notifying the public of the benefits of such areas.

All highway departments should seriously consider the development of a written inspection and maintenance plan intended for use by highway department employees for the efficient management and maintenance of highway-related facilities. Such a plan should incorporate some or all of the following components:

- Map identifying: (1) all structural facilities (catch basins, culverts, sediment retention facilities, etc.) with corresponding maintenance log; and (2) environmentally-sensitive areas or areas that should otherwise be given special consideration when conducting routine operation and

[5] NYS Department of State, Division of Coastal Resources. "Harbor Management Planning." Last viewed 4/407 at http://nyswaterfronts.com/downloads/pdfs/hmpguide.pdf

maintenance activities (rivers and stream crossings, protected and unprotected wetlands, steep slope areas/gullies, near-shore areas, etc.);
- Maintenance log accompanying the facility map which identifies attributes such as: the date of facility installation; inspection and maintenance schedule; overall condition; and an anticipated date of replacement and/or priority replacement list; and
- A "wish list" specifying targeted locations for new facility installation or facility improvement. Such a list should generally not be constrained by local fiduciary limitations; rather, the list should be expansive in the event that support from an outside granting agency arises.

In addition, maintenance procedures pertaining to roadside ditches should be included and given particular emphasis. Roadside ditches provide a direct link between the land and area waterways. During storm and thaw periods, these appurtenances can contribute an immense amount of stormwater and associated runoff into area waterbodies. Ditch shape and design, cleaning procedures, materials and retrofitting approaches are among the subjects that should be covered. Specifically, ditch maintenance guidelines should address the following:

- Avoid performing ditch maintenance during excessively wet periods;
- Perform site stabilization immediately following cleaning, using straw bales, straw mulch, grass-seeding, hydromulch, and other erosion control and revegetation techniques as appropriate;
- Perform ditch retrofitting in steep slope areas or areas prone to erosion, taking ditch shape and contour into account; and
- Retrofits may include the installation of control measures such as check dams and riprap or vegetated swales, turnouts, wing ditches, and dips to disperse runoff and reduce road surface drainage from flowing directly into watercourses or other detention/retention areas.

Other BMPs in highway design and construction can be found in detail through the EPA publication "National Management Measures to Control Nonpoint Source Pollution from Hydromodification," available online at http://www.epa.gov/owow/nps/hydromod/index.htm.

Furthermore, local officials should take deliberate steps to ensure that highway staff is familiar with Stormwater Phase II Regulations and associated permits and procedures. Training is cited as an important component of the Town Streets and Sidewalks Code, §106-10.A in order to "encourage the utilization of innovative and cost-cutting procedures as well as more efficient highway maintenance and consolidation methods." Employee training should also encompass appropriate practices for stormwater control as part of a comprehensive local stormwater management program. Such training opportunities are available throughout the year in most parts of NYS and can often be done in cooperation with other municipalities.

Local officials and staff should familiarize themselves with key design and guidance documents, in particular, the New York State Stormwater Management Design Manual, which provides design guidance on the most effective stormwater management practices.[6]

[6] Available online at http://www.dec.state.ny.us/website/dow/toolbox/swmanual/

5.2.6 Onsite Wastewater Treatment Systems (OWTS)

In 1999, the Ontario County Planning Department drafted the Model Local Law for On-Site Individual Wastewater Treatment.[7] In the instance that failing OWTS are recognized as a significant concern within the Honeoye Lake Watershed municipalities, this model ordinance or portions thereof can provide an adequate means of addressing the proper operation, maintenance and inspection of such systems. The law recommends inspections of existing wastewater treatment systems to occur during the following instances: prior to a change of use; prior to conveyance of real property; and when the structure is to be expanded by an area greater than 50%. Each of these requirements may be incorporated into local law in order to ensure that systems are being maintained and functioning properly. Furthermore, local law may require new systems to be subjected to the oversight, examination, and site evaluations deemed necessary in order to ensure that systems are being designed and installed properly (as per Appendix 75-A of the NYS Public Health Law).

In order to guarantee that OWTS are operating properly, inspections of systems should occur on a cyclical basis, roughly every 3 to 5 years. An excellent example of manageable OWTS inspection procedures can be found in Cayuga County. The Sanitary Code of the Cayuga County Health District currently requires property owners within the Owasco Lake and Little Sodus Bay watersheds to have an inspection completed every 3 years; all other properties within the County are required to have inspections every 5 years (performed on a staggered rotational basis depending on location).[8]

Another important aspect of OWTS management is education and outreach. A variety of county and regional organizations conduct education and outreach programs in an attempt to target homeowners, contractors and developers regarding proper installation and maintenance of OWTS. Information pertaining to the basic operation of systems, how failing systems can harm local water resources, recommended frequency for pump-outs to occur, and water conservation are several issues that should be conveyed through education and outreach activities.

[7] Available online at http://www.co.ontario.ny.us/planning/septic.htm
[8] Available online at: http://www.co.cayuga.ny.us/wqma/projects/sanitarycode.pdf

5.3 Assessment of Local Laws and Practices[9]

5.3.1 Town of Bristol, NY • Ontario County

Local Laws Reviewed:

- *Town of Bristol Design Criteria and Construction Specifications* (date unknown)
- *Zoning Ordinance of the Town of Bristol* (September 2000)
- *Regulations for Minor Subdivision and Land Development,* Town of Bristol, NY (October 2003)
- *Regulations for Major Subdivision and Land Development,* Town of Bristol, NY (October 2003)
- *Town of Bristol On-Site Wastewater Treatment Law* (June 2003)
- *Local Timber Harvesting Law* (March 2005)

5.3.1.1 Development

While the array of laws and procedures detailed within the Town of Bristol's local laws are adequate to prevent significant impacts to local water resources stemming from erosion and sedimentation, they do not acknowledge recent changes in Federal and state laws with regard to Phase II Stormwater Regulations. An explanation of how to approach Phase II Stormwater Regulations can be found in Section 5.2 General Overview of Local Laws and Practices, above. A primary recommendation is to ensure that local law recognize and act in accordance with these regulations.

Section 1.6 of the Town of Bristol Construction Specifications for Land Development cites specific regulations for preventing siltation or erosion stemming from the development of property within the Town of Bristol. Specifically, the regulations apply to major and minor subdivisions and the construction of multiple dwellings (as cited under Article 15, §1 of the Town Zoning Ordinance). Section 2 of the Bristol Construction Specifications for Land Development goes on to detail further requirements with regard to sediment and dust control, as well as the proper installation of critical stormwater facilities (catch basins and storm drains).

Based on this assessment it is recommended that Town of Bristol officials review Section 1.6 of the Bristol Construction Specifications for Land Development and compare them against Section 2.2.1 [Contents of Stormwater Pollution Prevention Plans] of the Sample Local Law for Stormwater Management and Erosion and Sediment Control. Local officials should strive to establish local equivalency with the 16 components of Stormwater Pollution Prevention Plans listed therein.

5.3.1.2 Agriculture and Forestry

Local actions pertaining to agricultural operations depend entirely upon the degree to which such operations exist. If local farms are suspected of impacting water resources within the Honeoye Lake Watershed, Agricultural Environmental Management (AEM) 5 year strategic plans for those farms should be reviewed. Concerned parties should assess the degree to which individual farm plans are being

[9] Genesee/Finger Lakes Regional Planning Council maintains a Local Law Library which contains holdings of local laws provided at the discretion of member municipalities. The review of local laws took place in the fall of 2006, utilizing holdings that were present at that point in time. Municipalities within the Honeoye Lake Watershed were contacted prior to the review in an effort to attain any missing or updated laws or sections of code. The analysis herein utilized G/FLRPC's latest holdings as of that point in time.

created, whether the specific criteria within those plans are being met, and if that criteria is adequate to protect water resources. AEM is a voluntary program; it may therefore be necessary to determine the number of farms participating in the program that are within the watershed as compared to the total number of farms within the watershed. Ontario County SWCD is responsible for administering the AEM program for Ontario County farms.

The Local Timber Harvesting Law enacted by the Town of Bristol in 2005 addresses nearly every BMP listed on the environmental assessment form (the only exception being "Seasonal preferences [considered] for logging operations"). If consistently and properly enforced, this law should adequately serve the purpose of protecting local water resources within the Town from careless or aberrant logging operations. No further revisions are necessary or recommended.

5.3.1.3 Waterways and Wetlands

The local law assessment for the Town of Bristol did not identify any environmental BMPs specific to waterways and wetlands. While the Town's Design Criteria and Construction Specifications identifies the "preservation of natural watercourses and drainage channels" as a preferable practice, local laws do not specify further protection measures or practices for area waterways and wetlands.

If the protection of natural watercourses within the Town is to be guaranteed, local officials should consider more stringent language than what is currently in place under Section 1.5.1 of the Town's Design Criteria. Specifically, a law which pertains to the preservation of natural water courses should cover the following: (a) identification of the location of watercourses to be protected on an official map; and (b) establishment of specific measures to be followed regarding activities in such areas (such as appropriate building setbacks, vegetated buffers, etc.[10] Similar measures can also be taken for wetland areas that are not protected under Article 24 of the NYS Environmental Conservation Law, which protects wetland areas of 12.4 acres or more.

5.3.1.4 Marinas

The Town of Bristol does not have any shoreline area or navigable waterways that lie within the Honeoye Lake Watershed. This section of the local law assessment therefore does not apply to this study.

5.3.1.5 Highways

The local law assessment form addresses basic good housekeeping practices and procedures that pertain to activities typically conducted within most local highway departments. Questions addressed three primary areas of concern: right of way maintenance (road right of way and drainage facilities); construction of new facilities (any type of land disturbing activity); and general shop operation (staff training, record keeping, etc.).

Operations conducted by the Town of Bristol Highway Department primarily involve routine right-of-way maintenance and repair. Stormwater management facilities are very limited within the Town; the majority of such infrastructure is confined to roadside ditches and one stormwater detention pond (which is maintained by the department). Roadside ditches have been gradually retrofitted and stabilized with rip-rap in steep-slope areas; failing culverts are also upgraded over time as they are identified and as

[10] See USEPA webpage "Model Ordinances to Protect Local Resources, Aquatic Buffers." Last viewed online June 18, 2007 at http://www.epa.gov/owow/nps/ordinance/buffers.htm

resources allow. The department uses 100% salt for deicing, which – when applied sensibly and away from environmentally-sensitive areas – is considered to be less harmful to surface water than when mixed with sand or other fine material.[11] Superintendent David Parsons indicated that this is indeed the case – salt is used sparingly whenever feasible and is rarely used along gravel roads (which provide adequate traction without salt when plowed). Salt supplies are also stored within a salt shed, preventing loss and runoff.

Basic BMPs were found to be in place with regard to erosion and sediment control, although the department does not typically disturb large areas of land while performing routine operations. Furthermore, the majority of routine highway right-of-way maintenance activities are generally exempt from Stormwater Phase II Regulations.[12] BMPs such as site stabilization and seeding of disturbed areas were identified as routine practices that are conducted after various land disturbance activities take place (ditch cleaning/grading, for example).

5.3.1.6 Onsite Wastewater Treatment Systems (OWTS)

The local law assessment form puts forth seven environmental BMPs that pertain to onsite wastewater treatment systems (OWTS). The two most important BMPs are 6-01 and 6-05 which pertain to system inspection. The Town of Bristol Onsite Wastewater Treatment Law includes a provision which nearly satisfies the language of BMP 6-05. §501 of the code explains the circumstances under which OWTS inspections are warranted – (1) prior to change of use; and (2) [building] expansion greater than 50%. While these are important and valuable provisions to have included in local law, they nonetheless fall short of fully meeting the BMP 6-05 as it is written ("inspection of all OWTS at property transfer or within one year prior to transfer").

A comprehensive septic system ordinance should require owners of OWTS to have their systems inspected and pumped at a rate that will allow the discovery of a failure within a reasonable period of time (i.e. every 3-5 years, depending on use and location).

5.3.2 Town of Canadice, NY • Ontario County

Local Laws Reviewed:

- *Town of Canadice Code* (1996) With specific emphasis on the following chapters:
  - *Chapter 48: Boats and Boating; Chapter 67: Flood Damage Prevention; Chapter 73: Junk Yards; Chapter 77: Land Use; Chapter 81: Mobile Homes; Chapter 92: Sewers; Chapter 95 Site Plan Review; Chapter 103: Solid Waste; Chapter 106: Streets and Sidewalks; Chapter 108: Subdivision of Land*
- *Town of Canadice Comprehensive Plan, Revision B* (1999)

[11] EPA Factsheet. "What You Should Know about Safe Winter Roads and the Environment." Sept. 2005. Last viewed online 4/02/07 at: http://www.epa.gov/region1/topics/water/pdfs/winterfacts.pdf

[12] Operators are strongly urged to contact their regional DEC office to confirm whether specific activities are exempt from review under Stormwater Phase II laws.

5.3.2.1 Development

Regulations stipulated under Chapter 95: Site Plan Review are comprehensive in scope with regard to the protection of environmentally sensitive areas, drainage, erosion, and sediment control. Site plan review is required for a wide variety of purposes, including: changes of use and structure of buildings; changes within commercial or industrial zones; change in the use of the land; filling or excavations; home occupations; and several other activities. Development, therefore, is clearly subject to stringent local oversight.

With specific regard to erosion and sediment control, Chapter 95 covers many similar items that are required within a Stormwater Pollution Prevention Plan (SWPPP), as required under the General Permit for Construction Activities (GP-02-01). This indicates a high level of reliability and thoroughness. Based on this assessment, however, it is recommended that local officials review Chapter 95 and compare it against Section 2.2.1 [Contents of Stormwater Pollution Prevention Plans] of the Sample Local Law. Local law should strive for equivalency with the 16 components of Stormwater Pollution Prevention Plans listed therein. Furthermore, local law should acknowledge recent changes in Federal and state laws with regard to Phase II Stormwater Regulations in an effort to promote statewide consistency. (Further information on Stormwater Phase II detailed in Section 5.2 General Overview of Local Laws and Practices, above.)

5.3.2.2 Agriculture and Forestry

Considerations for timber harvesting practices are contained within Chapter 95: Site Plan Review (§95-19L). The Site Plan Review process applies to individuals harvesting more than 10,000 board feet, 25 standard cords or the equivalent thereof. Written statements must be submitted by the harvester to the Planning Board with statements which illustrate professional approval from a professional forester. Review of the required information listed in §95-19L(2) covered nearly all BMPs found in the local law assessment form.

While the local law provides adequate protection from erosion and sedimentation when properly enforced, it is recommended that officials consider revising the local law in order to achieve a level of consistency with other municipalities within the Honeoye Lake Watershed. Centralized enforcement and adequate training for enforcement officials are also central components to effective.

5.3.2.3 Waterways and Wetlands

§95-19B of the Canadice Town Code addresses environmentally-sensitive areas, including wetlands, floodplains, watercourses, woodlands and other unique features. No regulations specific to the operation and maintenance of modified waterways were present. §95-19B(3) does provide basic oversight and review for development activities in and around watercourses (lakes, ponds, or streams). Based on this assessment, it is recommended that local officials consider further defining exactly what water bodies are subject to review under this section through written definition and/or an official map (intermittent watercourses or those which otherwise are not watered year-round may come into question).

§95-19B(1) of the code addresses wetlands in particular, citing review requirements for development activities on wetland areas identified on NYSDEC wetlands maps or within 200 feet of an identified wetland area. §24-0701.2 of the NYS Environmental Conservation Law regulations (Freshwater

Wetlands) apply to activities within *100 feet* of such areas; the local law is therefore more stringent than the state regulations.
Local officials may want to further consider evaluating the need for including mandatory setbacks of structures from stream banks and shorelines in order to minimize disturbance of land within such areas.

5.3.2.4 Marinas

No environmental BMPs specific to marinas (sometimes referred to as "dockings and moorings") were found within Canadice Town Code. §48 of the local code entitled "Boats and Boating" lists several restrictions pertaining to the operation of vessels; these restrictions are primarily intended to ensure public safety, however, and do not apply to water quality issues.

5.3.2.5 Highways

The local law assessment form addresses basic good housekeeping practices and procedures that pertain to activities typically conducted within most local highway departments. Questions addressed three primary areas of concern: right of way maintenance (road right of way and drainage facilities); construction of new facilities (any type of land disturbing activity); and general shop operation (staff training, record keeping, etc.). Conversation with the Town of Canadice's Highway Superintendent indicated that due diligence was being practices with regard to basic BMP implementation in the field.

While highway departments within most municipalities typically practice basic best management practices on an unofficial, voluntary basis, it is rare to see specific practices and procedures written directly into local code. The Town of Canadice Code (§106, "Streets and Sidewalks") presents a clear framework for addressing a variety of best management practices that pertain to highway maintenance. This section of the Code can be used as a valuable model for neighboring municipalities in the watershed as well as for rural towns throughout the region, as it sets clear priorities and expectations regarding the local roads and facilities therein.

The code contains directives and procedures that guide conscientious and consistent maintenance of local facilities. Guidelines are included for surface and roadside facilities such as bridges, drainage, road repair, and slopes. Several aspects of these guidelines appear to have erosion and sedimentation prevention specifically in mind. Given the town's rural nature, a distinction is made between low-volume roads and those that otherwise receive moderate or high traffic volumes. Article III of §106 states that a major reason for setting such standards is to decrease overall costs by reducing unnecessary maintenance on low-volume roads. Roads designated as "low-volume" are posted with signs intended to advise motorists of the need to exercise due diligence when traveling on such roads.

This feature of local law is generally unique to the region and worthy of mention for several reasons. Codifying highway maintenance procedures adds a degree of transparency to the operation and management of public assets, which lends significant credence to the department and the Town as a whole. Furthermore, these specific procedures have the *potential* to work in conjunction with environmental best management practices (although it is important to note that this is not the intent of this section of code). Low-volume roads can have the potential to have a low-impact on local water resources. The recommended reduction of salt and sand usage and implied decrease in impervious surface area can have a positive impact on local water resources if done in accordance with other basic roadside provisions (such as check dams, vegetative swales, or other types of low-maintenance

stormwater structures). Interpretative signage can also be designed to accompany low-volume road signs that are already in place, thereby acting as an information tool, notifying the public of the benefits of such areas.

5.3.2.6 Onsite Wastewater Treatment Systems (OWTS)

Adequate local provisions regarding the installation and inspection of onsite wastewater treatment systems can be found in §92 of Canadice Town Code. This section of the Code states that systems located on difficult sites must incorporate "current technology or design methods" in order to ensure the proper operation and functioning of the system. While §92-3F clearly states that systems must be maintained in "good working order," no specific inspection schedule is included within the code; rather, properties are subject to inspection due to either a change in use or building expansion. The Code further provides the Town with the discretion to require the property owner to retain the services of a design professional when deemed necessary, to retain the services of the Ontario County SWCD for application of the Uniform Inspection Procedures Program, and to allow property access for inspection as deemed necessary.[13] Each of these provisions is indicative of a conscientious effort to reduce the impacts of failing onsite wastewater treatment systems.

Based on this assessment, however, it is recommended that §92 of Canadice Town Code be amended to allow for system inspection on a more routine basis, preferably either at the time of property transfer or at regular intervals (approximately every 3-5 years).

5.3.3 Town of Naples, NY • Ontario County

Local Laws Reviewed:

- *Zoning, Chapter 132*
- *Subdivision of Land, Chapter 116*
- *Town of Naples Master Plan 2002-2007*

5.3.3.1 Development

Chapters 116 (Subdivision of Land) and 132 (Zoning) of the Town of Naples Code cover a wide variety of activities related to new and existing development which, when taken together and properly enforced, should provide adequate protection to local water resources.

Several important best management practices are contained within the local Subdivision Regulations. Article IV ("Development Standards for Subdivisions"), §116-21 E ("Preservation of natural features") provides strong assurance that features such as mature trees, lakes, ponds, streams, watercourse boundaries and other "unique physical features" will be maintained to the greatest degree practicable when new development occurs. Similar provisions are contained within the Zoning Code under Article IV ("Provisions Applicable to All Districts"), §132-15 ("Preservation of natural features"). Furthermore, §132-16 (Regulations applicable to all districts") of the Zoning Code includes specific restrictions on activities in steep-slope areas within the Town. Article VI ("Supplementary Regulations"), §132-30

[13] For more information on the Ontario County Uniform Inspection Procedures Program, visit the Ontario County Planning Department's "Uniform Septic System Law" page at http://www.co.ontario.ny.us/planning/septic.htm

("Steep slopes") of Zoning reinforces these restrictions with added provisions for any application for construction, excavation or other development on slopes which exceed 15 degrees.

Article VI ("Specifications for Sketch Plans"), §116-40 A(1) ("Final plat specifications for major subdivisions") of the Subdivision Code requires the submission of construction detail sheets for subdivisions "of four lots or less…". §116-41 ("Construction detail sheets"), Part E of the Subdivision Regulations addresses plans to be submitted by the developer for addressing erosion and sediment control. While this section of local law contains adequate procedures regarding erosion and sediment control, the section falls short of addressing Phase II Stormwater Regulations. Furthermore, the document referenced in Article VI, §116-41.E(j) ("New York Guidelines for Urban Sediment and Erosion Control") of the Zoning Code has been updated and renamed the "New York State Standards and Specifications for Erosion and Sediment Control." This should therefore be amended and updated in order to avoid confusion.

Based on this assessment, it is recommended that local officials review Subdivision Regulations and compare them against Section 2.2.1 [Contents of Stormwater Pollution Prevention Plans] of the Sample Local Law. Local law should strive for equivalency with the 16 components of Stormwater Pollution Prevention Plans listed therein. Furthermore, local law should acknowledge recent changes in Federal and state laws with regard to Phase II Stormwater Regulations in an effort to promote statewide consistency. (Further information on Stormwater Phase II detailed in Section 5.2 General Overview of Local Laws and Practices, above.)

5.3.3.2 Agriculture and Forestry

Only one best management practices specific to Agriculture and Forestry was identified through the local law and practices assessment (BMP 2-11: Use Agricultural Environmental Management).

5.3.3.3 Waterways and Wetlands

Town of Naples Code contains several provisions that directly protect local waterways. Town Subdivision Code, Article IV ("Development Standards for Subdivisions"), §116-20.D states that "The preservation of natural watercourses is preferable to the construction of drainage channels, and wherever practicable such natural watercourses should be preserved." Town Zoning Code, Article IV ("Provisions Applicable to All Districts"), §132-15 ("Preservation of Natural Features") disallows structures to be built within 100 feet from the center of the bed of a stream carrying water on average of six months of the year. This mandatory setback rule is a basic provision that can provide several benefits when properly enforced, including protection from flooding, the preservation of the aesthetic value of property, reduction in runoff, and general stream bank protection.

Based on this assessment, it is recommended that detail is added to §116, Article IV of the Town Subdivision Code and §132, Article IV of the Town Zoning Code identifying the location and name (if available) of specific watercourses that are to be protected. This can be accomplished through updating or amending the Official Map for the Town of Naples and providing a reference to the map within the sections of local law cited above.

5.3.3.4 Marinas

The Town of Naples does not have any shoreline area or navigable waterways that lie within the Honeoye Lake Watershed. This section of the local law assessment therefore does not apply to this study.

5.3.3.5 Highways

The local law assessment form addresses basic good housekeeping practices and procedures that pertain to activities typically conducted within most local highway departments. Questions addressed three primary areas of concern: right of way maintenance (road right of way and drainage facilities); construction of new facilities (any type of land disturbing activity); and general shop operation (staff training, record keeping, etc.).

Operations conducted by the Town of Naples Highway Department primarily involve routine right-of-way maintenance and repair. Stormwater management facilities are very limited within the Town; inspection of such facilities occurs on an annual basis. Roadside ditches have been gradually retrofitted and stabilized with rip-rap in steep-slope areas; failing culverts are also upgraded over time as they are identified and as resources allow.

Basic BMPs were found to be in place with regard to erosion and sediment control, although the department does not typically disturb large areas of land while performing routine operations. Furthermore, the majority of routine highway right-of-way maintenance activities are generally exempt from Stormwater Phase II Regulations.[14] Vegetation is generally maintained on steep slopes and within swale areas; temporary vegetation, mulching and hydroseeding is employed by the department when large ground disturbances occur.

5.3.3.6 Onsite Wastewater Treatment Systems (OWTS)

No specific onsite wastewater treatment system BMPs were found to be in place within the Town of Naples. Based on this assessment, it is recommended that local officials consider adopting all or portions of the Ontario County Model Local Law for On-Site Individual Wastewater Treatment.

5.3.4 Town of Richmond, NY • Ontario County

Local Laws Reviewed:

- *Subdivision Regulations (1990)*
- *Code of the Town of Richmond, Chapter 200, Zoning (2006)*
- *Comprehensive Plan (2004)*
- *Design Criteria & Construction Specs. For Land Development in the Town of Richmond*

5.3.4.1 Development

Three specific components of local law within the Town of Richmond cover activities related to development: Zoning, Subdivision and local Design Criteria and Construction Specifications for Land Development in the Town of Richmond.

[14] Operators are strongly urged to contact their regional DEC office to confirm whether specific activities are exempt from review under Stormwater Phase II laws.

Sections of the Town's Subdivision Rules and Regulations (see Article VII §1B ("Development Standards for Subdivisions, Treatment of Unique Features" and §2E ("Preservation of Natural Features")) are specific requirements intended to retain the natural and scenic beauty of new developments within the town. These sections of law, when properly enforced, ensure that features such as mature trees, lakes, ponds, streams, watercourse boundaries and other "unique physical features" will be maintained to the greatest degree practicable when new development occurs. These sections further require developers to retain, redistribute, and stabilize existing soils within a reasonable period of time (6 months), providing some assurance that erosion and sedimentation will be minimized.

§200-35 of the Zoning Code contains similar provisions intended to preserve natural features, including restrictions disallowing the construction of structures within 50 feet of the bed of a stream which carries water an average of six months. While stream setbacks are an important component of preserving aesthetic characteristics and protecting local water resources, a distance of 50 feet may prove to be inadequate in this regard. Future revision to a minimum distance of 100 feet may therefore be warranted. Furthermore, explicit specification of what streams fall under this regulation is recommended. Protected streams should be identified on the town's Official Map and by name (when applicable).

Specific controls to development and construction practices are contained within the Town's Design Criteria and Construction Specifications for Land Development.[15] Section I.6.1 entitled "Erosion Control" explains the intended erosion and sediment control design practices that are to be submitted with final subdivision plans (and to be put into place by the developer upon commencement of construction). Among the procedures that may be requested of the developer include the installation of sediment basins, minimal exposure of land, temporary vegetation and/or mulching on exposed areas, retaining natural vegetation when possible, and the installation of other protective measures as is determined necessary by either the Municipal Engineer or the Planning Board. Furthermore, it is clearly stated that the municipality "reserves the right to establish other more restrictive parameters" as deemed necessary and that stormwater discharge rates shall not exceed those which exist under natural conditions.

Section II of the Construction Specifications pertains to actual construction activities. Section II.9 ("Sediment and Dust Control") details the construction of facilities, intended objectives of those facilities, the conditions under which such facilities should need to be improved due to poor performance, and when they can be terminated. Dust and mud control are included among these objectives, and the document text clearly states the intention of the requirements and the responsible parties. Together, along with supporting text in the Subdivision Rules and Regulations, strong rules of enforcing adequate erosion and sediment control measures are in place.

Based on this assessment, it is recommended that local officials review erosion and sediment control procedures that are currently in place against Section 2.2.1 [Contents of Stormwater Pollution Prevention Plans] of the Sample Local Law. Local law should strive for equivalency with the 16 components of Stormwater Pollution Prevention Plans listed therein. Furthermore, local law should acknowledge recent changes in Federal and state laws with regard to Phase II Stormwater Regulations in an effort to promote statewide consistency. (Further information on Stormwater Phase II detailed in Section 5.2 General Overview of Local Laws and Practices, above.)

[15] Town of Richmond *Design Criteria and Construction Specifications for Land Development. §I.8.3.*

Basic BMPs were found to be in place with regard to erosion and sediment control, although the department does not typically disturb large areas of land while performing routine operations. Furthermore, the majority of routine highway right-of-way maintenance activities are generally exempt from Stormwater Phase II Regulations.[16] Erosion and sediment control practices are not typically conducted by the department when disturbing small areas of land.

5.3.4.2 Agriculture and Forestry

Only one best management practices specific to Agriculture and Forestry was identified through the local law and practices assessment (BMP 2-11: Use Agricultural Environmental Management).

Special use requirements within the Zoning Law (§200-46.B(3)) pertaining to logging and sawmills requires applicants to include "Provisions for the restoration of the property including how all waste materials will be disposed of during and after the operation has ceased and removal of the equipment." While this statement provides the Town with some protection regarding site restoration, determining exactly what constitutes adequate restoration is up to the discretion of the Code Enforcement Officer after authorization by the Zoning Board of Appeals and formal site plan approval.

5.3.4.3 Waterways and Wetlands

With regard to waterways, both Town Zoning and Subdivision Rules and Regulations address the preservation of natural features, which includes maintaining the integrity or natural condition of streams, brooks, drainage channels and views. Specifically, §200-35.A of the Zoning Code states that no structure shall be placed within 50 feet of the bed of a stream that carries water an average of 6 months per year. While stream setbacks are an important component of preserving aesthetic characteristics and protecting local water resources, a distance of 50 feet may prove to be inadequate in this regard. Future revision to a minimum distance of 100 feet may therefore be warranted. Streams intended to be protected should be indicated on the town's Official Map and/or in writing, specifying name and location.

Furthermore, Article VII, §2F(3) of the Subdivision Rules and Regulations stipulates that:

> …Particular attention shall be paid to development in the vicinity of Honeoye Creek and its flood plain, and no alteration of the existing characteristics of the areas shall take place without the specific approval of the Town as to the adequacy of the protective measures taken, if any, and the effects of such development on upstream and downstream reaches of the watercourse and adjacent properties...

These specific rules can provide several benefits when properly enforced, including protection from flooding, the preservation of the aesthetic value of property, reduction in runoff, and general stream bank protection.

5.3.4.4 Marinas

Several BMPs specific to marinas (sometimes referred to as "dockings and moorings") were found within Richmond Town Code under Article VI of the Zoning Code pertaining to Special Use Permits for marinas. This section of code simply states that any applicant seeking to obtain a permit for a marina

[16] Operators are strongly urged to contact their regional DEC office to confirm whether specific activities are exempt from review under Stormwater Phase II laws.

must first obtain any required permits from the associated state agency responsible for oversight of specified facilities (such as fueling stations, docks, or retaining walls). This section of code provides the Town with minimal assurance that marinas will be operating in accordance with state laws. It does not, however, provide complete assurance that hazardous facilities or activities taking place as a result of those facilities will be maintained over time, installed properly, or operated in a safe manner.

5.3.4.5 Highways

The local law assessment form addresses basic good housekeeping practices and procedures that pertain to activities typically conducted within most local highway departments. Questions addressed three primary areas of concern: right of way maintenance (road right of way and drainage facilities); construction of new facilities (any type of land disturbing activity); and general shop operation (staff training, record keeping, etc.). Conversation with the Town of Richmond's Highway Superintendent indicated that due diligence was being practiced with regard to basic BMP implementation in the field.

Operations conducted by the Town of Richmond Highway Department primarily involve routine right-of-way maintenance and repair. Stormwater management facilities are very limited within the town; currently the town has one detention pond, which is maintained by the highway department. Such facilities are likely to continue to be installed within Richmond with oversight from the highway department and assistance from the SWCD as necessary. Erosion-prone areas, such as steep roadside ditches and gullies, have been gradually addressed as resources have allowed. General practices in this regard involve the use of geo-fabrics with rip-rap; culverts have also been upgraded after significant failures have occurred (East Lake Road, for example). Other culverts that have questionable performance are known by the department and are targeted for upgrades – once again, as resources allow.

5.3.4.6 Onsite Wastewater Treatment Systems (OWTS)

BMP 6-06 ("Require all properties within 500' of municipal service to connect") was clearly stated within several sections of local law (Subdivision, Article VIII §1 Streets, F and G; Subdivision, Article VI §2 Preliminary Plat [requirements] E; and Construction Specs for Land Development, Sanitary Sewage Facilities I.11.1). Furthermore, local law requires percolation tests to be performed in order to determine the adequacy of local soils to perform properly if an OWTS is installed. No other BMPs specific to OWTS were identified within the Town of Richmond.

Based on this assessment, it is recommended that local officials consider adopting all or portions of the Ontario County Model Local Law for On-Site Individual Wastewater Treatment. Provisions to allow for routine inspection of onsite wastewater treatment systems should be included within local code, such as at time of property transfer or at specified increments (every 3 or 5 years, for example).

5.3.5 Town of South Bristol, NY • Ontario County

Local Laws Reviewed:

- *Town of South Bristol Comprehensive Plan*
- *Chapter 149, Subdivision of Land*
- *Chapter 170 Zoning*

5.3.5.1 Development

Town of South Bristol local law contains several components designed to maintain the natural integrity of natural features. Article VI ("Supplementary District Regulations") §170-63 ("Preservation of natural features") of the Zoning Code specifies that no structure shall be constructed within 50 feet of the bed of a stream carrying water an average of six months. This section of code also states that "Existing natural features, such as trees, brooks, drainage channels and views, shall be maintained" to the greatest degree practicable. Local Subdivision regulations contain similar provisions under Article 1, §§149-6 and 149-27-E. Furthermore, §§149-27-E(1) and (2) state that topsoil must be redistributed within the disturbed area within a reasonable period of time and, to the fullest extent possible, existing trees and shrubs must be preserved.

These regulations represent the most basic forms of protection that a municipality should enact in order to protect the health and maintain general welfare of the community. While stream setbacks are an important component of preserving aesthetic characteristics and protecting local water resources, a distance of 50 feet may prove to be inadequate in this regard. Future revision to a minimum distance of 100 feet may therefore be warranted. Furthermore, explicit specification of what streams fall under this regulation is recommended. Protected streams should be identified on the town's Official Map and by name (when applicable).

Based on this assessment, it is recommended that local officials review erosion and sediment control procedures that are currently in place Article 1, §§149-6 and 149-27-E of the Subdivision Law against Section 2.2.1 [Contents of Stormwater Pollution Prevention Plans] of the Sample Local Law. Local law should strive for equivalency with the 16 components of Stormwater Pollution Prevention Plans listed therein. Furthermore, local law should acknowledge recent changes in Federal and state laws with regard to Phase II Stormwater Regulations in an effort to promote statewide consistency. (Further information on Stormwater Phase II detailed in Section 5.2 General Overview of Local Laws and Practices, above.)

5.3.5.2 Agriculture and Forestry

Only one best management practice specific to Agriculture and Forestry was identified through the local law and practices assessment (BMP 2-11: Use Agricultural Environmental Management).

5.3.5.3 Waterways and Wetlands

As stated in Section 5.3.5.1 Development, above, Town of South Bristol local law contains several components designed to maintain the integrity of natural features, which in this case includes streams, brooks, and other drainage channels. Article VI ("Supplementary District Regulations") §170-63 ("Preservation of natural features") specifies that no structure shall be constructed within 50 feet of the bed of a stream carrying water an average of six months. This mandatory setback rule is a basic provision that can provide several benefits when properly enforced, including protection from flooding, the preservation of the aesthetic value of property, reduction in runoff, and general stream bank protection. In the event of future local law revision, local officials may want to consider expanding this minimum setback distance, perhaps only in identified environmentally-sensitive, pristine, or otherwise aesthetically pleasing areas. Furthermore, explicit specification of what streams fall under this regulation is strongly recommended. Protected streams should be identified on the town's Official Map and by name (when applicable).

5.3.5.4 Marinas

The Town of South Bristol does not have any shoreline area or navigable waterways that lie within the Honeoye Lake Watershed. This section of the local law assessment therefore does not apply to this study.

5.3.5.5 Highways

The local law assessment form addresses basic good housekeeping practices and procedures that pertain to activities typically conducted within most local highway departments. Questions addressed three primary areas of concern: right of way maintenance (road right of way and drainage facilities); construction of new facilities (any type of land disturbing activity); and general shop operation (staff training, record keeping, etc.). Correspondence with the Town of South Bristol's Highway Superintendent provided some indication that due diligence was being practiced with regard to basic BMP implementation in the field.

Operations conducted by the Town of South Bristol Highway Department primarily involve routine right-of-way maintenance and repair. Stormwater management facilities are very limited within the town; identifying and eliminating erosion problem areas within the town is not a specific priority of the department. Erosion and sediment control plans are devised when necessary with oversight and assistance from the SWCD as necessary.

5.3.5.6 Onsite Wastewater Treatment Systems (OWTS)

BMP 6-06 ("Require all properties within 500' of municipal service to connect") was clearly stated within local law. No other BMPs specific OWTS were identified within the Town of South Bristol.

Based on this assessment, it is recommended that local officials consider adopting all or portions of the Ontario County Model Local Law for On-Site Individual Wastewater Treatment. Provisions to allow for routine inspection of onsite wastewater treatment systems should be included within local code, such as at time of property transfer or at specified increments (every 3 or 5 years, for example).

5.3.6 Town of Springwater, NY • Livingston County

Local Laws Reviewed:

- *No local laws found to be in effect*

With the exception of basic uniform practices covered by regional entities (including the County Soil and Water Conservation District, County Department of Health, Finger Lakes/Lake Ontario Watershed Protection Alliance, and Cornell Cooperative Extension, and G/FLRPC) there were no local laws found to be in place within the Town of Springwater which would have a beneficial or protective effect on local water resources.

6. PROTECTION AND MANAGEMENT RECOMMENDATIONS

Protection and management recommendations focus on measures that stakeholders of the tributaries can implement to aid in reducing pollutant loads into Honeoye Lake. These recommendations include proactive measures that can be undertaken by community members, 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.

The protection and management recommendations described in the following section are organized as follows:

1. **Habitat Protection and Management Recommendations,** including wetland restoration and riparian zone management;
2. **Educational and Outreach Recommendations,** including community outreach materials, homeowner stewardship programs, municipal employee educational programs, and school educational programs;
3. **Point and Nonpoint Source Management and Pollution Control Recommendations,** including water quality sampling and monitoring programs, structural control actions, and non-structural actions; and,
4. **Local Laws and Practices Recommendations,** including the enforcement of laws and practices to reduce impacts on the watershed and the update of laws and practices related to watershed quality to reflect the current Best Management Practices (BMPs).

Prioritization of pollution prevention actions 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: excessive macrophytes and algae blooms. Not only is Honeoye Lake listed on the NYSDEC Priority Waterbody List as "impaired" due to water supply concerns relating to nutrients, but these problems were also expressed by lake users in previous public opinion surveys. Since nutrient enrichment is highly correlated with erosion of soil particles into the lake, many of the action items ranked as "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 and as funding allows. The ranking of "medium" priority is assigned to those action items which—although important—are not as vital as the high priority action items and therefore may not be completed for several years. "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 Lake Watershed such as mines, landfills, bulk storage facilities, spills, and agriculture.

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

6.2 Education and Outreach Recommendations

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 the lake and perform survey of resident practices. Provide & promote use of zero phosphorus fertilizer.	High	Cornell Cooperative Extension (CCE) and lawn care professionals may be willing to assist in this program.	$1,000	Grants, CCE	HVA, CCE, OCSWCD

Pollution Prevention Actions	Priority	Feasibility	Estimated Cost ($)	Source of Funds	Responsible Agency
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

The 14 pollution sources have been prioritized according to their placement in the document, from the most to the least serious. Within each of the 14 categories, the action items to remedy and avoid each pollution source have been placed in an order of overall efficacy, generally without regard to cost.

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
20. Investigate effect of zebra mussels and other invasive species on nutrient loading.	Long Term	Technical expertise required.	$1,000	HLWTF	HLWTF

Pollution Prevention Actions	Priority	Feasibility	Estimated Cost ($)	Source of Funds	Responsible Agency
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
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

Pollution Prevention Actions	Priority	Feasibility	Estimated Cost ($)	Source of Funds	Responsible Agency
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

Pollution Prevention Actions	Priority	Feasibility	Estimated Cost ($)	Source of Funds	Responsible Agency
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

Pollution Prevention Actions	Priority	Feasibility	Estimated Cost ($)	Source of Funds	Responsible Agency
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

Pollution Prevention Actions	Priority	Feasibility	Estimated Cost ($)	Source of Funds	Responsible Agency
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

Pollution Prevention Actions	Priority	Feasibility	Estimated Cost ($)	Source of Funds	Responsible Agency
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

Pollution Prevention Actions	Priority	Feasibility	Estimated Cost ($)	Source of Funds	Responsible Agency
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

Appendix L: Action Items provides the above cited action items grouped by priority: high, medium, and long term.

6.4 Local Laws and Practices Recommendations

6.4.1 Town of Bristol, NY • Ontario County

6.4.1.1 Development

1. Recognition of Stormwater Phase II Regulations directly in local law language.
2. Review Section 1.6 of the Construction Specifications for Land Development and compare against Section 2.2.1 [Contents of Stormwater Pollution Prevention Plans] of the Sample Local Law for Stormwater Management and Erosion and Sediment Control. Local law should strive for equivalency with the 16 components of Stormwater Pollution Prevention Plans listed therein.
3. Ensure adequate and comprehensive training for all pertinent local officials (CEO, Planning Board, Zoning Board) in the areas of sediment control, general pollution prevention, and comprehensive environmental planning techniques and procedures.

6.4.1.2 Agriculture and Forestry

Agriculture

No specific recommendations particular to the municipality beyond the encouragement of Agricultural Environmental Management.

Forestry

1. Ensure adequate training for CEO and other staff in charge of enforcing the local Timber Harvesting Law and/or monitoring local timer harvesting operations.
2. All towns within the watershed should strive for consistent Timber Harvesting Laws and centralized enforcement.

6.4.1.3 Waterways and Wetlands

1. Consider local legislation that provides adequate protection to watercourses within the town. Priority should be given to those streams that remain in a pristine or in an otherwise natural state. Any local law should include the following components: (a) the identification of the location of watercourses to be protected on an official map; and (b) establishment of specific measures to be followed regarding activities in such areas (such as appropriate building setbacks, vegetated buffers, etc.[17] Similar measures can also be taken for wetland areas that are not protected under Article 24 of the NYS Environmental Conservation Law, which protects wetland areas of 12.4 acres or more.
2. Further consideration of legislation to protect other environmentally-sensitive areas should be considered. Vernal pools, wetlands less than 12.4 acres, steep slopes, or ridgelines are among such areas that may be considered.

6.4.1.4 Marinas

Not applicable

6.4.1.5 Highways

1. Consider local code amendments which contain specific directives and procedures to guide conscientious and consistent maintenance of public lands and local highway/pedestrian facilities. Guidelines to consider include those for surface and roadside facilities such as bridges, drainage, road repair, slopes and erosion and sedimentation prevention.
2. Consider the development of a written inspection and maintenance plan intended for use by highway department employees for the efficient management and maintenance of highway- and pedestrian-related facilities. Specific details on plan components may be found in 5.2 General Overview of Local Laws of this report.

6.4.1.6 Onsite Wastewater Treatment Systems

1. Current local law should be amended in order to mandate inspections of onsite wastewater treatment systems at the time of property transfer.
2. If local resources allow, Honeoye Lake Watershed municipalities should consider regular inspection cycles for onsite wastewater treatment systems (i.e. every 3-5 years, depending on use and location).

6.4.2 Town of Canadice, NY • Ontario County

6.4.2.1 Development

1. Recognition of Stormwater Phase II Regulations directly in local law language
2. Review Chapter 95 of the Town of Canadice Code and compare it against Section 2.2.1 [Contents of Stormwater Pollution Prevention Plans] of the Sample Local Law. Local law should strive for equivalency with the 16 components of Stormwater Pollution Prevention Plans listed therein.

[17] See USEPA webpage "Model Ordinances to Protect Local Resources, Aquatic Buffers." Last viewed online June 18, 2007 at http://www.epa.gov/owow/nps/ordinance/buffers.htm

3. Ensure adequate and comprehensive training for all pertinent local officials (CEO, Planning Board, Zoning Board) in the areas of sediment control, general pollution prevention, and comprehensive environmental planning techniques and procedures.

6.4.2.2 Agriculture and Forestry

Agriculture

No specific recommendations particular to the municipality beyond the encouragement of Agricultural Environmental Management.

Forestry

1. Ensure adequate training for CEO and other staff in charge of enforcing the local Timber Harvesting Law and/or monitoring local timer harvesting operations.
2. All towns within the watershed should strive for consistent Timber Harvesting Laws and centralized enforcement.

6.4.2.3 Waterways and Wetlands

1. Regarding the definition in §95-19B of the Canadice Town Code of water bodies subject to review, consider revision that would include further written definition and/or an official map of watercourses to be protected (intermittent watercourses or those which otherwise are not watered year-round may come into question).
2. Further consideration of legislation to protect other environmentally-sensitive areas should be considered. Vernal pools, wetlands less than 12.4 acres, steep slopes, or ridgelines are among such areas that may be considered.

6.4.2.4 Marinas

1. Future consideration of the development of a Harbor Master Plan in cooperation with the Town of Richmond

6.4.2.5 Highways

1. Consider further development of a written inspection and maintenance plan intended for use by highway department employees for the efficient management and maintenance of highway-and pedestrian-related facilities. Specific details on plan components may be found in 5.2 General Overview of Local Laws of this report.

6.4.2.6 Onsite Wastewater Treatment Systems

1. Current local law should be amended in order to mandate inspections of onsite wastewater treatment systems at the time of property transfer.
2. If local resources allow, Honeoye Lake Watershed municipalities should consider regular inspection cycles for onsite wastewater treatment systems (i.e. every 3-5 years, depending on use and proximity to waterbodies).

6.4.3 Town of Naples, NY • Ontario County

6.4.3.1 Development

1. Recognition of Stormwater Phase II Regulations directly in local law language

2. Review Subdivision Regulations for the Town of Naples and compare them against Section 2.2.1 [Contents of Stormwater Pollution Prevention Plans] of the Sample Local Law. Local law should strive for equivalency with the 16 components of Stormwater Pollution Prevention Plans listed therein.
3. Ensure adequate and comprehensive training for all pertinent local officials (CEO, Planning Board, Zoning Board) in the areas of sediment control, general pollution prevention, and comprehensive environmental planning techniques and procedures.

6.4.3.2 Agriculture and Forestry

Agriculture

No specific recommendations particular to the municipality beyond the encouragement of Agricultural Environmental Management.

Forestry

1. Ensure adequate training for CEO and other staff in charge of enforcing the local Timber Harvesting Law and/or monitoring local timer harvesting operations.
2. All towns within the watershed should strive for consistent Timber Harvesting Laws and centralized enforcement.

6.4.3.3 Waterways and Wetlands

1. Consider revision of zoning and subdivision laws that would include further written definition and/or an official map of watercourses that are to be protected (intermittent watercourses or those which may not be watered year-round or which are not identified on an official map may come into question).
2. Further consideration of legislation to protect other environmentally-sensitive areas should be considered. Vernal pools, wetlands less than 12.4 acres, steep slopes, or ridgelines are among such areas that may be considered.

6.4.3.4 Marinas

Not applicable

6.4.3.5 Highways

1. Consider local code amendments which contain specific directives and procedures to guide conscientious and consistent maintenance of public lands and local highway/pedestrian facilities. Guidelines to consider include those for surface and roadside facilities such as bridges, drainage, road repair, slopes and erosion and sedimentation prevention.
2. Consider the development of a written inspection and maintenance plan intended for use by highway department employees for the efficient management and maintenance of highway- and pedestrian-related facilities. Specific details on plan components may be found in 5.2 General Overview of Local Laws of this report.

6.4.3.6 Onsite Wastewater Treatment Systems

1. Consider adopting all or portions of the Ontario County Model Local Law for On-Site Individual Wastewater Treatment.

6.4.4 Town of Richmond, NY • Ontario County

6.4.4.1 Development

1. Recognition of Stormwater Phase II Regulations directly in local law language
2. Review Section II of the Construction Specifications and compare contents against Section 2.2.1 [Contents of Stormwater Pollution Prevention Plans] of the Sample Local Law. Local law should strive for equivalency with the 16 components of Stormwater Pollution Prevention Plans listed therein.
3. Specify the names and locations of streams intended to received protection under §200-35 of the Zoning Code. Such streams should be identified on the Official Map and/or directly in the Zoning Code. Furthermore, give close consideration to the 50 foot stream buffer mandated in §200-35 of the Zoning Code. Stream buffers may require more or less land area, depending on the topography and sensitivity of the particular site under development.
4. Ensure adequate and comprehensive training for all pertinent local officials (CEO, Planning Board, Zoning Board) in the areas of sediment control, general pollution prevention, and comprehensive environmental planning techniques and procedures.

6.4.4.2 Agriculture and Forestry

Agriculture

No specific recommendations particular to the municipality beyond the encouragement of Agricultural Environmental Management.

Forestry

1. Ensure adequate training for CEO and other staff in charge of enforcing forestry operation restoration referenced in within the Zoning Law (§200-46.B (3)).
2. All towns within the watershed should strive for consistent Timber Harvesting Laws emphasizing baseline levels of protection and centralized enforcement.

6.4.4.3 Waterways and Wetlands

1. Consider revision of zoning and subdivision laws that would include further written definition and/or an official map of watercourses that are to be protected (intermittent watercourses or those which may not be watered year-round or which are not identified on an official map may come into question).
2. Further consideration of legislation to protect other environmentally-sensitive areas should be considered. Vernal pools, wetlands less than 12.4 acres, steep slopes, or ridgelines are among such areas that may be considered.

6.4.4.4 Marinas

1. Future consideration of the development of a Harbor Master Plan in cooperation with the Town of Richmond

6.4.4.5 Highways

1. Consider local code amendments which contain specific directives and procedures to guide conscientious and consistent maintenance of public lands and local highway/pedestrian facilities. Guidelines to consider include those for surface and roadside facilities such as bridges, drainage, road repair, slopes and erosion and sedimentation prevention.

2. Consider the development of a written inspection and maintenance plan intended for use by highway department employees for the efficient management and maintenance of highway- and pedestrian-related facilities. Specific details on plan components may be found in 5.2 General Overview of Local Laws of this report.
3. Explore opportunities for training highway department staff in the areas of Phase II Stormwater and other highway department best management practices and good housekeeping procedures.

6.4.4.6 Onsite Wastewater Treatment Systems

1. Current local law should be amended in order to mandate inspections of onsite wastewater treatment systems at the time of property transfer.
2. If local resources allow, Honeoye Lake Watershed municipalities should consider regular inspection cycles for onsite wastewater treatment systems (i.e. every 3-5 years, depending on use and location).

6.4.5 Town of South Bristol, NY • Ontario County

6.4.5.1 Development

1. Recognition of Stormwater Phase II Regulations directly in local law language
2. Review Zoning and Subdivision Regulations and compare contents against Section 2.2.1 [Contents of Stormwater Pollution Prevention Plans] of the Sample Local Law. Local law should strive for equivalency with the 16 components of Stormwater Pollution Prevention Plans listed therein.
3. Specify the names and locations of streams intended to receive protection under Article VI §170-63 of the Zoning Code. Such streams should be identified on the Official Map and/or directly in the Zoning Code. Furthermore, give close consideration to the 50 foot stream buffer mandated in §170-63.A. Stream buffers may require more or less land area, depending on the topography and sensitivity of the particular site under development.
4. Ensure adequate and comprehensive training for all pertinent local officials (CEO, Planning Board, Zoning Board) in the areas of sediment control, general pollution prevention, and comprehensive environmental planning techniques and procedures.

6.3.5.2 Agriculture and Forestry

Agriculture

No specific recommendations particular to the municipality beyond the encouragement of Agricultural Environmental Management.

Forestry

1. All towns within the watershed should strive for consistent Timber Harvesting Laws emphasizing baseline levels of protection and centralized enforcement.

6.3.5.3 Waterways and Wetlands

1. Consider revision of zoning and subdivision laws that would include further written definition and/or an official map of watercourses that are to be protected (intermittent watercourses or those which may not be watered year-round or which are not identified on an official map may come into question).

2. Further consideration of legislation to protect other environmentally-sensitive areas should be considered. Vernal pools, wetlands less than 12.4 acres, steep slopes, or ridgelines are among such areas that may be considered.

6.3.5.4 Marinas

Not applicable

6.3.5.5 Highways

1. Consider developing a list of priority erosion-prone areas, which can then be addressed on an incremental basis.
2. Consider local code amendments which contain specific directives and procedures to guide conscientious and consistent maintenance of public lands and local highway/pedestrian facilities. Guidelines to consider include those for surface and roadside facilities such as bridges, drainage, road repair, slopes and erosion and sedimentation prevention.
3. Consider the development of a written inspection and maintenance plan intended for use by highway department employees for the efficient management and maintenance of highway- and pedestrian-related facilities. Specific details on plan components may be found in 5.2 General Overview of Local Laws of this report.
4. Continue to explore opportunities for training highway department staff in the areas of Phase II Stormwater and other highway department best management practices and good housekeeping procedures.

6.3.5.6 Onsite Wastewater Treatment Systems

1. Current local law should be amended in order to mandate inspections of onsite wastewater treatment systems at the time of property transfer.
2. If local resources allow, Honeoye Lake Watershed municipalities should consider regular inspection cycles for onsite wastewater treatment systems (i.e. every 3-5 years, depending on use and location).

6.4.6 Town of Springwater, NY • Livingston County

The overall lack of local laws within the Town of Springwater precludes the ability to make specific recommendations within this analysis. It is therefore recommended that town officials continue to familiarize themselves with the watershed planning process occurring within the Honeoye Lake Watershed (as well as activities that may be taking place within neighboring watersheds) and consult with the Livingston County SWCD and Department of Planning as future interest and issues dictate.

7. IMPLEMENTATION STRATEGIES

Implementation strategies address the methods and means by which the protection recommendations, management actions, and priority actions identified in 6. Protection and Management Recommendations can be implemented. These strategies include coordination between various municipal agencies, identification of code and ordinance modifications, development of new programs and policies, sources of funding for program and project development, and procedures for monitoring and assessing results.

7.1 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 Honeoye Lake Watershed Management Plan (HLWMP) without the support of town, county, and state governments. In the formation of the Honeoye Lake Watershed Task Force (HLWTF) 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. The HLWTF will continue to manage the implementation of this HLWMP.

As in the case of the other Finger Lakes, it makes sense to speak of Honeoye Lake as an "economic engine" of the area. Recreation and tourism contribute substantially to the local economy, and the tax base is significantly affected by the presence and condition of Honeoye Lake. Self-interest requires that the watershed municipalities take action to protect the source of business and tax revenues.

Municipal support in the form of funding is tremendously important to the short and long term implementation of the HLWMP. Municipalities are not asked to shoulder the whole burden of what will be a costly plan, but they are expected to provide financial support and leadership to the project and have responded positively.

Because the HLWMP is completely voluntary, leadership from the municipal level is essential to the success of the project. None of the planning or implementation process is mandated by other levels of government or authorities, so local direction must come from within the watershed.

7.2 Basis for Decision Making

In watershed management planning, consideration of public opinion, past educational efforts, and a sound scientific basis must be taken into account in addition to considering environmental protection.

7.2.1 Gauging Public Opinion

Two surveys of public opinion were carried out: the first in 1986 (Gilman, 1986) and the second in 1993 by the HVA (Starke, 1993). (A summary of the two survey results are as follows.) In 1986, 532 responses were obtained as opposed to 206 responses in 1993. Most respondents defined themselves as shoreline residents—and about half of those respondents defined themselves as seasonal. Respondents were presented with a suggested list of "lake issues" and responded by selecting their chief concerns.

1986	1993
weeds	weeds
algal blooms	property value
boat speed	unsafe boating
bacteria	boat density
lake level (tie)	algal blooms
cottage density (tie)	

The issues from both surveys have not changes significantly over the past decade. Weeds and algal blooms were major lake issues in both surveys and are a major focus of this watershed plan. The lake level issue was addressed by reconstruction of the weir in 1999, which has proved effective at maintaining the lake level to less than a one foot variation from nominal level. Maintenance of the weir is addressed in this watershed plan. There has been limited testing that has shown bacteria levels is not a health problem. All other issues, while they might be quality of life or safety issues, are beyond the scope of this watershed plan and are not addressed.

Public hearings associated with this HLWMP will be used to gauge and record public opinion on current issues relating to Honeoye Lake watershed management.

7.2.2 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.

It should be clear from the list of the accomplishments of the HVA and the HLWTF that they have been involved in a long term public education program—first to draw the public's attention to the issues facing Honeoye Lake and then to engage the public in seeking solutions (Figure 7-1).

Outreach, education, and public participation are important issues to the Honeoye Lake Watershed. Appendix M: Public Participation Plan provides a framework for community participation and involvement in the implementation of the HLWMP.

Figure 7-1: Education Approach

7.2.3 Scientific Approach

Watershed management efforts must have a solid scientific basis, including the analysis of water quality problems, selection of remedial actions, and analysis and evaluation of results (Figure 7-2).

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 (Gilman, Souza, Callinan), internal and external nutrient loading (Souza, Callinan, Gilman), water chemistry (Callinan, Gilman), the impacts of various management options (Souza), land use and cover (Gilman), and plankton (Crego, Pearsall and Richardson).

Figure 7-2: Scientific Approach

7.3 Methods to Implement Action Items

The various action items identified in Section 6, Protection and Management Recommendations, require using different methods to accomplish their objectives. Some of the methods used include: education and outreach, land use regulation, structural control actions, and non-structural control actions.

7.3.1 Education and Outreach

Education and outreach is central to effecting change in environmental protection. Municipal employees, contractors, and the general public who understand the importance and benefits of the action items are capable and motivated to implement the action items necessary to protect the environment. Some of the action items from Section 6, Protection and Management Recommendations, which are primarily instructive in nature include: educating residents on a "lake-friendly" lawn program, educating riparian property owners about proper management of streambanks, educating municipal employees on erosion control and stormwater management, etc.

7.3.2 Land Use Regulations

Honeoye Lake and its watershed are located in six municipalities. Each municipality has 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 the Honeoye Lake Watershed will require the efforts of many levels of government, agencies, organizations, groups, and citizens working together in partnership.

Attention needs to be paid to the shoreline of Honeoye Lake, which is already densely populated and may be a source of water quality problems. Establishing a joint committee of planning board members from watershed municipalities to review land use regulations in their towns and make recommendations for improved water quality protection may help to protect the lake and improve water quality. The joint committee could participate in land use regulation actions such as:

- Adopt lake-protection district in the Towns of Richmond and Canadice;
- Adopt construction standards and consistent sediment and erosion control measures in the watershed towns, especially for steep slopes;
- Adopt design and construction standards for private roads;
- Work together to create an open space plan to identify environmentally-sensitive and undeveloped lands requiring protection; and,
- Seek the assistance of a knowledgeable land use consultant familiar with the coordination of a watershed management plan and municipal land use regulations.

The Honeoye Lake itself is subject to several forms of regulations and jurisdictions. For example, the NYS Office of General Services (NYSOGS) is responsible for uses of Honeoye Lake's bottom. Commercial users of the lake bottom acquire a permit from NYSOGS. Honeoye Lake's water on the other hand, is primarily the jurisdiction of Environmental Conservation Law and comes under the regulation of the New York State Department of Environmental Conservation (NYSDEC). The New York State Department of State (NYSDOS), under the Coastal Management Program, has designated Honeoye Lake as an "inland waterway." This allows the municipalities surrounding the lake the opportunity to develop a Local Waterfront Revitalization Program (LWRP) and qualify for grant monies. As a designated inland waterway, Honeoye Lake is also within the Coastal Nonpoint Boundary, making watershed communities eligible for Environmental Protection Fund (EPF) support.

Any excavation for a permanent structure on the shoreline of Honeoye Lake at or below the mean high water level (804.5) requires a permit from the NYSDEC. In 2003, a Uniform Docking and Mooring Law under New York State Navigation Law was proposed. Under the proposed law, the number of docks and boats that could be installed by shoreline property owners is related to the amount of shoreline owned. However, a Draft Docking and Mooring Law that was presented to the Towns of Richmond and Canadice in 2004 was rejected.

Honeoye Lake is patrolled by the Marine Unit of the Ontario County Sheriff's Department to enforce the common New York State laws for the safe operation of boats.

7.3.3 Structural Control Actions

Structural control actions are often required to correct existing problem or to prevent potential future problem. Some of the action items that fall into this category include roadbank and streambank improvement projects, aquatic weed harvesting, weir maintenance, etc.

7.3.4 Nonstructural Control Actions

Nonstructural control actions fall into two major categories: scientific investigations and encouraging use of BMPs to improve water quality. Some examples of scientific investigation that are part of the action items include lake water quality monitoring, tributary sampling, and creation of a target index to measure effectiveness of action items. Encouraging the use of BMPs by municipalities, foresters, contractors, landscape services, and private citizens is another tool used in the action item to foster improvement in water quality.

7.4 Monitoring and Assessment

A final step in the implementation of a watershed management plan is assuring the quality of the actions by setting benchmarks to monitor success or failure. It is recommended that the HLWMP establish a "trophic target" like that used in the Irondequoit Basin Report of 1986-88 (Irondequoit Creek Watershed Collaborative, 1999). With it, the HLWTF can 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 reductions 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 HLWTF 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.

7.5 Staffing

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. Other tasks could be accomplished by a well-trained employee, with some cost-savings to the organization. In some cases, volunteers may be able to accomplish tasks if they are sufficiently trained or organized by a staff person.

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

7.6 Prioritized Plan

Creating a five-year action plan is a reasonable beginning point for a project of significant scale and unknown duration. Many projects are more feasible if their costs are spread over a five-year term. Some actions can be further divided into steps to attain a large or distant goal..

7.7 Annual Work Plan

The recommendations outlined in Section 6, Protection and Management Recommendations, encompass actions by multiple agencies over a time period that extends for five-years or more. A key element for managing the program will be for the HLWTF to create an annual work plan to determine which action items should be initiated dependent on availability of funds. The order in which tasks are undertaken should be determined by the HLWTF in conjunction with the agency responsible for performing the task. At that time questions of cost, timing, and leadership can be further scrutinized. It is recommended that all of the action items identified in this document should be considered because some can be accomplished through volunteer efforts, some have minimal costs, some are purely administrative, and some should begin as soon as possible to pave the way for future tasks. An example of a multiple-year work plan is included in Table 7-1. Efforts will be directed at 12 of the 21 high priority items over a two-year period. This sample work plan is included to highlight the need for a high level of commitment and coordination by the many involved organizations—both public and private.

Pollution Prevention Actions	Description of Action Item	Priority	Estimated Cost	Source of Funds	Responsible Agency
6.1.1 Riparian Zone Management	*1. Conduct field survey to identify and prioritize the most severely eroding streambanks and shorelines.*	High	*?*	HLWTF	OCSWCD, HLWTF
	2. Where feasible, restore severely eroding streambanks and shorelines.	High	?	MUNI, OCDPW	OCSWCD
6.2.1 General Watershed Education	*3. Educate residents on a "lake-friendly" lawn program to reduce nutrient input to the lake and perform survey of resident practices. Provide & promote use of zero phosphorus fertilizer.*	High	$1,000	Grants, CCE	HVA, CCE, OCSWCD

6.2.1 General Watershed Education	*4. Educate riparian property owners about proper management of streambanks and shoreline to minimize erosion.*	High	$500	MUNI	OCSWCD, HVA
	5. Provide education for municipal officials on erosion control and stormwater management options.	High	<$500	Grants	OCSWCD, NYSDEC, HLWTF
	6. 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	<$500	OCSWCD	OCSWCD
	7. Conduct training session for highway superintendents on recommended winter road de-icing practices.	High	<$500	OCSWCD	OCSWCD
6.3.1 Nutrients	*8. Develop Macrophyte Management Plan according to DEC guidelines considering all forms macrophyte management.*	High	<$1,000	Towns of Canadice & Richmond, Grants	HLWTF, consultant
	9. Manage excessive macrophytes with weed harvesting until the WMP is completed.	High	$75,000/year	Towns of Canadice & Richmond, FL-LOWPA	Towns of Canadice & Richmond
	10. 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	$6,000	HLWTF, Grants	HLWTF
	11. Evaluate nutrient sources from highways, shoreline and streambanks.	High	$1,500	OCSWCD	OCSWCD, OCDPW, MUNI
	12. Institute a monitoring program to measure the trophic status of the lake and to evaluate the effectiveness and longevity of the alum treatment performed in 2006-2007.	High	$1,000 per year for 5 years ($5,000)	Towns of Canadice & Richmond, HLWTF	HLWTF

Table 7-1: Draft Annual Work Plan – 2007-2008

7.8 Financing

A sample budget has been constructed to show an approach to number of funding several of the highest priority actions over the next five-years.

7.8.1 Project Financial Needs for Five Years

Stream and Lake Sampling	50,000
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	720,000

7.8.2 Potential Funding for Five Years

Canadice and Richmond	370,000
NYS Aid to Localities	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	100,000
Total for 5 years	720,000

8. CONCLUSION

The Honeoye Lake Watershed Management Plan (HLWMP) demonstrates that an extensive amount of water quality data exists for Honeoye Lake and its watershed. This scientific data will be used to support sound measures necessary to protect and improve the Honeoye Lake Watershed. There are a few gaps in the data. These gaps will be addressed by instituting new monitoring programs, such as a tributary sampling program and a survey of streambanks which will assist in determining the supply of nutrients to the lake. In addition, regular water quality monitoring will continue to measure the effectiveness of the implementation of the action items recommended in this report.

Over 70 action items are recommended to address all existing and potential threats to the water quality of Honeoye Lake. Of these, 21 have been assigned as high priority and will be acted upon in the next couple of years and as funds allow. Most of the high priority action items are related to the 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 nonstructural control actions.

Over the next five years, the implementation of the high priority action items of the Honeoye Lake Watershed will likely consist of approximately $750,000 in financing, a part-time watershed manager, extensive volunteer efforts, governmental agency assistance, and various contract work.

Accomplishing the objectives of the HLWMP will require the cooperative efforts of all watershed municipalities in addition to New York State, Livingston and Ontario County agencies, educational institutions, private non-profit organizations, and the community. The HLWTF will manage the process on an annual basis, review priorities, and develop an annual work plan. It is expected that grants will be obtained to finance many of the action items in addition to the financial support from Livingston and Ontario County and the watershed municipalities.

Working on the action items identified in the HLWMP will go a long way toward accomplishing the overall objectives and recommendations necessary to:

- 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; and,
- To consider economic, social, and other incentives for water quality protection.

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