

STATE OF THE LAKE



Conesus Lake Watershed Characterization Report Update



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and
Livingston County Planning Department*

MAY 2013



Conesus Lake Characterization Report Update

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Appendix 1: Conesus Lake Management Plan Recommendations and Status

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Acronyms

AEM – Agriculture Environmental Management
APA – American Planning Association
BMP - Best Management Practice
CCE – Cornell Cooperative Extension
CEMP – Comprehensive Emergency Management Plan
CLA - Conesus Lake Association
CLAWS - Conesus Lake Aquatic Weed Strategy
CLWC – Conesus Lake Watershed Council
CLWMP – Conesus Lake Watershed Management Plan
CSREES – Cooperative State Research, Education, and Extension Services
DAM – Department of Agriculture and Markets
DGPS – digital Global Positioning Satellite
DO – Dissolved Oxygen
EPA - Environmental Protection Agency
EPF – Environmental Protection Fund
FOLLOWPA - Finger Lakes-Lake Ontario Watershed Protection Alliance
LGLFWCO – Lower Great Lakes Fish and Wildlife Conservation Office
NRCS - Natural Resources Conservation Service
NYS – New York State
NYSDEC - New York State Department of Environmental Conservation
NYSDOS - New York State Department of State
P - Phosphorus
PRISM – Partnership for Regional Invasive Species Management
PWL - Priority Waterbodies List
SEQR - State Environmental Quality Review
SRP – Soluble Reactive Phosphorus
SUNY - State University of New York
SWCD - Soil and Water Conservation District
TKN – Total Kjeldahl Nitrogen
TMDL – Total Maximum Daily Load
TP – Total Phosphorus

TSI – Trophic State Index

TSS – Total Suspended Solids

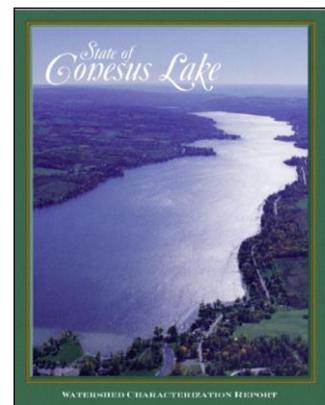
USDA - United States Department of Agriculture

VHS – Viral Hemorrhagic Septicemia

1. Executive Summary

The Conesus Lake watershed encompasses 70 square miles and includes all or part of seven municipalities within Livingston County. The Towns of Conesus, Geneseo, Groveland, Livonia, Springwater, and Sparta and the Village of Livonia are all or partially located within the watershed. The watershed is home to approximately 9,800 people and supplies water for 18,000 Livingston County residents. More than 18 streams flow through the Conesus Lake watershed, although three of them – North and South McMillan Creeks and Conesus Inlet – contribute up to 70% of the flow into Conesus Lake. The watershed is part of the 2500 square mile Genesee River Basin that flows into Lake Ontario.

The *State of Conesus Lake: Watershed Characterization Report*, completed in May 2002, provided the technical foundation for the 2003 *Conesus Lake Watershed Management Plan* (CLWMP). Taken together, these two documents inform an understanding of the issues affecting Conesus Lake and its watershed and provide a framework for making effective management decisions. Guided by the Management Plan's recommendations, local, state and federal partners have made a substantial investment in the watershed. Since 2002, more than six million dollars from federal, state and local sources have been directed toward efforts to restore and protect Conesus Lake and its watershed, monitor the effectiveness of these efforts, and communicate the findings to the public. This total does not include the countless hours of time expended by dedicated community leaders, public agency representatives, and municipal employees and volunteers.



This ten-year update to the Characterization Report describes the many projects and activities that have been implemented to mitigate the inflow of pollutants, such as nutrients and sediment, from the landscape to the lake, and evaluates the impact of these projects. More broadly, the effectiveness of the Management Plan is examined in terms of collaboration among the project partners, reduction in pollutant inflows, and changes in the lake's water quality and aquatic habitat. A table summarizing the recommendations of the Watershed Management Plan, and the progress toward implementation, is included as Appendix 1.

Collaboration

One major success to report is the collaborative approach to lake and watershed management. Among the recommendations of the CLWMP was creation of the Conesus Lake Watershed Council (CLWC); this intermunicipal organization was formed 2003 to oversee implementation of the Plan's priority actions. The Watershed Council was created by an Intermunicipal Agreement among Livingston County, the watershed municipalities and the water purveyors. By signing an intermunicipal agreement, each party committed to financially supporting the Watershed Council. The Council's budget helps support the Conesus Lake Watershed Inspection Program and the Conesus Lake Watershed Manager position. Livingston County Planning Department and Department of Health provide the staff and technical support to the Watershed Council. The Conesus Lake Association is an active participant in Council meetings and plays a key role in keeping the lake community engaged with local government.

The activities of the Watershed Council reflect the principles of adaptive management; as recommendations of the Management Plan are implemented, there is a parallel commitment to monitoring the lake and watershed to track improvements. One reason this “build and measure” approach is so effective in the Conesus Lake watershed is the successful long-term partnership between Livingston County and the State University of New York (SUNY) aquatic sciences programs at Brockport and Geneseo. Professors Joseph Makarewicz and Isidro Bosch have guided the design and implementation of the monitoring program and mentored students as they learn about how human activities affect the ecosystem.

The success of this institutional framework for lake and watershed management was celebrated in 2011, when the Conesus Lake Watershed Council received the Planning Excellence Award from the New York Upstate Chapter of the American Planning Association (APA) for Planning Excellence in Implementation. As the APA noted in the award citation:

“The level of cooperation within and partnerships among the Watershed Management Plan committees and between agencies has been heralded as a successful example of how the process should work.”

Watershed Measures to Reduce Contaminants

Agricultural Practices

Many recommendations of the 2003 Management Plan focused on mitigating nutrient and sediment inflows to the lake from its watershed. Agriculture is an important land use within the Conesus Lake watershed and is a foundation of the area’s economy, traditions, and visual character. Steams draining subwatershed areas with a significant portion of lands in active agriculture exhibited elevated levels of nutrients and sediment, two important pollutants. Consequently, reducing the environmental impact of active agriculture was a priority. Almost two million dollars of federal, state and local funds were directed toward agricultural best management practices (BMPs) within the watershed.

Both structural and cultural BMPs were implemented on the lands of the agricultural producers who volunteered to participate. Examples of these management practices include: cessation of manure spreading during the winter, reduction in fertilizer application rates, installation of subsurface drain tiles, use of grass filter strips, contour tillage, separation of roof runoff, fencing to keep cattle from streams, manure injection, gully plugs, rotational grazing, Whole Farm Nutrient Management Plans, and changes in crop rotation. The Livingston County Soil and Water Conservation District (LCSWCD) provided critical support to agricultural producers for the implementation of BMPs.

The SUNY Brockport and SUNY Geneseo researchers monitored the impact of the BMPs on the export of nutrients, sediment and other materials to Conesus Lake, by sampling at the base of the subwatershed streams (near the confluence with Conesus Lake) over a multiple-year program. This project provided a direct assessment of the effectiveness of agricultural BMPs at the watershed scale. In addition to tracking changes in tributary export, the research team looked downstream to evaluate how the water quality and nearshore habitat of Conesus Lake were affected by implementing BMPs to reduce nonpoint sources of nutrients and sediment from the landscape. The initial results are encouraging.

Residential Development

The 2010 population census data reveal that the population of Conesus Lake watershed has declined slightly over the last decade. The real property tax rolls indicate that the agricultural acreage in the watershed decreased by 8.9%, acreage classified as vacant increased by 6.8%, and residential acreage increased by 3.7%. Many of the watershed municipalities have updated and revised their Comprehensive Plans and associated zoning codes over the past decade, and have incorporated water quality-related provisions into their local codes. In addition, watershed municipalities have adopted local laws to address Sediment and Erosion Control, in a coordinated effort to mitigate the potential for substantial sediment loss during construction.

New York State has also addressed the potential for adverse water quality impacts of residential land use, through the statewide stormwater management regulations and ban on phosphorus in lawn fertilizers. The State's Dishwasher Detergent and Nutrient Runoff Law was designed to improve water quality by reducing phosphorus runoff. The law is intended reduce costs associated with removing phosphorus from stormwater and wastewater, and to improve recreational and other uses of the waterways.

Road ditches

Extensive road ditch stabilization programs have been implemented throughout the watershed, preventing tons of sediment and nutrients from reaching Conesus Lake each year. The Town of Groveland was awarded \$359,085 and the Town of Conesus was awarded \$1.2 million from the state's Environmental Protection Grant Fund (EPF) for road ditch remediation. These funds were used to implement structural erosion control measures at roadside drainage ditches along several road segments in the Conesus Lake watershed.



Figure 1-1. Before (left) and after (right) photos of a ditch adjacent to East Lake Road in the town of Livonia.

Streambank Stabilization

Following a detailed feasibility study, projections of water quality improvements, and cost-benefit calculations, seven stream segments located within the Towns of Conesus, Geneseo and Livonia and the

Village of Livonia were identified as priority areas for remediation. In 2008 and 2009, the EPF program awarded funding to the Town of Livonia on behalf of the affected municipalities to stabilize these areas. The streambank remediation project has entered the Engineering Phase, and construction on the seven streambank segments is anticipated to continue through the summers of 2013 and 2014.

Public Education and Awareness

Public education and awareness are a critical component of watershed management, as residential land uses have a direct impact on the health of the lake. Over the last decade, many types of educational materials, including pamphlets, reports, articles, and kiosks have been developed to keep the community engaged with efforts to improve the quality of Conesus Lake. The Conesus Lake Association has staffed booths at numerous events including DEC Days, CLA Youth Days, and the CLA Arts and Crafts Festival. The Conesus Stewardship Initiative is a direct effort to engage all watershed residents with the health of the lake through encouraging watershed residents to engage in lake-friendly activities at home.



Figure 1-2. At an outdoor public outreach event, Barb Rogers (County Watershed Inspector) demonstrates the concepts of watershed runoff to children using EnviroScape®, an environmental education model.

Conesus Lake Response

Trophic State

Water resource managers rely on three key indicator parameters to evaluate the trophic state (degree of nutrient enrichment) of lakes. Periodic measurements of three key water quality variables are used to track changes over time and compare trophic state condition between lakes. The three parameters are chlorophyll- α (an indicator of algal abundance), total phosphorus (the key nutrient affecting algal productivity), and Secchi disk transparency (a measure of water clarity). These parameters have been measured in Conesus Lake and the trend is toward improving water quality conditions. That is, total phosphorus and chlorophyll- α are declining or stable, and Secchi disk transparency is increasing. This positive development is likely the result of the suite of BMPs implemented across the watershed.

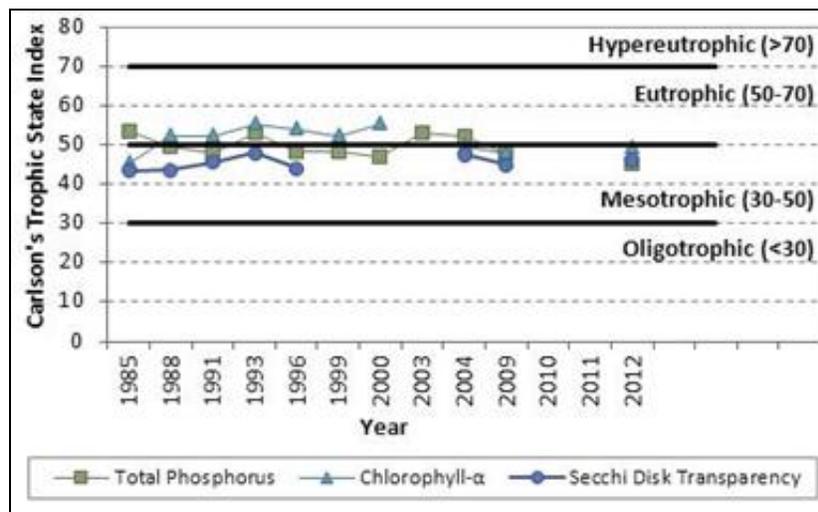


Figure 1-3. Carlson's Trophic State Index for Conesus Lake, 1985 – 2012.

Sodium and Chloride

The 2002 Watershed Characterization Report recognized that dissolved salts are of concern; sodium and chloride concentrations in Conesus Lake have steadily increased as the watershed became more developed. Monitoring data from 2012 indicate that sodium and chloride concentrations continue to increase, despite completion of salt storage facilities within the watershed. Current levels are above guidelines for safe drinking water for individuals on a salt-restricted diet.

Food Web

The Conesus Lake food web appears to have remained stable over the past decade, as indicated by the plankton and fish communities. The walleye stocking initiative may have improved the catch of adult fish, based on preliminary NYSDEC data, but does not appear to have affected alewife abundance. Related to the continued presence of the alewife, the lake's zooplankton community continues to be dominated by smaller-sized species; alewives preferentially graze on the larger-sized zooplankton.

Macrophytes

In Conesus Lake, the largest and most dense Eurasian watermilfoil-dominated macrophyte beds are located near the mouths of streams that drained primarily agricultural watersheds. This observation was part of the rationale for the federally-funded watershed management project, which (among other questions) tested the hypothesis that nutrient management at the watershed level could reduce Eurasian watermilfoil biomass adjacent to stream inflows. The project demonstrated the benefits of agricultural management on stream water quality and reduced plant abundance in nearshore areas. Lakewide, the macrophyte community appears to be trending toward improvement, with a diminished importance of Eurasian watermilfoil.

Wetlands

The habitat and ecological function of wetlands located along Conesus Lake have been affected by water level regulation to support recreation and manage the risk of flooding. The Lower Great Lakes Fish and Wildlife Conservation Office worked with NYSDEC and the Conesus Lake Association to replace two deteriorated aluminum water control structures with concrete box structures. The new control structures will enhance NYSDEC’s ability to restore seasonal water-level fluctuations in 15 acres of emergent wetlands within the Conesus Inlet Fish and Wildlife Management Area.

Emerging Issues

Climate Change

Climate scientists predict that western New York and the Great Lakes Plain region—including the Finger Lakes—will experience increased temperature and precipitation as a result of climate change. Rainfall intensity is projected to increase, as are periods of drought. Overall, extreme events will become more common. This pattern may result in greater risk of flash-flooding and erosion within the Conesus Lake watershed, adding to the nutrient and sediment loading to the lake.

Within Conesus Lake, climate change will eventually affect water temperatures. Coupled with increased event-driven nutrient and sediments, the lake will become increasingly susceptible to nuisance and potentially harmful algal blooms. The warmer lake water will continue to sustain the existing productive warmwater fishery for sportfish and panfish, but the coolwater fisheries are likely to decline.

Invasive species

Conesus Lake has been adversely affected by invasive species in the past, including Eurasian watermilfoil, dreissenid mussels, and the alewife, and remains vulnerable to future invasions. However, water resource managers are increasingly collaborating on regional approaches to invasive species management that

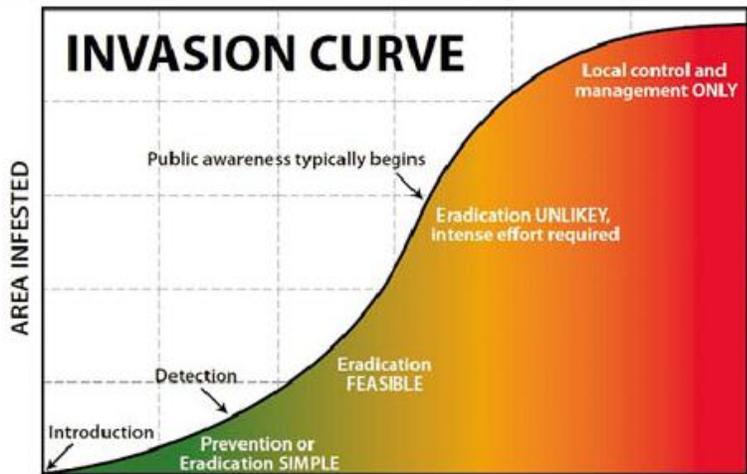


Figure 1-4: The Invasion Curve demonstrates why early action on invasive species is critical.

emphasize early detection and rapid response. In July, 2012, the NYS Legislature passed, and Governor Cuomo signed, legislation to protect New York's waterways and natural habitat from the devastating environmental effects of invasive species. Livingston County continues to participate in the Finger Lakes PRISM (Partnership for Regional Invasive Species Management), an information-sharing group created the state to foster a regional approach to managing invasive species. This program is administered through the

Finger Lakes Institute at Hobart William Smith Colleges in Geneva, NY. Support continues for the Conesus

Lake Association Aquatic Invasives Monitoring & Response Program. In addition an Invasive Species Subcommittee was created to assist the Conesus Lake Watershed Technical Committee in working on an Invasive Species Management Plan.

Recommendations

Update the Conesus Lake Watershed Management Plan

The *Conesus Lake Watershed Management Plan* recommended specific actions to improve the quality of the Lake by targeting sources of pollution threatening the Lake's continued use for water supply and recreation. Over the last decade, resources of federal, state, and local government and the watershed community have been invested in implementing many of the recommendations. The Plan was intended to serve as a "living document," to be updated as existing issues are resolved and new issues are encountered.

This 2013 update to the Watershed Characterization Report provides a foundation for updating the *Conesus Lake Watershed Management Plan*. As evident from the data presented in the subsequent chapters, the concerted efforts to implement agricultural BMPs, control stormwater runoff, and improve the wastewater collection infrastructure have reduced the watershed input of nutrients and sediment. The Lake's trophic state appears to have stabilized.

However, other metrics of the Lake's condition are not improving. The concentrations of sodium and chloride continue to increase in the water intakes, and they have reached thresholds where more aggressive control measures and increased public advisories are warranted. An updated Management Plan can provide the foundation for reviewing what has been done, and what other actions might be done to address this potentially serious issue.

Finally, some of the greatest threats to water quality and aquatic habitat are regional, not specific to Conesus Lake. Harmful algal blooms and invasive species are serious issues that will require collaboration among scientists, lake users, educators and the water resource management agencies. Nearshore water quality and aquatic habitat conditions, of great significance to recreational users, are changing in Conesus Lake and in many lakes across the entire region. The Watershed Management Plan will incorporate the new findings and evolving partnerships focused on these issues.

Continue the existing institutional framework for managing the lake and its watershed

The Conesus Lake Watershed Council is an award-winning partnership that has proven to be an effective institutional framework for watershed management over the past decade.

Continue to advocate for support of FLOWPA and other watershed management funding programs in the New York State budget

The monitoring of the lake and watershed that form the basis of this update to the Characterization Report were funded in large part by federal and state sources. The value of a science-based approach to managing our lakes and watersheds cannot be overstated. The Conesus Lake community should continue to advocate for resources to implement BMPs, monitor their effectiveness, and report the findings to the community.

Continue to support the position of Conesus Lake Watershed Manager and the Conesus Lake Watershed Inspection Program

By its very nature, watershed management involves a myriad of tasks, issues, and interest groups. The positions of Watershed Manager and Conesus Lake Watershed Inspector have contributed to the success of the program.

Consider requesting that Conesus Lake be formally de-listed from the state and federal 303(d) list, based on the improvements achieved with implementation of the Management Plan

NYSDEC updates their list of impaired waterbodies every two years; the next version of the state 303(d) list will be issued in draft in early 2014. In light of the improvements to Conesus Lake over the past decade, and the effective institutional structure in place to manage lake and watershed issues, we recommend that the Conesus Lake Watershed Council initiate a discussion of removing Conesus Lake from Part 1 of the 303(d) list. If approved by NYSDEC, removal of Conesus Lake from Part 1 of the 303(d) list may obviate the need for a regulatory Total Maximum Daily Load (TMDL) allocation for phosphorus. In addition to reviewing the documentation of improving water quality, the discussions with NYSDEC should highlight the success of locally-driven initiatives to identify measures for phosphorus reduction, and the positive relationships that have been developed among the diverse community of stakeholders.

Celebrate the success of the last decade and share the message

2. Introduction

The *State of Conesus Lake: Watershed Characterization Report* (EcoLogic LLC, 2002), completed in May 2002, provided the technical foundation for the 2003 *Conesus Lake Watershed Management Plan* (EcoLogic LLC, 2003). These documents inform an understanding of the issues that affect Conesus Lake and its watershed, and provide a framework for making decisions on effective management of this important natural resource.

A decade has passed since the Watershed Characterization Report was completed, and, as expected, the state of the lake and watershed has not remained static. Since 2002, population and land use patterns have changed. Agricultural practices have continued to evolve; there has been an infusion of financial support to implement agricultural Best Management Practices on watershed farms. Municipalities in the watershed have continued to improve their local controls on erosion and sedimentation. A disease, viral hemorrhagic septicemia (VHS), was detected in Conesus Lake fish. New York State passed legislation restricting use of phosphorus-containing fertilizers on residential lawns, and reducing the phosphorus content of dishwasher detergents. A pilot test of a solar-powered mixing device was conducted, as was an environmental assessment of an alum treatment program. A Fish Kill Contingency Plan was created. Streambank and roadbank stabilization projects have been implemented. The Army Corps of Engineers began an assessment of macrophyte growth and control alternatives. An updated bathymetric map of the lake was completed. These, and a myriad of other initiatives and events, have contributed to the knowledge base required to manage Conesus Lake and its watershed.

The Public Education and Outreach Committee has been active since the watershed planning process began; this committee has successfully kept information flowing among the many stakeholders. The Conesus Lake Association is an active partner in public education efforts. Multiple approaches, including web sites, newsletters, public meetings, hands-on workshops, and youth education programs are used to build understanding of how human actions affect the lake.

Throughout this decade of change, stakeholders have come together to discuss priorities, share information, and collaborate on a monitoring program tracking the lake response. This document, the ten-year update to the Watershed Characterization Report, catalogues new information and describes our enhanced understanding of the state of the lake and watershed. Ultimately, the findings of this update will provide the foundation for revising and updating the CLWMP.

3. Institutional Framework

3.1. Conesus Lake Watershed Management Council

Among the recommendations of the CLWMP was creation of the Conesus Lake Watershed Council; this intermunicipal organization was formed in 2003 to oversee implementation of the plan’s priority actions. The Watershed Council was created by an Intermunicipal Agreement between Livingston County and the watershed municipalities and water purveyors. By signing the Intermunicipal Agreement, each town and village committed to financially supporting the Watershed Council. The annual payment varies by town and village and is based on a multi-metric funding formula. Funds are used to help support the Conesus Lake Watershed Inspection Program and the Conesus Lake Watershed Manager position. The Livingston County Planning and Health Departments provide staff to the Watershed Council; the Council’s organizational structure is shown in Figure 3-1.

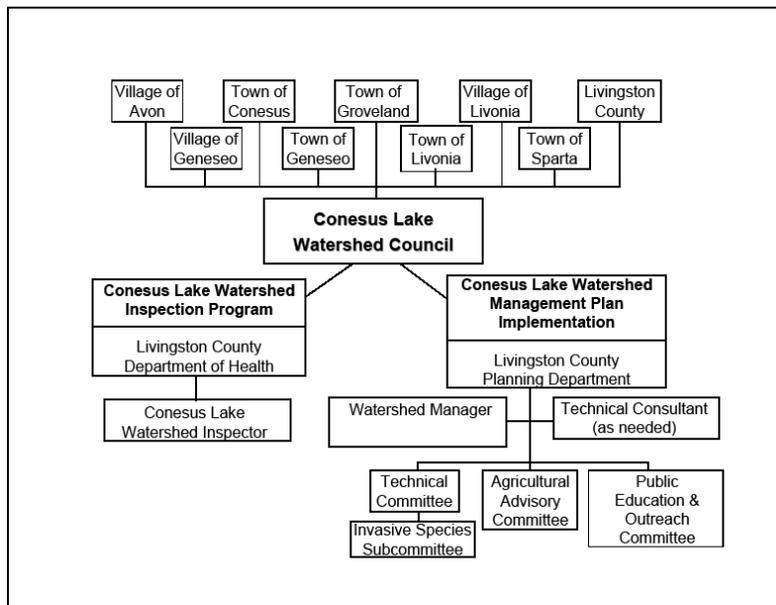


Figure 3-1. Conesus Lake Watershed Council organization chart.

The voting members of the Watershed Council include the elected supervisors and mayor of the towns and village in the watershed, the mayors of the two villages using Conesus Lake as a public water supply, and the Chairman of the Livingston County Board of Supervisors, or their designated representatives. Nonvoting members on the Watershed Council represent the Livingston County Planning Department, the Livingston County Department of Health, the Conesus Lake Association, the Livingston County Farm Bureau, and the Livingston County Water and Sewer Authority.

3.2. Monitoring Consortium

Another recommendation of the CLWMP was to foster collaboration on monitoring efforts. Since completion of the Watershed Characterization Report, Livingston County Planning Department has convened an annual meeting to coordinate monitoring activities for the lake and its watershed. The objective of this meeting is to identify priorities and opportunities for collaboration. In addition to the Planning Department and the Watershed Manager, the Livingston County Department of Health and the Watershed Inspector attend, as do the SUNY researchers, Dr. Joe Makarewicz (Brockport) and Dr. Sid Bosch (Geneseo). Dr. Liz Moran from EcoLogic attends these annual meetings as well, in her role as consultant to Livingston County Planning Department.

This collaborative approach has been effective. The framework in the CLWMP called for a three-year rotation among lake monitoring, watershed-wide monitoring, and specific stream segment or subwatershed monitoring. The framework was crafted to balance resources between the lake and watershed, while recognizing that funding opportunities would likely alter the sequencing of monitoring and focus. Moreover, the annual meetings provide a forum for discussion of emerging issues and an opportunity to build on information from prior years.

As shown in Table 3-1, there has been a great deal of monitoring and information gathering in the Conesus Lake watershed since the CLWMP was completed. The challenge is to turn the data into information that informs management decisions. This update to the *State of Conesus Lake: Watershed Characterization Report* is a step toward meeting the challenge.

Table 3-1. Summary of monitoring information gathered for Conesus Lake since 2003.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Trophic State Parameters	x			x	x		x		x(10)	x
Bacteria	x	x	x	x	x	x	x	x	x	x
Macrophytes	x	x	x	x	x	x	x	x		x
Watershed Load (USDA Sites)	x	x	x	x	x	x	x	x	x	x
Special Topics (Watershed)				1		1		9		
Special Topics (Conesus Lake)	3	5	6,7	8	8		2,3,4		10	
<i>KEY:</i>										
1- streambanks				4- plankton & fish			8- SolarBee®			
2- bathymetric survey				5- alum DEIS			9- major tributaries			
3- TP accumulation				6- benthic survey			10- spring runoff response			
				7- alum jar test						

3.3. *Communications and Outreach*

The Watershed Council’s communication and outreach efforts strive to keep the community engaged in the process of lake rehabilitation. Each year, the Watershed Council issues the Conesus Lake Report Card, detailing progress on the specific recommendations of the watershed management plan and reporting on activities over the past year. Annual report cards (2003 – 2012) are included in Appendix 2.

Other entities in the Conesus Lake watershed are active in public education and outreach. The Conesus Lake Association, the Watershed Manager, the Watershed Inspector, Cornell Cooperative Extension, and others are committed to working with the public, including youth groups, to improve understanding of the linkages between the lake and watershed, and the influences of human actions on water quality and habitat. A list of public information materials and activities is included below.

- Annual Report Cards- projects undertaken, results of lake and watershed monitoring, update on status of recommendations of the Watershed Management Plan, 2003 – 2012
- “Your Guide to Preserving Conesus Lake”- fact sheet on water quality issues, focused on public health (drinking water), recreational use and ecosystem impacts, 2009
- Storm drain stenciling program
- Informational kiosk at Vitale Park and Long Point Parks
- Periodic contributions to the “Laker News”- the CLA newsletter.
- “Conesus Lake Watershed: Is it Worth Protecting?” Booklet summarizing findings and recommendations of the Characterization Report and the Management Plan
- Informational brochure on cyanobacteria (blue-green algae), 2011
- Informational brochure on Hydrilla
- Invasive species awareness and prevention signage and material for boaters
- Invasive Species and Blue Green Algae identification and monitoring training sessions.
- Conesus Stewardship Initiative – a cohesive set of actions designed to educate watershed residents on the impact they have on the lake’s water quality and to promote lake-friendly residential best practices. These actions and programs are intended to assist and inspire all watershed residents to become proactive stewards of the future health of Conesus Lake.
- Presentations at CLA Youth Days, DEC Days, and at the CLA Arts and Crafts Festival.
- Presentations at annual Town Board meetings.

- Homeowner workshop at Long Point Park on the Emerald Ash Borer and an ash tree inventory.

In 2009, the International Association for Great Lakes Research published a special issue of the Journal of Great Lakes Research focused on “Watershed Management and Nearshore Lake Water Quality, the Conesus Lake Watershed Study.” Edited by Dr. Joe Makarewicz and Dr. Sid Bosch, the journal includes 15 detailed articles describing elements of the lake and watershed efforts. This represents a significant accomplishment, both in data integration and in communicating the findings to the scientific community.

3.4. Investment in Watershed Restoration and Protection

Since 2002, more than six million dollars from federal, state and local sources have been invested in efforts to restore and protect Conesus Lake and its watershed, monitor the effectiveness of these efforts, and communicate the findings to the public (Table 3-2). Not tracked in the table are the countless hours of time expended by dedicated community leaders, public agency representatives, and municipal employees - funded through taxpayer dollars – the Conesus Lake Association, private property owners, farmers and volunteers.

Table 3-2. Summary of state and local funds directed to the Conesus Lake Watershed, 2002-2013.

Grant/Funding Source	Year	Local Share	State Funds	Federal Funds	Other	Total
CLAWS 13	2002-2003	0.00	96,296.00	0.00	0.00	96,296.00
FL-LOWPA Special Project Fund - erosion control workshop	2003	1,111.94	2,342.50	0.00	0.00	3,454.44
FL-LOWPA Special Project Fund - benthic survey	2004	912.00	9,000.00	0.00	0.00	9,912.00
CLAWS 14	2003-2004	0.00	55,555.00	0.00	0.00	55,555.00
CLAWS 15	2004-2005	0.00	55,555.00	0.00	0.00	55,555.00
CLAWS 16	2005-2006	0.00	55,555.00	0.00	0.00	55,555.00
CLAWS 17	2006-2007	0.00	70,000.00	0.00	0.00	70,000.00
CLAWS 18	2007-2008	0.00	85,000.00	0.00	0.00	85,000.00
CLAWS 19	2008-2009	0.00	85,000.00	0.00	0.00	85,000.00
CLAWS 20	2009-2010	0.00	44,175.00	0.00	0.00	44,175.00
Scotts Products Grant	2013	0.00	5,000.00	0.00	0.00	5,000.00
USDA NRCS Agricultural BMP Projects	2002-2013	0.00	0.00	500,000.00	0.00	500,000.00
Kraft/Altria Group Foundation Grant SUNY Brockport	2004-2005	0.00	0.00	0.00	75,000.00	75,000.00
SUNY Brockport USDA Grant	2002-2007	0.00	0.00	1,200,000.00	0.00	1,200,000.00
Livingston County SWCD - Round 10	2004	13,512.50	37,987.50	0.00	0.00	51,500.00
Livingston County SWCD - Round 18	2011	42,057.50	97,272.50	0.00	0.00	139,330.00
Quality Communities Grant (Streambank Remediation)	2007	10,539.00	34,000.00	0.00	0.00	44,539.00
EPF Road ditch grant	2006-2011	179,710.76	179,375.00	0.00	0.00	359,085.76
Conesus Town EPF road ditch grant - Henderson Hill	2007	177,798.00	139,000.00	0.00	0.00	316,798.00
Conesus Town EPF road ditch grant - Partridge Corners/Bishop Rds	2012-2013	308,610.12	165,000.00	0.00	0.00	473,610.12
Conesus Town EPF road ditch grant - Kuder Hill Rd	2011-2012	302,589.43	158,090.00	0.00	0.00	460,679.43
EPF Streambank Remediation - Phase I	2009-2015	382,869.00	382,869.00	0.00	0.00	765,738.00
EPF Streambank Remediation - Phase II	2010-2016	358,132.00	358,132.00	0.00	0.00	716,264.00
Geneseo Solar Bee rental ((\$19,000- \$5,192)*2 years)		27,616.00	0.00	0.00	0.00	27,616.00
Livonia Solar Bee rental ((\$19,000- \$5,192)*2 years)		27,616.00	0.00	0.00	0.00	27,616.00
CLWC municipal Watershed Manager contribution 2003-2013*	2004-2013	302,800.00	0.00	0.00	0.00	302,800.00
Livingston County Implementation Funds		100,000.00	0.00	0.00	0.00	100,000.00
CLA Solar Bee rental ((\$19,000- \$5,192)*2years)		27,616.00	0.00	0.00	0.00	27,616.00
CLA Walleye Fingerlings stocking		25,000	0.00	0.00	0.00	25,000
Eurasian Watermilfoil Beetle Control Trial		5,000	0.00	0.00	0.00	5,000
CLA/DEC Restoration of Wetlands at Conesus Inlet Fish and Wildlife Management Area (GLRI grant)		35,714	0.00	0.00	0.00	35,714
TOTAL		\$ 2,235,874.25	2,115,204.50	\$ 1,700,000.00	\$ 75,000.00	\$6,219,408.75

4. The State of the Watershed 2012: Status and Trends

4.1. Population and Land Cover

The Conesus Lake watershed encompasses 75 square miles within Livingston County. Portions of six towns (Conesus, Geneseo, Groveland, Livonia, Sparta and Springwater) and the Village of Livonia are within the watershed boundaries (Figure 4-2). As evident from the 2000 and 2010 Census data, the watershed is experiencing only minor population change (Table 4-1); the population change in Livingston County as a whole (from 64,328 in 2000 to 65,393 in 2010) represents about a 1.6% increase over the decade. The population density based on the 2010 Census data is displayed in Figure 4-3 .

Table 4-1. Population change 2000-2010 (2010 Census).

Geographic area	Total population 2000	Total population 2010	Change	% Change
Livingston County	64,328	65,393	+1065	1.7%
Conesus Lake watershed	9,731	9,605	-126	-1.3%
Conesus town	2,353	2,473	+120	5.1%
Geneseo town outside of village	2,075	2,452	+377	18.2%
Groveland town	3,853	3,249	-604	-15.7%
Livonia town outside of village	5,913	6,400	+487	8.2%
Livonia village	1,373	1,409	+36	2.6%
Sparta town	1,627	1,624	-3	-0.2%
Springwater town	2,322	2,439	+117	5.0%

Source: U.S. Census Bureau, 2010 Census.

Note: Prior to 2010, inmates were included in the population census. Starting with the 2010 census, inmates were no longer included.

As described in the Watershed Characterization Report (EcoLogic LLC, 2002), water flows into the lake through a network of streams and rivulets; the watershed includes 18 delineated subwatersheds based on the surface drainage network. While the subwatershed boundaries are essentially stable, human activities, particularly land use and land cover, can affect the way water moves across the landscape.

Land use statistics by subwatershed have been calculated for 2012 and compared to the 1998 data reported in the Watershed Characterization Report. Direct comparisons of changes in land use classifications within subwatersheds are imprecise, due to Livingston County’s improved parcel mapping capabilities over the last decade. However, it appears that agricultural acreage in the watershed decreased by 8.9%, acreage classified as vacant increased by 6.8%, and residential acreage increased by 3.7% (Figure 4-4). There is a great deal of variation in land use among subwatersheds, as detailed in Figure 4-4 and Table 4-2. A map of the land use based on 2012 tax parcel data from Livingston County is included as Figure 4-5.

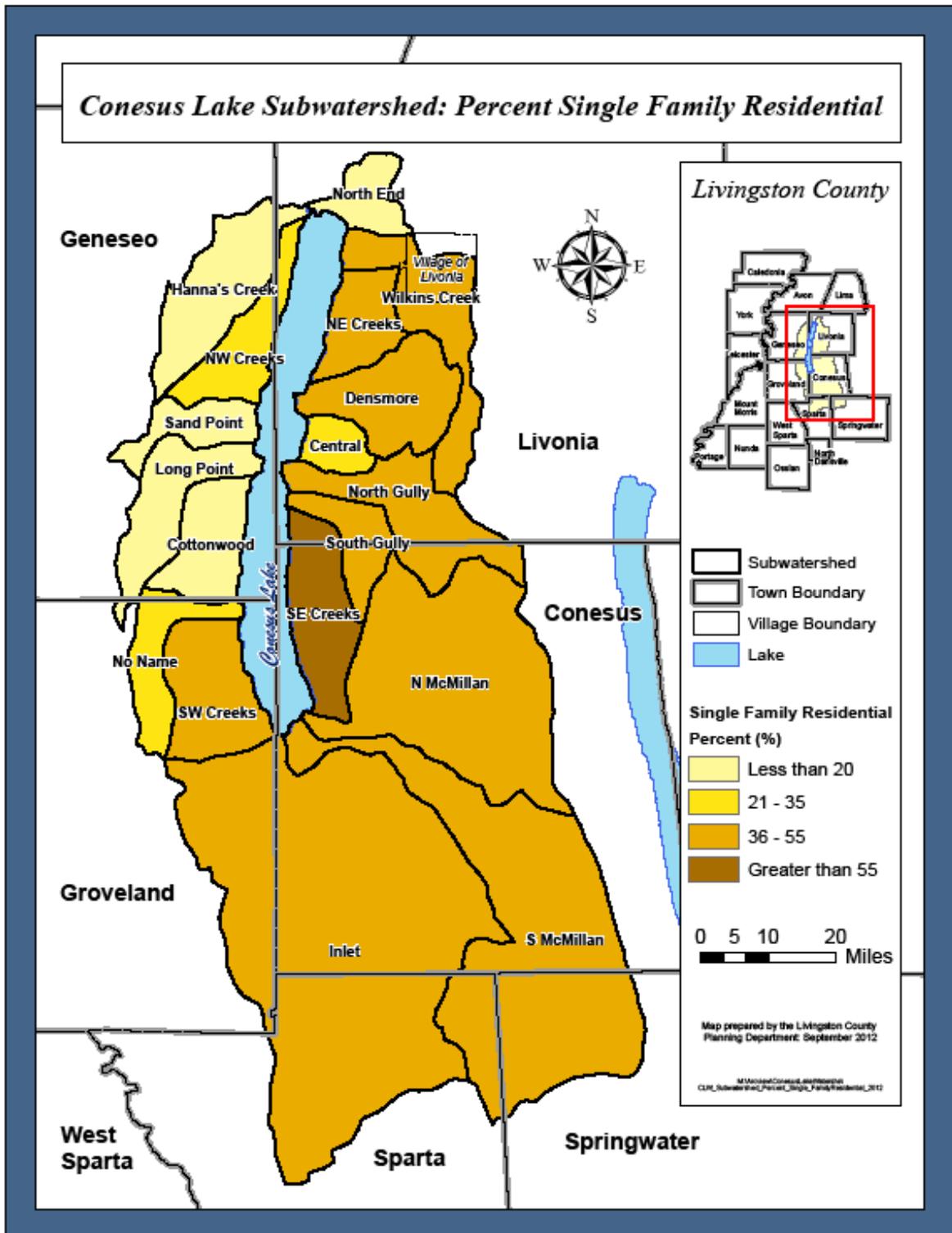


Figure 4-1. Percentage of single family residential land use in the Conesus Lake subwatersheds.

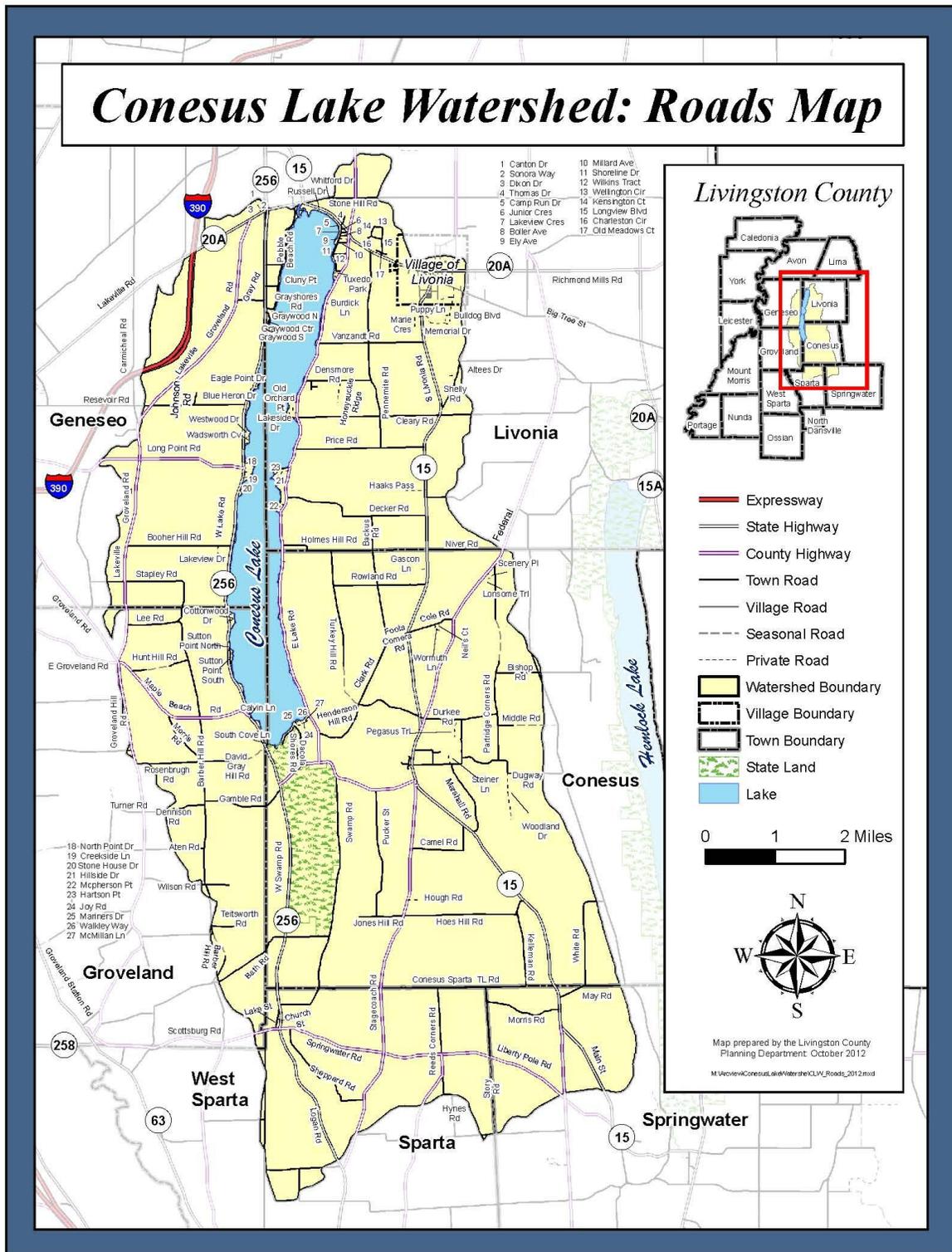


Figure 4-2. Road map of the Conesus Lake watershed.

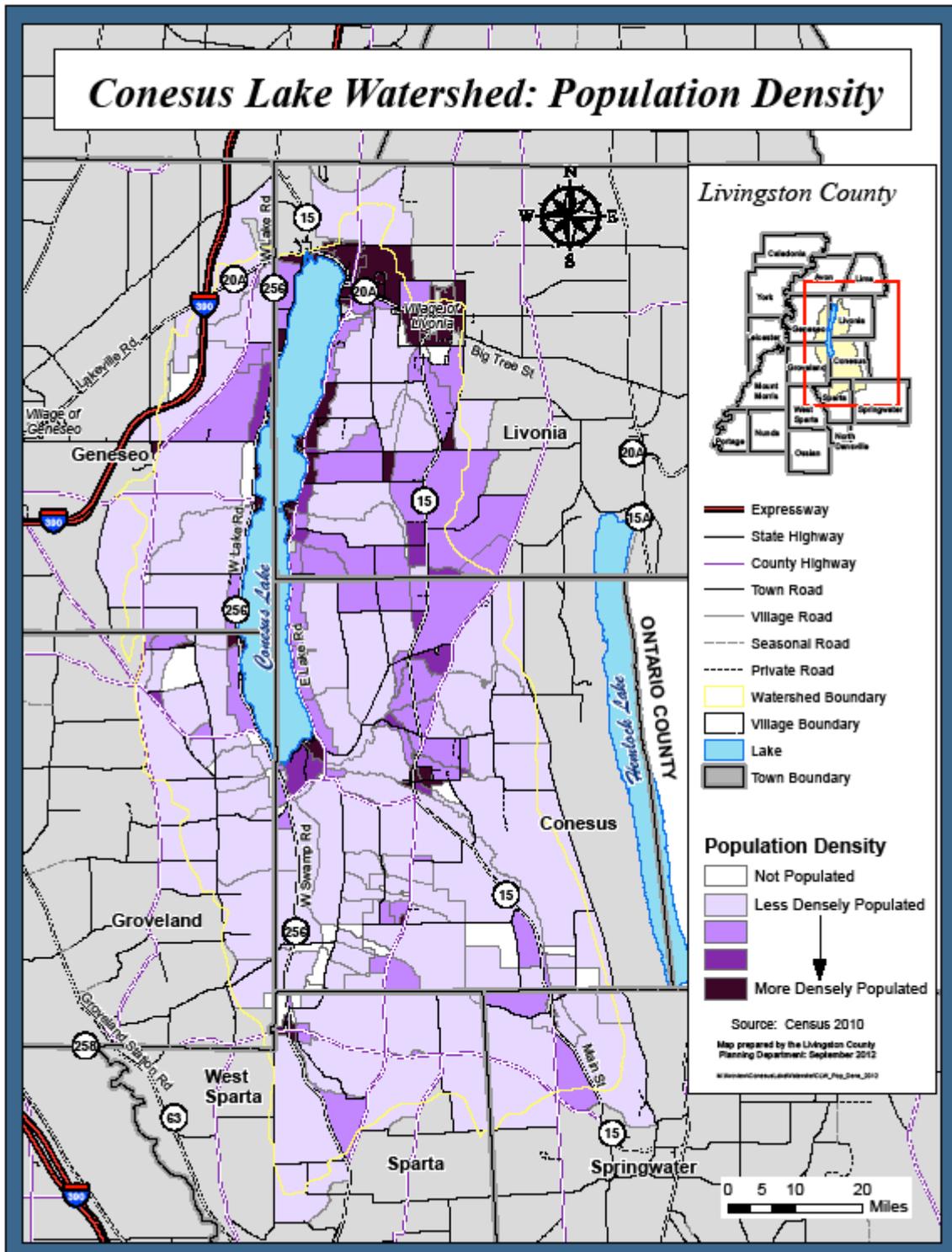


Figure 4-3. Population density in the Conesus Lake watershed, using 2010 U.S. census data.

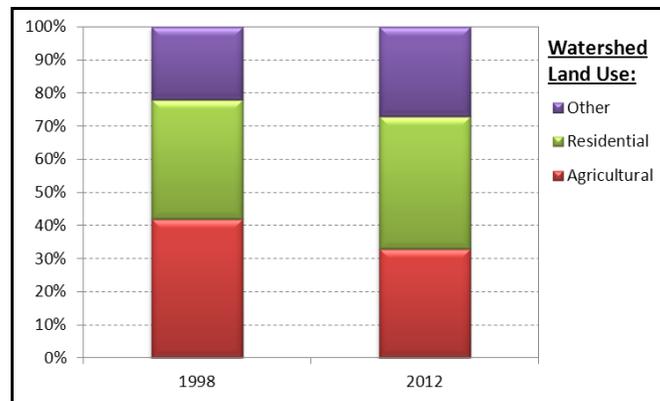


Figure 4-4. Land use breakdown, Conesus Lake watershed, 1998 and 2012.

Table 4-2. Percentage of land use in 2012 broken down by subwatershed.

Subwatershed	Agriculture	Single Family Residential (a)	Multi-Family Residential (b)	Seasonal Residences	Commercial	Industrial	Recreation	Vacant	Community Services	Public Services	Wild, Forest, Conservation, Parkland Areas
Central	61.1	27.6	3.8	0.1	0.0	0.0	0.0	7.4	0.0	0.0	0.0
Cottonwood	78.3	17.4	0.6	0.4	0.0	0.0	0.0	3.3	0.0	0.0	0.0
Densmore	43.5	42.6	0.1	0.3	3.5	0.0	0.0	10.0	0.0	0.0	0.0
Hanna's Creek	69.8	17.4	2.3	0.0	0.1	0.0	0.3	8.8	1.0	0.0	0.2
Inlet	27.1	39.8	0.1	0.8	0.0	0.0	0.0	23.2	0.1	0.1	8.7
Long Point	88.7	7.2	0.5	0.1	0.0	0.0	0.7	2.6	0.0	0.2	0.0
No Name	68.2	26.7	3.2	0.1	0.1	0.0	0.0	1.6	0.0	0.0	0.0
NE Creeks	25.3	40.1	0.8	0.3	0.4	0.0	0.0	29.4	3.6	0.0	0.0
North End	51.1	19.3	2.6	0.2	4.9	1.9	0.2	18.1	0.4	0.1	1.2
North Gully	31.8	45.3	1.7	0.1	3.1	0.0	0.0	17.1	0.7	0.1	0.0
N. McMillan	10.9	53.3	0.4	0.5	0.1	0.0	2.7	29.7	1.1	0.6	0.8
NW Creeks	43.8	24.7	0.5	1.0	0.0	0.0	0.0	28.3	1.6	0.2	0.0
Sand Point	82.6	12.9	0.0	0.4	0.0	0.0	0.0	4.1	0.0	0.0	0.0
SE Creeks	10.8	65.7	0.4	0.5	0.7	0.0	5.8	16.2	0.0	0.0	0.0
South Gully	40.5	50.1	1.1	0.4	0.0	0.0	0.0	8.0	0.0	0.0	0.0
S. McMillan	20.7	46.6	0.2	1.5	0.1	0.0	0.8	27.0	0.1	0.0	3.0
SW Creeks	38.4	45.4	7.7	0.3	0.0	0.0	0.0	7.8	0.2	0.0	0.0
Wilkins Creek	19.0	42.8	2.0	0.1	1.6	0.0	0.0	18.6	15.1	0.1	0.8
Total Watershed	33.1	40.1	0.9	0.7	0.5	0.0	0.7	19.8	1.0	0.1	3.1

Notes: Land use percentages in the watershed were calculated by analyzing the 2012 RPS acreage data.

(a) Single Family Residential = Property Classes 210, 240,241,250, 270, 283 (b) Multi-Family Residential = Property Classes 220,230,271,280,411,416

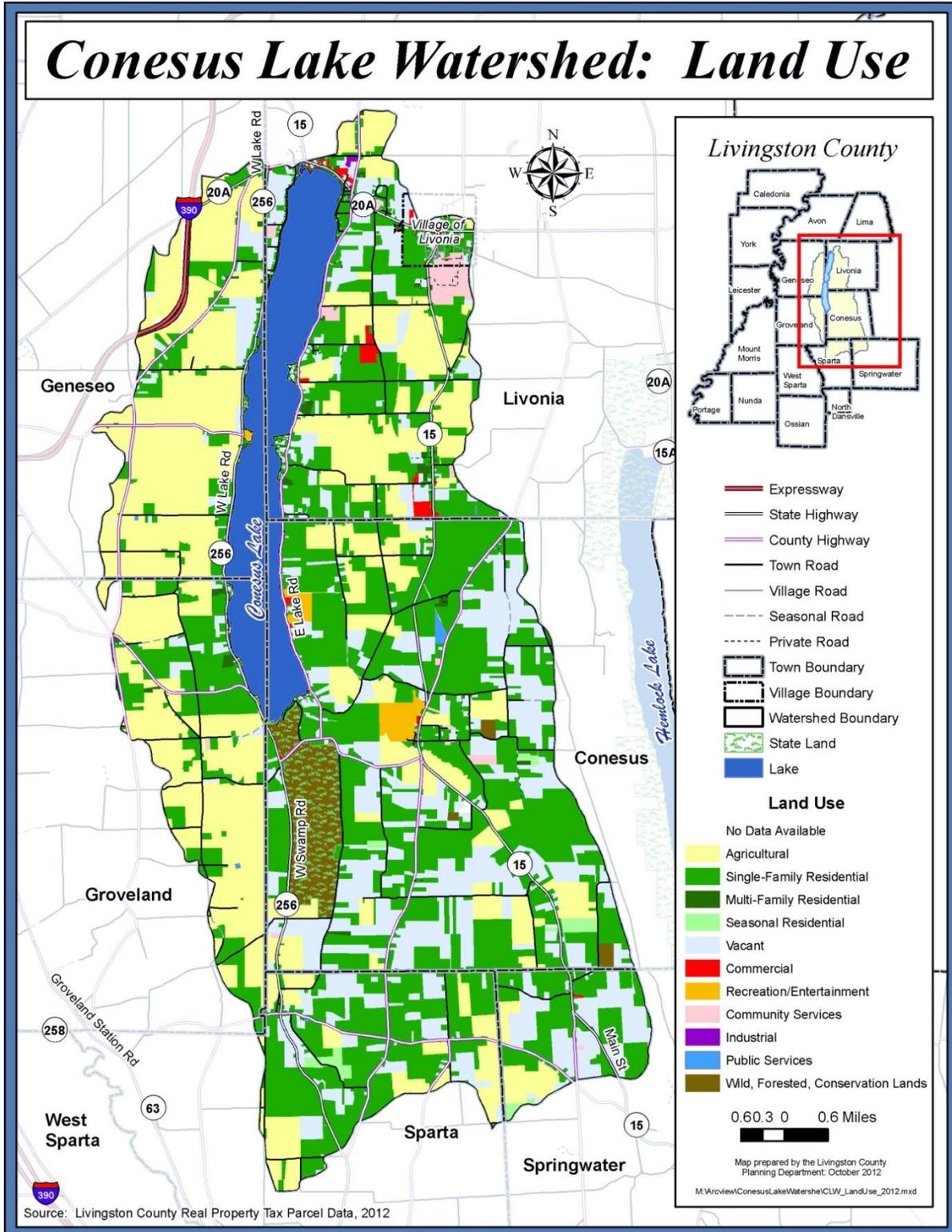


Figure 4-5. Land use in the Conesus Lake watershed, based on Livingston County real property tax parcel data, 2012.

4.2. Agricultural Practices

Agriculture remains a dominant land use and economic activity in Livingston County. In the Conesus Lake watershed, agricultural lands are concentrated along the west side of the watershed. According to the Livingston County Agriculture and Farmland Protection Plan (ACDS LLC, 2006), there is a county-wide trend away from mid-sized family-owned farms toward fewer and larger farms, along with more niche farms and hobby farms, often equestrian. Dairy farming is the dominant agribusiness. The County has among the largest percentages of prime and productive soils found in New York State. As of 2012, just over 4,500 acres of farmland in Livingston County have been placed in the state's Purchase of Development Rights program, ensuring continued use for agriculture.

The Watershed Characterization Report noted that many farms within the Conesus Lake watershed were engaged in developing Agriculture Environmental Management (AEM) Plans; this voluntary effort has been supported, in part, with grants from the state's Environmental Protection Fund.

The Conesus Lake watershed was the subject of a federally-funded research, education, and extension program focused on water quality improvement on agricultural lands. Dr. Joseph Makarewicz of SUNY Brockport directed the project, which was funded by the Cooperative State Research, Education and Extension Service (CSREES) of the U.S. Department of Agriculture (USDA). The Conesus Lake USDA project enlisted cooperating farmers within six subwatersheds, concentrated in the west side of the watershed (Figure 4-6). A seventh subwatershed, North McMillan Creek, with much less land in active agriculture, was used as a control. The subwatershed areas vary in size and stream discharge (Figure 4-5).

A range of BMPs were implemented in the experimental watersheds, tailored to existing farming practices and site conditions. The researchers monitored the impact of the BMPs on the export of nutrients, sediment and other materials to Conesus Lake, by sampling at the base of the subwatershed streams (near the confluence with Conesus Lake) over a multiple-year program. This project provided a direct assessment of the effectiveness of agricultural BMPs at the watershed scale. In addition to tracking changes in tributary export, the research team looked downstream to evaluate how the water quality and nearshore habitat of Conesus Lake were affected by implementing BMPs to reduce nonpoint sources of nutrients and sediment from the landscape.

Both structural and cultural BMPs were implemented on the lands of the participating agricultural producers. Examples of these management practices include: cessation of manure spreading during the winter, reduction in fertilizer application rates, installation of subsurface drain tiles, use of grass filter strips, contour tillage, separation of roof runoff, fencing to keep cattle from streams, manure injection, gully plugs, rotational grazing, and changes in crop rotation. A complete list of practices implemented in each of the experimental subwatersheds is included in Herendeen and Glazier (2009); data are summarized in Table 4-3.

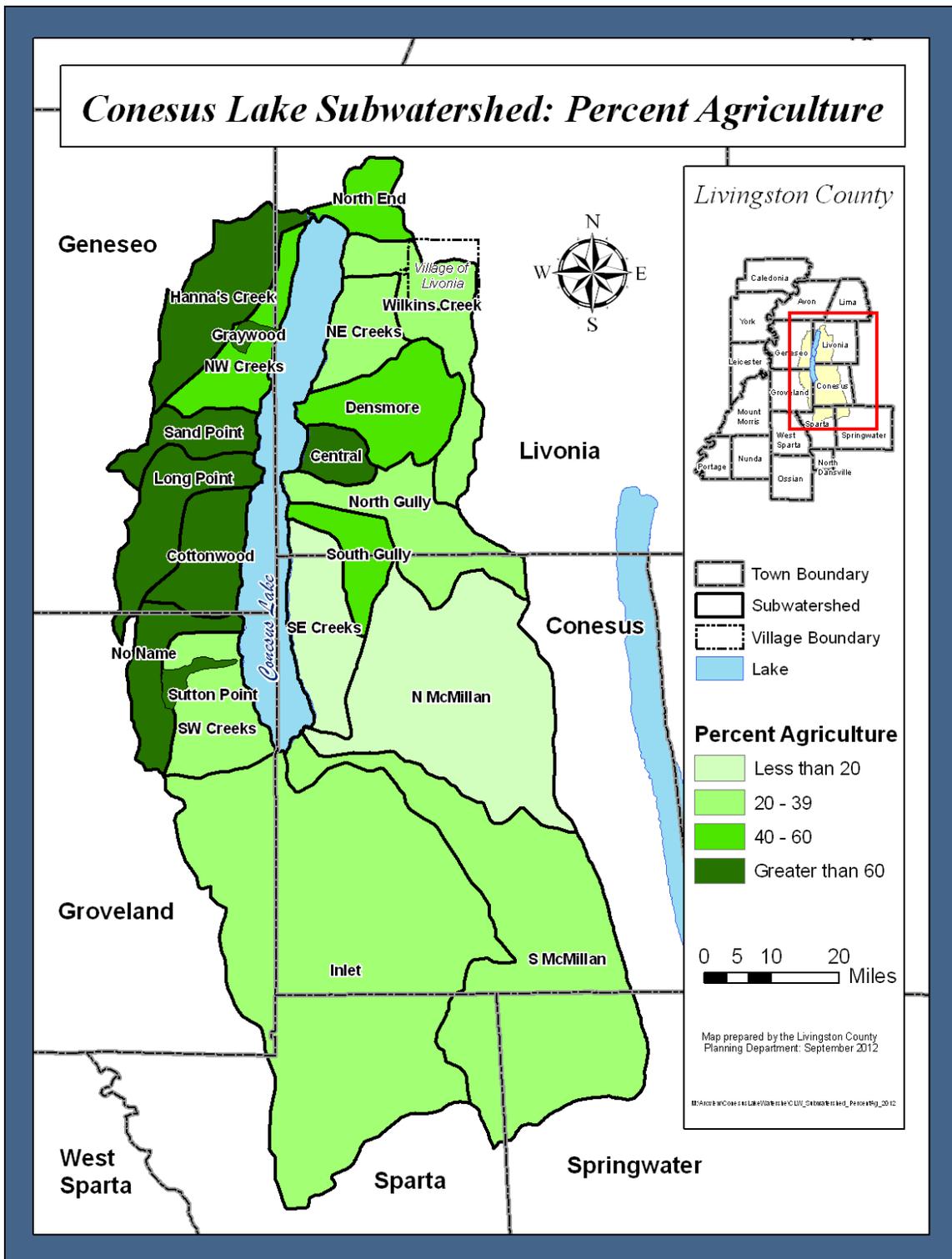


Figure 4-6. Percentage of agricultural acreage in each of the Conesus Lake subwatersheds.

Table 4-3. Characteristics of the Conesus Lake subwatersheds included in the USDA-funded study of the effectiveness of BMPs.

Site	Area (ha)	Percent agricultural land cover	Mean daily discharge (m ³ /ha/day)
<u>Study Sites:</u>			
Graywood Gully	38.1	74	41(29) ¹
Cottonwood Gully	98.8	75	22
Long Point Gully	588	86	13
Sand Point Gully	188	83	12
Sutton Point Gully/SW	67.5	76	26
<u>Control Site:</u>			
North McMillan Creek	1778	12	17

¹Discharge weighted by extended watershed of Graywood Gully

4.3. Effectiveness of agricultural BMPs on tributary water quality and loading

As part of the USDA study, the SUNY Brockport team collected weekly data for streamflow (discharge) and concentration of major nutrients, sediment, and other water quality indicator parameters at the base of the seven study watersheds (six experimental and one control). This intensive sampling program was in place during the USDA-funded program (2002-2007). Subsequent to the USDA program, the SUNY Brockport investigators continued a more limited stream monitoring program.

Interpretation of the large data sets generated as part of the program was challenging due to the episodic nature of nonpoint source pollution export. As described by Zollweg and Makarewicz (2009), the majority of nonpoint source pollution loading occurs during storm events; a wet year may mask improvements achieved by BMPs, and a dry year may exaggerate their effectiveness. To address these issues, investigators used an Analysis of Covariance (ANCOVA) to statistically evaluate whether the export of nutrients, sediment and other materials from the subwatersheds was significantly reduced following BMP implementation.

A summary of the overall impact of the BMPs in the experimental watersheds (Table 4-4) illustrates the variability associated with this type of environmental data. Notably, the concentration of nutrients and other materials in the streams generally declined over the monitoring period, with some exceptions. This pattern was not seen in the control subwatershed, North McMillan Creek. The researchers hypothesize that it may require more time (longer than five years) for the groundwater, surface water, and soil chemistry to reach a new equilibrium state (Makarewicz, et al., 2009).

Table 4-4. Summary of changes in marginal mean concentrations of nutrients and sediment over 5 years, experimental subwatersheds (Conesus Lake).

Watershed	BMPs implemented	Percent change in marginal mean concentrations, water years 1-5				
		NO ₃	TKN	TP	SRP	TSS
North McMillan	none (control)	-35	0	60	-15	95
Sutton Point	60% conversion of cropland to alfalfa	-39 a	-33 a	1	12	-72 a
Graywood	Whole farm planning, multiple BMPs	-58 a	-54 a	-47 a	-24	-65 a
Cottonwood	Gully plugs, 28% reduction in cropland	-32 b	-32 a	-12	4	-71 a
Sand Point	Rotational grazing (9.5% land), fencing	-44 a	-12	19	-8	-10
Long Point	37% reduction in cropland, remove cattle	-42 a	-24 a	-36 a	-53 a	-31

Notes:
a- designates statistically significant decrease
b- designates statistically significant decrease years 2 to 5
source: (Makarewicz, et al., 2009) p. 32

This overall analysis may, at times, mask the effectiveness of certain agricultural practices where the reduction in loading might be evident over a shorter time frame. For example, Makarewicz and Lewis (2009) completed an ANCOVA of winter monitoring data (21 December through 20 March) collected in Graywood Gully. The winter data were used to evaluate the reduction in loading realized by cessation of winter manure application, and demonstrated a statistically significant reduction in loading of water quality constituents associated with animal waste.

In addition, the reduction in loading from agricultural watersheds has effectively decreased the abundance of macrophytes, filamentous algae, and bacteria in the near shore areas of Conesus Lake. This is a result of reduction in phosphorus and nitrogen transported by the streams.

4.4. The Stream Water Quality Index

After the USDA funding ended in 2007, Dr. Makarewicz and colleagues continued monitoring the experimental subwatersheds at a reduced intensity, to evaluate whether the BMPs continued to provide water quality benefits. The reduction in frequency was necessary because of funding limitations; since 2007 the stream monitoring program has been funded, in part, from the annual allocation of Finger Lakes-Lake Ontario Watershed Protection Alliance (FLOWPA) to Livingston County Planning Department. Stream monitoring within the Conesus Lake watershed has occurred, at various intensities, for ten consecutive years (2002 - 2012).

Given the reduction in available funding resources, and the competing priorities for monitoring funds, the team evaluated various monitoring and data analysis strategies. The USDA data set provided a statistical framework for testing the impact of various sampling periods and data analysis. After reviewing various methods, Dr. Makarewicz and his colleagues concluded that a spring monitoring program was most likely to detect changes in transport of materials from the agricultural landscape. During the spring, the land is tilled, fertilized and planted. Once summer arrives, stream discharge is much lower, and the growing vegetation effectively takes up nutrients. The recommendation that the annual monitoring effort focus on the spring has now been incorporated into the annual program design.

In addition, the investigators used the USDA dataset to test various indicators of stream condition: concentration, flow-weighted average concentration, simple annual and seasonal loads, etc. The preferred metric was the “marginal mean load.” This is an ANCOVA statistical test, with stream discharge as the covariate. Statistically, the effect of streamflow is removed from the analysis so that the variability of observed loading is attributed to changes in nonpoint source loading. A series of standard curves was developed for the experimental subwatersheds using this statistical evaluation. Each monitored parameter has its own standard curve. The approach has been called the Stream Water Quality Index.

Data from the 2002 – 2007 intensive monitoring programs were used to develop a regression between discharge and concentration for each stream, for each parameter. The historical data (baseline) used in the plots were collected prior to the implementation of BMPs within the selected watershed. Once the pre-improvement plots are created, the research team plots new monitoring data (collected after BMPs are in place) on the site-specific standard curves; the plots display whether the new data are within the range of the baseline data. Points plotting below the line (outside of the statistical confidence interval) indicate improving conditions. That is, for comparable stream flow conditions, the concentration of the water quality parameter is reduced compared to previous years before protective measures were implemented. Points plotting above the line indicate degrading conditions.

The standard curve of total phosphorus data for Cottonwood Gully (Figure 4-7) illustrates the approach. Note that the 2011 measured data indicate improving conditions—less phosphorus export during spring runoff—in this subwatershed. This data analysis and visualization tool will be valuable to the Conesus Lake watershed management team. The Stream Water Quality Index can provide a rapid assessment of where conditions may be degrading, and where field reconnaissance may be warranted to understand the changes.

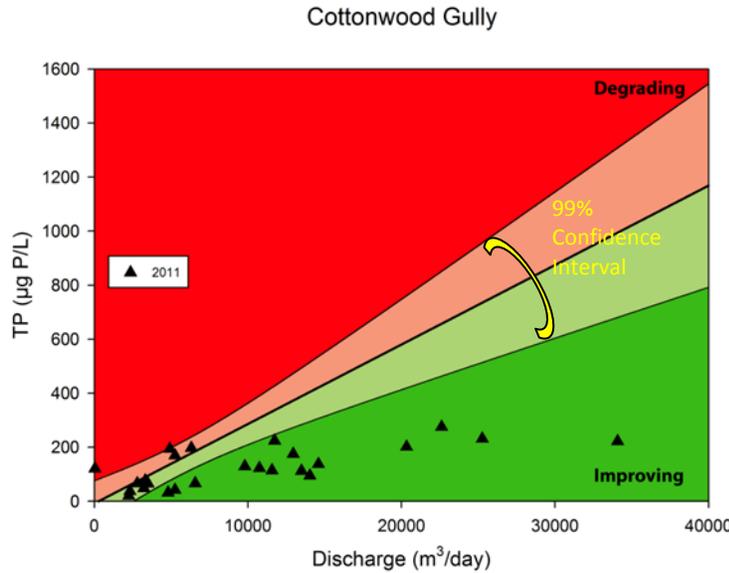


Figure 4-7. Regression line and 99% Confidence Interval based on historic spring phosphorus data, with 2011 data plotted as triangles.

The Stream Water Quality Index must be applied with care, as noted by Makarewicz (2012). Specifically, the watershed management team should be aware of the following considerations.

- *Requires a sufficient number of data points.* The larger the number of sampling points over various flow or discharge regimes, the better this tool will be for evaluating status of the streams. With a smaller number of sampling points, a greater amount of uncertainty will be introduced into the evaluation of the stream and watershed, as variability in discharge and analyte measurements over a day can be quite large – especially during events.
- *Requires high-frequency flow measurements.* In the work completed in 2011 and 2012, discharge was measured over an entire day using an automated recorder. Flow measurements should be based minimally on hourly measurements of discharge to calculate a daily discharge. This is especially true for rain/melt events.
- *Limited in applicability to spring monitoring data.* The Stream Water Quality Assessment was developed for the spring period and not for other periods of time. It is not appropriate to use during other seasons.

The SUNY Brockport team analyzed the 2002 – 2007 intensive monitoring data sets, and developed Stream Water Quality Indices for the six experimental USDA subwatersheds. Indices were developed for total suspended solids (TSS), total phosphorus (TP), soluble reactive phosphorus (SRP), nitrate, total Kjeldahl nitrogen (TKN), and sodium. Spring sampling was completed for selected streams in 2011 and 2012. Results are summarized below.

4.4.1. Cottonwood Gully

Analysis of the 2011 data using the Stream Water Quality Assessment Index indicate that the measured parameters (TP, TSS, TKN, sodium, and nitrate) suggest improvements in stream water quality observed

during and after implementation of the USDA Best Management Practices are being maintained. Only with SRP did the 2011 data suggest that the loss of SRP from the watershed was often above historical concentrations from the 2003 to 2007 period (when BMPs were initiated). Elevated concentrations may be associated with fertilization practices. Cottonwood Gully was not monitored in 2012.

4.4.2. *North McMillan Creek*

North McMillan Creek was the control watershed used in the USDA study, as the watershed is the most forested and had the least amount of agriculture. The 2011 data for TP, SRP, TKN, nitrate, and TSS indicate that the quality of the water leaving this watershed is not degraded and has not changed from the 2003 to 2007 period. The exception to this trend is sodium. Application of deicing salt on roads during the winter is a common practice, expected by the public in the Finger Lakes Region. The North McMillan 2011 data suggest that application rates and/or the number of applications may have been higher in 2011 than they were from 2003 to 2007. One factor affecting the sodium measured in the creek is the proximity of the sampling site to the downstream side of a bridge, where runoff from the roadway, likely affected by deicing salts, enters the stream. North McMillan Creek was not monitored in 2012.

4.4.3. *Graywood Gully*

As part of the USDA project, extensive BMPs were implemented within this agricultural watershed in 2002 and 2003. Major decreases in the export of nutrients and sediment were documented following the BMPs. In the spring of 2012, the majority of the stream samples indicated improving or stable conditions compared to the historical baseline data for TP, nitrate, TSS and sodium. Elevated levels of SRP and TKN were observed in approximately a quarter of the samples; these samples were collected during rain events. The 2012 data indicate that during storm events, nutrients and sediment were lost at rates that are comparable to the baseline conditions.

4.4.4. *Long Point Gully*

This agricultural subwatershed experienced major changes in land use and practices. In 2002, dairy cattle were removed from the Long Point Gully watershed; in 2003, there was a 37% reduction in crop acreage. As a result, major reductions in the export of nitrate, TP and SRP were documented.

In 2012, losses of soil from the watershed were generally below historic concentrations. TP, SRP and TKN concentrations exceeded historic levels only during runoff events, whereas half the time, nitrate concentrations exceeded historic levels for both event and non-event samples. These instances of high nitrate levels may be associated with fertilization practices.

Nearly three-quarters of the samples collected from Long Point Gully in 2012 indicated degrading conditions for sodium. The application of road salts appears to have increased since the 2003 through 2007 period.

4.4.5. *Sutton Point Gully*

Land use in this small subwatershed is predominantly agricultural, with about 76% of the area actively farmed. Over the course of the USDA program, about 60% of the farm fields were converted from cultivated field crops to alfalfa. A dramatic reduction in the export of sediment from the subwatershed was achieved. In addition, the flux of nitrate and TKN were reduced over the 2002 to 2007 period. Sutton Point Gully was not monitored in 2011 or 2012.

4.4.6. *Sand Point Gully*

Agricultural BMPs for this small agricultural subwatershed included a rotational grazing plan and measures such as fencing strips and cattle watering troughs to prevent animal access to the streams. Two gully plugs, as well as tiles, were installed in a small portion of the watershed in 2002. Results of monitoring the stream that drains this subwatershed indicate that the mean concentrations of TP, SRP, TKN and TSS did not change, while nitrate concentrations significantly decreased. Based on 2012 visual observations, much of the land cover has returned to early growth forest. The 2012 water quality sampling results indicate that, for TP, SRP, TSS, nitrate and TKN, the water quality is as good - or better than - the 2003 to 2007 period. However, increases in nutrient and soil concentrations were observed during storm events, suggesting that nutrient and soils are still being lost from this watershed during runoff events, at levels that are high relative to the historical data.

In spring 2012, concentrations of sodium in Sand Point Gully were higher than historical measurements. Similar to North McMillan Creek, the sampling location for Sand Point Gully is located just downstream of a bridge; winter deicing salts are likely to be affecting water quality at this location.

4.4.7. *Outlook for Using the Stream Water Quality Assessment Index*

This spring-based Stream Water Quality Assessment Index appears to be a viable, cost-effective approach to tracking water quality conditions in the subwatershed streams included in the USDA-funded intensive monitoring program. As discussed, it is important to sample during runoff events. The results of the 2011 and 2012 monitoring efforts are summarized in Table 4-5.

Table 4-5. Results of the Stream Water Quality Assessment Index, post-BMP monitoring (2008-present), relative to the baseline monitoring period 2003-2007.

Subwatershed	Monitoring Year	Parameters					
		TP	SRP	TKN	NO3	TSS	Na
Cottonwood	2011	Improving	Degrading	Improving	Improving	Improving	Improving
North McMillan	2011	Improving	Improving	Improving	Improving	Improving	Degrading
Graywood Gully	2012	Stable	Degrading	Stable	Stable	Stable	Stable
Sand Point Gully	2012	Improving	Stable	Improving	Improving	Improving	Degrading
Long Point	2012	Degrading	Stable	Degrading	Degrading	Improving	Degrading
Sutton Point	Not sampled	--	--	--	--	--	--

Sources:

2012 - *Stream Water Quality Assessment of Long Point Gully, Graywood Gully, and Sand Point Gully: Conesus Lake Tributaries Spring 2012*, Joseph C. Makarewicz, Theodore W. Lewis, and Dale Pettenski, The Department of Environmental Science and Biology The College at Brockport State University of New York June 2012.

2011 - *The Development of an Stream Water Quality Assessment Index to Evaluate Stream Health Conesus Lake Tributaries Spring 2011*, Joseph C. Makarewicz, Theodore W. Lewis, and Blake Snyder, The Department of Environmental Science and Biology The College at Brockport State University of New York November 2011.

4.5. Streambank Remediation and Road Ditch Remediation

The restoration and stabilization of watershed streambeds is a high priority recommendation in the *Conesus Lake Watershed Management Plan* (Recommendation C-1). Erosion and sediment from unstable stream banks affects water quality, degrades the recreational and aesthetic aspects of the lake, and diminishes the suitability of the lake as a habitat for plants and animals.

4.5.1. Streambank Remediation

In 2004, Livingston County was awarded a grant from the NYS Quality Communities program to investigate erosion along twelve tributaries to Conesus Lake (Figure 4-8). An engineering consultant identified 41 individual stream reaches, completed a technical evaluation and developed recommendations for streambank stabilization measures (Stantec Consulting Services Inc., 2006).

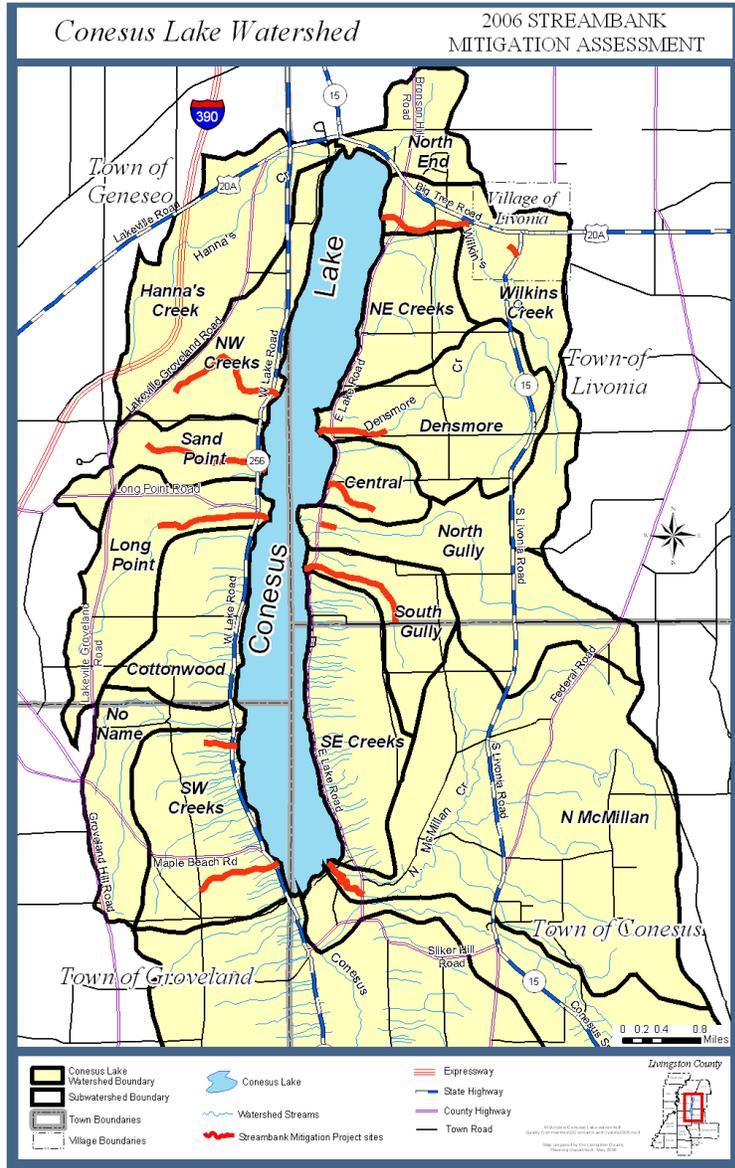


Figure 4-8. Stream segments evaluated with funding from a 2004-2005 New York State Quality Communities Grant.

Following a detailed review of site-specific technical feasibility, costs, and benefits, seven of these stream reaches located within the Towns of Conesus, Geneseo, and Livonia and the Village of Livonia were selected for remediation. In 2008 and 2009, the Town of Livonia was awarded grants from the New York State Environmental Protection Fund (EPF) on behalf of the other municipalities to reexamine and remediate these seven areas (Figure 4-9). The New York State Department of State (NYS DOS) administers these grants. Erosion on stream reaches feeding the lake contributes a large amount of sediment into the lake. This project will ultimately improve water quality in the streams and in the lake, and it will also minimize erosion and damage to riparian properties.

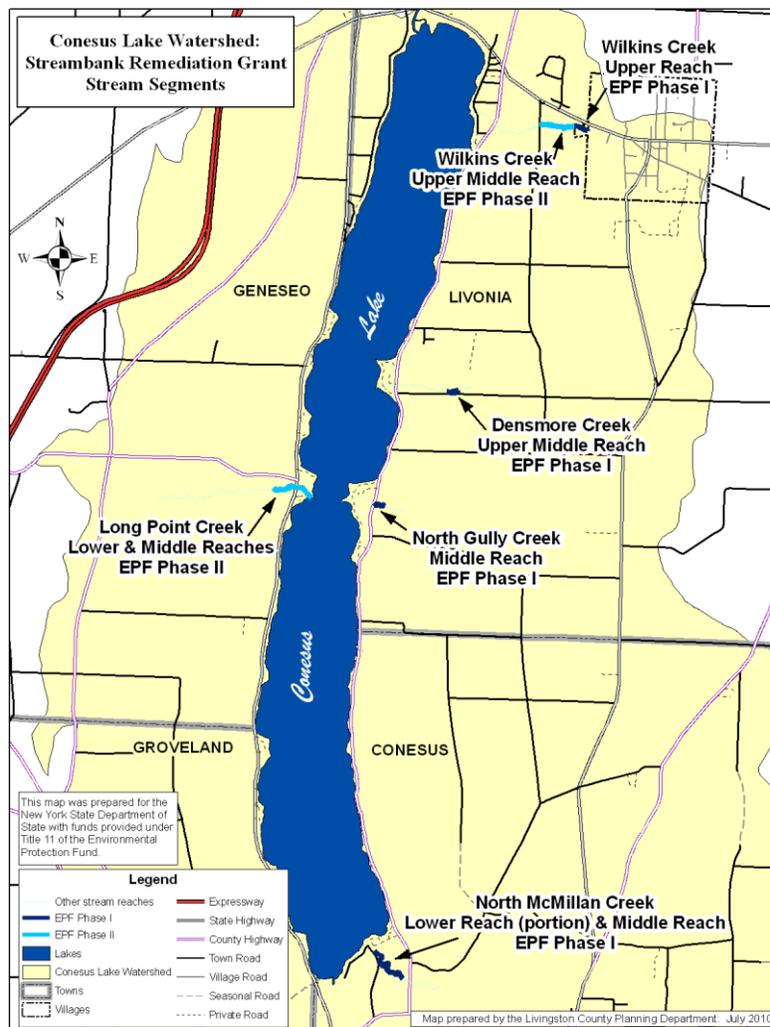


Figure 4-9. Five streams and seven stream segments targeted for streambank remediation with funding from two Environmental Protection Fund grants awarded by the NYS Department of State.

In 2008, pre-remediation (baseline) conditions were evaluated in several stream reaches considered high priority for restoration (Makarewicz et al., 2008). These data serve as a baseline to determine the effectiveness of restoration projects. Suspended sediment concentrations were monitored during runoff events in 2008; samples were collected from Wilkins Creek, Densmore Creek, North Gully, and North McMillan Creek. After remedial measures are complete, additional monitoring will be conducted to evaluate the restoration projects' effectiveness.

The streambank remediation project is in the engineering design phase; the engineering firm Barton & Loguidice is re-evaluating the stream segments and creating construction documents. This phase is scheduled to continue into early 2013. It is anticipated that work on all of these stream segments will be completed by 2015.

4.5.2. Road Ditch Remediation

Recommendation D-3 in the *Conesus Lake Watershed Management Plan* identifies the need to remediate roadside ditches in poor condition. In 2005, the Town of Groveland was awarded a grant under the New York State Environmental Protection Fund (EPF) on behalf of the watershed municipalities to examine and remediate eight high priority road ditch segments (Figure 4-10).

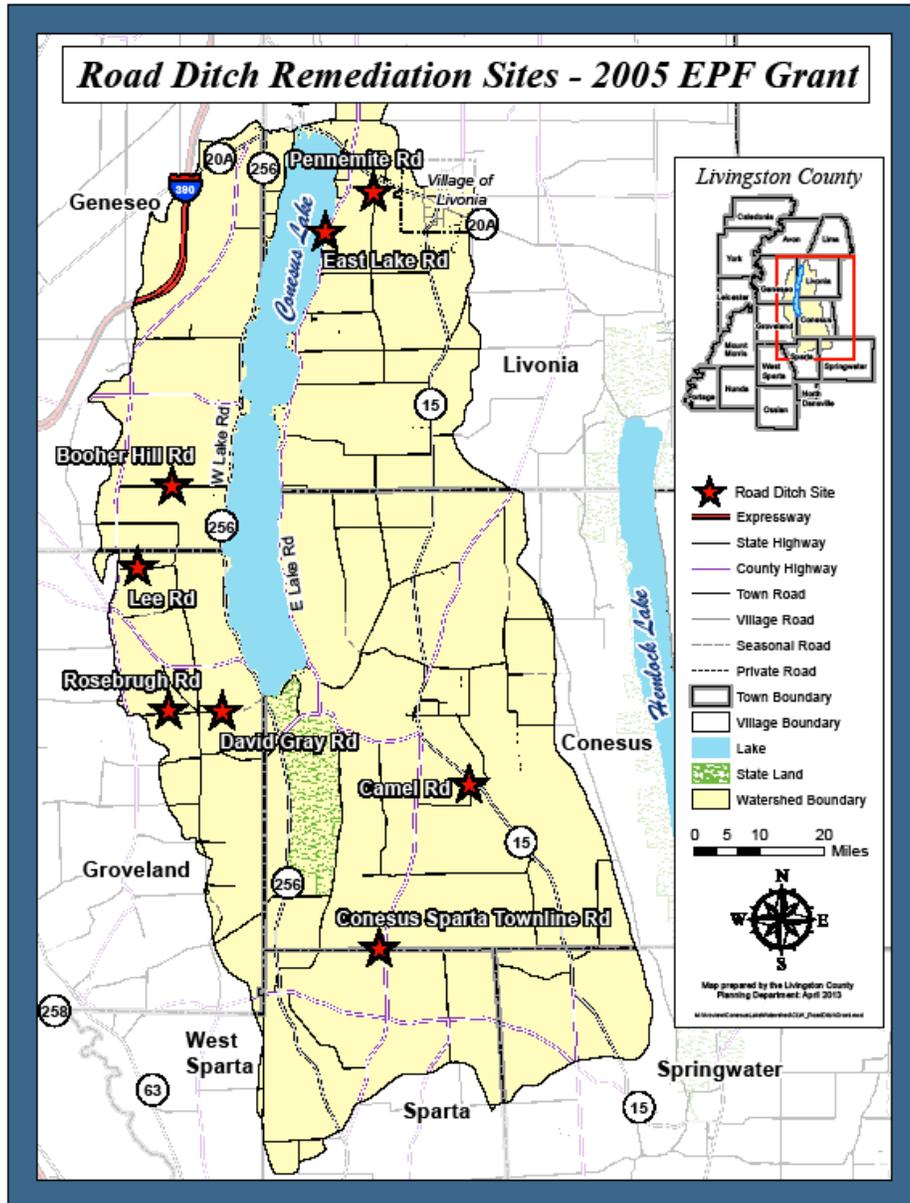


Figure 4-10. Road ditch remediation sites funded through a 2005 Environmental Protection Fund grant issued by the NYS Department of State.

The Towns of Conesus, Geneseo, Groveland and Livonia and Livingston County implemented structural erosion control measures at roadside drainage ditches along several road segments in the Conesus Lake

watershed. Priority locations were identified in a comprehensive inventory of roadside ditches. Municipal highway departments shaped the ditches to an appropriate cross section, graded the shoulders as necessary, installed geotextile fabric, and lined the ditches with medium stone fill, chinked with light stone fill. Work followed design plans prepared by the Livingston County Deputy Highway Superintendent. Roadside drainage ditches that were remediated included the following: Camel Road in Conesus, Booher Hill Road in Geneseo, David Gray Road, Lee Road and Rosebrugh Road in Groveland, East Lake Road and Pennemite Road in Livonia, and Conesus-Sparta Town Line Road in Sparta (Table 4-6).

Table 4-6. Road ditch segments and remedial work.

**Conesus Lake Watershed Road Ditch Remediation
Summary of Erosion Control Measures Needed by Road Segment**

ID	Road Segment	Jurisdiction	Segment Length	Existing Condition of Drainage Ditch	Annual Sediment Loss (lbs)	Work Needed
R-1	East Lake Road	Livingston County	1,900 ft.	Very steep, continually eroding back slope; utility poles on back side of ditch	14,080	Stabilize ditch w/ light stone, check dams, seeding. Stabilize poles w/ pipe covered by light stone fill
R-2	Pennemite Hill Road	Livonia	150 ft.	Stormwater flows from adjacent property at 90 degree angle, causing side ditch to erode.	2,900	Line ditch w/ geotextile fabric and stone fill per typical cross-section #1. Place gabion baskets at point of stormwater entry.
R-3	Camel Road	Conesus	3,500 ft.	7% grade w/ high volume water flow	51,320	Line ditch w/ geotextile fabric and stone fill per typical cross-section #1
R-5	David Gray Road	Groveland	900 ft.	5% grade w/ low-moderate volume water flow	3,300	Construct check dams with light stone to slow water flow. Place so that elevations of upper and lower check dams are the same
R-6	Rosebrugh Road	Groveland	1,800 ft.	5% grade w/ low-moderate volume water flow	18,280	Construct check dams with light stone to slow water flow. Place so that elevations of upper and lower check dams are the same
R-7	Lee Road	Geneseo	300 ft.	5% grade w/ low-moderate volume water flow	3,300	Construct check dams with light stone to slow water flow. Place so that elevations of upper and lower check dams are the same
R-8	Booher Hill Road	Geneseo	450 ft.	5% grade w/ moderate volume water flow	940	Line ditch w/ geotextile fabric and stone per typical cross-section #1 but with Gabion stone only
R-9	Conesus-Sparta Town Line Road	Sparta	2,500 ft.	10% grade w/ high volume water flow	14,080	Line ditch w/ geotextile fabric and stone fill per typical cross-section #1

Note: Road ditch segment R-4 (McGinty Road) was excluded from the final project due to budget and scope considerations.

In total, these efforts stabilized 10,500 feet of roadside drainage ditches within the lake watershed, with an estimated reduction in annual sediment loss of more than 50 tons. Photographs of the roadside ditch remediation (Figure 4-11, Figure 4-12, Figure 4-13, and Figure 4-14) illustrate the scope of the remedial projects.



Figure 4-11. Before (left) and after (right) photos of road ditch remediation on East Lake Road in the Town of Livonia.



Figure 4-12. Before (left) and after (right) photos of ditch remediation efforts on Rosebrugh Road in the Town of Groveland.



Figure 4-13. Before (left) and after (right) photos of ditch remediation efforts on Lee Road in the Town of Groveland.



Figure 4-14. Before (left) and after (right) photos of ditch remediation efforts on Booher Hill Road in the Town of Geneseo.

The Town of Conesus received several additional grants to improve drainage and stabilize roadside ditches on the following roads:

- Henderson Hill Road
- Partridge Road
- Camel Road
- Kuder Hill Road
- Bishop Road

The Town of Conesus Highway Department has remediated and armored over 50,000 feet of roadside ditches (approximately 10 miles) located on 12% to 30 % grades on roads that contribute runoff directly into McMillan Creek and the Conesus Lake Inlet. Again, this effort is projected to prevent tons of sediment from entering the streams and ultimately the lake each year.

4.6. Town and Village Initiatives: Local Regulations and Programs

Many watershed municipalities have updated their local land use regulations since 2002, as reflected in the inventory of current codes presented in Table 4-7. Municipal land use regulations are enforced at the local level by municipal boards (Planning Board and Zoning Board of Appeals), municipal code enforcement officers, and elected officials (Town Board and Village Board of Trustees).

Table 4-7. Inventory of Municipal Land Use Regulations (updates since the 2002 report are in Bold and Italics).

Municipality	Zoning	Master Plan	Subdivision Regulations	Docks & Mooring Laws	Sediment and Erosion Control Law	Flood Damage Prevention Law	Other Relevant Studies or Requirements	Planning Board	Zoning Board of Appeals	Agricultural & Farmland Protection
Town of Conesus	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No
Town of Geneseo	Yes	Yes	Yes	Yes	Yes	Yes	Yes ³	Yes	Yes	<i>Received grant in 2012</i>
Town of Groveland	Yes	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Town of Livonia	Yes	Yes	Yes	Yes	Yes ¹	Yes	Yes ⁴	Yes	Yes	No
Village of Livonia	Yes	Yes	Yes	--	Yes ¹	Yes ²	Yes ⁴	Yes	Yes	No
Town of Sparta	Yes	Yes	Yes	--	No	Yes	No	Yes	Yes	No
Town of Springwater	No	No	Yes	--	No	Yes	No	Yes	Yes⁵	No

¹Section 150-68 of the Town/Village of Livonia Zoning Code

²The Village of Livonia has submitted a petition through NYSDEC to FEMA for updated floodplain maps due to serious inadequacies and errors

³Town of Geneseo Design Criteria and Construction Specifications for Land Development

⁴ Livonia Design Criteria and Construction Specifications for Land Development

⁵*Springwater has a Board of Appeals*

One of the first recommendations of the *Conesus Lake Watershed Management Plan* to be implemented, even before the Plan was adopted, was creation of a Model Erosion and Sediment Control Law. Soil erosion was documented in the “State of Conesus Lake: Watershed Characterization Report” as a serious problem in the Conesus Lake Watershed. The Livingston County Watershed Inspector had documented multiple cases of inadequate erosion and sediment control practices around the Lake and through the watershed. Throughout the watershed planning process, the public emphasized the need for effective measures to mitigate erosion problems in the watershed. The Towns of Conesus, Geneseo and Groveland adopted town-wide Erosion and Sediment Control Laws. The Town of Livonia has existing regulations in their code addressing erosion and sediment control.

A summary of regulated activities, as well as activities that are exempt or beyond local jurisdiction (Table 4-8), demonstrates that most significant activities that disturb lands are required to have effective sediment and erosion control measures in place.

Table 4-8. Regulatory approach to soil disturbance in the model erosion and sediment control law.

Regulated by the Law	Exempted from the Law	Outside the Local Jurisdiction of the Law
Land disturbing activities that affect more than 500 square feet of soil, including, but not limited to: <ul style="list-style-type: none"> - residential construction - land moving and land clearing activities - commercial development 	Agricultural operations	State DOT practices
	Activities disturbing less than 500 square feet of soil	County Highway Department practices
	Gardens	

4.6.1 Zoning

Six municipalities in the watershed - the Towns of Conesus, Geneseo, Groveland, Livonia and Sparta and the Village of Livonia - have adopted zoning regulations. The Town of Springwater has not adopted zoning but has subdivision regulations in place as well as ordinances governing minimum lot sizes, mobile homes and mobile home parks.

Requirements for minimum lot size and maximum building coverage requirements for shoreline properties vary by town (Table 4-9), as do setback requirements (Table 4-10).

Table 4-9. Municipal Zoning on Properties along the Lake Shore*: Comparison of Minimum Lot Size and Maximum Coverage Requirements.

Zoning District	Minimum Lot Size Requirement	Maximum Lot Coverage
Town of Conesus		
Lake Residential-1 (LR1)	single family = 5,000 sq. ft. two family = 7,500 sq. ft.	50%
Lake Residential-2 (LR2)	single family = 3,000 sq. ft. two family = 5,000 sq. ft.	50%
Town of Geneseo		
Lake Neighborhood Business Zoning District (LNB)	1 acre	40% (was 35%)
Lake Shore Zoning District (L)	10,000 sq. ft. (was 6,000 sq. ft.)	25% (was 35%)
Town of Groveland		
Lake Shore Residential (LSR)	6,000 sq. ft.	35%
Town of Livonia		
Waterfront Development (WD)	Determined through site plan review process	minimum 30% green space maximum 40% lot coverage
Neighborhood Residential (NR)	Min. area for residential uses varies depending upon availability of public water and sewer. Single-family minimum lot sizes range from 15,000 - 40,000 square feet. Two-family minimum lot sizes range from 20,000 to 80,000 square feet. Min. lot sizes for multi-family and mixed residential developments are guided by the multi-family density standard of 8 DU/Acre.	25%
<p>* Includes properties between Conesus Lake and West Lake Road. Also includes properties between Conesus Lake and East Lake Road. Updates since 2002 in Bold Italics</p>		

Table 4-10. Municipal zoning on properties along the lake shoreline* and comparison of area setback requirements.

Zoning District	Area Setback Requirements		
	Front	Side	Rear
Town of Conesus			
Lake Residential-1 (LR-1)	25 ft.	5 ft.	Above high water elevation
Lake Residential-2 (LR-2)	10 ft.	5 ft.	Above high water elevation
Town of Geneseo			
Lake Neighborhood Business Zoning District (LNB)	125 ft.	15 ft.	40 ft.
Lake Shore Zoning District (L)	<i>32 ft.</i> <i>(was 75 ft.)</i>	<i>15 ft.</i> <i>(was 10 ft.)</i>	<i>15 ft.</i> <i>(was 5 ft.)</i>
Town of Groveland			
Lake Shore Residential (LSR)	75 ft.	6 ft.	5 ft.
Town of Livonia			
Waterfront Development (WD)	35 ft. from state highways, or 25 ft. from driveway, shared access road or dedicated local road	15 ft.	25 ft. from mean high water level
Neighborhood Residential (NR)	50 ft.	15 ft.	30 ft.
<p>* Includes properties between Conesus Lake and West Lake Road. Also includes properties between Conesus Lake and East Lake Road. Bold Italics indicates new information since 2002.</p>			

4.6.2 Comprehensive Plans

A Comprehensive Plan is an advisory document, setting forth policies to guide future growth and development of the community. These plans are broad in scope, and examine the physical, social and economic characteristics that make up a community. Various issues of community concern are described, along with specific recommendations to guide the community into the future.

The Towns of Conesus, Geneseo, Livonia, and Sparta and the Village of Livonia have adopted or amended their Comprehensive Plans (Table 4-11).

Table 4-11. Municipal Comprehensive Plans.

Municipality	Date Created or Last Amended
Town of Conesus	2005
Town of Geneseo	2009
Town of Livonia	2005
Village of Livonia	2005
Town of Sparta	1993

The Town of Groveland also completed an Agricultural & Farmland Protection Plan in 2010. The Town of Geneseo received a grant from the NYS Department of Agriculture & Markets in 2012 to complete an Agriculture & Farmland Protection Plan, and it is anticipated that work on this plan will begin in 2013.

4.6.3 Docks and Moorings Laws

All four shoreline towns have a local law regulating docks and moorings. All four towns have similar requirements including general provisions for number of boats permitted, placement of docks, moorings and hoist facilities, and other conditions for approval.

Town	Year
Town of Conesus	2004
Town of Geneseo	1993
Town of Groveland	2005
Town on Livonia	2007

4.6.4 Subdivision Regulations

All watershed municipalities have adopted subdivision regulations.

4.7. *New York State Initiatives*

In 2010, New York State promulgated the Dishwasher Detergent and Nutrient Runoff Law, designed to improve water quality by reducing phosphorus runoff. The law was intended to reduce costs to local governments and private entities required to remove excess phosphorus from stormwater and wastewater, and improve recreational and other uses of the state's waters.

The fertilizer portion of the law became effective on January 1, 2012. This law:

- Prohibits the use of phosphorus lawn fertilizer unless establishing a new lawn or a soil test shows that the lawn does not have enough phosphorus.
- Prohibits the application of lawn fertilizer on impervious surfaces and require pick up of fertilizer applied or spilled onto impervious surfaces.
- Prohibits the application of lawn fertilizer within 20 feet of any surface water except: where there is a vegetative buffer of at least 10 feet; or where the fertilizer is applied by a device with a spreader guard, deflector shield or drop spreader at least three feet from surface water.
- Prohibits the application of lawn fertilizer containing nitrogen, phosphorus, or potassium between December 1st and April 1st.
- Requires retailers to display phosphorus containing fertilizers separately from non-phosphorus fertilizers and to post an educational sign where the phosphorus fertilizers are displayed.

The dishwasher detergent portion of the law, effective August 2010, prohibits the sale of phosphorus-containing detergent for dishwashers.

In July, 2012, the NYS Legislature passed, and Governor Cuomo signed, legislation to protect New York's waterways and natural habitat from the devastating environmental effects of invasive species. The new law, which became effective in January, 2013, provides that the regulations governing invasive species are appropriate for New York's farming community and plant nurseries, while protecting the environment. The law implements a critical recommendation of the Invasive Species Task Force. Under the provisions of the new law, the NYSDEC and the Department of Agriculture and Markets (DAM) have been granted the authority to regulate the sale, purchase, possession, introduction, importation, and transport of invasive species. In addition, the law establishes penalties for those who violate the new regulations.

5. The State of the Lake 2012: Status and Trends

The 2002 *State of Conesus Lake: Watershed Characterization Report* compiled existing data and information to evaluate the lake's water quality and the status of its biological community. As for most lakes, a patchwork of information exists for Conesus Lake; monitoring has been undertaken by a variety of organizations to meet a variety of objectives. One outcome of the planning process was adoption of a coordinated monitoring framework. As discussed in Section 3.2 Monitoring Consortium, under this framework, the various monitoring efforts are directed toward analyzing and reporting on metrics important to Conesus Lake. Good metrics are relatively easy to measure, associated with low variability, and provide data that are comparable between lakes and over time. Some metrics are used to assess intrinsic ecosystem characteristics, while others evaluate whether conditions support the desired human uses of the aquatic system. For most lakes, the primary metrics track trophic state. Based on the areas of concern identified in the 2001 report, metrics for Conesus Lake also encompass dissolved salts, aquatic vegetation, pesticides, indicator bacteria, sedimentation, and invasive species.

5.1 Regulatory status

In New York, the Department of Environmental Conservation (NYSDEC) classifies surface waters—including lakes, rivers, streams, embayments, estuaries, and groundwater—with respect to their designated use. Conesus Lake is a Class AA waterbody. According to Part 701.5 of the New York Codes, Rules and Regulations (NYCRR), the best usages of Class AA waters are:

- a source of water supply for drinking, culinary or food processing purposes;
- primary and secondary contact recreation; and
- fishing (the waters shall be suitable for fish, shellfish, and wildlife propagation and survival).
- Further, this classification may be given to those waters that, if subjected to approved disinfection treatment, with additional treatment if necessary to remove naturally present impurities, meet or will meet New York State Department of Health drinking water standards and are or will be considered safe and satisfactory for drinking water purposes.

The waters of the state are assessed to determine whether water quality and habitat conditions support the designated use. The assessment process, which gathers information from local stakeholders, results in a statewide listing of priority waterbodies (The Waterbody Inventory/Priority Waterbodies List, or PWL), where the designated uses may not be fully attained. For each of the designated uses (for example, swimming or public water supply), the extent to which the designated uses may not be met is ranked, on a scale ranging from threatened (least severe) to precluded (most severe). Metrics for the evaluation are summarized in Table 5-1.

Table 5-1. NYSDEC assessment of severity of use impairment.

Severity	Criteria
Precluded	<i>Frequent/persistent</i> water quality, or quantity, conditions and/or associated habitat degradation <i>prevents all aspects</i> of the waterbody use.
Impaired	<ul style="list-style-type: none"> • Occasional water quality, or quantity, conditions and/or habitat characteristics <i>periodically prevent</i> the use of the waterbody, or; • Waterbody uses are not precluded, but some aspects of the use are <i>limited or restricted</i>, or; • Waterbody uses are not precluded, but <i>frequent/persistent</i> water quality, or quantity, conditions and/or associated habitat degradation <i>discourage</i> the use of the waterbody, or; • Support of the waterbody use <i>requires additional/advanced</i> measures or treatment.
Stressed	Waterbody uses are not significantly limited or restricted, but occasional water quality, or quantity, conditions and/or associated habitat degradation <i>periodically discourage</i> the use of the waterbody.
Threatened	<ul style="list-style-type: none"> • Water quality currently supports waterbody uses and the ecosystem exhibits no obvious signs of stress, however <i>existing or changing land use patterns</i> may result in restricted use or ecosystem disruption, or; • Monitoring <i>data reveal increasing contamination</i> or the presence of toxics below the level of concern, or; • Waterbody uses are not restricted and no water quality problems exist, but the waterbody is a <i>highly valued resource</i> deemed worthy of special protection and consideration.
<p><i>Source:</i> The New York State Consolidated Assessment and Listing Methodology - Section 305(b) Assessment Methodology., May 2009</p>	

The most recent Genesee River Basin Waterbody Inventory/Priority Waterbodies List Report (PWL) was issued in March 2003. Conesus Lake was included in this list (cited as water segment: Ont 117- 40-P67 Conesus Lake (0402-0004)) based on several of the designated uses. In addition to ranking the severity of the non-attainment, the list denotes the level of data available to support the designation and potential sources of pollution (Table 5-2).

Table 5-2. Conesus Lake Priority Waterbodies List status, as published in 2003.

Designated use	Attainment status	Documentation	Causal/contributing factors
Recreation	Impaired	Known	Algal/Weed Growth, D.O./Oxygen Demand, Nutrients, Problem Species
Public bathing	Stressed	Known	Agriculture, Other Source
Aesthetics	Stressed	Suspected	Not stated
Water supply	Threatened	Suspected	Not stated

Source: Genesee River Basin Waterbody Inventory/Priority Waterbodies List Report, March 2003

In 2004, NYSDEC placed Conesus Lake on its List of Impaired Waterbodies, also known as the 303(d) list, in Part 1 - Individual Waterbody Segments with Impairment Requiring TMDL Development. The 303(d) list is a compilation of lakes, streams, and coastal areas where water quality conditions are not adequate to support a designated use. Designated uses may be human oriented (e.g. drinking water, swimming, boating, shellfish consumption) or ecologically oriented (e.g. fish propagation, fish survival). The list is named for the section of the federal Clean Water Act requiring states, territories, and authorized tribes to assess water quality conditions within their jurisdictions. Water quality conditions are compared with criteria and standards defined in terms of the specific uses. The 303(d) list is a product of this assessment; water bodies are placed on the list when additional controls are needed to bring water quality into compliance with standards and criteria defined for designated uses.

The Section 303(d) List is updated every two years. The current list in effect is the Final 2012 NYS Section 303(d) List (July 2012) which was approved by USEPA. In this current document, Conesus Lake is listed for impairment from phosphorus due to agriculture (as first listed in 2006) and oxygen demand due to agriculture (as first listed in 2002).

5.2 Physical Characteristics

5.2.1 Bathymetry

In 2009, CR Environmental of Falmouth Massachusetts completed a bathymetric survey of Conesus Lake that resulted in an update of the lake’s bathymetric map (Figure 5-1).

The process integrated digital Global Positioning Satellite (DGPS) technology with a precise depth measurement to create a high resolution map of the lake bottom. The bathymetric data acquisition system consisted of a laptop computer running hydrographic survey software (a program called HYPACK), a precision single-beam echosounder and a Trimble DGPS. Depth measurements were collected using an precision echosounder equipped with an 8-degree 200-kHz transducer. The echosounder digitized and

recorded the lake bottom and exported depth values to HYPACK. The echosounder transducer was mounted to the rail of the survey vessel amidships using a high-strength adjustable boom. The DGPS antenna was attached to the top of the transducer boom.

This bathymetric map allows managers to accurately assess the lake volume at specific depth intervals. Note the relatively shallow northern basin and the large extent of littoral habitat – areas less than 20 feet deep – where light can penetrate to the bottom sediments and support plant growth.

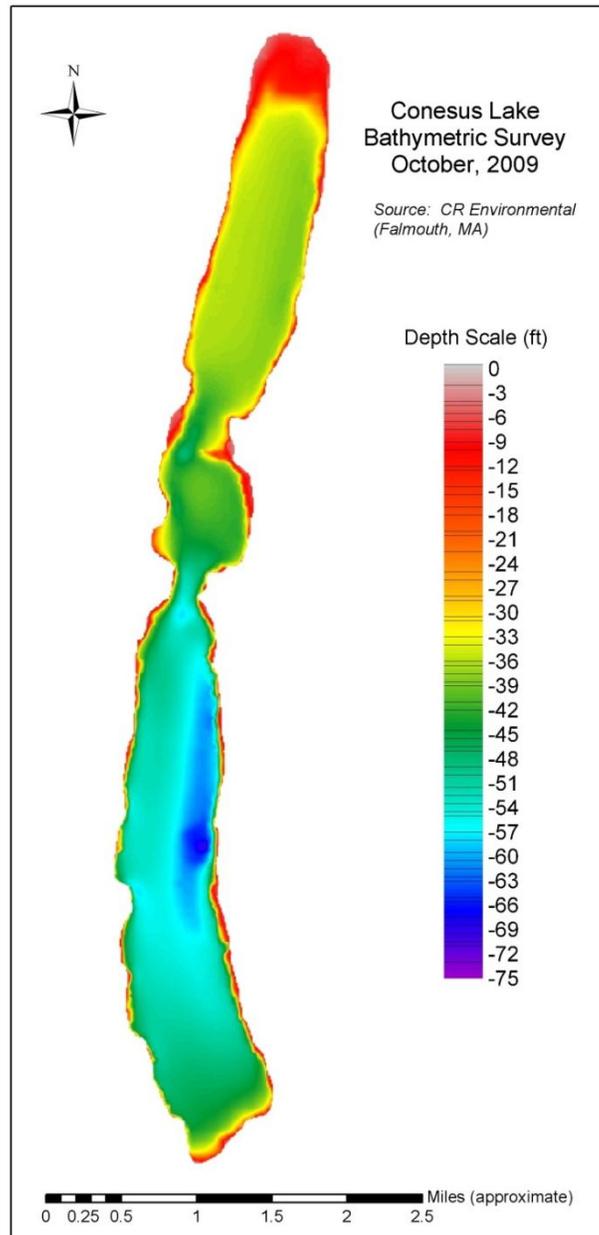


Figure 5-1. Updated bathymetric map of Conesus Lake, 2009.

5.2.2 Ice cover

The “ice-off” date of Conesus Lake is one indicator of trends in weather. An ice cover may form and break up multiple times in late fall and early winter on Conesus Lake, as on other lakes; however, once the ice is gone in the spring, a complete re-freeze is rare. If spring warming occurs earlier in the year, then ice-off is also likely to occur earlier. Observations of ice-off have been made since the winter of 1980-81; most of these observations were made from Leisure Time Marina, located on the east shore about 1 mile south of the public launch site. (Stewart 2012). Based on the lake ice-out dates (Figure 5-2), there is no trend observed indicating changes in ice-out dates over time. The earliest ice-out date occurred on February 10, 2002, while the latest date of ice-out occurred on April 10, 2001. The average ice-out date is March 22, and the median is March 26.

There was also no trend observed in the duration of ice cover (Figure 5-3). Duration of full winter ice cover ranged from seven days (2001-2002) to 114 days (2000-2001), with average duration of 65.2 days. The absence of trends in ice-off dates and duration of ice cover suggests little change over time in the past 30 years of local conditions on Conesus Lake; local ice cover conditions may not be a suitable surrogate observation for global climate change as measured by air temperature increases.

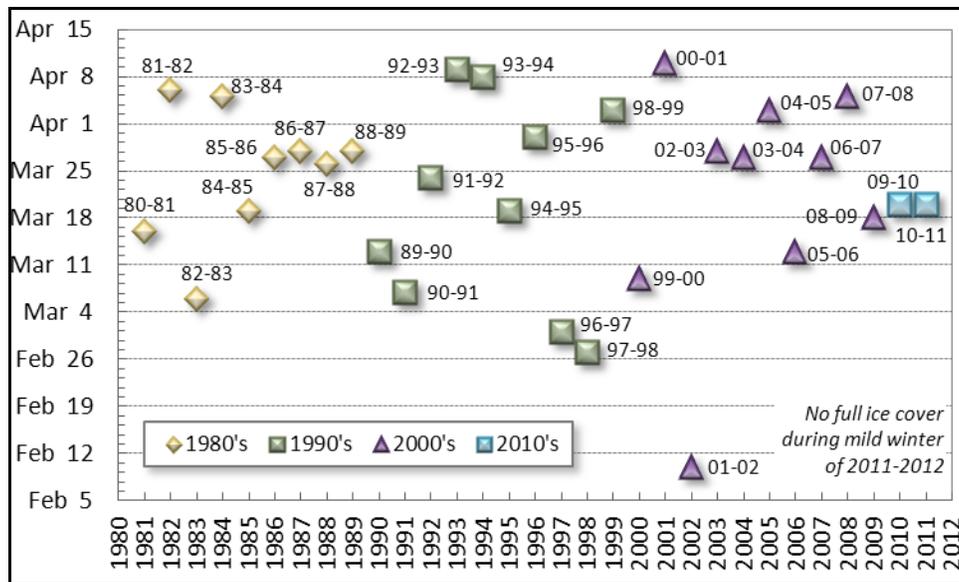


Figure 5-2. Conesus Lake ice-off dates, winter 1980-1981 through winter 2011-2012.

Source: Dr. Kenton M. Stewart, SUNY Buffalo, unpublished data collected on the East shore of the Southern Basin.

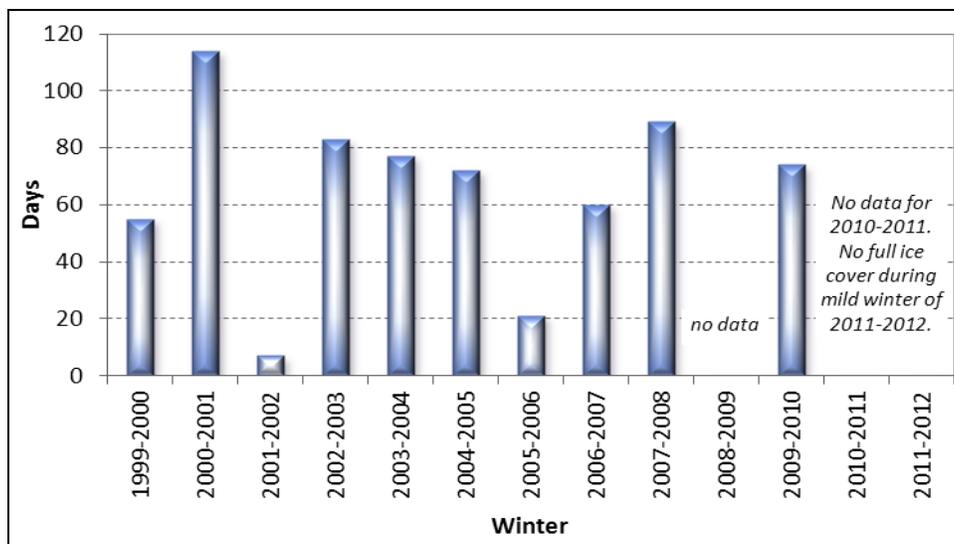


Figure 5-3. Conesus Lake approximate duration (days) of full ice cover, winter 1999-2000 through winter 2011-2012.

Source: Dr. Kenton M. Stewart, SUNY Buffalo, unpublished data.

5.3 Chemical Characteristics and Trophic State

The trophic state of a lake is typically defined by three parameters: phosphorus concentration, Secchi disk transparency, and chlorophyll- α concentration. These three parameters are used to assess lake productivity. In turn, the lake productivity is related to the dissolved oxygen content of the water column; highly productive lakes consume more oxygen and therefore have zones of low oxygen or anoxia. The presence of anoxic conditions in lower waters, adjacent to the sediments, will promote flux of phosphorus from sediment storage into the water column where it becomes more available to algae. This can result in more algal blooms.

In the following sections, the status and trends in the trophic state of Conesus Lake will be discussed, as well as deep water dissolved oxygen conditions, deep water sediment flux of nutrients, and the State Environmental Quality Review (SEQR) for alum treatment of Conesus Lake.

5.3.1 Total phosphorus, Secchi disk transparency, chlorophyll- α

Total phosphorus (TP) concentrations have been measured in the lake intermittently since the early 1970s (Figure 5-4). Summer average TP is used as an index of the lake’s trophic state and suitability for use in water supply and recreation. Elevated TP concentrations have an effect on algal abundance and water clarity. NYSDEC has adopted a guidance value for TP in lakes of 20 $\mu\text{g/L}$ summer average (defined as the period from June 1 to September 30). Since the adoption of the CLWMP and the agricultural BMPs, the summer average TP has been below the 20 $\mu\text{g/L}$ guidance value in two of the four years for which monitoring was conducted.

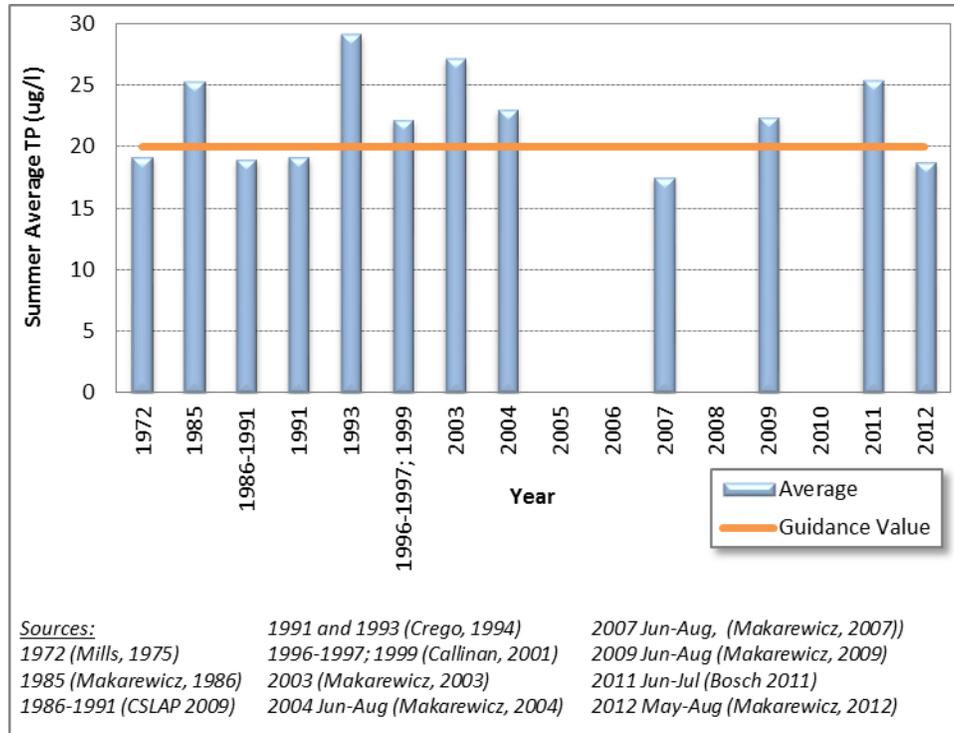


Figure 5-4. Summer average epilimnetic total phosphorus (ug/L), Conesus Lake. Summer data are generally defined as the period June-August; seasonal sampling period for data prior to 2003 cannot be verified and is assumed to represent summer.

Chlorophyll- α , the primary pigment present in phytoplankton, is used as an indicator of algal abundance. In general, when TP concentrations are higher, there is greater algal abundance, and Chlorophyll- α concentrations will also be higher. A summary of chlorophyll- α measurements over time is shown in Figure 5-5. Upper waters summer average chlorophyll- α concentrations less than 6 $\mu\text{g/L}$ correspond to a low frequency of perceived use impairment. Average concentrations from 2009 and 2011 are within 1 $\mu\text{g/L}$ of the perceived use impairment threshold.

NYSDEC is currently proposing revisions to nutrient criteria for lakes; instead of using total P as the indicator of trophic state, the response variable, chlorophyll- α , will be used. The proposed revisions are anticipated to be released for public comment prior to 2015.

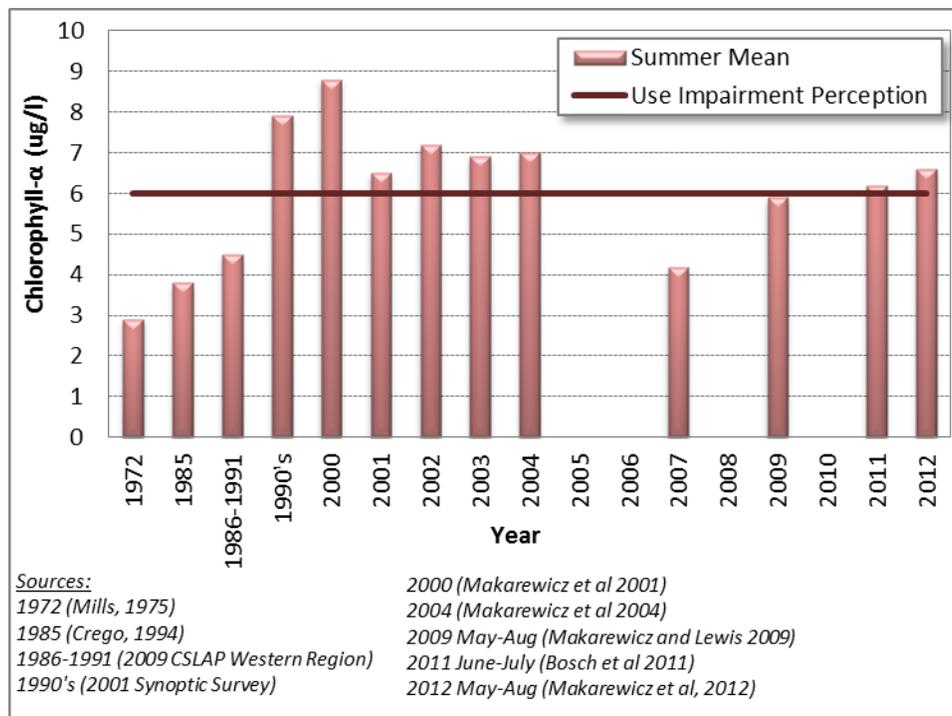


Figure 5-5. Historical summer average chlorophyll-a concentration in upper waters, Conesus Lake.

Secchi disk transparency is a measurement of water clarity, which can be affected by algal abundance. Where algal abundance is high, water clarity is diminished and the Secchi disk measurements (an index of light penetration) are lower. Secchi disk measurements have been taken intermittently in Conesus Lake since as early as 1910 (Figure 5-6). The earliest measurements (prior to the 1980s) exceeded 4 meters. Through the 1980s and into the 1990s, measurements were reported around 3 meters. Recent data are comparable.

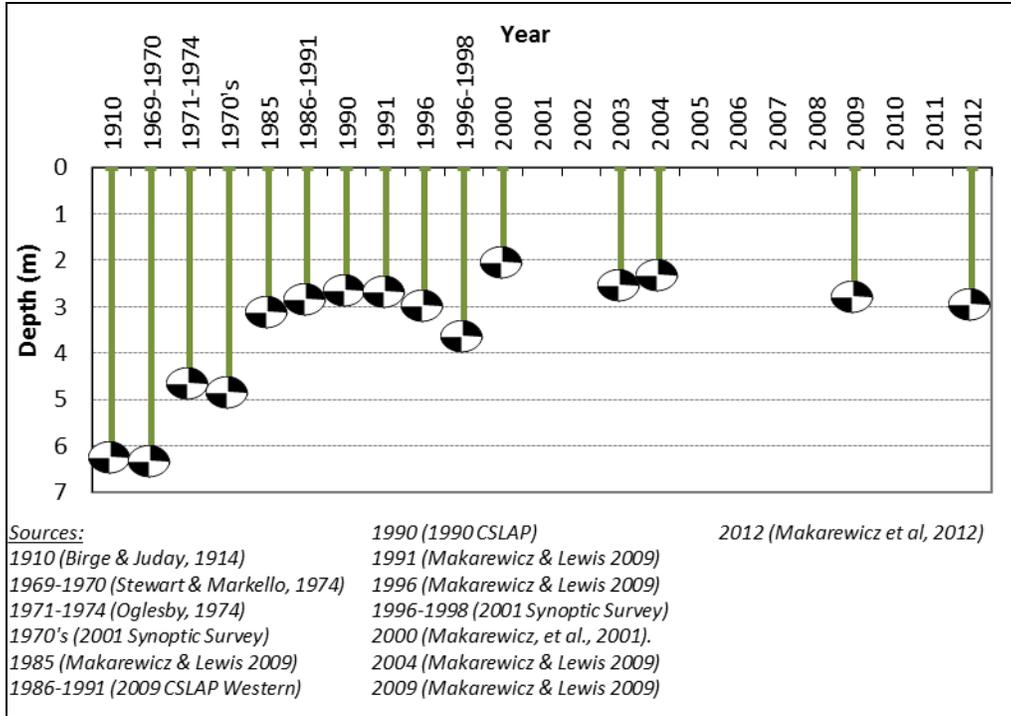


Figure 5-6: Summer average Secchi disk transparency, 1910-2012

These three parameters – total phosphorus (TP), chlorophyll- α , and Secchi disk transparency – are inter-related, and may be used to assess algal biomass. Of the three, chlorophyll- α is the most direct measure to estimate algal biomass; total phosphorus and Secchi transparency are indirect measures. All three parameters are used in Carlson’s Trophic Status Index (TSI), useful in assessing the productivity of the lake. The TSI is calculated using measurements from the lake (Equation 5-1), and the resulting values indicate the trophic state as noted in Table 5-3.

Equation 5-1: TSI calculations

$$TSI(SD) = 60 - 14.41 \ln(SD \text{ measurement})$$

$$TSI(CHL) = 9.81 \ln(CHL \text{ measurement}) + 30.6$$

$$TSI(TP) = 14.42 \ln(TP \text{ measurement}) + 4.15$$

Where:

- SD = Secchi Disk
- CHL = Chlorophyll- α
- TP = Total Phosphorus
- ln = natural logarithm

Table 5-3. Trophic State scale and attributes summary.

Range of TSI Values	Trophic State	Attributes
<30	Oligotrophic	Clear water, oxygenated throughout the year in the deep water (hypolimnion)
30-50	Mesotrophic	Moderately clear water, increasing probability of hypolimnetic anoxia during summer
50-70	Eutrophic	Anoxic hypolimnia, macrophyte and algal problems possible
>70	Hypereutrophic	Dense algae and macrophytes; algal scum; light-limited productivity.

The summary of the trophic state of Conesus Lake over time is shown in Figure 5-7. There is very little change since the 1980s. The TSI values for the three indices range between 40 and 60, around the borderline between mesotrophic and eutrophic states. It is encouraging to note the decline into the mesotrophic category; this suggests that the effects of agricultural BMPs and other reductions in nonpoint source pollution associated with the CLWMP recommendations are becoming evident.

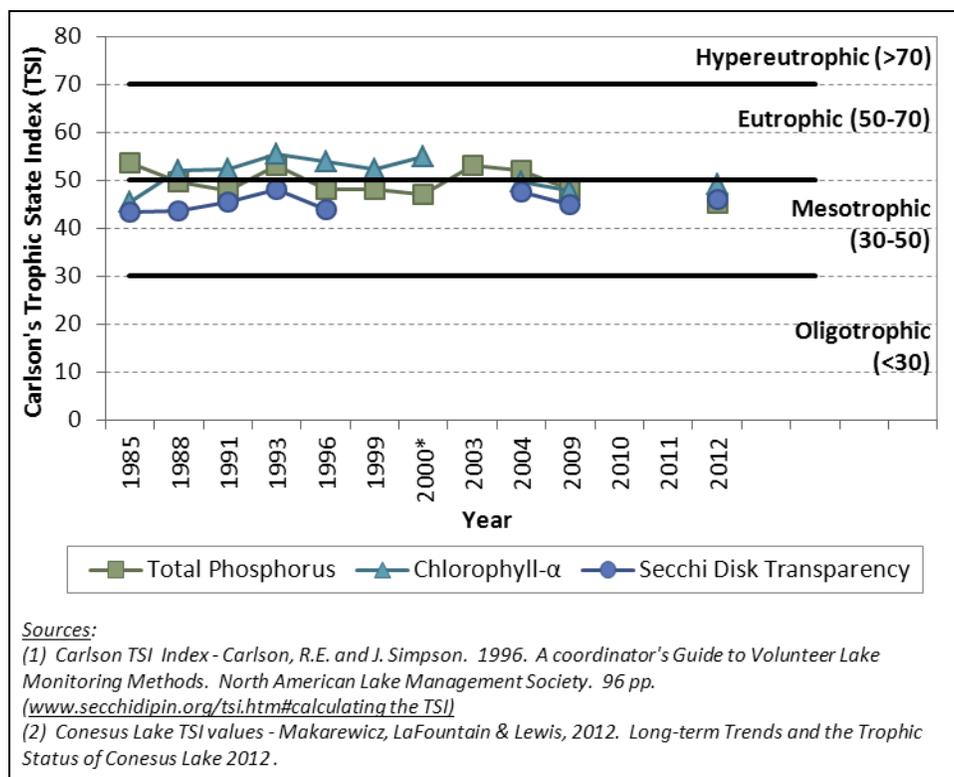
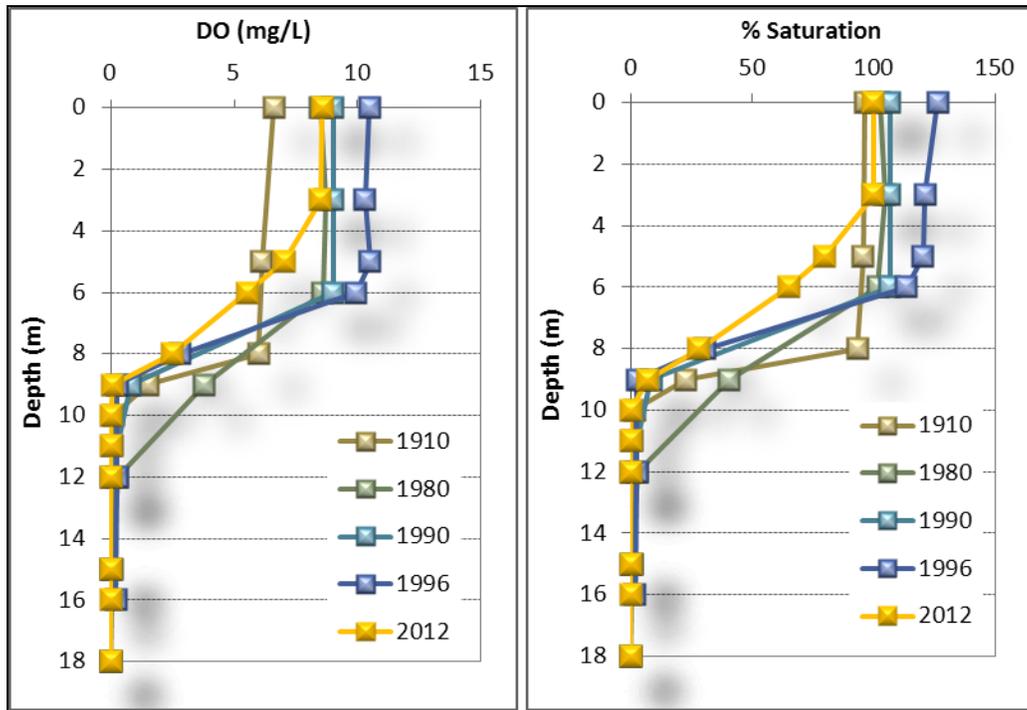


Figure 5-7. Trends in Trophic State Indices for Conesus Lake.

5.3.2 Deep water dissolved oxygen

Long-term monitoring of Conesus Lake confirms that summertime oxygen depletion of the lake’s deep water is a consistent feature (Figure 5-8). Anoxic conditions develop during thermal stratification, and can extend upward through the water column to a depth of about 9 meters. The dissolved oxygen (DO) profiles do show evidence of change over the century of monitoring. Note that the percent saturation of DO at the 8 m depth has declined from 100% in 1910 to 25% in recent years.



Sources: 1910 (Birge and Juday, 1914); 1980 and 1990 (Stewart, unpublished); 1996 preliminary NYSDEC Finger Lakes survey data (Callinan, 1997); 2012 (Makarewicz et al, 2012).

Figure 5-8. August dissolved oxygen and percent saturation profiles of Conesus Lake in 1910, 1980, 1990, 1996, and 2012.

5.3.3 Sediment flux estimates

During stratification, lakes with anoxic hypolimnia often accumulate TP in the hypolimnion; much of this phosphorus is released from the anoxic sediment surface through oxidation-reduction reactions (Nurnberg 1984). If this phosphorus is transported vertically to the upper sunlit layer of the lake, it may stimulate algal growth (Cooke et al. 1977).

At Conesus Lake in 2009, bi-weekly monitoring was conducted of TP concentrations throughout the water column during the summer stratification period (Makarewicz, 2009). Hypolimnetic anoxia was reported in early July, and elevated hypolimnetic concentrations of TP were evident by mid-July. By late August, deep water concentrations of TP were almost 40 times higher than TP concentrations in the lake’s upper waters.

Based on 2009 results, the annual mass of phosphorus released from the lake sediments during hypolimnetic anoxia is 8,000 kg P/year (8.7 mg P/m²/day), which is within the range of reported release rates for various lakes (range 6 to 18 mg P/m²/day, average 12.9 mg P/m²/day (Mawson et al. 1983). The amount of phosphorus flowing into Conesus Lake annually through the monitored subwatersheds is approximately 2,100 kg P/year. The monitored subwatersheds represent about half of the major subwatersheds of Conesus Lake. If the losses from the unmonitored subwatersheds are similar to that of the monitored subwatersheds, the external annual phosphorus load to Conesus Lake is approximately 4,200 kg. This is likely to be a conservative estimate, as the amount of P lost from unmonitored subwatersheds—as well as from small rivulets and storm drains—has not been quantified. Moreover, the external load will vary from year-to-year depending on the range of hydrologic conditions. Watershed loading will be lower in dry years, and higher in wet years—particularly years with more intense storms.

Considering that external loading from the watershed is in the range of 4,200 kg P/year, the amount of internal phosphorus flux from sediments (8,000 kg P/year) represents the majority of the phosphorus loading to the lake. However, not all phosphorus released from the sediments will reach the upper waters, even as the lake mixes. A portion of the phosphorus released from sediments will re-precipitate as oxides of iron and manganese once the water column becomes oxygenated as the waters cool and mix in the fall.

5.3.4 Inorganic water quality conditions

Conesus Lake monitoring efforts encompass some water quality constituents in addition to the trophic state parameters. In particular, the concentration of dissolved salts (sodium chloride) has been of concern. By 2002, monitoring data confirmed that chloride concentrations in Conesus Lake had steadily increased as the watershed became more developed. Sodium and chloride concentrations at the water intakes continued to rise. By 2009, the concentration of sodium in the lake water had increased from approximately 15 mg/L to 25 mg/L. Monitoring results from 2012 indicate that sodium concentrations continue to increase, ranging from approximately 24 mg/L to 31 mg/L (Figure 5-9). Measurements at this magnitude are well above the EPA's Drinking Water Equivalency Level for sodium, which is established at 20 mg/L (Makarewicz et al. 2009).

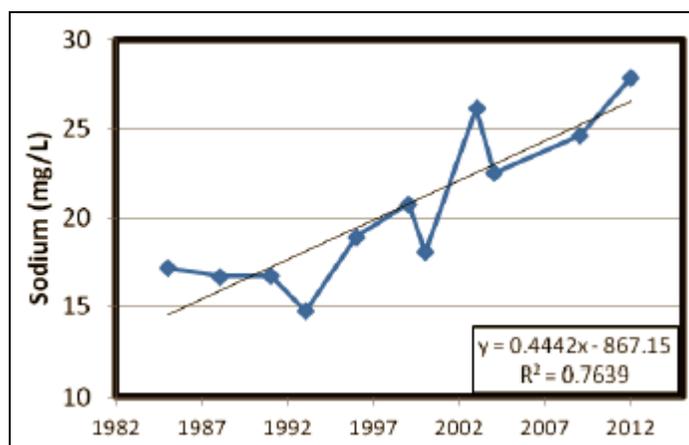


Figure 5-9. Average upper waters concentrations of sodium, 1985 to 2012 (Makarewicz, 2012).

The increase in sodium concentrations in the lake is attributed to application of deicing chemicals to roads in the watershed. In 2004, Livingston County and the towns surrounding Conesus Lake implemented BMPs and covered all salt piles in an effort to reduce salt input to the lake. However, as sodium concentrations have continued to increase since 2004, additional BMPs for reducing the risk of salt runoff to the lake are essential.

5.4 Biological Characteristics

5.4.1 *Macrophytes and macroalgae*

Macrophytes are aquatic plants characterized by the presence of roots, stems, flowers and seeds. Often included in discussions about macrophytes are certain species of large algae, or macroalgae, also described as “filamentous algae”. Filamentous algae form masses of long, hair-like strands, creating greenish floating mats. Both macrophytes and filamentous algae provide a number of important functions to the lake ecosystem. Soft sediments are stabilized by plant roots, while wind and wave action are dissipated by the plant stems and leaves. Beds of macrophytes and filamentous algae also trap particulate material, capture photosynthetic energy, and serve as a base to the aquatic and terrestrial food web. The presence of macrophytes in the littoral zone is correlated with higher diversity and abundance of invertebrates, an essential food source for the lake biota. Macrophytes also provide habitat areas for insects and fish.

While macrophytes and filamentous algae are beneficial in many ways, nuisance levels of growth can impair the recreational uses of the lake. Excessive filamentous algae can create unsightly masses in the water, and create a stench when decaying along the shoreline. High nutrient levels in the lake can create conditions suitable for excessive growth of macrophytes and filamentous algae.

As part of the USDA agricultural BMP evaluations Dr. Sid Bosch of SUNY Geneseo has been measuring macrophyte growth adjacent to the “control” and “treatment” subwatersheds. He has evaluated the size and density of the weed beds, the changes in the dominance of Eurasian watermilfoil, and the extent of the filamentous algae community in these areas. In addition, Dr. Bosch completed a macrophyte survey in 2012 to document species diversity and relative abundance of the macrophyte community lake-wide and to compare its current state to conditions reported in 1968 and 1999.

One of the most important results of the Bosch (1999) study was finding that the largest and most dense Eurasian watermilfoil-dominated macrophyte beds were located near streams that drained primarily agricultural watersheds. This observation was part of the rationale for the USDA watershed management project (2003-2009), which among many other questions tested the hypothesis that nutrient management at the watershed level could reduce Eurasian watermilfoil biomass in the littoral zone adjacent to stream inflows (Makarewicz et al., 2009). The results of the project demonstrated the benefits of agricultural management in terms of stream water quality and in reducing plant growth in nearshore areas (e.g., Makarewicz et al., 2009, Bosch et al. 2009a, b).

The watershed management project also tested the hypothesis that nutrient management at the watershed level could reduce filamentous algae growth. While some of the program monitoring indicated reduction in

filamentous algae in nearshore locations, the redirection of the mouth of North Gully did not produce the expected reduction in filamentous algae growth. Filamentous algae continue to be a problem both in nearshore areas and the center of the lake.

Monitoring of the Conesus Lake macrophyte beds has continued in recent years at Sutton Point Gully, Sand Point Gully and Cottonwood Gully, as well as North Gully, which served as a reference site for the USDA project. In the winter 2008, the North Gully stream channel was diverted to direct runoff into the open water and away from the macrophyte bed south of McPhersons Point (North Gully Cove). Initial studies by Bosch and colleagues (2008, 2009, and 2010) found no evidence that diversion of the stream had reduced the abundance of Eurasian watermilfoil or algae in North Gully Cove.

Samples in 2012 were collected in late July and August near the peak of the macrophyte growing season, along three historical transects at Sutton Point, North, Gully Cove, Sand Point and Cottonwood Gully. At these sites in 2012, the surface area of coverage and the standing crop of the milfoil-dominated zone remained low or continued to decrease when compared to 2009, even in sites that had already undergone significant reductions of milfoil biomass from 2004-2008 in response to watershed management. At the North Gully site, where in 2008 the stream channel was redirected to drain away from the macrophyte bed, the surface area of the milfoil dominated zone and the total milfoil standing crop were about 40% lower than in 2009.

In 2012, a macrophyte survey of Conesus Lake was conducted to survey the species diversity and relative abundance of the macrophyte community lake-wide and to compare its current state to trends identified in 1968 and 1999.

Most of the macrophyte species currently abundant in Conesus Lake were abundant in previous surveys, going back to W.C. Muenschner's survey in 1926. The one exception is in the dominance of the invasive Eurasian watermilfoil, which had colonized the lake by the late 1960s and ultimately supplanted the native northern milfoil and displaced the dominant water stargrass in most of the lake. The species assemblage of macrophytes observed in Conesus Lake is listed in Table 5-4.

Table 5-4. Species of macrophytes reported present in Conesus Lake, 1926-2012.

Name	Common Name	1926 ^a	1968-1970 ^b	1999 ^c	2012 ^d
<i>Ceratophyllum demersum</i>	Coontail	x	x		x
<i>Chara</i> spp.	Muskgrass	x	x	x	x
<i>Elodea canadensis</i>	Common waterweed	x	x		x
<i>Heteranthera (Zosterella) dubia</i>	Water stargrass	x	x	x	x
Watermilfoils:					
<i>Myriophyllum exalbescens</i> *	Common watermilfoil	x	x		
<i>Myriophyllum sibiricum</i> *	Common watermilfoil			x	
<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	x		x	x
<i>Najas flexilis</i>	Slender naiad	x	x	x	x
<i>Nymphaea odorata</i>	White water lily			x	
Pondweeds:					
<i>Potamogeton amplifolius</i>	Large-leaf pondweed	x	x		
<i>Potamogeton angustifolius</i>	Illinois pondweed		x		x
<i>Potamogeton crispus</i>	Curly-leaf pondweed	x	x	x	x
<i>Potamogeton epihydrus</i>	Ribbon-leaf pondweed	x		x	
<i>Potamogeton diversifolius</i>	Water thread pondweed				x
<i>Potamogeton foliosus</i>	Leafy pondweed	x			
<i>Potamogeton gramineus</i>	Variable-leaf pondweed	x	x		x
<i>Potamogeton natans</i>	Floating pondweed	x			
<i>Potamogeton nodosus</i>	Long-leaf pondweed		x	x	x
<i>Potamogeton pectinatus</i> **	Sago pondweed	x	x	x	x
<i>Potamogeton pusillus</i>	Small pondweed		x		

Name	Common Name	1926 ^a	1968-1970 ^b	1999 ^c	2012 ^d
<i>Potamogeton richardsonii</i>	Richardson's pondweed	x	x		
<i>Potamogeton zosteriformis</i>	Flat-stem pondweed	x	x		x
Crowfoots:					
<i>Ranunculus longirostris</i>	Stiff water crowfoot			x	x
<i>Ranunculus trichophyllus</i>	Thread-leaf crowfoot		x		
<i>Ruppia sp.</i>	Ditch grass				x
<i>Utricularia vulgaris</i>	Common bladderwort	x	x		
<i>Vallisneria americana</i>	Wild celery	x	x	x	x
Number of Species		18	18	12	16
<p>*In 2002 version of this table, <i>Myriophyllum exalbescens</i> and <i>Myriophyllum sibiricum</i> were listed as separate species. According to the ITIS database, <i>Myriophyllum exalbescens</i> is a synonym for <i>Myriophyllum sibiricum</i>, which is the accepted name. Retrieved 5/29/2012 from the Integrated Taxonomic Information System online database, http://www.itis.gov.</p> <p>** In 2002, this species was listed in the table as <i>Potamogeton pectinatus</i>. Currently, the accepted name is <i>Stuckenia pectinata</i> (per USDA Plant Fact Sheet published 2010).</p> <p>Sources: a – Muenscher (1927) b – Forest et al (1967-1985) – SUNY Geneseo c – Bosch et al (1999-2000) – SUNY Geneseo d – Bosch et al (2012) – SUNY Geneseo</p>					

This shift in the community is reflected in all community metrics tested. Specifically, data from 1968 and 2012 were compared to investigate changes in species richness (defined as the number of species), the Simpson's Index of Diversity¹, and the Proportional Index of Community Similarity² of the macrophyte community. Results of this analysis comparing 1968 and 2012 macrophyte communities are presented in Table 5-5.

¹ The Simpson's Index of Diversity, widely used in the ecological literature, provides a single value that incorporates the species richness and the relative abundance of species in a community. Range is 0 to 1, "1" represents infinite diversity and "0" no diversity.

² The Proportional Index of Community Similarity uses the proportional weight of individual species in two communities, and the comparison of these communities yields a PSI value between 0 and 100%, where 100% represents two identical communities and 0% represents two communities having no species in common.

Table 5-5. Species diversity of macrophytes observed in Conesus Lake, 1926-2002.

Metric	1968	2012	Comments
Species Richness	4.25	9.6	Average number of species by site in 2012 was significantly higher than in 1968.
Simpson's Diversity Index	0.43	0.32	Average diversity by site was greater in 1968 than in 2012, though not significantly
Eurasian water milfoil, % dry weight	14%	44%	Milfoil was greater percent of biomass in 2012 than in 1968
Proportional Community Similarity Index	37.5%		Similarity index is low given the apparent stability of the species composition; likely result of major shift in relative species abundance.

5.4.2 *Cyanobacteria*

An emerging issue in lake management is the development of harmful blooms of cyanobacteria (blue-green algae). A Blue-Green Algae Early Detection and Rapid Response Plan for Conesus Lake was developed in 2011 to improve public understanding of this issue, and to ensure that the state, county and local agencies - including water purveyors - understand their responsibilities and have access to clear and verified data. More information is available on the County website (<http://www.co.livingston.state.ny.us/planning.htm>).

In the summer of 2012, Dr. Sid Bosch of SUNY Geneseo developed a quantitative methodology to characterize the local intensity of cyanobacterial blooms in Conesus Lake, using the pigment phycocyanin as an indicator of bloom intensity. The concentration of phycocyanin in freshly collected samples can be estimated from the pigment's natural fluorescence peak. Phycocyanin concentration is strongly correlated with the number of cyanobacteria cells in the water and thus bloom intensity.

The method developed by Dr. Bosch was used on August 7-14, 2012, when surface slicks of cyanobacteria were observed in shoreline areas. The fluorescence and calculated phycocyanin concentrations measured for surface slicks were very high. The Livingston County Department of Health decided to temporarily close public beaches and to warn residents of potential risks associated with direct contact with affected waters.

5.4.3 *Benthic macroinvertebrates*

Dr. Sid Bosch and students from SUNY Geneseo completed a survey of the deep-water benthic macroinvertebrate community of Conesus Lake in 2005, as part of the environmental impact analysis of a potential alum treatment program (Bosch, Beary, Lombardi, & Arnold, 2005). The goal of the study was to characterize the aquatic biota inhabiting the sediments underlying water deeper than 8 m, which is subject to seasonal anoxia.

Results of the 2005 sampling and analysis indicated that the macroinvertebrate community is dominated by chironomid larvae (family Chironominae, genus *Chironomus*) and by small oligochaete worms, members of the widespread families Tubificidae and Naididae. These three groups jointly represented 83% and 99% of the macroinvertebrates collected at depths of 8-13m and 15-20m in 2005 (Figure 5-10). Isopods, scuds, bivalves, leeches and hydras in decreasing importance represented the non-chironomid, non-oligochaete components of our collections, accounting for only 9% of the total fauna.

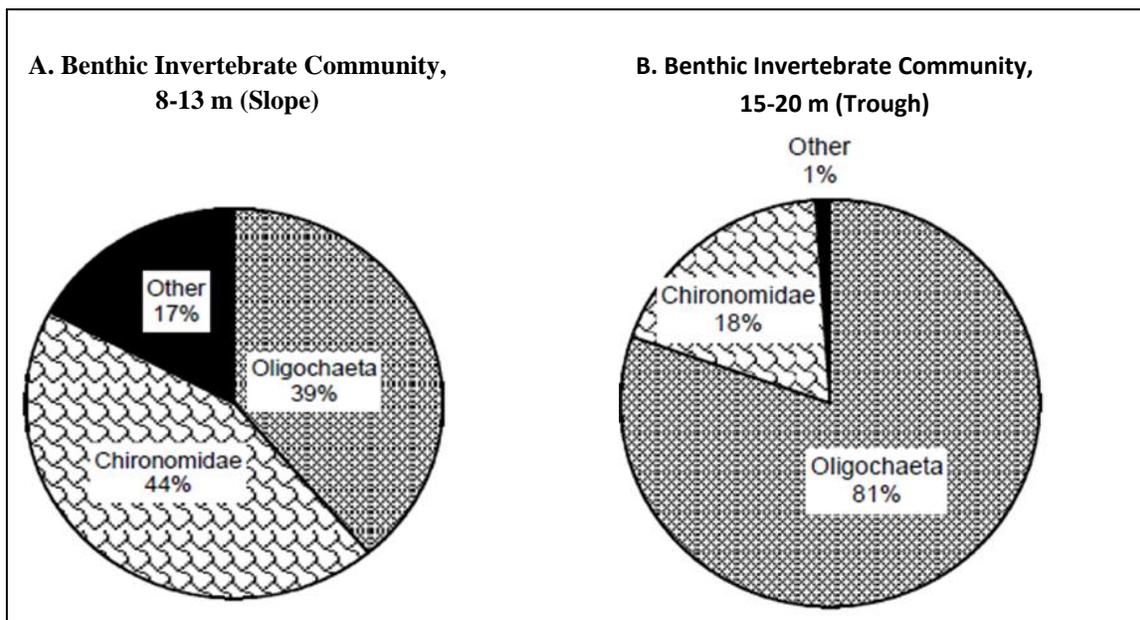


Figure 5-10. Dominant benthic macroinvertebrate taxa from the deep slope (A) and the trough (B) of Conesus Lake. (Bosch, et. al., 2005).

Species of tubificid and naididae worms and of the midge genus *Chironomus* are highly tolerant of low oxygen concentrations, and normally thrive in deeper waters of eutrophic inland waters. Water column profiles taken in July indicated that the macroinvertebrate communities in all of the sampling sites were subject to uniformly cold (9-11°C) low-oxygen conditions.

5.4.4 Zooplankton

As discussed in the 2001 Watershed Characterization Report, one of the adverse impacts of the relatively recent proliferation of alewife in Conesus Lake is the extirpation of the larger-bodied zooplankton, such as *Daphnia* species, which are effective grazers of the lake’s phytoplankton. Biomanipulation is the deliberate alteration of an ecosystem by adding or removing species, especially predators. In Conesus Lake, the stocking of walleye by NYSDEC and the Conesus Lake Association has been underway for many years with two objectives: to increase the population of walleye of legal size for fishing and to reduce the number of alewife in the lake.

If alewife populations are reduced, it is believed that the large *Daphnia* populations that once existed in Conesus Lake may return to historic levels and then graze and reduce down the high phytoplankton levels in the lake (Makarewicz 2001). Unfortunately, there has been no significant change in the zooplankton

community in the last twenty years despite the walleye stocking program. *Daphnia* abundance (<3.04/L) and biomass (<1 mg/m³) is still low (Figure 5-11) while the overall size (length) of the zooplankton community is still less than a quarter of the size in 1972. (Makarewicz and Lewis, 2009)

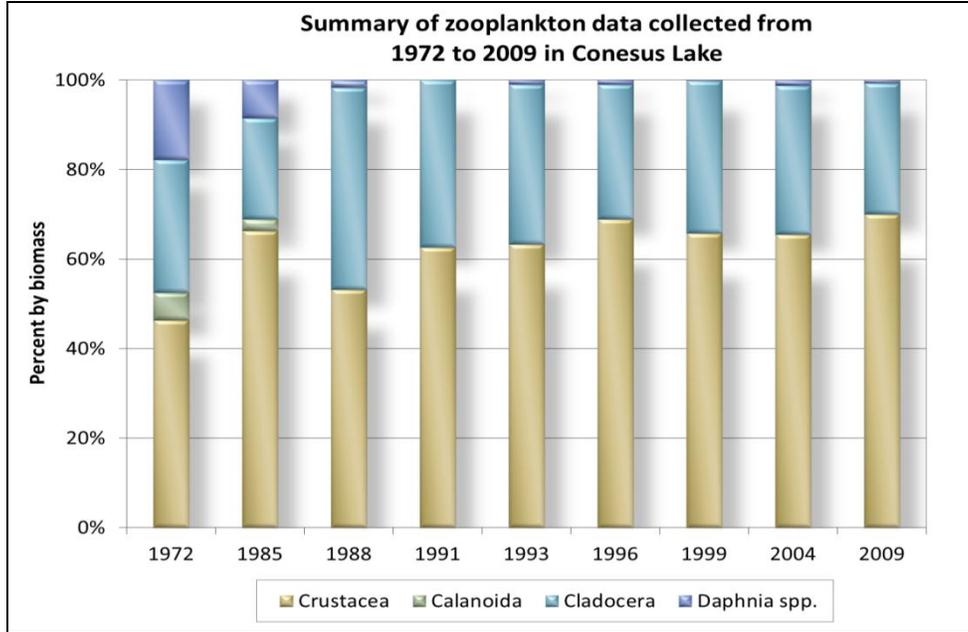


Figure 5-11. Summary of zooplankton percent biomass data collected in Conesus Lake, 1972-2009.

The species richness of zooplankton species in Conesus Lake appears to be declining (Table 5-6), with a loss of larger-bodies cladocerans.

Table 5-6. Presence (X) or absence (-) of zooplankton species in samples collected from different monitoring programs.

Class/Order	Species	1910-1993	2009
Cladocera	<i>Bosmina longirostris</i>	X	X
	<i>Bosmina</i> sp.	X	-
	<i>Ceriodaphnia reticulata</i>	X	-
	<i>Ceriodaphnia</i> sp.	X	X
	<i>Chydoridae</i> sp.	X	-
	<i>Daphnia galeata-mendota</i>	X	-
	<i>Daphnia hyaline</i>	X	-
	<i>Daphnia pulex</i>	X	-
	<i>Daphnia retrocurva</i>	X	X
	<i>Diaphanosoma birgei</i>	X	-
	<i>Eubosmina coregoni</i>	X	-
	<i>Leptodora kindtii</i>	X	-
Copepoda (Cyclopoid Copepodid)	<i>Acanthocyclops vernalis</i>	-	X
	Copepod nauplius	-	X
	Cyclopoid copepodid	X	X

Class/Order	Species	1910-1993	2009
	<i>Cyclops bicuspidatus thomasi</i>	X	-
	<i>Cyclops vernalis</i>	X	-
	<i>Diacyclops thomasi</i>	-	X
	<i>Diaptomus minutus</i>	X	-
	<i>Diaptomus pallidus</i>	X	-
	<i>Diaptomus sicilis</i>	X	-
	<i>Eucyclops agilis</i>	X	-
	<i>Mesocyclops edax</i>	X	X
	nauplii	X	-
	<i>Tropocyclops prasinus</i>	X	-
	<i>Tropocyclops prasinusmexicanus</i>	X	-
Rotifera	<i>Ascomorpha</i> sp.	X	X
	<i>Asplanchna priodonta</i>	X	X
	<i>Brachionus</i> sp.	X	-
	<i>Collotheca</i> sp.	X	-
	<i>Conochilis unicornis</i>	X	X
	<i>Filinia longiseta</i>	-	X
	<i>Filinia terminalis</i>	X	-
	<i>Gastropus</i> sp.	-	X
	<i>Hexarthra</i> sp.	X	-
	<i>Kellicottia bostoniensis</i>	X	X
	<i>Kellicottia longispina</i>	X	X
	<i>Keratella cochlearis</i>	X	X
	<i>Keratella crassa</i>	X	X
	<i>Keratella earlinae</i>	X	X
	<i>Keratella hiemalis</i>	X	-
	<i>Keratella quadrata</i>	X	X
	<i>Lecance tenuiseta</i>	X	-
	<i>Notholca acuminata</i>	-	X
	<i>Ploesoma hudsonii</i>	-	X
	<i>Polyarthra dolichoptera</i>	-	X
	<i>Polyarthra eurypta</i>	-	X
	<i>Polyarthra major</i>	-	X
	<i>Polyarthra remata</i>	-	X
	<i>Polyarthra vulgaris</i>	-	X
	<i>Pompolyx sulcata</i>	-	X
	<i>Synchaeta</i> sp.	-	X
	<i>Trichocerca multicrinis</i>	-	X
Total number of species		38	29
Sources: 1910-1993 (EcoLogic, LLC, 2002) 2009 (Makarewicz & Lewis, 2009)			

5.4.5 Fish Community

According to NYSDEC, Conesus Lake was traditionally a productive fishery for warmwater sportfish and panfish. The species assemblage has changed; the outstanding walleye fishery of the 1960s diminished through the 1970s, while the lake’s yellow perch ice fishery declined during the 1980s. The decline of the yellow perch fishery was attributed to the introduction of alewife; this fish competes with yellow perch for food.

Fish stock assessment surveys are conducted by NYSDEC Region 8 in Conesus Lake every three years. Only partial data are currently available for the 2009 survey (Table 5-7). Based on the preliminary reports, the major species appear to be relatively stable in abundance since 2001. However, the reported increase in walleye catch is interesting, given the fingerling stocking initiative. NYSDEC expects to release the final 2009 report in 2013.

Table 5-7. Fish species captured by NYSDEC Region 8, by gill netting.

SPECIES	2001 Fall Gill Netting (Survey No. 801029)		2004 Fall WW STG (Survey No. 804007)		2009 (partial, preliminary data)	
	TOTAL	No./Net	TOTAL	No./Net	TOTAL	No./Net
Alewife	40	3.33	34	2.83		
Northern pike	10	0.83	21	1.75	9	1.00
Common Carp	5	0.42	7	0.58		
White sucker	5	0.42	7	0.58		
Brown bullhead	93	7.75	76	6.33		
Rock bass	36	3.00	50	4.17		
Pumpkinseed	172	14.33	211	17.58		
Bluegill	239	19.92	244	20.33		
Smallmouth bass	34	2.83	23	1.92	27	3.00
Black Crappie			8	0.67		
Yellow perch	8	0.67	1	0.08	4	0.40
Walleye	108	9.00	101	8.42	109	12.10
TOTAL	750	62.5	783	65.2	885	98.30
No. spp.	11		12		13	
No. nets		12		12		9

5.4.5.1. Alewife

As evident in the fish survey data, alewife account for 4% to 5% of the fish species captured; despite the relatively low contribution to the fish community, alewife can affect the lake’s overall food web. The proliferation of alewife in Conesus Lake is having a serious impact on the populations of the larger-bodied zooplankton, such as *Daphnia* species, which are effective grazers of the lake’s phytoplankton. As a result,

the phytoplankton populations increase and water clarity decreases. In addition, alewife is considered a risk to native fish populations in the Great Lakes basin, since the species affects fish community structure through fish larval predation, competition for zooplankton food base, and by carrying high concentrations of thiaminase that break down the thiamine necessary for successful egg development in predators feeding on alewife (Rudstam et al. 2010).

The effectiveness of biomanipulation techniques, such as the fingerling stocking program underway for Conesus Lake, in controlling alewife have been evaluated. Researchers from Cornell University evaluated alewife and walleye data from Cayuta Lake and Canadarago Lakes (Rudstam et al. 2010). The results from the two lakes indicated that alewife have strong compensatory responses to low density. Initial findings suggest that, although alewife abundance declined following walleye stocking in Cayuta Lake, the adult walleye population could not maintain a level that would permanently decrease alewife abundance. An understanding of these responses is critical, not only for investigating the possibility of controlling alewife by stocking walleye, but also to understand overall ecosystem dynamics (Rudstam et al. 2010).

5.4.5.2. Habitat Improvement

The habitat and ecological function of wetlands located along Conesus Lake have been affected by water-level regulation to support recreation and manage the risk of flooding. The Lower Great Lakes Fish and Wildlife Conservation Office (LGLFWCO) worked with the New York State Department of Environmental Conservation (DEC) Bureau of Fisheries and Bureau of Operations, and the Conesus Lake Association to replace two deteriorated aluminum water control structures with concrete box structures. The new structures will enhance NYSDEC's ability to manage and restore more seasonal, water-level fluctuations in 15 acres of emergent wetlands fringing Conesus Lake located within the Conesus Inlet Fish and Wildlife Management Area. In addition, the wetlands were graded to increase topographic and plant diversity to further enhance habitat function of wetlands (Figure 5-12). This project was funded in part by the Great Lakes Basin Fish Habitat Partnership. This project will benefit Northern Pike in Conesus Lake by improving spawning habitat, and re-opening and restoring/enhancing wetlands (U.S. Fish and Wildlife Service, Northeast Region, 2011).



Figure 5-12. Grading wetlands along Conesus Lake to increase habitat heterogeneity (background) and newly installed water control structure and dike (foreground). Credit: Raymond Li, USFWS

Source: (<http://www.fws.gov/northeast/fisheries/about/glri.html>).

5.4.5.3. Fish Kill Contingency Plan

A fish kill of approximately 35 visible fish occurred throughout Conesus Lake in August/September 2006. All of the affected fish were large/adult walleye. A sub-sample was collected by the NYSDEC Region 8 Fisheries Management Unit and tested at Cornell University's Fish Pathology Lab. Testing revealed that Viral Hemorrhagic Septicemia (VHS) was the disease agent causing the fish kill. VHS will not cause disease in humans.

In response to the fish kill and the detection of VHS in the lake, Livingston County convened an ad-hoc working group to develop a detailed plan for a coordinated, rapid response to such an event. The group included the Conesus Lake Watershed Manager and representatives from the Towns of Geneseo, Livonia, Conesus, and Groveland, NYSDEC, Livingston County Emergency Management Office, Livingston County Department of Health, Livingston County Planning Department, Livingston County Water & Sewer Authority, and the Conesus Lake Association.

The outcome of this group's effort is the Conesus Lake Fish Kill Contingency Plan (2008), outlining specific tasks, responsibilities and lines of communication, meant to ensure a coordinated, effective and timely response that will protect public health and maintain the quality of the public water supply. The Fish Kill Contingency Plan is part of the Livingston County Comprehensive Emergency Management Plan (CEMP).

5.4.5.4. Fish Stocking

NYSDEC and the Conesus Lake Association stock Conesus Lake (Table 5-8). The walleye population is increasing in response to this annual stocking of hatchery fingerlings (2004 Conesus Lake Report Card). The yellow perch population also exhibits signs of improvement. Additionally, beginning in 1991, NYSDEC began stocking Conesus with tiger muskies - a fast growing, sterile hybrid between northern pike and muskellunge.

In 2011, 9,700 tiger muskellunge averaging 10.5 inches in length were released. Early indications are that this striking fish will add an element of excitement to the fishery (www.dec.ny.gov/outdoor/25575.html).

Table 5-8. Number of individuals stocked in Conesus Lake by the CLA and DEC.

Year	Stocking	
	Walleye	Tiger Musky
2004	90,000	0
2005	6,000	0
2006	1,500	0
2007	67,000	0
2008	2,250	0
2009	1,700	9,500
2010	66,500	0
2011	200	9,700
2012	48,000	12,000

6. Assessment: Factors Affecting Lake and Watershed Management

6.1. *Population and land use changes*

Based on 2000 and 2010 census data, the municipalities within the Conesus Lake watershed are experiencing only minor population growth; the population increase (from 64,328 in 2000 to 65,393 in 2010) represents about a 1.6% increase over the decade. From 1998 to 2012, the agricultural acreage in the watershed decreased by 8.9%, acreage classified as vacant increased by 6.8%, and residential acreage increased by 3.7%.

6.2. *Water and sewer infrastructure improvements*

The public water supply system has been improved over the decade since completion of the Watershed Characterization Report, with expansion of service areas into the Hamlet of Conesus in the Town of Conesus and into the Hamlet of Scottsburg in the Town of Sparta, continued investment in water treatment, and improved redundancy of supply (Figure 6-1). The Village of Geneseo public water supply is now able to draw water from Hemlock Lake in emergency situations. The watershed municipalities have been supported in this effort with funds from the NYS Environmental Facilities Corporation.

Wastewater collection and treatment have also been improved. The Livingston County Water and Sewer Authority completed improvements to the wastewater treatment facility discharging to the lake outlet; the improvements have reduced the effluent concentrations of ammonia and oxygen-demanding materials. The collection system now extends approximately 36 miles and serves approximately 3631 units (at 2.5 persons per unit, this equates to a population of 9077) within Livonia, Conesus, Groveland and Geneseo. In 2009, sewer service was also extended into the Hamlet of Conesus in the Town of Conesus. NYS funds have supplemented local funds for the upgrades and expansion of wastewater capacity.

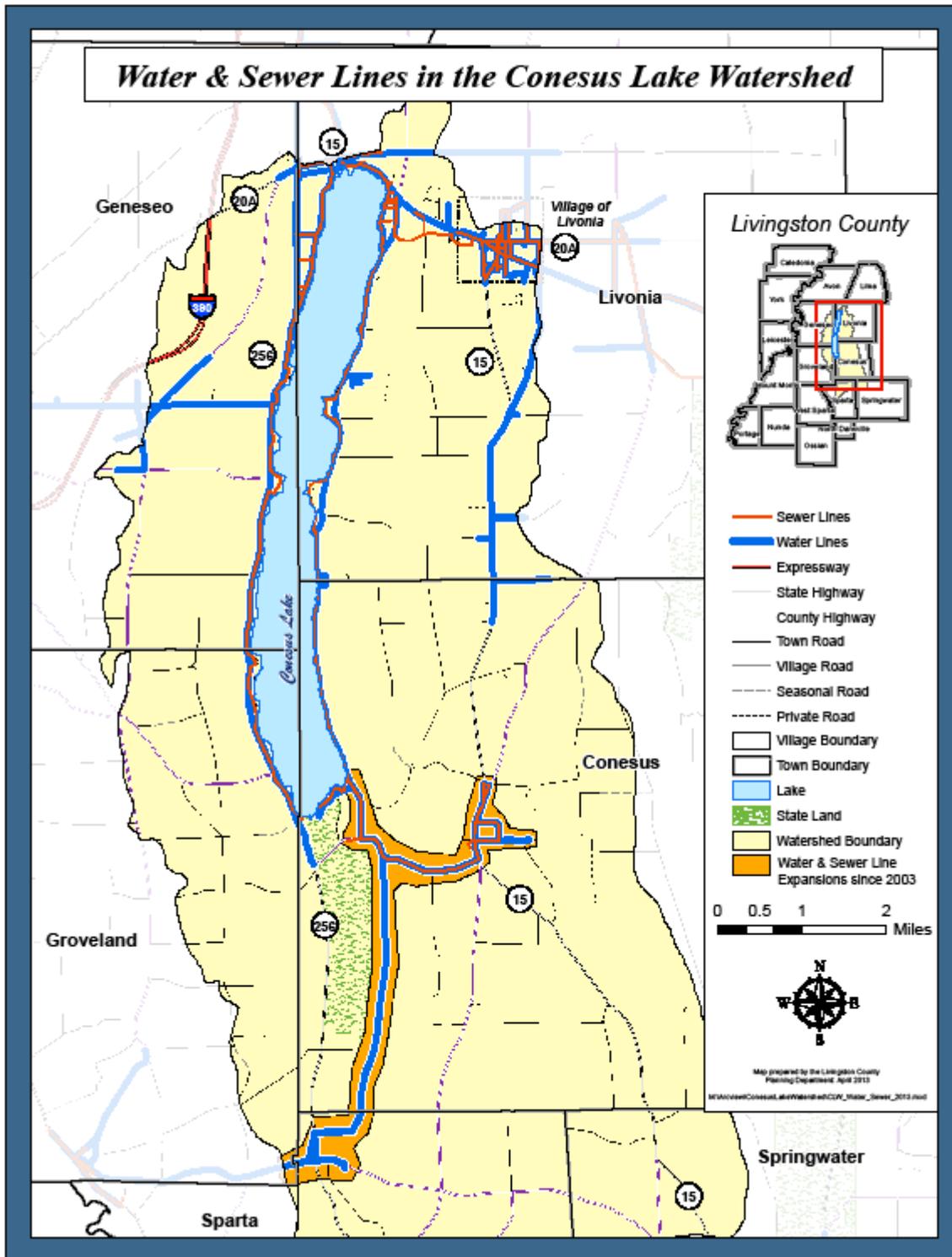


Figure 6-1: Public water and sewer infrastructure in the Conesus Lake watershed.

6.3. Public education and outreach efforts

A review of the remedial measures employed to address Conesus Lake water quality issues, and their effectiveness was published in 2009 as a Special Issue of the Journal of Great Lakes Research.

Many helpful educational pieces have been developed over the last decade, to keep the community informed of water quality conditions and trends, and how their actions affect the quality of the lake. The Conesus Lake Association has been an active partner in this engagement. Changes in technology have made communications faster and less costly; the expanded use of web sites and electronic transmittal of newsletters have improved our collective ability to keep the watershed community informed of new developments.

Outreach efforts focused on engaging the community and teaching them about the lake. At the CLA Youth Days, the CLA Arts and Crafts Festival, DEC Days, and other events, the CLA staffed a booth that was designed to increase lake awareness among all watershed residents. Information kiosks have also been installed at two public parks. The CLA offered a workshop for homeowners on the Emerald Ash Borer and collaborated on an initiative to stencil storm sewers flowing into the lake.

The Jean Meekin Memorial Lake Level Report is a monitoring program that records the height of the lake within 1/8 inch (relative to sea level). These measurements are used to produce a lake level curve that is available to the public on the Conesus Lake Association website.

6.4. Institutional framework and collaborations

Upon completion of the *Conesus Lake Watershed Management Plan*, the watershed municipalities formed the Conesus Lake Watershed Council as the institutional framework for implementation of the recommended actions. The Council has remained in place through multiple election cycles. Livingston County has supported the position of Watershed Manager; this professional position is housed in the Planning Department. The Conesus Lake Association is an active participant in Council meetings and is a key factor in keeping the lake community engaged with local government.

The effectiveness of this institutional framework for lake and watershed management was celebrated in 2011, when the Conesus Lake Watershed Council received the Planning Excellence Award from the New York Upstate Chapter of the American Planning Association (APA) for Planning Excellence Implementation. As the APA noted: *“The level of cooperation within and partnerships among the Watershed Management Plan committees and between agencies has been heralded as a successful example of how the process should work.”*

6.5. Effectiveness of remedial measures

6.5.1. Loading reductions from BMP implementation

The agricultural best management practices implemented in the Conesus Lake watershed have been effective in reducing the loss of nutrients and sediment from the landscape. As described in Section 4.3, changes in farming practices have improved stream water quality and reduced loading to the lake. The reduced loading from streams has a measurable and direct impact on nearshore areas of Conesus Lake.

Investigators from SUNY-Geneseo, led by Dr. Sid Bosch, measured the biomass of Eurasian watermilfoil in nearshore areas adjacent to tributary inflows in 2000. They documented a strong correlation between macrophyte abundance and the concentrations of total phosphorus in the adjacent streams (Johnson, Bosch, & Valentino, 2001). Studies on metaphyton (filamentous algae) in incubation chambers in 2000, 2001, and 2002 demonstrated that stream effluent that had elevated levels of phosphorus promoted metaphyton growth (D'Aiuto, Makarewicz, & Bosch, 2006).

In addition, extensive road ditch stabilization programs have been implemented throughout the watershed, effectively preventing tons of sediment, and its associated nutrients, from reaching Conesus Lake each year. For example, the Town of Conesus has remediated almost 10 miles of severely eroding roadways over a seven year period, with financial support from various NYS programs matched with in-kind contributions of town funds from the Town of Conesus, Town of Geneseo, Town of Groveland, Town of Livonia, and Town of Sparta through their Highway Department personnel and equipment budgets.

In response to the reduced loading from these watershed BMPs, lake-wide water quality conditions are improving as indicated by the key trophic state parameters (total phosphorus, chlorophyll- α and Secchi disk transparency). The macrophyte community also appears to be trending toward improvement, with a diminished importance of Eurasian watermilfoil.

6.5.2. Biological control of Eurasian watermilfoil using aquatic weevils

Control of aquatic weeds using the aquatic weevil has been investigated in Conesus Lake. In July 2005, the CLA sponsored a weevil pilot test in the 4000 block of East Lake Road; 7,000 weevil larvae were introduced in an effort to control Eurasian watermilfoil. SUNY Geneseo researchers monitored the results of the introduction. The results of this monitoring effort documented a major decline in milfoil abundance in July 2006 in areas of the littoral zone where the larvae were introduced. However, several lines of evidence suggest that the decline was not a direct result of herbivory by introduced weevils; the pilot test area exhibited low weevil population density, and there were limited signs of weevil damage to plants. Perhaps most importantly, milfoil beds exhibited a steep decline in many regions of Conesus Lake, including areas where no weevils had been detected. (Bosch, Groveman, Bonk, & St. James, 2006)

6.5.3. SolarBee® pilot test

A pilot test of the effectiveness of SolarBee® units in improving Conesus Lake water quality was conducted in 2006 and 2007. Three SolarBee® units, which are solar-powered water circulation devices, were installed in Conesus Lake for this pilot test. The pilot test was funded by Livingston County, using grant funds from the Finger Lakes—Lake Ontario Watershed Protection Alliance, the Conesus Lake Association, the Town of Geneseo, the Town of Livonia, the Town of Groveland and the Town of Conesus.

The pilot test was designed to test specific hypotheses related to the manufacturer's claims of effectiveness in improving lake water quality conditions relative to turbidity, abundance of algae and cyanobacteria, bacterial abundance, metaphyton, and macrophytes. The conclusion of the 2006 effort was that the SolarBee® units did not appear to be an effective alternative for consistent improvements to nearshore areas of Conesus Lake. However, the localized improvements in water clarity and reductions in metaphyton

cover reported in 2006 were sufficient for the project partners to authorize a second year of deployment and monitoring. Results of the 2007 program were very similar to 2006.

Overall, there were no statistically significant differences between sites where SolarBee® units were deployed and reference locations. The improvements observed in 2006 in turbidity and metaphyton at one location were not apparent in 2007. There were no consistent spatial or temporal patterns associated with the SolarBee® units in 2007. Water quality conditions at the SolarBee® sites were not distinguishable from natural daily and weekly changes in the Conesus Lake system. The units were removed in 2007.

6.5.4. Diversion of North Gully Creek

Over the last decade, the cove south of McPhersons Point (North Gully Cove) has been characterized by dense growth of Eurasian watermilfoil and an extensive cover of filamentous algae. North Gully Creek flowed into this cove, and contributed a substantial nutrient load, both dissolved and particulate, to the nearshore of the lake. In an effort to mitigate the impacts of this identified contributor of nutrients, the channel was reconfigured in February 2008 to direct flow northward along the McPhersons Point shoreline. The objective of this stream channel reconfiguration was to direct the stream, and its nutrient load, away from the cove and into the open waters.

Following the diversion, scientists and students from SUNY Geneseo investigated whether the diversion had been effective in reducing the amount of plant growth in North Gully Cove. Sampling and analysis were completed in the summers of 2008, 2009 and 2010; results were compared with baseline (pre-diversion) sampling of this area. In addition, results were compared with other nearshore areas. No clear signal of improvement was detected.

6.5.5. Feasibility of an alum treatment program to control internal phosphorus loading

Once the magnitude of the internal phosphorus loading to Conesus Lake was understood, Livingston County Planning Department and the CLMP technical committee decided to evaluate the potential environmental benefits, risks and costs associated with an alum treatment program. Alum (aluminum sulfate) treatment is a lake restoration technique designed to prevent phosphorus release from sediments, even when the deep waters become anoxic. The feasibility study of an alum treatment program for Conesus Lake was completed in 2004 and was reported as a Draft Environmental Impact Statement (DEIS).

Alum treatment is a potentially effective lake restoration technique, and has been used in many lakes and ponds with positive results. Additional research and monitoring was completed to assess whether this alternative would be effective in Conesus Lake; results indicate that an alum treatment program is potentially effective in Conesus Lake for the following reasons.

- The lake is a phosphorus limited system, and is currently impaired by excessive phosphorus and algal blooms.
- Internal (sediment) loading is a significant component of the lake's phosphorus budget.
- The external phosphorus loading has been measured, and the community has adopted a range of best management practices for controlling sources

- Conesus Lake water quality conditions, high alkalinity and circumneutral pH, mitigate the risk of aluminum toxicity.

The DEIS findings concluded that an alum treatment would improve water clarity and would not cause adverse environmental impacts. Even when external loadings are controlled to the best extent practicable, phosphorus loading from sediment release will keep ambient water column phosphorus concentrations over the NYSDEC threshold for impaired waters (currently, this limit is set at 20 ppb total P in the upper waters, expressed as a summer average).

The costs of an alum treatment program are high and would require support at all levels. A number of regulatory permits and approvals would be necessary, as documented in the DEIS. Currently, Livingston County is closely following the outcome of the Honeoye Lake alum treatment project in order to develop a deeper understanding of the process and potential. Continued careful monitoring of Conesus Lake will be used to determine if an alum treatment program is recommended.

7. Emerging issues

7.1. Climate change

To help inform New York State’s response to climate change, the New York State Energy Research and Development Authority (NYSERDA) published *Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation* (Rosenzweig et al. 2011). This ClimAID integrated assessment was undertaken to provide decision-makers with information on the state’s vulnerability to climate change, and to facilitate development of adaptation strategies informed by both local experience and scientific knowledge.

According to the ClimAID report, Western New York and the Great Lakes Plain region – including the Finger Lakes - are forecast to experience increases in both temperature and precipitation as a result of global climate change (Table 7-1). Rainfall intensity is projected to increase, as are periods of drought. Overall, extreme events will become more common.

Agricultural revenue in the Finger Lakes region is the highest in the state. High value crops may need irrigation, while conditions for grape production are projected to improve.

Table 7-1. Projected changes in temperature and precipitation resulting from global warming in the Western New York and Great Lakes Plain region.

	Baseline	2050s	2080s
Temperature	48°F	+3.0°F to +5.5°F	+4.5°F to +8.5°F
Precipitation	37 inches	0% to +10%	0% to +10%
<u>Projected Seasonal Precipitation Percent Change, 2050’s</u>			
	Winter	+5% to +15%	
	Spring	0% to +15%	
	Summer	-10% to +10%	
	Fall	-5% to +10%	
Source: Rosenzweig, Solecki, DeGaetano, O’Grady, Hassol, & Grabhorn, 2011			

The ClimAID report (2011) discusses a wide range of climate change impacts, adaptation strategies, equity, and economics affecting sectors such as water resources, coastal zones, ecosystems, agriculture, energy, transportation, telecommunications, and public health. The impact of global climate change on Conesus Lake and watershed are summarized below.

The status of water resources is dependent on multiple interacting factors. With respect to climate change, increasing average air temperature, possible future changes in timing and quantity of snow, increased

frequency and intensity of rainfall, longer dry periods in summer, and evaporation rates will all have impacts on water resources. The ClimAID report discussed how rising air temperatures intensify the water cycle by driving increased evaporation and precipitation, resulting in heavier rainfall events with longer dry periods in between. Heavier downpours will cause an increase in localized flash flooding and erosion, which will transport more pollutants to receiving waterbodies. Water temperature directly increases with air temperature, with a proportionality constant of 0.6–0.8 (an air temperature increase of 9°F would result in a water temperature increase of 5–7°F). Higher water temperatures will have direct impacts on certain elements of water quality such as oxygen content (Shaw, et al., 2011).

Warming conditions and changes in precipitation patterns will affect the ecosystem balance of New York State. The ClimAID report identified major ecosystem vulnerabilities for New York, including widespread shifts in species composition of natural landscapes and favored expansion of some invasive species such as kudzu and hemlock wooly adelgid. Coldwater fisheries will be negatively impacted by warmer water temperatures, unless the waterbody is sufficiently deep or shaded to keep the water cooler. Lakes, streams, inland wetlands, and associated aquatic species will be highly vulnerable to changes in the timing, supply, and intensity of rainfall and snowmelt, groundwater recharge, and duration of ice cover (Wolfe, et al., 2011).

Climate change will likely have a direct impact on crops, livestock, and pests, as well as an indirect impact on New York State's economy. These impacts will include both challenges and opportunities as farmers adjust to a longer growing season and warmer temperatures. The ClimAID report summarized the impacts for agriculture in New York State, including increased risk of summer drought and increased frequency of heavy rainfall events, though projections for future rainfall and drought severity are not as certain as predictions for temperature change. New York is likely to remain relatively water-rich as compared with other agricultural regions (Wolfe, et al., 2011).

In the Conesus Lake watershed, the predominant land uses are residential (41.7%), agriculture (33.1%), vacant (19.8%), and all other land uses (5.4%). Combined with a longer growing season, the prediction of a relative abundance of water may encourage the spread of agricultural uses in the watershed. "Vacant" lands have the potential to be developed into agricultural production, which could increase the agricultural footprint in the watershed. An increase in agricultural land use would result in an increase in nutrient runoff, requiring further implementation of BMPs to maintain water quality.

The precipitation pattern is predicted to change to one of more high-intensity, short duration rainfall with longer dry periods between. This pattern may result in greater risk of flash-flooding and erosion within the Conesus Lake watershed, adding to the nutrient and sediment loading to the lake.

Within Conesus Lake itself, climate change may increase the water temperature. With the potential for increase nutrient loading from the watershed as a result of more agricultural use and changes in precipitation patterns, algal blooms may become more likely in the warmer lake waters. The warmer waters of the lake will continue to sustain the productive warmwater fishery for sportfish and panfish, though coolwater and coldwater fisheries in the area may suffer. Warmer waters may also adversely affect native species of plants and animals, while creating more suitable conditions for non-native species originating from warmer climates, some of which may be invasive.

7.2. *Invasive species*

Livingston County continues to participate in the Finger Lakes PRISM (Partnership for Regional Invasive Species Management), an information-sharing group created by New York State to foster a regional approach to managing invasive species, both aquatic and terrestrial. This program is now administered through the Finger Lakes Institute at Hobart William Smith Colleges in Geneva, NY. The Conesus Lake Association (CLA) also has an Aquatic Invasive Monitoring & Response Program. The Invasive Species Subcommittee, a subcommittee under the Conesus Lake Watershed Council Technical Committee, was created in 2012. This subcommittee prepares comprehensive and cooperative invasive species programming, such as the Conesus Lake Invasive Species Management Plan and the Conesus Lake Boat Launch Invasive Species Prevention and Feasibility Study. Both the Conesus Lake Watershed Invasive Species Prevention and Response Plan and the Conesus Lake Boat Launch Invasive Species Prevention Feasibility Study should be completed in 2013. It is anticipated that the Conesus Lake Boat Launch will be participating in the Finger Lakes Institute's Watercraft Steward programming in 2013.

7.2.1. *Eurasian watermilfoil*

Eurasian watermilfoil (*Myriophyllum spicatum*) has been established in the Finger Lakes for decades, and is a profound nuisance to recreational users of lakes. The plant growth and reproductive characteristics are well known. Eurasian watermilfoil grows rapidly toward the water surface and then extends laterally, forming a dense canopy that effectively shades out other plants. Frequently, Eurasian watermilfoil occurs in near monocultures, forming dense beds. Several studies on Eurasian watermilfoil in Conesus Lake have been conducted. Dr. Sid Bosch, along with colleagues and students at SUNY-Geneseo, has been monitoring the distribution and abundance of milfoil for many years as part of the collaborative monitoring program. Recently-collected data indicate trends toward reduced importance of milfoil in Conesus Lake.

7.2.2. *Water chestnut*

Water chestnut (*Trapa natans*) is a more recent invasive to the Finger Lakes region, and has not yet been confirmed present in Conesus lake. Water chestnut poses a significant threat to recreational opportunities due to its growth habit and reproductive structure. Like the Eurasian watermilfoil and curly-leaf pondweed, water chestnut grows in dense floating mats that block sunlight from penetrating the water column and reaching other plants. Dense mats of water chestnuts can make boat passage very difficult. This aquatic plant produces a nut with four spines; each spine can be as long as one-half inch and can penetrate through shoes, thus posing a risk of harm to recreational users. The CLA Aquatic Invasives Monitoring & Response Program met in July 2011 with the Watershed Manager to discuss an action plan for monitoring and reporting water chestnut and Asian clam.

7.2.3. *Dreissenid mussels*

NYSDEC has been monitoring the Finger Lakes for water quality and environmental factors potentially affecting (and affected by) dreissenid mussels, i.e., zebra mussels and the closely-related quagga mussels. Data have been collected each year since 1995 to assess the communities of phytoplankton and zooplankton, calcium concentrations of the lake water, and nutrient levels.

Dr. Sid Bosch and associates studied spawning and larval production of zebra mussels in the lake during 2004. The final report was released in the spring of 2005. This study identified a pattern of low-level reproductive activity punctuated by mass spawning events, consistent with previous studies on Conesus Lake and elsewhere. The peak spawning events coincided with times of the full moon, consistent with the hypothesis that moonlight may provide a synchronizing cue for zebra mussel reproduction. Larval production in 2004 was close to the highest levels recorded in previous summers. Additional investigations are planned for 2013.

7.3. Invasive Species to Watch

7.3.1. Asian clams

The Conesus Lake Association's interest in developing a monitoring program and action plan for Asian Clam (*Corbicula fluminea*) and water chestnut led to the CLWC developing a response plan for invasive species and creating an invasive species subcommittee. Early detection - before the infestation becomes widespread - provides the best chance for eradication. Impervious mats and suction harvesting are accepted eradication techniques.

The Conesus Lake Association provides a web page <http://www.conesuslake.org/water-quality/invasive-species/33-rehmann.html> with information describing the Asian clam and its preferred habitat:

- The Asian clam has two half shells hinged together, typically is less than 1.5 inches long, and has an oval/triangular shape. They are yellow brown, and light brown to black with distinctive elevated concentric ridges on the surface. The Asian clam prefers sand, mud, or gravel bottoms in shallow water.
- The Asian clam is hermaphroditic (you only need one to reproduce). A single clam can release over 400 offspring per day. They have a life span of approximately seven years.
- These animals do not swim, but can be moved easily by water currents and transported by humans. Juvenile Asian clams can be relocated easily in bait buckets, live wells, engine cooling systems, trailers, etc. They may also be released, either deliberately or accidentally, directly into the water. There are no current restrictions on the sale, purchase, or transport of Asian clams.

The Asian clam has become established in Castle Creek, Lake George, the outlet of Seneca Lake in Geneva, and near Penn Yan at the NYSEG generating station on Seneca Lake. The clam has also been identified in Owasco Lake at the northeast end. The Asian clam was not detected in Vitale Park on Conesus Lake during a survey done by CLA divers on Sept 18, 2011.

7.3.2. Emerald Ash Borer

Emerald Ash Borer (EAB) is an Asian beetle (*Agrilus planipennis*) that infests and kills ash trees, including American species of green, white, black and blue ash that are native to this region. EAB adults are small, metallic green, winged beetles that are active from May to September. The larval stage of EAB feeds under the bark of the trees, creating S-shaped galleries, cutting off the flow of water and nutrients to the trees.

Infested trees are characterized by canopy die back, epicormic shoots, bark splitting; “D” shaped insect emergence holes, and increased woodpecker activity. Infested trees die over a two to four year period. This invasive insect is responsible for the destruction of over 50 million ash trees in the U.S. since its discovery in Michigan in 2002. NYS has more than 900 million ash trees, representing 7% of all trees in the state; Livingston County has an estimated ash distribution of 19%; this is the percent of total basal area of trees that is comprised of ash species. EAB poses a threat to water quality, as loss of trees can lead to increased erosion and sedimentation rates.

NYSDEC, USDA APHIS, and NYS DAM have proposed and issued State and Federal EAB quarantines involving at least 40 counties in New York, including Livingston County, and a number of the eastern states that regulate the movement of ash trees, ash products and all firewood (as of 2013).

The recent discovery of EAB in Caledonia (2010) prompted the Planning Department and the Department of Health to issue joint public educational materials. In addition, the Planning Department held an informational meeting at Long Point Park in Geneseo to identify potential cooperative efforts and an EAB training session for municipal officials, local decision makers and environmental professionals/groups (2011). With the support of local municipal officials and in partnership with SUNY Geneseo, the Planning Department completed the Livingston County Preliminary Ash Tree Inventory for the County’s villages and towns (2010-2011). At least 846 ash trees were inventoried in Livingston County. Livingston County villages and towns were provided with the Ash Tree Inventory Report and digital tree location maps, as applicable. Ash trees in Long Point Park in Geneseo and Vitale Park in Livonia were marked with purple ribbons and educational tags to increase public awareness of the EAB threat. EAB has not yet been identified within the Conesus Lake watershed

7.3.3. *Feral swine*

Feral swine, also known as feral pigs or wild boars, is a designation that can be applied to introduced Eurasian boars, escaped or released domestic pigs, and cross-breeds of the two. Eurasian boars were introduced to North America as early as 1539 as domestic pigs; additional introductions of other wild Eurasian boar races for hunting occurred through the 1800’s and 1900’s. New York populations of feral swine have most likely emerged from escaped and abandoned Eurasian boars kept in captivity and at hunting preserves. Feral swine crossbreed readily with domestic pigs, resulting in a wide range of coat colors and body shapes. Many look like typical wild boars, while others may be hard to distinguish from domestic pigs. Feral swine engage in wallowing behavior to keep cool; wallowing degrades riparian areas and leads to increased rates of erosion and sedimentation. Feral swine also root through the soil while foraging, which can lead to increased erosion. The NYSDEC website contains more information on feral pigs in New York.

Known breeding populations of feral swine in NY (2011) include northwest Cortland, southwest Onondaga, and southern Tioga Counties. Pennsylvania also has well established populations in 18 or more counties. Feral swine have been observed in several Southern Tier counties bordering Pennsylvania, as well as in a few upstate counties associated with hunting preserves (Cornell Cooperative Extension Invasive Species Program). Isolated sightings have been observed in Livingston County and the Conesus Lake watershed (iMap Invasives, NYSDEC Data).

7.3.4. *Hydrilla*

Hydrilla is a highly invasive aquatic plant native to Southeast Asia, which is able to grow under conditions of low light and low nutrient availability. This plant spreads through vegetative propagation, so mechanical removal efforts can exacerbate the problem. Early in the season, hydrilla quickly spreads across the bottom of a waterbody; once water temperatures increase, the horizontal mass sends up vertical shoots that can grow as quickly as 1 foot per day. The plant can grow up to 25 feet. Dense mats of hydrilla can shade out native species, eliminate fish spawning sites, reduce oxygen content in the water, destroy fish and duck habitat, and interfere with recreation.

In August 2011, hydrilla was discovered in the Cayuga Inlet (Tompkins County NY). Due to its reproductive and growth habits, hydrilla is a particularly worrisome invasive. A hydrilla fact sheet was created by Livingston County in 2012 to inform boaters about the risk posed by Hydrilla and effective means of preventing its spread of it – and other aquatic plants.

7.4. ***Conesus Lake's status on the state's 305 (b) and 303 (d) lists***

Conesus Lake remains on the New York State 303 (d) List of Impaired Waters Requiring a TMDL/Other Strategy, on account of phosphorus concentrations that exceed the current NYS guidance value for lakes. In addition, the lake is on the State's Priority Waterbodies List (the PWL, also known as the 305(b) list). According to NYSDEC, some action will eventually be required for waterbodies listed as requiring a TMDL or other strategy for water quality improvement. These actions range from delisting to completing a TMDL allocation for phosphorus, or implementing other potentially effective measures for water quality improvement. How Conesus Lake is handled under this regulatory program is among the significant emerging issues.

8. Conclusions

The Conesus Lake Watershed Council is the intermunicipal organization overseeing the implementation of the recommendations of the *Conesus Lake Watershed Management Plan*. Over the past decade, the Council has brought together the watershed municipalities and other stakeholders in a coordinated program to address lake and watershed issues. This update to the 2003 *State of Conesus Lake: Watershed Characterization Report* summarizes the actions taken within the watershed to reduce nonpoint sources of pollution. In addition, the updated Characterization Report evaluates lake water quality and habitat conditions, highlights the ongoing commitment to public education and outreach, and looks ahead to emerging issues.

In support of the *Conesus Lake Watershed Management Plan*, a monitoring consortium, comprised of Livingston County Department of Health, Livingston County Planning Department, the Watershed Manager, the Watershed Inspector, researchers Dr. Sid Bosch and Dr. Joe Makarewicz, and consultants, monitors different measures of lake, watershed, and ecosystem health. Each year, a report card is produced, highlighting accomplishments and critical results from the watershed monitoring and looking towards future challenges.

Over the past decade, the Conesus Lake Watershed Council has partnered with numerous organizations to support watershed measures designed to reduce nutrient and sediment load. These measures include BMPs for agricultural operations and remediation of eroding stream banks and road ditches; planning initiatives and local laws that strengthen the capacity of municipalities to manage growth and protect the water ways; expansion of public infrastructure for water and sewer; and monitoring to document the effectiveness of these actions.

A large investment has been made in agricultural BMPs, with evidence of success. In the six agricultural subwatersheds with BMPs and extensive monitoring, all six demonstrated statistically significant decreases in some metrics of stream nutrient chemistry. Two of the agricultural subwatersheds (Graywood and Long Point) evidenced statistically significant reductions in all monitored parameters. The reduction in watershed nutrient loss is also evident in the lake; shoreline areas adjacent to the streams draining the experimental agricultural subwatersheds exhibit diminished abundance of nuisance macrophytes and filamentous algae. Despite the overall improvement, significant runoff events continue to deliver substantial amounts of nutrients and sediment to the lake.

Lakewide water quality is improving as well. Conesus Lake is showing signs of a stabilization of its productivity levels, along with some evidence of a gradual decline in water column phosphorus and chlorophyll levels. Since the 1980s, Conesus Lake has hovered between mesotrophic and eutrophic states; recent data indicates that the lake is tending toward a mesotrophic state.

Monitoring of the lake ecosystem has also produced encouraging results, although invasive species continue to pose a problem. The native macrophyte community continues to rebound as non-native species like Eurasian watermilfoil decrease in abundance. The lake's fish community has been the focus of significant

stocking efforts. Despite the increase in walleye population and the introduction of tiger muskies, the yellow perch population continues to be in decline; this is attributed to the alewife population.

Over the past decade, the Conesus Lake Watershed Council has focused the watershed community's efforts to address many priority recommendations. The Council has remained dynamic, adapting its structure and priorities as new challenges arise. The periodic updates to both the Watershed Management Plan and the State of Conesus Lake Characterization Report will enable the Watershed Council to focus on current challenges and deal with issues in a proactive manner, using the best available science. The emerging issues of responding to climate change, adapting to basin-wide nutrient reduction goals, and preventing damage from invasive species will continue to pose challenges to all regional water resources.

9. Recommendations

9.1. Update the Conesus Lake Watershed Management Plan

The *Conesus Lake Watershed Management Plan* recommended specific actions to improve the quality of the Lake, by targeting sources of pollution threatening the Lake's continued use for water supply and recreation. Over the last decade, resources of federal, state and local government and the watershed community have been invested in implementing many of the recommendations. The Plan was intended to serve as a "living document," to be updated as existing issues are resolved and new issues are encountered.

This 2013 update to the Watershed Characterization Report provides a foundation for updating the *Conesus Lake Watershed Management Plan*. As evident from the data presented in the preceding chapters, the concerted efforts to implement agricultural BMPs, control stormwater runoff, and improve the wastewater collection infrastructure have reduced the watershed input of nutrients and sediment. The Lake's trophic state appears to have stabilized.

However, other metrics of the Lake's condition are not improving. The concentrations of sodium and chloride continue to increase in the water intakes, and they have reached thresholds where more aggressive control measures and increased public advisories are warranted. An updated Management Plan can provide the foundation for reviewing what has been done, and what other actions might be done to address this potentially serious issue.

Finally, some of the greatest threats to water quality and aquatic habitat are regional, not specific to Conesus Lake. Harmful algal blooms and invasive species are serious issues that will require collaboration among scientists, lake users, educators and the water resource management agencies. Nearshore water quality and aquatic habitat conditions, of great significance to recreational users, are changing in Conesus Lake and in many lakes across the entire region. The Watershed Management Plan will incorporate the new findings and evolving partnerships focused on these issues.

9.2. Continue the existing institutional framework for managing the lake and its watershed

The Conesus Lake Watershed Council is an award-winning partnership that has proven to be an effective institutional framework for watershed management over the past decade.

9.3. Continue to advocate for support of FLOWPA and other watershed management funding programs in the New York State budget

The monitoring of the lake and watershed that form the basis of this update to the Characterization Report were funded in large part by federal and state sources. The value of a science-based approach to managing our lakes and watersheds cannot be overstated. The Conesus Lake community should continue to advocate for resources to implement BMPs, monitor their effectiveness, and report the findings to the community.

9.4. Continue to support the position of Conesus Lake Watershed Manager and the Conesus Lake Watershed Inspection Program

By its very nature, watershed management involves a myriad of tasks, issues, and interest groups. The Watershed Manager and the Conesus Lake Watershed Inspection Program have contributed to the success of the program.

9.5. Consider requesting that Conesus Lake be formally de-listed from the state and federal 303(d) list, based on the improvements achieved with implementation of the Management Plan

NYSDEC updates their list of impaired waterbodies every two years; the next version of the state 303(d) list will be issued in draft in early 2014. In light of the improvements to Conesus Lake over the past decade, and the effective institutional structure in place to manage lake and watershed issues, we recommend that the Conesus Lake Watershed Council initiate a discussion of removing Conesus Lake from Part 1 of the 303(d) list. If approved by NYSDEC, removal of Conesus Lake from Part 1 of the 303(d) list may obviate the need for a regulatory Total Maximum Daily Load (TMDL) allocation for phosphorus. In addition to reviewing the documentation of improving water quality, the discussions with NYSDEC should highlight the success of locally-driven initiatives to identify measures for phosphorus reduction, and the positive relationships that have been developed among the diverse community of stakeholders.

9.6. Celebrate the success of the last decade and share the message

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GLOSSARY OF TERMS

GLOSSARY

Alewife: (*Alosa pseudoharengus*) Small, non-native fish

Alum: Aluminum sulfate; a coagulant widely used in water treatment systems

Bathymetry: Measurement of water depth at various places in a body of water

Bio-manipulation: Technique used to restore eutrophied lakes, based on the active management of the food web

Biomass: Total mass (dry weight) of living matter within a given unit of environmental area

Biota: Plant and animal life of a region or ecosystem, as in a stream or other body of water

Biotic: Pertaining to life or living things, or caused by living organisms

Chlorophyll: The green pigment of plants

DO: Dissolved oxygen

Ecology: The study of inter-relationships of living things to one another and to the environment

Ecosystem: A community of animals, plants, and bacteria, and its interrelated physical and chemical environment

Epilimnion: Warm upper layer of a body of water

Eurasian watermilfoil: (*Myriophyllum spicatum*) A rapidly growing aquatic plant that tends to create floating mats of vegetation

Eutrophic: Supporting high levels of plant and animal life; highly productive

Fingerlings: A young or small fish

Fry: Recently hatched fish

Groundwater: Generally, all subsurface water

Hydrologic budget: An accounting of the inflow, outflow, and storage in a hydrologic unit, such as drainage basin, or lake

Hydrology: The study of the movement and storage of water in the natural and disturbed environment: The condition of the aquatic environment at some specified time and place

Hydroseeding: Dissemination of seed under pressure, in a water medium

Hypolimnion: The lowermost, non-circulating layer of cold water in a thermally stratified lake or reservoir

Indicator organism: An organism whose presence is a sign that certain environmental conditions exist

Ion: An electrically charged atom

Limnology: The study of the physical, chemical, hydrological, and biological aspects of fresh water bodies

Littoral zone: That portion of a body of fresh water extending from the shoreline lakeward, up to the limit of occupancy of rooted plants

Load: The amount of material that a transporting agency, such as a stream, is actually carrying at any given time

Loading: The quantity of a substance (a contaminant) entering the receiving waters

Macroalgae: Multicellular algae; a large kind of algae

Macroinvertebrates: An animal without a backbone, large enough to see without magnification

Macrophytes: Plants in the aquatic environment, large enough to see without magnification

Metalimnion: Middle layer of a thermally stratified lake: In this layer there is a rapid decrease in temperature with depth (thermocline)

N: Chemical symbol for nitrogen

P: Chemical symbol for phosphorus

Pathogens: Disease causing organisms

Photosynthesis: The process in green plants and certain other organisms by which carbohydrates are synthesized from carbon dioxide and water using light as an energy source. Most forms of photosynthesis release oxygen as a byproduct.

Phytoplankton: Microscopic floating plants that live suspended in bodies of water

Plankton: The community of suspended or floating organisms that live in open water

Riparian: Pertaining to the banks of a river, stream, or other, typically, flowing body of water; Also the plant and animal communities along such bodies of water:

Rivulet: A small stream or brook

Runoff: That portion of precipitation that moves from the land into surface water bodies

Secchi disk: A circular plate used to measure the transparency or clarity of water by noting the greatest depth at which it can be seen

Setback: Denotes the positioning of a structure in relationship to a stream bank. A setback regulation can be a requirement for the placement of urban buildings away from a stream bank or shoreline.

Stratification: The arrangement of a body of water, such as a lake, into two or more horizontal layers of differing characteristics, such as temperature, density, etc

Subwatershed: An area drained by a single stream or group of minor streams

TDP: Total dissolved phosphorus

Thermocline: The region in a thermally stratified body of water that separates warmer oxygen-rich surface water from cold oxygen-poor deep water, and in which temperature decreases rapidly with depth (Metalimnion)

TKN: Total Kjeldahl nitrogen

TP: Total phosphorus

Trophic state: Refers to how productive is a body of water, i.e., how much food is available in the system to support living organisms

TSS: Total suspended sediments

Watershed: An area that, because of topographic slope, contributes water to a specified surface water drainage system, such as a river or lake

Wetland: An area that is periodically inundated or saturated by surface or groundwater on an annual or seasonal basis, that displays hydric soils, and that typically supports or is capable of supporting water-loving vegetation:

Zebra mussels: (*Dreissena polymorpha*) Invasive fresh water mollusks native to the Caspian and Black Sea areas

Zoning: The partition of a city, county, township, or other governmental unit or area by ordinance, into sections reserved for different land-use purposes, such as residential, business, manufacturing, greenbelt, or agriculture

Zooplankton: The animal part of the plankton: They are secondary consumers feeding on bacteria, phytoplankton, and detritus: Because they are grazers in the aquatic environment, zooplankton are a vital part of the aquatic food web:

LIST OF ACRONYMS

ACOE - Army Corps of Engineers
BMP - Best Management Practice
CCE – Cornell Cooperative Extension
CLA - Conesus Lake Association
CLAWS - Conesus Lake Aquatic Weed Strategy
CLWMP – Conesus Lake Watershed Management Plan
CSLAP - Citizens’ Statewide Lake Assessment Program
EPA - Environmental Protection Agency
FOLLOWPA - Finger Lakes-Lake Ontario Watershed Protection Alliance
G/FLRPC - Genesee/Finger Lakes Regional Planning Council
GLOW- Genesee-Livingston-Orleans-Wyoming Region Solid Waste Management Committee
LCDOH - Livingston County Department of Health
LCPD – Livingston County Planning Department
NRCS - Natural Resources Conservation Service
NYS – New York State
NYSDEC - New York State Department of Environmental Conservation
NYSDOH - New York State Department of Health
NYSDOPRHP –New York State Department of Parks, Recreation, and Historic Preservation
NYSDOS - New York State Department of State
NYSDOT - New York State Department of Transportation
PWL - Priority Waterbodies List
PWC – Personal Water Craft
SEQR - State Environmental Quality Review
SEQRA - State Environmental Quality Review Act
SPDES - State Pollution Discharge Elimination System
SUNY - State University of New York
SWCD - Soil and Water Conservation District
TMDL – Total Maximum Daily Load
USDA - United States Department of Agriculture
USGS - United States Geological Survey
WASA – Water and Sewer Authority
WC – Watershed Council

APPENDIX 1: CONESUS LAKE MANAGEMENT PLAN PRIORITIES AND STATUS

Priority	Rec. #	Description	Measures and Targets	Projected Cost	Status
A. Development Issues					
High	A-1	<p>Review and amend zoning regulations to improve consistency in near-lake areas and address specific water quality related concerns in the watershed. Specific changes include:</p> <ul style="list-style-type: none"> • Limit impervious cover • Establish riparian setbacks or buffer strips for non-agricultural parcels • Protect critical environmental areas • Establish development regulations with strict stormwater management requirements. 	<p>All watershed municipalities review and modify land use laws by December 2004</p>	<p>Estimated \$80K to \$100K.</p> <p>Resources are available for this task through a grant from the NYS DOS.</p>	<p>Genesee/Finger Lakes Regional Planning Council (G/FLRPC) completed a Local Laws project in 2005. This project involved developing specific water quality control laws and/or ordinances for local governments within Conesus Lake watershed, then producing a manual for local governments to assist them in the area of water resource and land use planning, regulation and control.</p> <p>Since 2005, the Livingston County Planning Dept. has worked with Towns on zoning updates, providing technical assistance regarding zoning and watershed issues, and assistance with EPF applications for the development on consistent land use regulations.</p>
Medium	A-2	<p>Revise the Model Erosion & Sediment Control Law to include riparian buffers.</p>	<p>All watershed municipalities to have adopted an Erosion and Sediment Control Law by December 2003.</p>	<p>Costs associated with additional erosion control would accrue primarily to developers and builders.</p> <p>Some additional workload for municipal Code Enforcement Officers and the Conesus Lake Watershed Inspector is anticipated, which will affect municipal budgets.</p>	<p>In 2003, three lakeshore towns adopted the Model Erosion and Sediment Control Law.</p> <p>The addition of riparian buffers to the model law has not been pursued, but the task may be included in a future EPF grant application.</p>
Medium	A-3	<p>Develop public education campaigns (or promote if existing) to include, but not be limited to, the following:</p> <ul style="list-style-type: none"> • Encourage planting and protection of streamside vegetation • Discourage use of herbicides, pesticides, and fertilizers on shoreline properties • Erosion control and lake-friendly landscaping 	<p>Two public education and outreach events or products each year.</p>	<p>Estimated \$1,500 per year.</p> <p>State, federal or private grants may be available for this task.</p>	<p>Activities undertaken as part of this task include:</p> <ul style="list-style-type: none"> • 2004 - Publication of lake and watershed stewardship booklet • 2005 - Distribution of lake and watershed stewardship booklet; monthly news articles by Watershed Manager • 2009 – Creation of a laminated public information piece distributed to approximately 2,000 residents. • 2010- <ul style="list-style-type: none"> ○ Phosphorus (P) Free Lawn Fertilizer Project ○ Contracted to construct a public education kiosk at Vitale Park. ○ Participated in public events at nature centers and craft shows • 2011- <ul style="list-style-type: none"> ○ Co-sponsored Homeowner's Emerald Ash Borer (EAB) educational workshop ○ Preliminary planning phase of Planning Dept. web site • 2012- <ul style="list-style-type: none"> ○ Vitale Park kiosk and content completed ○ Construction began on Long Point Park kiosk

Priority	Rec. #	Description	Measures and Targets	Projected Cost	Status												
B. Agriculture																	
High	B-1	Secure funding to help mitigate the financial impacts of changes in agricultural practices on the producers.	<p>Goal is to bring in enough funding to achieve the following levels of participation by 2005, for sources of nonpoint source pollutants from agricultural operations:</p> <ul style="list-style-type: none"> • 70% will complete AEM Tier 1 (self-assessment survey) • 40% will complete AEM Tier 2 (technical worksheet) • 20% will complete AEM Tier 3 (develop management plans) • 20% will complete AEM Tier 4 (implementation of BMPs) <p>An assessment survey (AEM Tier 5) will be used to re-evaluate these goals for 2010.</p>	<p>Variable, depending on participation and specific practices. Possible sources of funding are listed as part of this recommendation.</p> <p>Agricultural agencies (SWCD, FSA, CCE and others) working with farmers on the implementation of the AEM program must target significant sources of pollution first. This is part of the requirements of the program, and funding is contingent upon this.</p>	<p>In progress, through USDA grants, SWCD, and FSA programs. In 2008, the CLWC Agricultural Committee put together action items for the 2009 CLWMP work plan. Agencies will continue to use existing funding sources and look for new funding sources for agricultural BMPs annually as part of their existing programs.</p> <p>From 2003-2012, funding for agricultural projects in the Conesus Lake watershed totaled \$2,078,830.00:</p> <table border="0"> <tr> <td>CLAWS/FLOWPA funds -</td> <td>\$113,000</td> </tr> <tr> <td>USDA NRCS Agricultural BMP Projects -</td> <td>\$500,000</td> </tr> <tr> <td>Kraft/Altria Group Foundation Grant -</td> <td>\$75,000</td> </tr> <tr> <td>SUNY Brockport USDA Grant -</td> <td>\$1,200,000</td> </tr> <tr> <td>Livingston County SWCD - Round 10 -</td> <td>\$51,500</td> </tr> <tr> <td>Livingston County SWCD - Round 18 -</td> <td>\$139,330</td> </tr> </table>	CLAWS/FLOWPA funds -	\$113,000	USDA NRCS Agricultural BMP Projects -	\$500,000	Kraft/Altria Group Foundation Grant -	\$75,000	SUNY Brockport USDA Grant -	\$1,200,000	Livingston County SWCD - Round 10 -	\$51,500	Livingston County SWCD - Round 18 -	\$139,330
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Kraft/Altria Group Foundation Grant -	\$75,000																
SUNY Brockport USDA Grant -	\$1,200,000																
Livingston County SWCD - Round 10 -	\$51,500																
Livingston County SWCD - Round 18 -	\$139,330																
High	B-2	Implement practices that will reduce nonpoint source pollution from farms. Agricultural practices designed to reduce the input of sediment, nutrients, pathogens, pesticides, and other potential pollutants to Conesus Lake should be selected and implemented through the Agricultural Environmental Management (AEM) framework of whole farm planning.	<p>Goal is 70% of watershed farm participation in the AEM program (Tiers 1-5) by 2005.</p>	<p>Variable, depending on individual producers and which BMPs are appropriate. Possible funding sources are outlined as part of Recommendation B-1.</p>	<p>From 2003 – 2012, the following agricultural BMPs have been implemented in the watershed: stream bank restoration, installation of underground outlets and gully plugs, drainage tile installation, tile outlet diversions and underground outlets, barnyard heavy use area protection management, roof water management, barnyard water pollution prevention project, strip and cover cropping, and a grassed waterway system. By 2005, four whole farm plans were completed using USDA funding.</p> <p>In 2010, Nutrient Trap technology was reviewed by the CLWC Agricultural and Technical Committees.</p>												
High	B-3	Develop and implement programs and partnerships to facilitate removal of waste materials from farms.	<p>Programs underway by 2005.</p>	<p>Expected to be low, assuming that distributors will collect pesticide products. Operation Clean Sweep has received EPA funding.</p>	<p>There was no action on this task prior to 2008.</p> <p>In 2008, the CLWC Agricultural Committee put together action items for the 2009 CLWMP Work Plan.</p> <p>In 2009 and 2010, there were no existing GLOW programs. The GLOW Region Solid Waste Management Committee was formed in 1987 by the counties of Genesee, Livingston, Orleans and Wyoming through an Intermunicipal Cooperation Agreement (IMA). The purpose of this partnership is to develop strategies for the management of solid waste in the region. GLOW is willing to participate in new program development.</p> <p>In 2010, the impact on the new NYSDEC regulation on open burning was discussed with the Agriculture Committee.</p>												

Appendix 1

Priority	Rec. #	Description	Measures and Targets	Projected Cost	Status
High	B-4	Develop programs for public education and outreach for both the agricultural and the non-agricultural community.	Two new outreach efforts each year from 2003 to 2008.	Estimated annual cost: \$2,000. State, federal or private grants may be available for this task.	<p>In 2004, a lake and watershed stewardship booklet was published, and an agricultural BMPs brochure was created.</p> <p>In 2005, the watershed stewardship booklet, a citizen pledge, and monthly news articles were distributed. Such activities continued through 2008, when the CLWC Public Education and Outreach Committee put together action items for the 2009 CLWMP Work Plan.</p> <p>In 2008, agricultural producers and others took a tour highlighting BMPs being implemented on farms associated with the USDA grant</p> <p>In 2009, a public education fact sheet on agriculture in the watershed was completed. An article was published in the Laker News.</p>
High	B-5	Recruit additional agricultural producers to serve on an advisory committee during the implementation phase of the Conesus Lake Watershed Management Plan	Creation of the Committee within 2 months of creation of the Watershed Council, first meeting within 4 months. Goal is to have representation by one active agricultural producer from each municipality in the watershed on the committee.	Staff time of agencies, volunteer time of producers.	The committee was created in 2004, and activities are on-going.

Priority	Rec. #	Description	Measures and Targets	Projected Cost	Status
C. Stormwater Management					
High	C-1	Develop and implement program to restore and stabilize streambanks in the watershed.	Restoration of at least one mile of stream segment per year, until 2013. <i>Note: Restoration is a costly effort, and all sources of funding assistance should be investigated. Many grants have a long application process that can take up to one year to complete. Therefore, the timing for this recommendation will change depending on availability of funds.</i>	Estimates range from \$30 to \$100 or more per linear foot. Cost is dependent on type and extent of restoration needed, ease of access, property owner participation, and other factors. Funding for this recommendation would depend on outside grants and local cost-sharing options.	In 2004, funding opportunities were investigated. In 2005, a NYS Quality Communities Program grant was awarded to Livingston County for a streambank assessment of the Conesus Lake watershed. In 2008, the McPherson's Point Project/North Gully Straightening Project was completed, and the Town of Livonia received notice of an EPF grant award for stream bank remediation (\$382,869). During 2009, the Town of Livonia was awarded an EPF grant for \$358,132 for Phase II of the streambank remediation project. In 2012, Livingston County contracted with Barton & Loguidice, P.C., for engineering and construction oversight services. The project partners also held a kickoff meeting with the Department of State in September.
Low	C-2	Identify and develop sites for regional stormwater treatment areas in cooperation with NYSDEC and other stakeholders.	One facility site identified by December 2004; facility completed by December 2006.	Depends on required size, type and location. Funding for this recommendation would depend on outside grants and local cost-sharing options.	Grant funding was investigated. No additional action was taken on this item.
Medium	C-3	Develop public education campaigns on the impact of human activities on the health of the Lake. <i>Note: Recommendation C-3 was adopted by CLWC March 26, 2009</i>			In 2009 a campaign to raise public awareness of connection between stormwater drainage and the health of Conesus Lake was initiated by the Conesus Lake Association. A storm drain stenciling project was completed in November, 2009. The project was repeated in 2012 with the installation of storm drain medallions. In 2010, the CLA Water Quality Committee initiated the Conesus Lake campaign, a project designed to encourage lakeside residents to be good lake stewards. During 2011, several initiatives were completed: <ul style="list-style-type: none">• Support continued to the Conesus Lake Association's Conesus Campaign.• A Conesus Stewardship Initiative (CSI) Booth was staffed at several local entertainment venues.• "Welcome to the Lake" kits were personally delivered to 40 new lake owners.• The "Lake Friendly Vendor" program signed up 11 vendors, and signage for Vendors with no storefront (e.g.: lawn care) are being developed to expand the program.• Articles on CSI programs were included in the Finger Lakes Institute July "Happenings" online magazine and the Livingston County News

Priority	Rec. #	Description	Measures and Targets	Projected Cost	Status
D. Roadway Maintenance					
High	D-1	Provide training on erosion control practices for municipal highway departments to support compliance with state and federal Phase II Storm Water Regulations.	Manually provided to each municipality by February 2003. 25% of municipal roadway personnel attend a workshop each year.	Costs include printing of manuals, workshop registration, and travel. Livingston Co. Planning Dept. is using CLAWS funds to purchase and distribute manuals.	In 2003, manuals were distributed to all municipal highway departments in the watershed.
Medium	D-2	Implement best management practices, such as hydroseeding or other approved methods, as soon as possible after road construction or maintenance activities occur in the watershed.	The goal is to have all road construction and maintenance activities subject to hydroseeding or other appropriate BMPs within three days.	Municipal budgets and grants	This is an ongoing recommendation. Hydroseeding equipment and operation has shifted from the Livingston County Soil & Water Conservation District to the Livingston County Highway Department. In 2004, the Town of Conesus constructed a salt storage facility to cover the previously open storage of road salt.
Medium	D-3	Municipal Highway Departments should develop a plan, subject to available funding, to remediate ditches in poor condition.	Remediation of at least 1 mile per year from 2004 to 2008. <i>(Note: Because of the high cost of this effort, remediation work will likely require outside funding. Most grants have a long application process that can take up to one year to complete. Therefore, the schedule for this recommendation may change depending on the availability of funds.)</i>	Average cost for repairs, including labor, equipment and materials, is about \$3,600 per 100 linear feet (based on estimates from Livingston County Highway Department 2002). Final costs depend on site-specific conditions. Funding sources include state, county and municipal highway budgets, supplemented with outside funds as available.	In 2004 and 2005, EPF grant applications were submitted for road ditch remediation. In 2006, the Town of Groveland was awarded \$359,085 for road ditch remediation in the Towns of Conesus, Geneseo, Groveland, Livonia and Sparta. Between 2008 and 2012, the Conesus Highway Department received over \$1.2 million in EPF grants and completed road ditch remediation on Henderson Hill Road, Partridge Corners Road, and Kuder Hill Road. During 2009, Towns were in the process of returning their Memorandum of Agreement for the administration of the EPF road ditch grant. Also, work plans were submitted to the State, and NYSDOS approved the work plans. In 2010, the NYSDOS approved the preliminary plans for road ditch remediation. During 2011, the EPF Road Ditch Grant was administered and closed out.
Low	D-4	Develop plan to phase-in computer controlled spreaders on trucks used for winter deicing (includes training, funding, and use of the equipment). Promote sensible deicing practices; develop incentives and/or disincentives	<ul style="list-style-type: none"> Reduce total salt loading by 10% from 2001-2002 baseline conditions 50% of fleet to be equipped with these devices by winter 2005. 	Municipal budgets and possible grants. The computer-based spreading devices cost approximately \$1,200 per truck. The capital cost of the equipment may be recovered by Towns that contract with DOT to maintain state roads (training and maintenance costs are not included)	There was no action taken on this task because it was deemed impractical after further investigation.

Conesus Lake Watershed Characterization Report Update

Priority	Rec. #	Description	Measures and Targets	Projected Cost	Status
Low	D-5	<p>Develop and promote public education campaigns for the following:</p> <ul style="list-style-type: none"> • Sensible winter driving • Why and when are road ditches cleaned • Need to keep yard debris and trash out of road ditches <p><i>Note: Recommendation D-5 was adopted by CLWC March 26, 2009</i></p>	<p>One new public information or education product per year.</p>	<p>Estimated at \$1,500 per year.</p> <p>State, federal or private grants may be available for this task.</p>	<p>This is an ongoing effort. In 2004, a lake and watershed stewardship booklet was published, and then distributed in 2005. During 2005, monthly news articles were published by the Watershed Manager.</p> <p>In 2009, the Livingston County Department of Health submitted an article to the Laker News on road ditch purpose, maintenance and cleanup.</p>

Priority	Rec. #	Description	Measures and Targets	Projected Cost	Status
E. Recreational issues					
High	E-1	<p>Three interrelated recommendations concerning toilet facilities on boats:</p> <ul style="list-style-type: none"> • Allow boats with permanently fixed, self-contained toilets with no overboard discharge mechanisms to operate on Conesus Lake. • Install pumpout facilities for boats in areas with easy access • Allow marine sanitation devices, i.e. porta-potties, on boats. 	<ul style="list-style-type: none"> • Draft revisions to the watershed rules and regulations by June 2003 • Local endorsement of the revisions by December 2003 and forward to NYSDOH • NYSDOH review and approve by December 2004 • Siting and design work, grant applications for pumpout facility by December 2004 • Pumpout facility operational by June 2005 	<p>Revising the watershed rules and regulations will require a commitment of staff time from the lead and involved agencies.</p> <p>A cost estimate will be developed for pumpout facility (estimated range <\$20,000). Grants for construction of a pumpout facility are available through the Clean Vessel Act.</p>	<p>In 2003, the watershed rules and regulations were revised, and the revisions were sent to NYSDOH for approval. No response has been received from the State as of 2012.</p>
High	E-2	<p>Develop a public education campaign (or promote existing campaign, where applicable) including, but not limited to, the following issues:</p> <ul style="list-style-type: none"> • Effect of boat speed on weeds (creates weed-chop) • Precautions to follow when discarding unused bait or transporting bait from one waterbody to another (exotic species introduction). • Need to clean and inspect boat (body, bilge, coolant system, etc.) and trailer when transporting from one waterbody to another (exotic species introduction). • Existing boat and personal watercraft laws. 	<p>Produce or adapt one type of information outreach annually</p>	<p>Estimated at \$1,500 per year.</p> <p>State, federal or private grants may be available for this task.</p>	<p>This is an ongoing effort. In 2004, a lake and watershed stewardship booklet was published.</p> <p>In 2005, two outreach items were distributed: the lake and watershed stewardship booklet and the new boating brochures.</p> <p>In 2008, the CLWC Public Education and Outreach Committee put together action items for the 2009 CLWMP Work Plan.</p> <p>2012:</p> <ul style="list-style-type: none"> • Creation of an Invasive Species Subcommittee. • Public education workshops, presentations, signage & brochures targeting invasive species presentation through clean boating practices.
High	E-3	<p>Continue enforcement of existing boat and personal watercraft laws.</p>	<p>Track number of complaints and enforcement actions each year.</p>	<p>No additional cost is associated with this recommendation</p>	<p>From 2003 through 2012, the Livingston County Sheriff's Marine Patrol enforced existing boat and PWC laws.</p>
Medium	E-4	<p>Amend Town dock laws to add the provision of 24-hour access to toilet facilities to the list of requirements for granting a Special Use Permit.</p>	<p>Review and modification to local land use laws, as appropriate, by December 2003.</p>	<p>Will accrue to affected homeowners whose docks require a Special Use Permit.</p>	<p>This task was integrated into the Genesee/Finger Lakes Regional Planning Commission's (G/FLRPC) Local Laws project. The Local Laws project, completed in 2005, involved developing specific water quality control laws and/or ordinances for local governments within Conesus Lake watershed, then producing a manual for local governments to assist them in the area of water resource and land use planning, regulation and control.</p>

Conesus Lake Watershed Characterization Report Update

Priority	Rec. #	Description	Measures and Targets	Projected Cost	Status
Medium	E-5	Winterize facilities at the State Boat Launch on East Lake Road and at the Town of Geneseo's Long Point Park to permit year-round use of public toilets.	Facilities winterized by winter 2004-2005	To be determined, estimated at <\$20,000. State, federal or private grants may be available for this task.	There was no action on this task from 2003 through 2006. In 2007, documentation indicates this task was underway. In 2009, Rich Parker of NYS Office of Parks, Recreation and Historic Preservation (OPRHP) was contacted to determine interest in boat launch facility. NYS was not interested for boat launch. Town of Geneseo and Livingston County SWCD worked cooperatively on efforts to winterize the facilities at Long Point Park
Low	E-6	Allow portable ice-fishing shelters for daily use on Conesus Lake. These shelters must be removed from the Lake at least once in each 24-hour period. <i>Note: Recommendation E-6 was revised by CLWC November 9, 2007</i>	<ul style="list-style-type: none"> • Draft revisions to watershed rules and regulations by June 2003 • Local endorsement of the revisions by December 2003 and forward to NYSDOH • NYSDOH review and approve by December 2004 • Ice-fishing structures allowable by winter of 2004-2005 	Revising the watershed rules and regulations will require a commitment of staff time.	In 2003, revised rules were sent to NYSDOH for approval. No response has been received from the State as of 2012.

Priority	Rec. #	Description	Measures and Targets	Projected Cost	Status
F. Water Supply, Wastewater Permits and Infrastructure					
High	F-1	NYSDEC should review and update their 1994 safe yield allocation calculation for Conesus Lake, and make any necessary revisions to water allocations for public water supply and wastewater dilution.	<ul style="list-style-type: none"> Revised analysis by December 2004 Modified water supply permits (as needed) by December 2005 	Staff cost of affected agencies.	<p>In 2004, a letter was submitted to NYSDEC requesting the update. No response has been received from NYSDEC as of 2012.</p> <p>In 2003, the Livingston County Water & Sewer Authority took over management of the dam and lake levels.</p>
Medium	F-2	Extend sewer system to areas shown on Map 5-3 (of CLWMP): <u>Current and Proposed Sanitary Sewer Service Area</u> . Areas of expansion to include: Dacula Shores, Conesus Hamlet, Scottsburg Hamlet, cove areas between Conesus Lake and West/East Lake Roads, along West Lake Road, and along East Lake Road.	<ul style="list-style-type: none"> Engineering design and cost estimates by December 2003 Referendum by August 2004 Construction complete, new areas on-line by 2006. 	Accrues to affected residents.	<p>In 2005, public water was extended into the hamlet of Conesus.</p> <p>In 2007, public water was extended into the hamlet of Scottsburg in the Town of Sparta.</p> <p>In 2009, public sewer was extended into the hamlet of Conesus.</p>
Medium	F-3	Control sanitary sewer overflows within the collection system	Ongoing	Vary with project, grants and subsidized loans are available for wastewater collection and treatment system improvements.	Since 2003, Livingston County Water and Sewer Authority has conducted inflow and infiltration studies on sewer pipes in the sewer system in the Conesus Lake watershed.
Low	F-4	Develop protocol and timeline to inventory septic/sanitary systems within the watershed	<ul style="list-style-type: none"> Develop methodology and design database by June 2004. Complete inventory by September 2007 	<p>Grant or County budget.</p> <p>The estimated cost of this recommendation is equivalent to 1/4 of a full-time staff person during the period of 2004-2007. Student interns are recommended for completing these tasks.</p>	After initial investigation into the project, no further action has been taken.

Priority	Rec. #	Description	Measures and Targets	Projected Cost	Status
G. In-Lake Measures					
High	G-1	Investigate and implement effective methods to control the spread of non-native (exotic) organisms.	<p>Staff or committee member of the Watershed Council to participate in one forum annually regarding exotic invasive species.</p> <p>Prepare annual summary of emerging issues and progress towards control as part of the Annual Reporting (Recommendation H-2)</p>	<p>Municipal budgets and grants, donated in-kind services.</p> <p>Estimate \$400 per year.</p>	<p>Work on this task began in 2003.</p> <p>In 2005, a boating brochure and lake and watershed stewardship booklet were distributed.</p> <p>In 2008, Livingston County joined the Finger Lakes PRISM, an information-sharing group that was formally created by New York State to look at the problem of aquatic and terrestrial invasive species on a regional level.</p> <p>In 2009 through 2012, Livingston County continued to participate in the Finger Lakes PRISM.</p> <p>In 2010, the discovery of the Emerald Ash Borer (EAB) in Caledonia prompted the Planning Department and the Department of Health to issue joint public education materials to the public.</p> <p>In 2011, the Watershed Manager attended the iMAP Invasives Program workshop, the Cayuga Lake Hydrilla workshop, and the Cornell Cooperative Extension's Invasive Species In-Service. Also, support continued for the Conesus Lake Association's Aquatic Invasives Monitoring & Response Program.</p> <p>In 2012, the Invasive Species Subcommittee was created, and the subcommittee worked with the NYS Boat Launch to install "Stop Aquatic Hitchhikers" posters and brochures at the boat launch on East Lake Road.</p> <p>In Summer 2012, the Conesus Lake Watershed Manager and the CLA held a plant identification workshop at Vitale Park.</p> <p>In 2012, the Invasive Species Subcommittee began work on a Conesus Lake Invasive Species Management Plan.</p>
High	G-2	Develop and implement a program for cleaning accumulated aquatic plants and algae along the shoreline of Conesus Lake.	<p>Identify vendors, develop Special Benefit District or other funding source, identify disposal sites, and design program during 2003.</p> <p>Full-scale program in place by summer 2004.</p>	<p>To be determined. Cost could be assumed by participating shoreline owners.</p>	<p>The work on this task has been underway since 2003.</p> <p>In August 2004, a CLA pilot program was initiated involving volunteer collection of shoreline weeds.</p> <p>In 2008, a comprehensive Fish Kill Contingency Plan was adopted by the CLWC to address cleanup of large fish kills.</p> <p>In 2010, a leaf pick-up program was included in the 2010 GLRI grant application; unfortunately, this proposal was not funded.</p> <p>In 2011, a Blue-Green Algae Early Detection and Rapid Response Plan was created. To provide proactive public education and outreach content to inform Lake Users about blue-green algae, a trifold informational brochure was created and distributed. Website content was being created.</p>

Appendix 1

Priority	Rec. #	Description	Measures and Targets	Projected Cost	Status
High	G-3	Initiate effort to determine if alum treatment to control release of phosphorus from deep lake sediments would be effective in Conesus Lake. Proceed with plans for implementation if effectiveness is warranted and monitor for environmental impacts.	<ul style="list-style-type: none"> • Additional water quality monitoring and jar tests, August 2003 • Data analysis and reporting, go/no go decisions: November 2003 • Cost estimates, funding request and detailed application plan, final by June 2004 • Full-scale application, summer 2005. 	<p>The estimated cost for the necessary studies and permits for alum application is \$15,000.</p> <p>Alum treatment costs about \$70 per acre-foot. Based on a preliminary estimate of the area treated, hypolimnetic injection of the material over the deepest portion of the lake would cost about \$100,000. This cost estimate would be refined based on the detailed lake monitoring and jar tests.</p> <p>State, federal or private grants may be available.</p>	<p>In 2004, feasibility analysis and SEQR process was completed, with a finding of no significant impact.</p> <p>In 2005, the Finger Lakes - Lake Ontario Watershed Protection Alliance (FL-LOWPA) benthic survey grant was received, and the benthic survey was completed.</p> <p>In 2008, the Council evaluated the action taken on alum and directed the Planning Department, Watershed Manager, and Technical Committee to conduct further research into phosphorus loading from the watershed and to look into conducting a bathymetric survey of Conesus Lake.</p> <p>In 2009, CR Environmental completed a bathymetric survey of the lake. Tom Harvey (Ontario County Planning Department) conducted a presentation on Honeoye Lake Year 2 alum treatment.</p> <p>In 2010, the Ontario County Planning Department staff and Honeoye Lake Association officials presented to the Technical Committee the latest on Honeoye Lake's alum treatment.</p> <p>In 2011 and 2012, the Honeoye Lake project continued to be monitored. Contact was maintained with NYSDEC on the State's position on alum treatment on State lakes.</p>

Conesus Lake Watershed Characterization Report Update

Priority	Rec. #	Description	Measures and Targets	Projected Cost	Status
High	G-4	<p>Initiate effort to determine if increased stocking of walleye fingerlings, or other species, would be an effective biological control in Conesus Lake.</p> <p>Proceed with plans for implementation if effectiveness is warranted.</p>	<ul style="list-style-type: none"> Identify interested investigators by December 2003 Convene technical team to complete feasibility assessment by June 2004 Go/no-go decision by September 2004 If warranted, proceed with identifying cooperators by December 2004 Pond construction and training complete by March 2005 Stocking to begin by 2006 and continue for 5 years. 	<p>Approximately \$500K based on 142 fish per acre (350/ha) if purchased from private source. Cost will be much less if local rearing ponds are available and successful.</p> <p>The NYSDEC Bureau of Fisheries, Fish Culture Section, under its Cooperative Walleye Rearing Program, may be able to provide walleye fry at no cost, as available.</p> <p>Grants may be available to build rearing ponds on non-DEC cooperator's property. One such opportunity may be to build wastewater finishing ponds at the Livingston Co. Water & Sewer Authority's wastewater treatment plant in Lakeville, which could also function as rearing ponds for walleye fingerlings.</p>	<p>In 2004, construction of Finger Lakes Community College (FLCC) rearing ponds was completed. The DEC stocked 65,000 walleye fingerlings and the CLA stocking 25,000 walleye fingerlings in Conesus Lake.</p> <p>In 2005, CLA financial support of FLCC walleye rearing continued and they stocked 6,000 walleye fingerlings in Conesus Lake.</p> <p>In 2006, the CLA stocked 1,500 walleye fingerlings in Conesus Lake and continued their support of the FLCC walleye rearing.</p> <p>In 2007, the CLA stocked 2,000 walleye fingerlings and the DEC stocked 65,000 walleye of various stages in Conesus Lake. The CLA continued their support of the FLCC walleye rearing program.</p> <p>In 2008, Conesus Lake was stocked with approximately 250 advanced walleye fingerlings from FLCC rearing ponds; the CLA purchased approximately 2,000 advanced walleye fingerlings to stock the lake.</p> <p>In 2009, the CLA purchased approximately 1,700 walleye fingerlings and NYSDEC stocked 9,500 tiger musky during the third and fourth quarters. Zooplankton monitoring was conducted as part of the summer 2009 annual program.</p> <p>In 2010, results of the 2009 zooplankton monitoring showed that the large zooplankton population has not rebounded since the introduction of alewife. The CLA continued to work on its caged walleye rearing project. The Lake was stocked with 66,500 walleye fingerlings. The NYSDEC/CLA Great Lakes Restoration Initiative Grant to upgrade the Northern Pike Habitat Area was in progress.</p> <p>In 2011, the CLA, working with FLCC, stocked the lake with about 200 ten inch fingerlings. The NYSDEC 2011 stocking program did not include walleye.</p>

Appendix 1

Priority	Rec. #	Description	Measures and Targets	Projected Cost	Status
Medium	G-5	Develop an experimental program for control of aquatic weeds using the aquatic moth and/or weevil	<p>During 2003, convene a workshop to develop experimental protocol, and identify funding sources.</p> <p>Target limited pilot testing in 2004.</p>	<p>A private vendor, EnviroSource, has estimated the cost for pilot tests in three areas of the lake at \$13,000 to \$15,000. Their cost for weevils is \$1000 per 1000 adults, plus an initial survey that can range from \$4,000 to \$10,000 depending on what is needed.</p> <p>Cornell Cooperative Extension sells the weevils at \$1 per adult, which is comparable to the EnviroSource price for weevils only. Cost for the aquatic moth, based on experimental studies, is \$10,000 for 20,000 moths. Stocking density is estimated at 20,000 moths per 0.5 acres.</p> <p>State, federal or private grants may be available for this project. Special Benefit District funding may be pursued.</p>	<p>In 2004, the Technical Committee met with a weevil vendor.</p> <p>In 2005, the CLA aquatic weevil pilot project started in July, with the intent to be completed in Spring 2006. The aquatic weevil was not shown to be effective in aquatic weed control in Conesus Lake.</p>
Low	G-6	Develop program for suctioning aquatic weeds from designated public areas that are too shallow for harvester to maneuver.	Implementation in 2004, as funding allows.	<p>Estimated costs are about \$200 per hour for a professional diver capable of suctioning an area of about 500 sq. ft. in one hour.</p> <p>A Special Benefit District would need to be created to pay for this effort.</p>	In 2005, the Technical Committee heard a presentation from a contractor who specializes in aquatic weed suction at the June meeting. No further action was taken.
Low	G-7	Develop a weed harvesting program either by contracting with outside vendor or purchasing equipment.	<ul style="list-style-type: none"> • Develop an integrated aquatic plant management plan for Conesus Lake by September 2003. • Identify equipment, contractors and funding sources • Initiate limited harvesting in target areas • Full-scale program as funding allows. 	<p>Capital cost to purchase each harvester is estimated at \$70,000 to \$100,000. Annual operating and maintenance cost are at least \$100,000 for multiple harvesters.</p> <p>Cost for contracting a harvesting service (based on previous experience and adjusting for inflation) is estimated to be at least \$40,500 for 200 hours of harvesting.</p> <p>A Special Benefit District would need to be created to pay for this effort.</p>	There has been no action on this task.
High	G-8	<p>Determine if new technologies would be effective in Conesus Lake to improve water quality or enhance the recreational use of the Lake. Proceed with plans for implementation if effectiveness is warranted and monitor for environmental impacts.</p> <p><i>Note: Recommendation G-8 was adopted by CLWC May 12, 2006.</i></p>	Dependent on new technology proposed.		Examined the SolarBee technology in 2006 & 2007.

Conesus Lake Watershed Characterization Report Update

Priority	Rec. #	Description	Measures and Targets	Projected Cost	Status
High	G-9	<p>Initiate effort to determine if water circulation devices, including, but not limited to, SolarBee, would be effective in Conesus Lake to decrease algae and nuisance aquatic plant concentrations. Proceed with plans for implementation if effectiveness is warranted and monitor for environmental impacts.</p> <p><i>Note: Recommendation G-8 was adopted by CLWC May 12, 2006.</i></p>	<ul style="list-style-type: none"> • Installation of units, April 2006 • Preliminary report and analysis, October 2006 • Presentation of preliminary report to Towns for consideration in 2007 Town budgets, October 2006 • Update analysis and presentation for Conesus Lake Watershed Council meeting, February 2007 • Year 2 decision to continue pilot program at same level, discontinue or pursue larger deployment, February 2007 • If pilot program demonstrates success to the satisfaction of the lead agencies: <ul style="list-style-type: none"> ○ Cost estimates, funding request and detailed installation expansion plan ○ Full-scale installation • Public education efforts before and during pilot program. Additional public education efforts if full-scale program is proposed after pilot program. 		<p>A pilot program for SolarBee water circulation units was conducted in 2006 & 2007. The Towns of Livonia and Geneseo and the CLA each leased a SolarBee unit for two years, and Livingston County provided funding to monitor water quality. An analysis of these water quality monitoring results showed that these units did not provide a statistically significant improvement in water quality.</p>

Priority	Rec. #	Description	Measures and Targets	Projected Cost	Status
H. Coordinated Monitoring Efforts and Annual Reporting					
High	H-1	<p>Conduct an annual monitoring program of Conesus Lake and its watershed to evaluate water quality and ecological conditions, assess the effectiveness of controls, and identify the need for additional actions.</p> <p>An annual monitoring meeting should be held to coordinate the monitoring program.</p>	<ul style="list-style-type: none"> • Annual planning meeting • Annual reporting to watershed residents and interested parties 	<p>The costs of monitoring will vary based on the number of locations and the suite of parameters.</p> <p>An annual budget of \$10,000 is considered a baseline.</p>	<p>This is an ongoing task, the annual component of which was completed each year from 2003 through 2012.</p> <p>In 2008, EcoLogic, LLC, Dr. Makarewicz, Dick Davin (Watershed Inspector), and Dr. Bosch collaborated on the preparation of a plan for 2008 monitoring activities.</p> <p>In 2009, a meeting to discuss phosphorus loading investigation and zooplankton monitoring was held. Monitoring started in mid-May, and continued through September 2009.</p> <p>In 2010, a meeting was held to discuss the annual monitoring program. In the summer of 2010 monitoring and reporting were completed by SUNY Brockport, SUNY Geneseo, and Livingston County Department of Health.</p> <p>In 2011 a meeting was held to discuss the annual monitoring program. Watershed stream monitoring began in March. SUNY Brockport monitored Cottonwood and North McMillan Gully Creeks for event/non-event samples. SUNY Geneseo began monitoring the Lake in late June. Livingston County Department of Health continued beach monitoring over the summer. Monitoring was completed, and written reports finalized.</p>
High	H-2	<p>Prepare and distribute an annual Conesus Lake and Watershed Report Card describing progress towards implementing the CLWMP recommendations, elements of the CLWMP work plan for the upcoming year, the status of funding requests, and water quality and ecological conditions of the lake and watershed.</p>	Annual reporting	Annual cost range \$2,000-\$5,000	<p>This is an ongoing task, the annual component of which was completed each year from 2003 through 2012.</p>

APPENDIX 2: 2003-2012 CONESUS LAKE REPORT CARDS



Conesus Lake and Watershed Report Card

Assessment of the Conesus Lake Watershed
Management Plan in 2012

Conesus Lake Watershed Council

January 11, 2013



PURPOSE OF THIS DOCUMENT

One of the recommendations of the Conesus Lake Watershed Management Plan (CLWMP) is to prepare an annual update summarizing the status of activities in the watershed, particularly the ongoing efforts to reduce nonpoint source pollution. This annual summary also provides a forum for tracking conditions in Conesus Lake and highlighting new information.



MAJOR ACCOMPLISHMENTS

Since its formation in 2003, the Conesus Lake Watershed Council (CLWC) has coordinated implementation of the recommendations of the CLWMP. The Watershed Council is an intermunicipal organization with a dual mission: first, to coordinate actions for restoring the health of Conesus Lake and its watershed, and second, to communicate progress to the watershed community and other stakeholders. Restoring the health of the lake and its watershed requires a sustained effort and a focus on many interrelated issues.

Progress in implementation of the CLWMP continued in 2012. Highlights include:

- ***The Conesus Lake Watershed Characterization Report*** is undergoing a 10-year update, to incorporate the data and information garnered over the past decade and to assess changes. The report will be issued in 2013.
- ***Stream testing*** of several streams that were included in the USDA program continued, led by Dr. Joseph Makarewicz of SUNY Brockport, to measure the concentration of nutrients and sediments flowing into Conesus Lake from the subwatersheds. Three USDA subwatersheds were monitored during the spring of 2012, and the results evaluated using the Stream Watershed Quality Index.
- ***Historical trends of macrophyte diversity and biomass in Conesus Lake*** were evaluated, led by Dr. Sid Bosch of SUNY Geneseo. Eurasian watermilfoil biomass at the mouths of USDA streams were assessed, as well as macrophyte community diversity throughout the lake, building on studies dating back to 1927.
- ***Conesus Lake trophic state*** was assessed in 2012 by researchers at SUNY Brockport.
- ***Blue-Green Algae (Cyanobacteria) Early Detection and Rapid Response Plan*** was approved by the CLWC in August 2011. This plan was developed to outline the response to a major blue-green algal bloom on Conesus Lake. Researchers from SUNY Geneseo developed *Procedures for Estimation of Cyanobacterial Bloom Intensity by Phycocyanin Fluorescence* to test the lake waters and enable early detection and rapid response. The CLWC approved an updated version of the plan in January 2011.
- ***Invasive Species Management Plan***. The CLWC is developing an Invasive Species Management Plan to serve as a reference for problem solving and decision making throughout the invasive species management process.



TEN-YEAR UPDATE OF THE CONESUS LAKE WATERSHED CHARACTERIZATION REPORT

In May 2002, the *State of Conesus Lake: Watershed Characterization Report* was completed as the first step toward preparing the 2003 *Conesus Lake Watershed Management Plan*. The *Watershed Characterization Report* documented the water quality and ecological conditions of Conesus Lake and its watershed in 2002. Specific areas of concern were identified, including issues such as sedimentation, nutrient enrichment, bacteria contamination and pesticide levels that threaten the long-term health of the lake and its desirable uses as a drinking water supply and recreational resource.

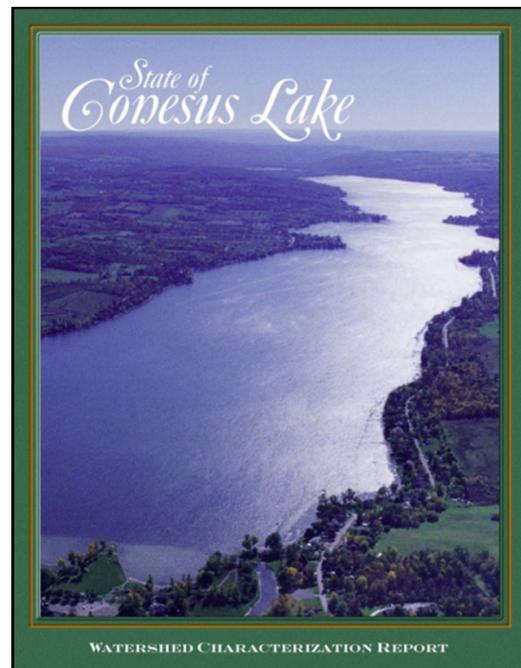
A decade has passed since the *Watershed Characterization Report* was completed, and, as expected, the state of the lake and its watershed has not remained static. Since 2002, population and land use patterns have changed. Agricultural practices have continued to evolve; there has been an infusion of financial support to implement agricultural Best Management Practices (BMPs) on watershed farms. Municipalities in the watershed have continued to improve their local controls on erosion and sedimentation. New York State passed legislation restricting use of phosphorus-containing fertilizers on residential lawns and reducing the phosphorus content of dishwasher detergents. Streambank and roadbank stabilization projects have been implemented. The Army Corps of Engineers began an assessment of macrophyte growth and control alternatives. An updated bathymetric map of the lake was completed. These, and a myriad of other initiatives and events, have contributed to the knowledge base required to manage Conesus Lake and its watershed.

In 2012, the CLWC approved undertaking a ten-year update to the Watershed Characterization Report. This update will incorporate the data and information garnered from 2003 through 2012. Sources of these data include the annual monitoring program administered by Livingston County Planning Department, funded by the State through the Finger Lakes-Lake Ontario Watershed Protection Alliance (FLOWPA), and the findings of the USDA program led by Dr. Joe Makarewicz of SUNY-Brockport.

The ten-year update to the *Watershed Characterization Report* will address questions such as:

- What has been learned from the annual lake and watershed monitoring programs?
- Is the lake's trophic state stable?
- Is there evidence of reduction in nonpoint source loading from the agricultural BMPs?
- Has the macrophyte community changed?
- Has the community of macroalgae changed?
- Are there new invasive species threats?
- What is the status of Conesus Lake on the State's 305(b) and 303(d) lists of water quality and desired uses?

The ten-year update of the *Watershed Characterization Report* will be available in 2013.



FINDINGS OF THE 2012 INVESTIGATIONS: WATERSHED MONITORING

During the spring of 2012, SUNY Brockport scientists completed their tenth consecutive year of water quality monitoring of streams flowing into Conesus Lake through agricultural and/or forested areas. The 2012 monitoring program was designed to contribute to the long-term data record.

2012 Monitoring Program - Objectives

In 2010, the SUNY Brockport team compared the annual stream nutrient and sediment loading estimates from 2003-2007 to the same loading estimates calculated from the 2008-2010 data. The investigators concluded that in order to evaluate the effectiveness of best management practices (BMPs) in keeping soils and nutrients on the landscape, it is most important to capture the spring conditions - typically characterized by higher runoff and precipitation - rather than summer conditions. In 2011, the Conesus Lake work plan was changed to initiate a spring rather than summer sampling period for creeks of concern.

Also in 2011, the SUNY Brockport team developed a graphical index of stream discharge versus parameter concentration based on historical spring data. This approach, referred to as the Stream Watershed Quality Index, appears to be a viable, cost-effective tool for continued evaluation of the water quality of the USDA streams and performance of the BMPs. An example graphic demonstrating the Stream Watershed Quality Index is shown in Figure 1. The data are plotted on the index as black markers; the data in the "green" zone represent improving conditions, while data in the "red" zone indicate degrading conditions.

Indices were developed for six parameters measured in six watersheds. The six parameters are: total suspended solids (TSS), total phosphorus (TP), soluble reactive phosphorus (SRP), nitrate, total Kjeldahl nitrogen (TKN), and sodium. The six watersheds are: Cottonwood Gully, North McMillan Creek, Graywood Gully, Creek, Sutton Point Creek, and Sand Point Gully.

In 2011, only Cottonwood Gully and North McMillan Creek were sampled in the spring and evaluated using the Stream Watershed Quality Index. The objective of the 2012 monitoring program was to extend the use of the Stream Watershed Quality Index and evaluate three other USDA streams (Long Point Creek, Sand Point Gully, and Graywood Gully) during the spring (March 1 through May 8) of 2012. The results of this program would be used to assess whether conditions in streams draining these watersheds are improving, getting worse, or not changing.

The results from the 2012 monitoring season showed generally improving trends with the two areas of concern highlighted on the following page.

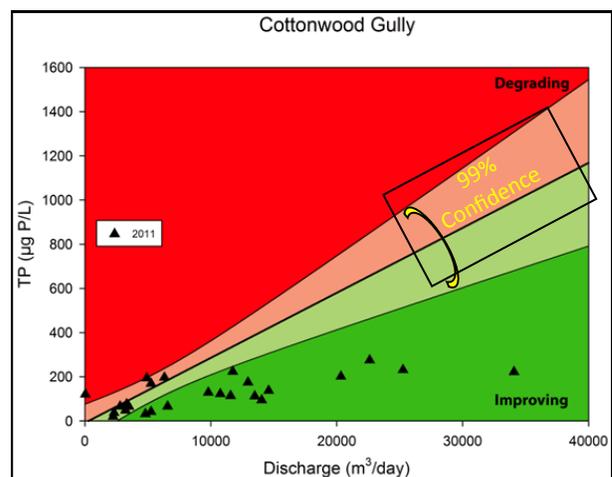


Figure 1. Regression Line and 99% Confidence Interval based on historic spring phosphorus data, with 2011 data. Image courtesy: Makarewicz et al, 2011. SUNY Brockport.

**FINDINGS OF THE 2012 INVESTIGATIONS :
WATERSHED MONITORING (CONTINUED)**

Monitoring Trends 2012

The researchers applied the Stream Watershed Quality Index to evaluate the 2012 water quality trends in Long Point Creek, Sand Point Gully, and Graywood Gully. Overall, during the monitoring period, levels of nutrients and soils losses from the three stations were at or below levels observed during baseline period conditions (2002 to 2007). However, elevated levels of nutrients were observed during rain events - especially during the rising limb of the stream hydrograph, as runoff enters the stream and water levels begin to rise.

Two specific observations were highlighted in the 2012 data analysis by SUNY Brockport scientists. First, as observed at the Sand Point Gully and Graywood Gully monitoring stations, elevated levels of some nutrients at the Long Point Creek station were associated with rain events and/or snow melt. However, more than half of the measured nitrate levels were elevated, which included both event and non-event samples (Figure 2), indicating degrading water quality is occurring as a result of runoff and during periods when there is no runoff. Elevated concentrations may be associated with fertilization practices.

The second observation highlighted concerns over elevated sodium levels at the Sand Point Gully and Long Point Creek stations. This represents an increase over historical levels (Figure 3). Sodium is a component of deicing salts; researchers have documented increasing deicing salt levels over the past 50 years in the Conesus Lake water supply (Makarewicz and Lewis, 2009). Deicing salt application rates on roads may also have increased during this period.

Recommendations

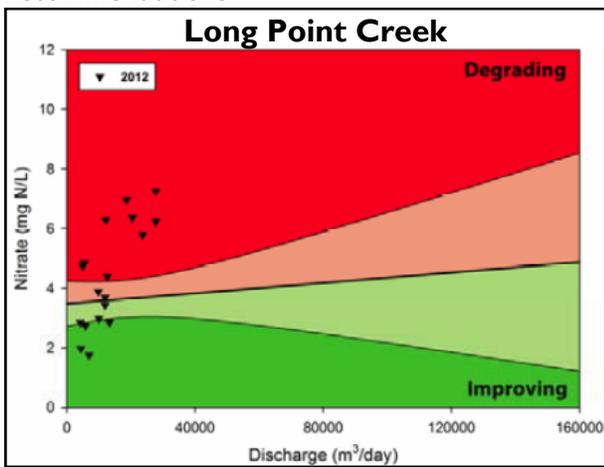


Figure 2. Long Point Creek - based on historic spring nitrate data, with 2012 monitoring data.
Image courtesy: Makarewicz et al, 2012. SUNY Brockport.

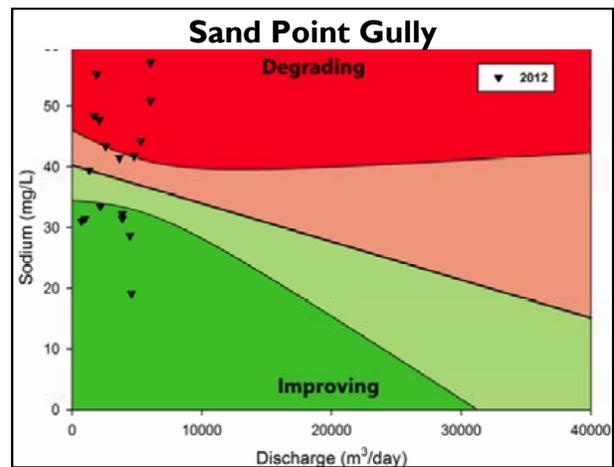


Figure 3. Sand Point Gully- based on historic spring sodium data, with 2012 monitoring data.
Image courtesy: Makarewicz et al, 2012. SUNY Brockport.

Three recommendations were suggested by the SUNY Brockport team resulting from this analysis. First, work with the Soil and Water Conservation District on methods to reduce runoff volume and manage fertilizer application in these watersheds. Second, discuss with the Highway Departments rates of deicing salt application and the impact on the lake. Third, continue use of the Stream Watershed Index to evaluate land-use practices and to assist in future watershed planning and management.

FINDINGS OF THE 2012 INVESTIGATIONS: HISTORICAL TRENDS OF MACROPHYTE DIVERSITY AND BIOMASS IN CONESUS LAKE

The submerged macrophyte community of Conesus Lake is one of the most extensively studied in the Finger Lakes region. W.C. Muenschner (1927) first described this varied flora in a study that also included Silver Lake. SUNY Geneseo Professor Herman Forest and his co-workers conducted the first quantitative studies of the macrophyte community in Conesus Lake in 1967-1970. In 1999, Bosch and colleagues conducted the first lake-wide survey of macrophytes since Forest's work in the 1970s.

One of the most important results of the Bosch (1999) study was finding that the largest and most dense milfoil-dominated macrophyte beds were located near streams that drained primarily agricultural watersheds. This observation was part of the rationale for the USDA watershed management project (2003-2009), which among many other questions tested the possibility that nutrient management at the watershed level could reduce milfoil biomass downstream along the lake littoral (Makarewicz et al., 2009). Monitoring of the Conesus Lake macrophyte beds has continued in recent years at Sutton Point Creek, Sand Point Gully and Cottonwood Gully, as well as North Gully, which served as a reference site for the USDA project.

During 2012, SUNY Geneseo scientists conducted a macrophyte monitoring program. The two principal goals of the program were:

- Continue monitoring the biomass of Eurasian watermilfoil in four macrophyte beds sampled since 2000, initially as part of the USDA watershed study. In particular, evaluation of the macrophyte bed in North Gully Cove (south of McPherson Point) would provide data to assess whether diversion of the North Gully stream channel away from the bed had resulted in reduction of milfoil or algae growth in North Gully Cove.
- Survey the species diversity and relative abundance of the macrophyte community lake-wide and compare its current state to trends identified in 1968 and 1999.



*Image courtesy: Bosch et al, 2012.
SUNY Geneseo.*

Eurasian Watermilfoil Biomass—Status and Trends

At the Sutton Point Creek, Sand Point Gully, and Cottonwood Gully long-term monitoring sites, the surface area of coverage and the standing crop of the milfoil-dominated zone remained low or continued to decrease when compared to 2009, even in sites that had already undergone significant reductions of milfoil biomass from 2004-2008 in response to watershed management. At the North Gully site, where in 2008 the stream channel was redirected to drain away from the macrophyte bed, the surface area of the milfoil dominated zone and the total milfoil standing crop were about 40% lower than in 2009. As a result of this data assessment, a strong case can be made that the declining milfoil standing crops over the past three years are a continuation of improvement generated by BMPs established in the watersheds as part of the USDA project.

Presently milfoil is especially dominant near the mouths of some streams, where it represents 84.3% of the biomass in the 2-3 m depth zone. In areas more removed from the influence of these streams, milfoil is only 43.8% of the biomass and many of the native macrophytes are found in much greater abundance. This observation offers some hope that continuing nutrient management will not only reduce the dominance of

FINDINGS OF THE 2012 INVESTIGATIONS: HISTORICAL TRENDS OF MACROPHYTE DIVERSITY AND BIOMASS IN CONESUS LAKE (CONTINUED)

Eurasian milfoil, as already documented in the long-term monitoring sites, but also restore diversity in the macrophyte community that was lost with the spread of this invasive.

Species Diversity and Relative Abundance—Status and Trends

Most of the macrophyte species that are currently abundant in Conesus Lake were abundant in previous surveys, even going back to W.C. Muenschner’s survey in 1927. The one exception is in the dominance of the invasive Eurasian watermilfoil, which was introduced to the lake by the late 1960s. Ultimately, this invasive species supplanted the native Northern milfoil and displaced the dominant Water stargrass in most of the lake (Figure 4).

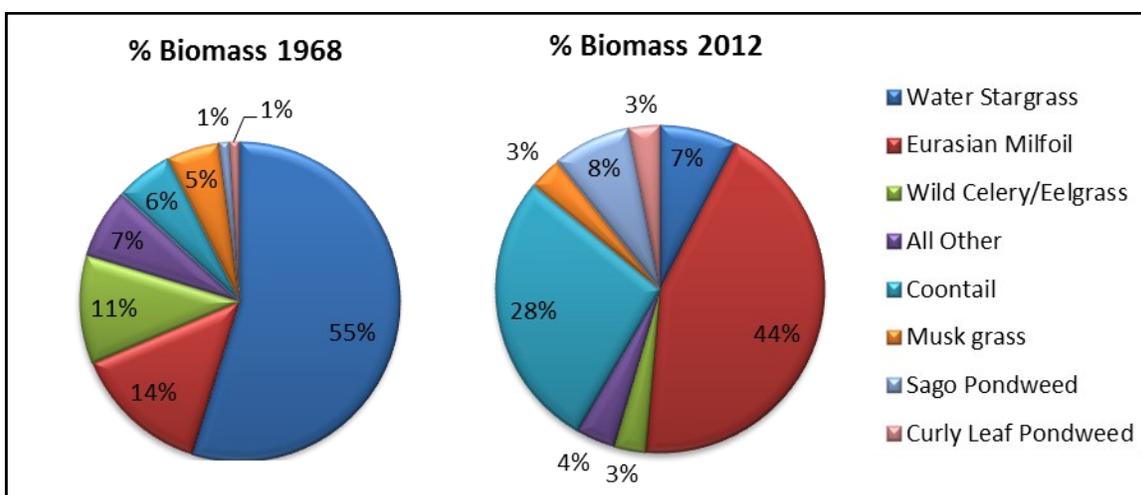


Figure 4. A comparison of percent biomass of macrophytes in Conesus Lake, 1968 and 2012. Source: Bosch et al, 2012. SUNY Geneseo.

This shift in the community is reflected in all of the community metrics tested. For example, the Simpson’s Diversity index is a metric that provides a single value that incorporates the species richness and the relative abundance of species in a community on a scale from 0 to 1, with 1 representing infinite diversity and a 0 representing no diversity. The Simpson’s Diversity Index in 2012 was 0.32 with milfoil representing more than 43% of the dry weight, as compared to an Simpson’s Index of 0.43 and 14% dry weight for 1968.

Conclusions

The results of the 2012 survey at the North Gully, Sutton Point Gully, Sand Point Gully, and Cottonwood Gully long-term monitoring sites indicate that dominance of Eurasian watermilfoil continues to abate. Specifically, the surface area and total standing crops of milfoil have decreased markedly since 2009, while the overall size of the macrophyte bed has changed very little.

Lake-wide, the species composition of the macrophyte community in Conesus Lake seems to be very stable, having changed only slightly since the first survey conducted by W.C. Muenschner (1927). It is virtually the same as that documented by Professor Herman Forest during his extensive studies in Conesus Lake in the 1960s and 1970s. The one exception is the invasion and subsequent spread to all parts of the lake by Eurasian watermilfoil, which may have begun in the late 1960s.

FINDINGS OF THE 2012 INVESTIGATIONS: TROPHIC STATE

The trophic state of a lake is typically defined by three parameters: phosphorus concentration, Secchi disk transparency, and chlorophyll- α concentration. These three parameters are used to assess lake productivity. In turn, the lake productivity is related to the dissolved oxygen content of the water column; highly productive lakes consume more oxygen and therefore have zones of low oxygen or anoxia. The presence of anoxic conditions in lower waters, adjacent to the sediments, will promote flux of phosphorus from sediment storage into the water column where it becomes more available to algae. This can result in more algal blooms.

Carlson's Trophic State Index

These three parameters – total phosphorus (TP), chlorophyll- α , and Secchi disk transparency – are interrelated, and may be used to assess algal biomass. All three parameters are used in Carlson's Trophic State Index (TSI), useful in assessing the productivity of the lake. The TSI is calculated using measurements from the lake, and the resulting values indicate the trophic state, as shown in Table 1.

Range of TSI Values	Trophic State	Attributes
<30	Oligotrophic	Clear water, oxygenated throughout the year in the hypolimnion (lower waters)
30-50	Mesotrophic	Moderately clear water, increasing probability of hypolimnetic anoxia during summer
50-70	Eutrophic	Anoxic hypolimnia, macrophyte and algal problems possible
>70	Hyper-eutrophic	Dense algae and macrophytes; algal scum; light-limited productivity.

Conesus Lake Trophic State

Table 1: Carlson's Trophic State Index is a useful metric for assessing lake productivity based on three parameters.

SUNY Brockport researchers conducted monitoring of Conesus Lake during the summer of 2012. The researchers evaluated the current trophic state of the lake and identified whether improvements or further degradation of water quality had occurred. Using the Carlson Index, they calculated the TSI values for Conesus Lake in 2012: total phosphorus (45.1), chlorophyll- α (49.2), and Secchi disk transparency (46.0).

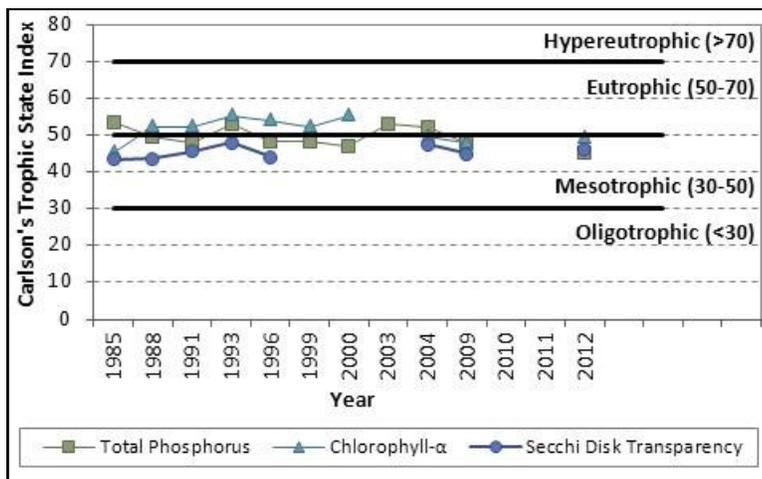


Figure 5. Historical evaluation of Conesus Lake trophic state.

These results suggest that Conesus Lake is in a mesotrophic state, with TSI values between 30 and 50. Historic TSI values show that Conesus Lake has been typically on the border between the mesotrophic and eutrophic states (Figure 5).

Along with other indicators, these analyses suggest that Conesus Lake water quality and trophic state appear to be improving, and may be the result of management efforts.

2012 FOCUS ON CONESUS LAKE BACTERIAL MONITORING AND BLUE-GREEN ALGAE (CYANOBACTERIA)

Bacteriological Monitoring

The Livingston County Department of Health samples nearshore waters at designated bathing beaches in Conesus Lake each summer for the presence of fecal coliform bacteria. This class of bacteria is used to indicate the potential presence of pathogenic (disease-causing) microorganisms. In 2012, samples were collected at three sites: Long Point Beach, Southern Shores Beach and Camp Stella Maris. Results are compared to



Image courtesy: Camp Stella Maris on-line photo gallery.

the state ambient water quality standard for bacteria, which is used by the Department of Environmental Conservation to evaluate water quality and by the Department of Health to evaluate suitability for swimming at designated beaches.

The state's ambient water quality standard for fecal coliform bacteria is 200 colony forming units per 100 ml of lake water (cfu/100ml), is calculated as the geometric average of at least five samples per month. The Department of Health collects on average three samples per month. The geometric mean for the sample concentration in 2012 was 4cfu/100 ml, therefore results for the Conesus Lake beaches in 2012 were well below the 200 cfu/100 ml standard, indicating consistent compliance.

Blue-Green Algae (Cyanobacteria)

An emerging issue in lake management is the development of harmful blooms of cyanobacteria (blue-green algae). A Blue-Green Algae Early Detection and Rapid Response Plan for Conesus Lake was developed in 2011 to improve public understanding of this issue, and to ensure that the state, county and local agencies - including water purveyors - understand their responsibilities and have access to clear and verified data. More information is available on the County website (<http://www.co.livingston.state.ny.us/planning.htm>).

In the summer of 2012, Dr. Sid Bosch of SUNY Geneseo developed a quantitative methodology to characterize the local intensity of cyanobacterial blooms in Conesus Lake, using the pigment phycocyanin as an indicator of bloom intensity. The concentration of phycocyanin in freshly collected samples can be estimated from the pigment's natural fluorescence peak. Phycocyanin concentration is strongly correlated with the number of cyanobacteria cells in the water and thus bloom intensity.

The method developed by Dr. Bosch was used on August 7-14, 2012, when surface slicks of cyanobacteria were observed in shoreline areas. The fluorescence and calculated phycocyanin concentrations measured for surface slicks were very high, and insights about bloom intensity gained from these measurements were considered by the Livingston County Department of Health to temporarily close public beaches and to warn residents of potential risks in the affected areas.

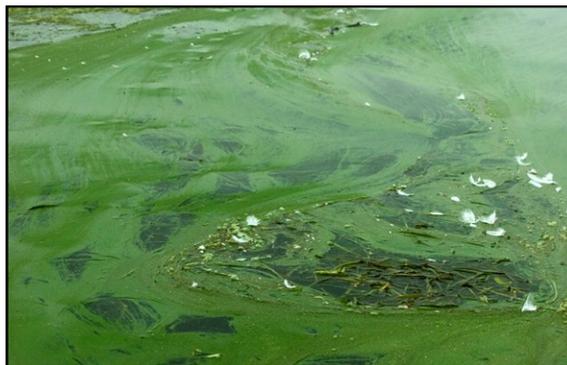


Image courtesy: Bosch et al, 2012. SUNY Geneseo.

2012 FOCUS ON CONESUS LAKE INVASIVE SPECIES MANAGEMENT PLAN

Invasive species, by definition, are non-native, introduced species that cause harm to the environment, human health, and/or economy. Invasive species grow relatively unchecked and disrupt the native ecosystem until the environment begins to evolve and adapt on its own.

Invasive Species Management Plan

Conesus Lake is currently home to four confirmed aquatic invasive species. Of these four species, three (Eurasian watermilfoil, alewife and the zebra mussel) account for the most prominent and significant impacts to Conesus Lake.

During 2012, the CLWC initiated development of an Invasive Species Management Plan for Conesus Lake. This Plan aims to facilitate effective and efficient collaboration between organizations and agencies to prevent new invasive species infestations from entering Conesus Lake and to minimize the ecological, economical and recreational impacts of existing invasive species in the Conesus Lake watershed. The Plan will serve as a reference for problem solving and decision making throughout the invasive species management process.

The CLWC Invasive Species Management Plan has three goals:

- 1) Implement programming to prevent new invasive species from entering Conesus Lake.
- 2) Create an early detection and rapid response system to detect new invasive species while they are at easily treatable levels.
- 3) Realistically and efficiently manage existing invasive species infestations, both in-lake and in the watershed, to minimize impacts to the ecosystem, human health, recreation and economy given existing resources and funding opportunities.

The Plan consists of three elements: Prevention, Monitoring, and Early Detection/Rapid Response.

- **Prevention** is the most cost effective management strategy for the control of invasive species. Increasing awareness levels of invasive species issues and educating the public on prevention best management practices are key. Once a species is established in an ecosystem, direct costs associated with management and indirect economic losses can spiral out of control.
- **Monitoring** will be conducted in a coordinated manner between different groups, including a volunteer monitoring program that will be established.
- The **Early Detection and Rapid Response** element will provide the preparation and planning needed to undergo a rapid response to a newly detected invasive species infestation.

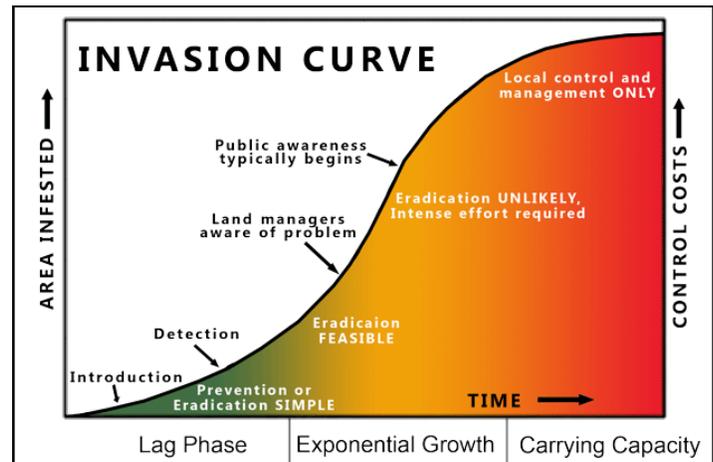


Figure 6. The Invasive Species Invasion Curve emphasizes the importance of addressing new invasions in the early stages.

Image Courtesy of Alaska Department of Natural Resources



CONESUS LAKE WATERSHED MANAGEMENT PLAN

IMPLEMENTATION STATUS REPORT—2012 YEAR IN REVIEW

# in Plan	Recommendation	Priority	Action Taken
All	Secure funding outside of the EPF funding source to implement CLWMP activities. Investigate and apply for funds from grants opportunities as they arise.	High	<ul style="list-style-type: none"> • In progress. The Planning Department received a \$5,000 grant from Scott's Products, administered through the NYS Soil and Water Conservation Committee and FLOWPA for a rain garden and public education campaign at Long Point Park.
A-1	Review and amend zoning regulations to improve consistency in near-lake areas.	High	<ul style="list-style-type: none"> • The Town of Geneseo has been awarded a grant to complete an Agricultural & Farmland Protection Plan, part of which will look at the connection between land use regulations and agriculture. The Town of Geneseo is also in the process of updating the Town Zoning Code. The Planning Department will be assisting in both planning projects.
A-3	Develop public education campaigns on BMPs for lake and watershed residents.	Medium	<ul style="list-style-type: none"> • A Planning Department website is in progress. The Watershed Manager is working on eliminating outdated information, updating contact information and creating new material. This website will be the up-to-date source of public education and outreach information. • The Public Education and Outreach Committee is working on developing content for the public education kiosk constructed at Long Point Park. • Other public education efforts are in progress. The Watershed Inspector and Watershed Manager are assisting the CLA by providing an up to date contact list for Lake inspection and management issues. A draft was approved for distribution in October.
B-1	Secure funding to help mitigate the financial impacts of changes in agricultural practices on the producers.	High	<ul style="list-style-type: none"> • In progress. Agencies will continue these activities annually as part of their existing programs. • Livingston County SWCD was awarded funding for four watershed projects through the Agricultural Nonpoint Source Abatement and Control Program (Round 18) through the New York State Department of Agriculture and Markets.
B-2	Implement practices that will reduce non-point source pollution from farms.	High	<ul style="list-style-type: none"> • An overgrazed pasture in No Name sub-watershed was converted to cropland with grass field borders to provide a buffer for the adjacent stream. Drainage improvements were installed to address concerns from roof water runoff and past pasture compaction. Additional implementation projects are currently underway. • Agricultural BMPs continue to be implemented by watershed farmers, the Livingston County SWCD, and the USDA NRCS.

Key to Acronyms:

BMPs - Best Management Practices

CLWMP - Conesus Lake Watershed Management Plan

FLOWPA - Finger Lakes-Lake Ontario Watershed Protection Alliance

SWCD - Soil and Water Conservation District

CLA - Conesus Lake Association

EPF - Environmental Protection Fund

NRCS - Natural Resource Conservation Service

USDA - United States Department of Agriculture

**CONESUS LAKE WATERSHED MANAGEMENT PLAN
IMPLEMENTATION STATUS REPORT—2012 YEAR IN REVIEW**

# in Plan	Recommendation	Priority	Action Taken
C-1	Develop and implement program to restore and stabilize stream banks in the watershed.	High	<ul style="list-style-type: none"> The NY State Department of State executed contracts for both the Phase 1 EPF streambank remediation grant (Town of Livonia, Village of Livonia and the Town of Conesus) and the Phase 2 EPF streambank remediation grant (Towns of Livonia and Geneseo). For both reconnaissance is set to run through Winter of 2013. Construction on both phases is anticipated to begin in Spring 2013.
C-3	Develop public education campaigns on the impact of human activities on the health of the Lake.	Medium	<ul style="list-style-type: none"> The CLA “Welcome to the Lake Kit” program reached out to 20 new owners this season. The CLA also set up a shoreline clean-up sub-committee and established a weed mat program to control aquatic vegetation. Sixteen filamentous algae cleanup kits were purchased by lakeshore residents and shared among neighbors. One hundred and fifty weed mat signs have been placed at retailers or handed out to individuals. An estimated 35 weed mats have been purchased for Smith Lumber in addition to an unknown number of others who bought materials to construct their own mats.
G-1	Investigate and implement effective methods to control the spread of non-native (exotic) organisms.	High	<ul style="list-style-type: none"> The CLA Invasive Species Project Team is working with the CLWC Technical Committee members on the CLWC Invasive Species Plan. The Conesus Lake Watershed Manager and the CLA Invasive Species Project Team held a hands-on Hydrilla identification and monitoring workshop to train volunteer invasive species monitors. Presentations on Hydrilla and aquatic invasive species prevention were given to the Livingston County Federation of Sportsmen's Clubs, Finger Lakes Conservation Council meeting, and the Watershed Council and Technical Committee. An aquatic invasive species informational booth was staffed at the DEC National Hunting and Fishing Days Livingston County continues to participate in the Finger Lakes PRISM, an information-sharing group formally created by New York State to look regionally at the problem of aquatic and terrestrial invasive species. The CLWC Invasive Species Sub-Committee met nine times in 2012. First and second drafts of the Invasive Species Management Plan were reviewed.

Key to Acronyms:

CLA - Conesus Lake Association
DEC - Department of Environmental Conservation

CLWC - Conesus Lake Watershed Council
PRISM - Partnership for Regional Invasive Species Management



**CONESUS LAKE WATERSHED MANAGEMENT PLAN
IMPLEMENTATION STATUS REPORT—2012 YEAR IN REVIEW**

# in Plan	Recommendation	Priority	Action Taken
G-2	Initiate a leaf cleanup program for lakeside and near-shore residents of Conesus Lake.	High	<ul style="list-style-type: none"> Funding opportunities were investigated for the procurement of suitable leaf pick-up equipment. No new funding opportunities were available during 2012.
G-3	Initiate effort to determine if alum treatment to control release of phosphorus from deep lake sediments would be effective in Conesus Lake. Proceed with plans for implementation if effectiveness is warranted and monitor for environmental impacts.	High	<ul style="list-style-type: none"> The Watershed Manager received an update on the Honeoye Lake Alum treatment from the Ontario County Planning Department.
G-4	Initiate effort to determine if increased stocking of walleye fingerlings, or other species, would be an effective biological control in Conesus Lake.	High	<ul style="list-style-type: none"> In 2012, the CLA stocked 1,000 ten-inch fingerlings from a private hatchery, and 78 six-inch fingerlings provided through the FLCC program. DEC stocked 47,000 two to five -inch walleye and 12,000 ten-and-a-half-inch tiger muskellunge fingerlings.
H-1	Conduct an annual monitoring program of Conesus Lake and its watershed. An annual monitoring meeting should be held to coordinate the monitoring program.	High	<ul style="list-style-type: none"> Meeting to discuss annual monitoring was held in January 2012. SUNY Brockport completed monitoring three USDA study streams (Sand Point Gully, Long Point Creek and Graywood Gully). SUNY Brockport completed its in-lake trophic indices monitoring. SUNY Geneseo completed macrophyte survey Livingston County Department of Health purchased blue-green algae toxin test strips for trial use for the blue-green algae monitoring program, and completed its 2012 public bathing beach monitoring program.
H-2	Prepare and distribute an annual Conesus Lake and Watershed Report Card.	High	<ul style="list-style-type: none"> 2011 Report Card completed and presented to the CLWC.
H-2	Update the Conesus Lake Watershed Characterization Report	High	<ul style="list-style-type: none"> In progress. The CLWC approved a project to update the Watershed Characterization Report. EcoLogic and the Planning Department are working on the update.

Key to Acronyms:

CLA - Conesus Lake Association

FLCC - Finger Lakes Community College

SUNY - State University of New York

CLWC - Conesus Lake Watershed Council

DEC - Department of Environmental Conservation

USDA - United States Department of Agriculture

For additional information contact:
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Conesus Lake and Watershed Report Card

Assessment of the Conesus Lake Watershed
Management Plan in 2011

Conesus Lake Watershed Council

February 2012

PURPOSE OF THIS DOCUMENT

One of the recommendations of the Conesus Lake Watershed Management Plan (CLWMP) is to prepare an annual update summarizing the status of activities in the watershed, particularly the ongoing efforts to reduce nonpoint source pollution. This annual summary also provides a forum for tracking conditions in Conesus Lake and highlighting new information.

MAJOR ACCOMPLISHMENTS

Since its formation in 2003, the Conesus Lake Watershed Council (CLWC) has coordinated implementation of the recommendations of the CLWMP. The Watershed Council is an intermunicipal organization with a dual mission: first, to coordinate actions for restoring the health of Conesus Lake and its watershed, and second, to communicate progress to the watershed community and other stakeholders. Restoring the health of the lake and its watershed requires a sustained effort and a focus on many inter-related issues.

In recognition of these efforts, the CLWC received the Planning Excellence Award from the New York Upstate Chapter of the American Planning Association (APA) for Planning Excellence Implementation. As the APA noted: *“The level of cooperation within and partnerships among the Watershed Management Plan committees and between agencies has been heralded as a successful example of how the process should work.”*

Progress in implementation of the CLWMP continued in 2011. Highlights include:

- **Stream testing** continued for a ninth year, led by Dr. Joseph Makarewicz of SUNY Brockport, to measure the concentration of nutrients and sediments flowing into Conesus Lake from the subwatersheds.
- **Investigation of the relationship between spring runoff and lake water characteristics** was undertaken, led by Dr. Sid Bosch of SUNY Geneseo. The monitoring plan included analysis of metaphyton cover in McPhersons’ Cove, Cottonwood Gully and Sand Point Gully, and measurement of selected water quality parameters at the deepest part of the lake.
- **Public education and outreach activities** were very active in 2011, with educational kiosks, and the high-profile presence of the Conesus Lake Association’s Conesus Stewardship Initiative at local events.



Members present at the APA meeting to accept the award. Pictured from left to right: Heather Ferrero (LCPD), Dr. Liz Moran (EcoLogic, LLC), Penny Trimm (LCPD), Miranda Reid (Conesus Lake Watershed Manager, LCPD), Brenda Donohue (Supervisor, Town of Conesus and Chair, CLWC), Angela Ellis (current Planning Director, LCPD), Mary Underhill (LCPD), David Woods (past Planning Director, LCPD), Darlene Essler (LCPD), and Wayne France (President, Conesus Lake Association).

FINDINGS OF THE 2011 INVESTIGATIONS : WATERSHED MONITORING

During the spring and summer of 2011, SUNY Brockport scientists completed their ninth consecutive year of water quality monitoring of streams flowing into Conesus Lake through agricultural and/or forested areas. The 2011 monitoring program was designed to contribute to the long-term data record, which documents water quality conditions before and after implementation of agricultural best management practices (BMPs).

2011 Monitoring Program - Objectives

In 2010, the SUNY Brockport team compared the annual stream nutrient and sediment loading estimates from 2003-2007 to the same loading estimates calculated from the 2008-2010 data. The 2003-2007 loading estimates were calculated from the year-round monitoring effort undertaken as part of the USDA program. The more recent loads were calculated using monitoring data from summer with stream loading estimates calculated from data collected only during summer months. The investigators concluded that summer data do not adequately reflect the large declines in nutrient and sediment loading that resulted from implementing BMPs in agricultural watersheds. The team concluded that it is most important to capture spring conditions, which are typically characterized by higher runoff and precipitation, in order to evaluate the effectiveness of BMPs in keeping soils and nutrients on the landscape. The SUNY team recommended that monitoring in the Conesus Lake watershed begin in March, rather than May, as a means to provide a more robust index for evaluating the effectiveness of BMPs and detecting trends.



Image courtesy: Livingston County Planning Department.

As a result of these findings, two objectives were defined for the 2011 monitoring program:

- Change the monitoring of two of the USDA stream stations (Cottonwood Gully and North McMillan Creek) from summer to spring.
- Develop a spring-based Stream Water Quality Assessment Index as a cost-effective means for the County to continue monitoring the performance of the BMPs.

In 2011, stream samples were collected at two former USDA monitoring sites at the base of the Cottonwood Gully and the North McMillan Creek sub-watersheds between March 1 and May 31. No data for four other USDA creeks - Graywood Creek, Long Point Gully, Sutton Point, and Sand Point - were collected in 2011.

Development of a Stream Water Quality Assessment Index

A major goal of 2011 was to develop a simple, cost-effective assessment tool based on spring, rather than summer data, utilizing the spring 2003 to 2007 USDA program database. Such an assessment tool would support an evaluation of the relative nutrient loading from the Conesus Lake subwatersheds, and how well the BMPs were being maintained.

**FINDINGS OF THE 2011 INVESTIGATIONS :
WATERSHED MONITORING (CONTINUED)**

The SUNY Brockport team developed a graphical index of stream discharge versus nutrient concentration based on historical spring data. For example, using the USDA pre-BMP implementation data, this approach correlates total phosphorus concentration with stream discharge; as stream discharge increased, phosphorus concentrations also increased. Based on a statistical analysis of these data, a relationship in the form of a regression was plotted, shown as a straight black line in Figure 1. The two curved lines to either side of the black regression line, with lighter-colored shading, represent the 99% confidence interval. Most of the historical data results plot within this 99% confidence interval.

Using this template, the phosphorus results from the 2011 spring sampling - representing the post-BMP implementation conditions - were plotted as black triangles in Figure 1. From a management perspective, consider that points outside of the confidence interval indicate changed conditions. If the data plot within the 99% confidence interval, one may conclude that there was no substantial change from the historic pre-BMP data. In Figure 1, where the stream discharge level is less than 10,000 m³/day, the 2011 data do not show much change from historical conditions. However, at higher flows, the data points are distributed primarily in the darker green area of the graphic. This illustrates the positive effects of the BMPs on water quality at higher stream flows, and suggests that the loss of total phosphorus from the Cottonwood Gully watershed is less than that of the pre-BMP period.

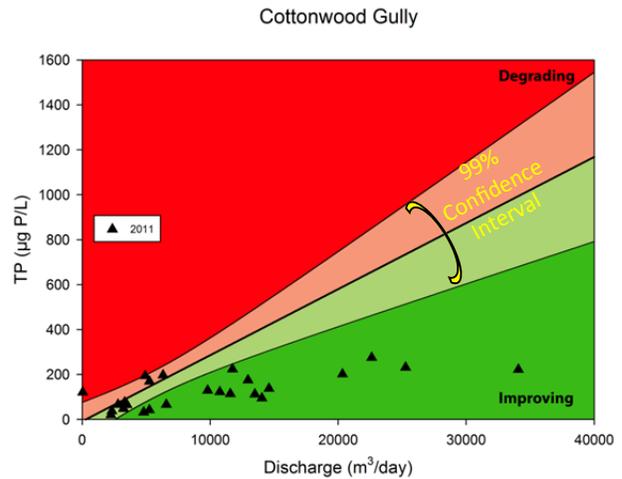


Figure 1. Regression Line and 99% Confidence Interval based on historic spring phosphorus data, with 2011 data plotted as triangles.
Image courtesy: Makarewicz et al, 2011. SUNY Brockport.

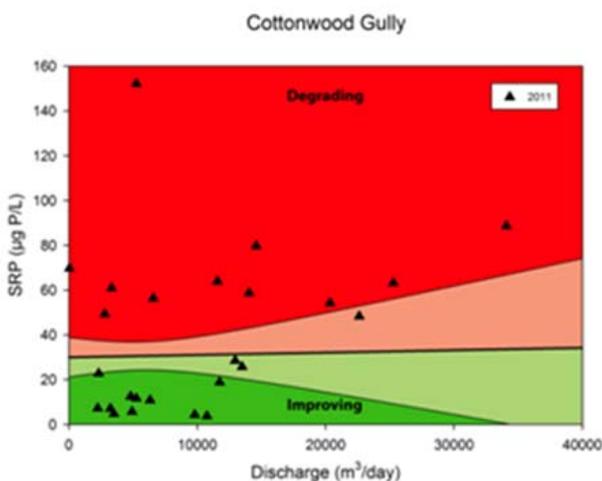


Figure 2. Regression Line and 99% Confidence Interval based on historic spring SRP data, with 2011 data.
Image courtesy: Makarewicz et al, 2011. SUNY Brockport.

Indices were developed by the SUNY Brockport team for six parameters measured in six watersheds. The six parameters are: total suspended solids (TSS), total phosphorus (TP), soluble reactive phosphorus (SRP), nitrate, total Kjeldahl nitrogen (TKN), and sodium. The six watersheds are: Cottonwood Gully, North McMillan Creek, Graywood Creek, Long Point Gully, Sutton Point, and Sand Point.

This spring-based Stream Water Quality Assessment Index appears to be a viable, cost-effective tool for continued evaluation of the water quality of the USDA streams and performance of the BMPs.

FINDINGS OF THE 2011 INVESTIGATIONS : WATERSHED MONITORING (CONTINUED)

Monitoring Trends 2011

The researchers applied the assessment index to determine what the 2011 data indicate about water quality trends in Cottonwood Gully. Overall, water quality conditions have improved. That is, the 2011 data are plotted on the index, the data are in the “green” zone. This result suggests that the improvements in stream water quality observed during and after implementation of the USDA BMPs are being maintained into 2011. There was one exception: soluble reactive phosphorus (SRP). The concentrations of SRP were distributed between the “red” and “green” zones. (Figure 2). This result suggests that the loss of SRP from the watershed during 2011 was frequently greater than measured historically in this subwatershed. If the trend continues, investigations of possible causes— changes in land use, development, or farming practices— is warranted.

The other tributary sampled in 2011 was North McMillan Creek. North McMillan Creek watershed was the control watershed used in the USDA study, as it was the most forested and least agricultural. Overall, water quality was in the “green” zone, with the exception of sodium (Figure 3). Sodium concentrations were distributed in the “red” zone, particularly at higher discharge rates. This may be attributable to deicing salts. The sampling location is near the bridge, where snowmelt and associated salts enter into the creek. The data for North McMillan suggest that application rates and/or the number of applications may have been higher in 2011 than in the 2003 -2007 period.

Findings and Recommendation - Changing from Summer to Spring Monitoring

If possible, monitoring of the Conesus Lake subwatersheds should continue as a mechanism to evaluate potential effects of changes in land use. Future stream monitoring should focus on the spring period. The Stream Water Quality Assessment Index is an appropriate data visualization tool to differentiate real change from year-to-year variability arising from different streamflow conditions.

At the Conesus Lake Association’s Youth Day at Vitale Park, Barb Rogers (Co-Watershed Inspector) demonstrates the concepts of watershed runoff to children using EnviroScope®, an environmental education model.

Image courtesy: Livingston County Planning Department.

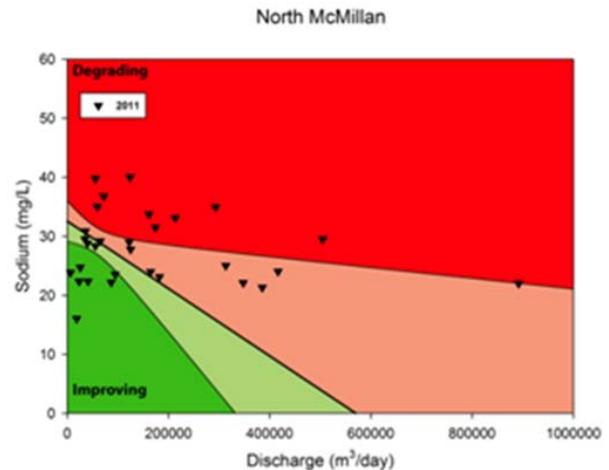


Figure 3. Regression Line and 99% Confidence Interval based on historic spring sodium data, with 2011 data.
Image courtesy: Makarewicz et al, 2011. SUNY Brockport.



FINDINGS OF THE 2011 INVESTIGATIONS: RELATIONSHIP BETWEEN SPRING PRECIPITATION AND LAKE CONDITIONS

In April and May 2011, the Rochester area experienced the highest rainfall totals in at least 11 years. The Conesus Lake 2011 sampling program included monitoring selected limnological parameters and algal biomass in order to examine the lake's response to the unusually high spring precipitation and runoff. The monitoring plan was designed to meet two objectives:

- First, to assess whether the unusually high spring precipitation and runoff had a discernible effect on the lake's limnological conditions during the early summer period (late June to mid-July).
- Second, to estimate the metaphyton cover in three study areas, McPhersons' Cove, Cottonwood Gully and Sand Point Gully, where baseline conditions were known. The team was interested in determining whether the spring runoff would result in increased biomass of filamentous algae growing in these nearshore areas.



Image courtesy: Bosch et al, 2011. SUNY Geneseo.

The SUNY Geneseo team of Isidro Bosch, Grace Savoy-Burke and Emily Van Ness conducted the monitoring program to address these questions.

Did the high precipitation and runoff have a discernible effect on Conesus Lake?

No. Water column profiles were taken over the deepest parts in the lake's southern basin, and measured for nutrients, chlorophyll-a, water transparency, and other physiochemical characteristics. Comparisons of the 2011 results with historical records for the same time period demonstrated that 2011 was not consistently different from previous years. One possible exception was a bloom of phytoplankton detected on July 19th; on this date, the surface turbidity, and chlorophyll-a levels were unusually high for Conesus Lake, and the Secchi disk transparency was unusually low. Whether this lake-wide bloom was a response to the high springtime rainfall and associated runoff of nutrients and sediment from the watershed could not be ascertained.

Did the runoff result in increased amount of filamentous algae in nearshore areas?

Yes. Qualitative observations at three study sites along the nearshore in June and July revealed that the areal coverage of filamentous algae was exceedingly high. Macrophyte beds were widely covered with algae and the growth of the pervasive Eurasian watermilfoil may have been suppressed. Because there was no surface macrophyte canopy, the filamentous algal mat remained well below the surface where it could not be measured quantitatively by the surface quadrat method used in previous studies.

Conclusions

Much of the nutrient supply delivered by the spring runoff was likely intercepted nearshore, where it triggered extensive blooms of filamentous algae. In the open water regions of the lake, nutrient levels were not consistently high and other aspects of the water column ecosystem were within the range measured in previous years.

2011 FOCUS ON CONESUS LAKE ECOSYSTEM HEALTH AND PUBLIC OUTREACH EFFORTS

Bacteriological Monitoring

The Livingston County Department of Health samples nearshore waters at designated bathing beaches in Conesus Lake each summer for the presence of fecal coliform bacteria. This class of bacteria is used to indicate the potential presence of pathogenic (disease-causing) microorganisms. In 2011, samples were collected at three sites: Long Point Beach, Southern Shores Beach and Camp Stella Maris. Results are compared to



Image courtesy: Camp Stella Maris on-line photo gallery.

the state ambient water quality standard for bacteria, which is used by the Department of Environmental Conservation to evaluate water quality and by the Department of Health to evaluate suitability for swimming at designated beaches.

The state's ambient water quality standard for fecal coliform bacteria standard, 200 colony forming units per 100 ml of lake water (cfu/100ml), is calculated as the geometric average of at least five samples per month. The Department of Health collects on average four samples per month. The maximum sample concentration in 2011 was 52 cfu/100ml, therefore results for the three Conesus Lake beaches in 2011 were well below the 200 cfu/100ml standard, indicating consistent compliance.

Blue-Green Algae

An emerging issue in lake management is the development of harmful blooms of cyanobacteria (blue-green algae). A Blue-Green Algae Early Detection and Rapid Response Plan for Conesus Lake was developed in 2011 to improve public understanding of this issue, and to ensure that the state, county and local agencies, including water purveyors, understand their responsibilities and have access to clear and verified data. The CLWC has created an informational brochure for distribution to Lake users in the event of a bloom. The response plan and brochure are available on the County website (<http://www.co.livingston.state.ny.us/planning.htm>).

Invasive Species

Livingston County continues to participate in the Finger Lakes PRISM (Partnership for Regional Invasive Species Management), an information-sharing group created by New York State to foster a regional approach to managing invasive species, both aquatic and terrestrial. In 2011, the Watershed Manager attended workshops on the statewide invasive species mapping database (iMapInvasives), the Hydrilla task force response on Cayuga Lake, and Cornell Cooperative Extension's Invasive Species In-Service. Support continues for the Conesus Lake Association (CLA) Aquatic Invasives Monitoring & Response Program. A meeting was held July 27, 2011 to discuss an action plan for monitoring and reporting two aquatic invasives (Asian Clam and Water Chestnut). The CLA conducted a volunteer diving survey for Asian Clams at the north end of the Lake in September. Good news- no Asian Clams were found.

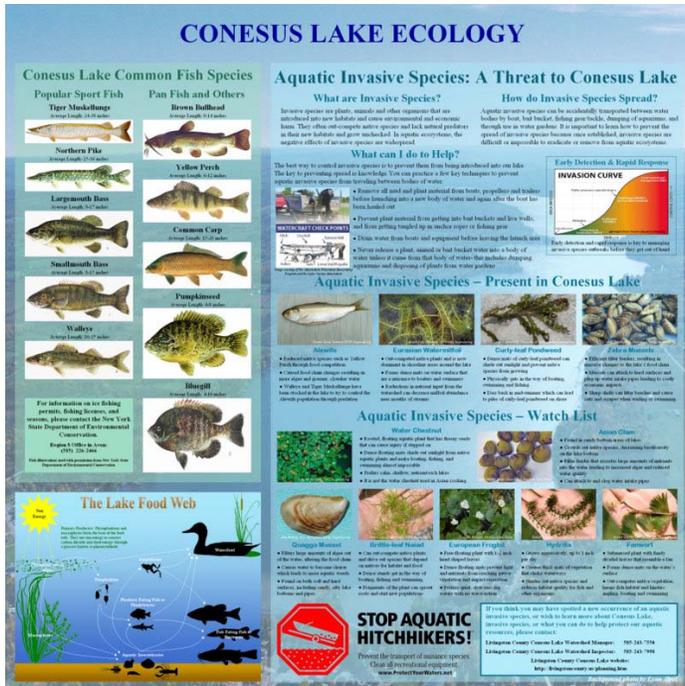


Image courtesy: Conesus Lake Association

2011 FOCUS ON CONESUS LAKE ECOSYSTEM HEALTH AND PUBLIC OUTREACH EFFORTS

Public education kiosks

The construction of the Vitale Park kiosk structure was completed in 2011. Another similar educational kiosk has been planned for Long Point Park, with completion in summer 2012. Educational content for the kiosk displays was developed by the Livingston County Planning Department and the CLWC Public Education and Outreach Committee.



Example of educational information available at kiosks.
Image courtesy: Livingston County Planning Department



Jim Damon, a Livonia Eagle Scout (left) and a local contractor (right) construct the public education kiosk at Vitale Park.
Image courtesy: Livingston County Planning Department.

Conesus Campaign

Support continues to the Conesus Lake Association's Conesus Campaign to educate lakeside and watershed residents on lake-friendly best management practices. During 2011, a *Conesus Stewardship Initiative (CSI) Booth* was staffed at the Chip Holt Center/CLA Youth Day, Geneseo Rotary Summer Festival, CLA Arts and Craft show, the Livonia Autumn in the Village festival and the Fiddlers Picnic at Long Point. Forty "Welcome to the Lake" kits have been personally delivered to new lake property owners. The "Lake Friendly Vendor" program has signed up 11 vendors, and signage is being developed for Vendors that do not have a storefront - such as lawn care services - to expand the program.



In addition to these activities, articles on the CSI programs were included in the Finger Lakes Institute on-line magazine "Happenings" (<http://flihappenings.wordpress.com/2011/06/29/conesus2011/>) and in the Livingston County News.



CONESUS LAKE WATERSHED MANAGEMENT PLAN IMPLEMENTATION STATUS REPORT—2011 YEAR IN REVIEW

# in Plan	Recommendation	Priority	Action Taken
A-1	Review and amend zoning regulations to improve consistency in near-lake areas.	High	<ul style="list-style-type: none"> • The Planning Department continued working with the Town of Conesus on their zoning update. Technical assistance was provided as needed to all watershed towns and villages regarding zoning and watershed issues.
A-3	Develop public education campaigns on BMPs for lake and watershed residents.	Medium	<ul style="list-style-type: none"> • Construction of the Vitale Park kiosk structure is almost complete. Preliminary plans for content for the Vitale Park Kiosk were discussed at the PE&O Meeting on July 19 and presented at the August 12th Watershed Council Meeting. Content has been finalized and printed. • The Planning Department, PE&O Committee and Environmental Management Council co-sponsored a Homeowner's Emerald Ash Borer (EAB) educational workshop for Livingston County residents, held at Long Point Park on June 4. • A Planning Department website is in the preliminary planning phase. This website will be the up-to-date source of public education and outreach information. • The Geneseo Town Board approved the PE&O Committee to work on a educational kiosk for Long Point Park. A contract was authorized between the Town of Geneseo and the Planning Department for the construction of the kiosk, which will be complete by August 1, 2012.
B-1	Secure funding to help mitigate the financial impacts of changes in agricultural practices on the producers.	High	<ul style="list-style-type: none"> • In progress. Agencies will continue to use existing funding sources and look for new funding sources for agricultural BMPs annually as part of their existing programs.
B-2	Implement practices that will reduce non-point source pollution from farms.	High	<ul style="list-style-type: none"> • Three grass waterways (totaling ~5450 feet in length) were installed on watershed farms to address severe gully erosion. Seventy-five acres of cover crops were also installed. • Agricultural BMPs continue to be implemented by watershed farmers, the Livingston County SWCD, and the USDA NRCS.
C-1	Develop and implement program to restore and stabilize stream banks in the watershed.	High	<ul style="list-style-type: none"> • Streambank buffer initiative In progress. Agencies continue annually to focus efforts on watershed areas that are not currently buffered as part of their existing programs. • Assistance to Towns of Conesus and Livonia with EPF streambank remediation grant (Phases I and II) is ongoing. The Towns of Livonia and Conesus approved a draft contract. When an executed contract is received from the Department of State, an RFP and a letter to land-owners will be sent.

Key to Acronyms:

BMPs - Best Management Practices
 NRCS - Natural Resource Conservation Service
 RFP - Request for Proposals
 USDA - United States Department of Agriculture

EPF - Environmental Protection Fund
 PE&O - Public Education and Outreach
 SWCD - Soil and Water Conservation District

**CONESUS LAKE WATERSHED MANAGEMENT PLAN
IMPLEMENTATION STATUS REPORT—2011 YEAR IN REVIEW**

# in Plan	Recommendation	Priority	Action Taken
C-3	Develop public education campaigns on the impact of human activities on the health of the Lake.	Medium	<ul style="list-style-type: none"> • Support continues to the Conesus Lake Association's Conesus Campaign to educate lakeside and watershed residents on lake-friendly best management practices. • A Conesus Stewardship Initiative (CSI) Booth was staffed at the Chip Holt Center/CLA Youth Day, Geneseo Rotary Summer Festival, CLA Arts and Craft show, the Livonia Autumn in the Village festival and the Fiddlers Picnic at Long Point. • "Welcome to the Lake" kits have been personally delivered to 40 new lake owners. • The "Lake Friendly Vendor" program has signed up 11 vendors. Currently developing signage for Vendors with no storefront (e.g.: lawn care) to expand program. • Articles on CSI programs were included in the Finger Lakes Institute July "Happenings" online magazine and the Livingston County News.
D-3	Municipal Highway Departments should develop a plan, subject to available funding, to remediate ditches in poor condition.	Medium	<ul style="list-style-type: none"> • EPF Road Ditch Grant: Administer and close out EPF road ditch grant; final payment request was sent to the State in June.
G-1	Investigate and implement effective methods to control the spread of non-native (exotic) organisms.	High	<ul style="list-style-type: none"> • Livingston County continues to participate in the Finger Lakes PRISM, an information-sharing group formally created by New York State to look regionally at the problem of aquatic and terrestrial invasive species. The Watershed Manager attended the iMAPInvasives Program workshop, the Cayuga Lake Hydrilla workshop, and the Cornell Cooperative Extension's Invasive Species In-Service. • Support continues for the Conesus Lake Association's Aquatic Invasives Monitoring & Response Program. A meeting was held on July 27 to discuss an action plan for monitoring and reporting new aquatic invasives (Asian Clam and Water Chestnut). The CLA conducted a diving survey for Asian Clams at the northern end of the lake in September, and no Asian Clams were found.

On Sunday, September 18, a survey for Asian clams was conducted by volunteer divers in the cove area at Vitale Park. Fortunately, no Asian clams were found. From left to right the divers are Rob Hudak, Jim Feuerstein, Mike Saviola, and Christy Tyler. Mike organized the project.

Image courtesy: Conesus Lake Association.



Key to Acronyms:

CLA - Conesus Lake Association

EPF - Environmental Protection Fund

iMAPInvasives- an on-line, GIS-based, all-taxa invasive species mapping tool (<http://www.imapinvasives.org/index.html>)

CSI - Conesus Stewardship Initiative

PRISM - Partnership for Regional Invasive Species Management



CONESUS LAKE WATERSHED MANAGEMENT PLAN
IMPLEMENTATION STATUS REPORT—2011 YEAR IN REVIEW

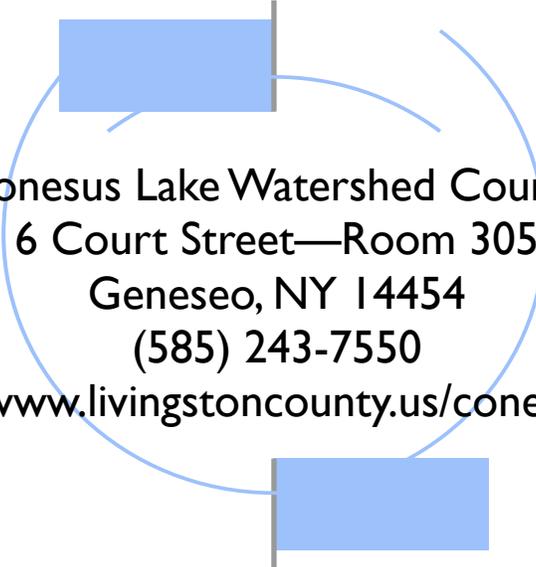
# in Plan	Recommendation	Priority	Action Taken
G-2	Develop and implement a program for cleaning accumulated aquatic plants and algae along the shoreline of Conesus Lake.	High	<ul style="list-style-type: none"> Created a Blue-Green Algae Early Detection and Rapid Response Plan, which was approved at the August 12th CLWC Meeting. To provide proactive public education and outreach content to inform Lake Users about blue-green algae, a tri-fold informational brochure was created and distributed. Website content is being created.
G-3	Initiate effort to determine if alum treatment to control release of phosphorus from deep lake sediments would be effective in Conesus Lake. Proceed with plans for implementation if effectiveness is warranted and monitor for environmental impacts.	High	Continued following the success of the Honeoye Lake project. Maintain contact with NYS DEC on State position on alum treatment on NYS lakes.
G-4	Initiate effort to determine if increased stocking of walleye fingerlings, or other species, would be an effective biological control in Conesus Lake.	High	The CLA, working with FLCC, stocked about 200, ten inch fingerlings into the lake in October. DEC 2011 stocking programs for Conesus Lake did not include walleye.
H-1	Conduct an annual monitoring program of Conesus Lake and its watershed. An annual monitoring meeting should be held to coordinate the monitoring program.	High	Meeting to discuss annual monitoring was held in February. Watershed stream monitoring began in March. SUNY Brockport monitored Cottonwood & North McMillan Gully Creeks for event/non-event samples. SUNY Geneseo began monitoring the Lake in late June. Livingston County Department of Health continued beach monitoring over the summer. Monitoring was completed, and written reports finalized.
H-2	Prepare and distribute an annual Conesus Lake and Watershed Report Card.	High	2010 Report Card completed and presented to the CLWC.

Key to Acronyms:

CLA - Conesus Lake Association
 FLCC - Finger Lakes Community College
 SUNY - State University of New York

CLWC - Conesus Lake Watershed Council
 NYS DEC - New York State Dept. of Environmental Conservation

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Conesus Lake and Watershed Report Card

Assessment of the Conesus Lake Watershed
Management Plan in 2010

Conesus Lake Watershed Council

May 2011

PURPOSE OF THIS DOCUMENT

One of the recommendations of the Conesus Lake Watershed Management Plan (CLWMP) is to prepare an annual update summarizing the status of activities in the watershed, particularly the ongoing efforts to reduce nonpoint source pollution. This annual summary also provides a forum for tracking conditions in Conesus Lake and highlighting new information.

MAJOR ACCOMPLISHMENTS

Since its formation in 2003, the Conesus Lake Watershed Council (CLWC) has coordinated implementation of the recommendations of the CLWMP. The Watershed Council is an intermunicipal organization with a dual mission: first, to coordinate actions for restoring the health of Conesus Lake and its watershed, and second, to communicate progress to the watershed community and other stakeholders. Restoring the health of the lake and its watershed requires a sustained effort and a focus on many inter-related issues. There was substantial progress in 2010 on several fronts.

- **Stream testing** to measure the concentration of nutrients and sediments flowing into Conesus Lake. Sampling the agricultural subwatersheds that were part of the USDA-funded program was led by Dr. Joseph Makarewicz of SUNY Brockport; the 2010 data represent the eighth year of record.
- **A focused investigation of water quality conditions** in Cottonwood Gully and two adjacent rivulets was conducted by the Livingston County Department of Health, at the request of the Town of Geneseo.
- **Mapping the abundance and distribution of macrophytes.** Dr. Sid Bosch of SUNY Geneseo continued his long-term sampling and analysis of Conesus Lake's aquatic plant community.
- **Streambank remediation.** The Town of Livonia was awarded a grant from the state's Environmental Protection Fund for \$358,132 for Phase II of the streambank remediation project. The draft contract is being finalized.
- **Public education and outreach:**
 - The CLA Water Quality Committee recently initiated the Conesus Lake campaign - a project designed to encourage lakeside residents to be good lake stewards.
 - **Phosphorus (P) Free Lawn Fertilizer Project.** This cooperative demonstration project, led by the CLA in partnership with Cornell Cooperative Extension, Geneseo School District, Planning, and Dept. of Health, measured the phosphorus in near-shore areas of the Lake.
 - Livingston County has contracted with the Town of Livonia for construction of a public education kiosk at Vitale Park.



FINDINGS OF THE 2010 INVESTIGATIONS : WATERSHED MONITORING

During the summer of 2010, SUNY Brockport scientists completed their eighth consecutive year of water quality monitoring of streams flowing into Conesus Lake through agricultural and/or forested areas. The 2010 monitoring program was designed to contribute to the long-term data record, which documents water quality conditions before and after implementation of agricultural best management practices (BMPs).

Trend Analysis

The SUNY Brockport team evaluated three approaches to analysis and interpretation of the long-term stream monitoring data in order to define a robust index of watershed health. This is not a simple task; water quality monitoring in streams is complicated by the significant influence of stream flow (discharge) on transport of particulate and dissolved materials from the watershed. The eight years of stream monitoring in the Conesus Lake watershed encompasses periods of wet weather and dry weather. The impact of stream discharge must be considered when comparing conditions before and after BMPs, so that real change can be differentiated from weather-related effects.

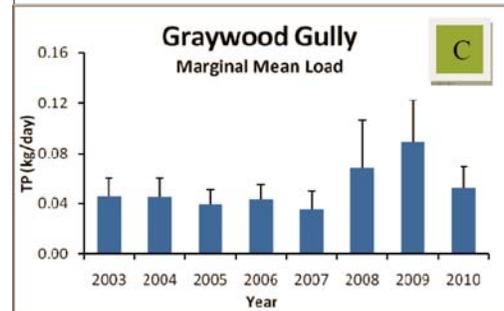
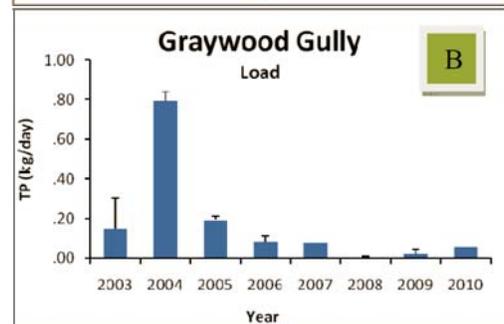
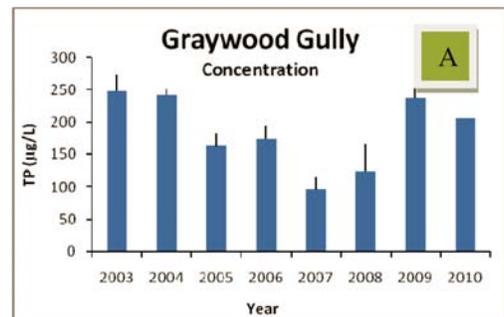
The three approaches to trend analysis are briefly described in this section of the 2010 Report Card. For a copy of the technical report by Professor Makarewicz of SUNY Brockport and his colleagues, please contact the Planning Department.

Method 1 - Stream Concentration Approach

Prior to 2009, concentrations of nutrients and sediment in streams were generally decreasing. However, concentrations increased in 2009 (Figure A). Was this a result of some change in land use or management practices? No changes were observed during a visual inspection of the watershed. Concentration is a function of discharge from streams; that is, as discharge increases, concentrations increase as more material is washed from the land. There was a lot of rain during the spring of 2009 which would have increased runoff, resulting in higher concentrations measured in the streams. Since concentration data alone do not account for changes in stream discharge, using concentration data to assess trends in land management may be misleading.

Method 2 - Simple Loading Calculation

To refine the data assessment, a simple loading calculation (concentration times discharge = loading per unit time) is used to account for stream discharge (Figure B). This calculation is a function of discharge and will increase with increasing rainfall and discharge. In contrast to the findings using concentration data, there has been a steady decrease in the amount of phosphorus loss since 2004 that is directly correlated with summer stream discharge.





FINDINGS OF THE 2010 INVESTIGATIONS : WATERSHED MONITORING

Method 3 - Marginal Mean Load Approach

In Figure C, the effect of discharge is considered using a statistical process called *Analysis of Covariance (ANCOVA)*. This process adjusts (weights) the mean concentration and load by discharge and produces an adjusted average loss from the watershed (the *marginal mean load*). An increase in marginal mean load in 2008 and 2009 was not statistically significant, suggesting that agricultural BMPs are being maintained .

Findings and Recommendation– Watershed Health Index

Method 3, the marginal mean load approach, provided a better interpretation of the effects of land use practices, compared with the concentration method and the simple load calculation. This assessment method could be further improved by collecting data early in the season and during hydrologic events. Summer monitoring is less likely to capture declines in loading resulting from watershed BMPs. The management plans implemented as part of the USDA project were designed to reduce nutrient and soil transport from the watershed by reducing overland flow of water. Consequently, the impact of these practices are most pronounced during wet weather, which tends to occur in winter and spring. Summer low flows are less susceptible to overland flow conditions. In addition, vegetation is actively taking up nutrients, intercepting rainfall, and serving to retain soil on the land during the summer. It appears that monitoring in the spring and early summer (March-June) would provide the most robust watershed health index to detect trends and evaluate the effectiveness of BMPs. This is the season when the agricultural community is actively tilling the lands and planting crops.

Nutrient and Sediment Monitoring, 2010

In 2010, four of the USDA streams (Graywood Gully, Long Point Gully, Cottonwood Gully, and North McMillan Creek) were monitored to determine if management practices were maintained after the USDA project ended, and to determine if new land use practices that may be affecting water quality have been adopted.

The historical data, re-evaluated in the context of marginal mean loads, indicate that since the implementation of best management plans (BMPs), adjusted losses from the USDA watersheds have generally not changed significantly. However, there are some exceptions. At Cottonwood Gully, a significant increase in nitrate export was observed from 2008 to 2010. Also, a trend of increasing soluble reactive phosphorus and total Kjeldahl nitrogen was observed from 2007 to 2010. At Long Point Gully, a trend of increased losses of total phosphorus and soluble reactive phosphorus was observed in the summer of 2008 through 2010. At Graywood Gully in 2009, there was an increase in phosphorus export.; this increase was not statistically significant.

Nutrient Loss from Inlet and South McMillan Creeks

It has been generally assumed that the Inlet and South McMillan Creek subwatersheds do not represent a significant fraction of the total load of nutrients and sediment to Conesus Lake, since these watersheds are primarily forested with a small proportion of land in agriculture. However, there were no recent monitoring data to quantify the nutrient and sediment export from these two large subwatersheds. The 2010 program

**FINDINGS OF THE 2010 INVESTIGATIONS :
WATERSHED MONITORING**

included monitoring the water quality conditions of these two streams, and developing rating curves to support discharge estimates.

The 2010 results are very interesting. The concentrations of phosphorus and soil in water from the Inlet and South McMillan Creeks were lower than concentrations measured in watersheds with more land area in active agriculture, and slightly higher than the concentrations from North McMillan Creek (Figure D). Despite the relatively low concentrations of nutrients and sediment, the load of phosphorus from the forested watersheds was higher than from the agricultural watersheds (Figure E).

Although losses from the forested subwatersheds to the lake (loading) were high, concentrations were low. The elevated loads are due to the high discharge of water, rather than from land use practices. The relatively undisturbed forested landscape offers few opportunities to implement best management practices, as compared with the agricultural subwatersheds. In the Inlet and South McMillan Creek watersheds, which are dominated by forest, it is unlikely that any improvements in water quality would be realized by management.

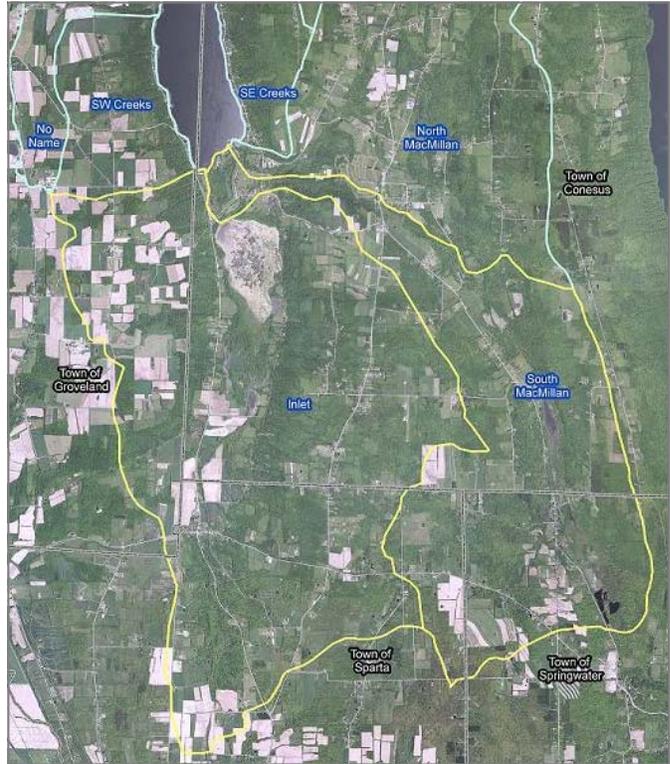


Image courtesy: Livingston County Planning Department

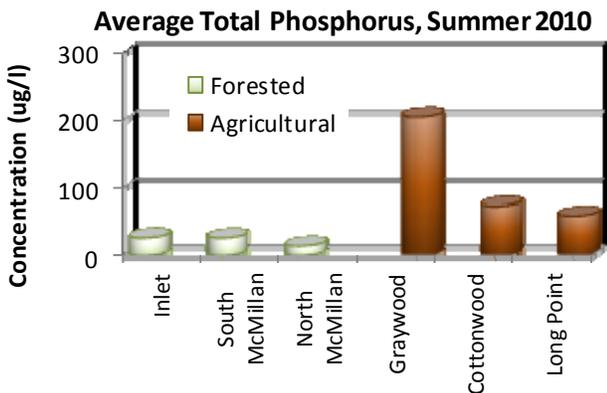


Figure D. Concentrations of total phosphorus were lower in streams from forested watersheds than from streams with predominantly agricultural watersheds.

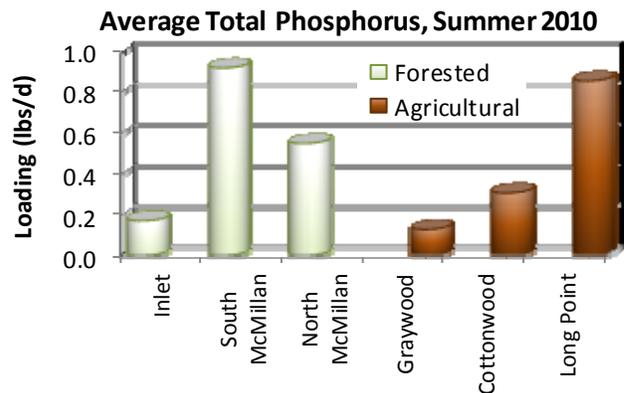


Figure E. Due to larger volume of water discharged from South and North McMillan Creeks, loading of phosphorus is elevated compared with other watersheds.

FINDINGS OF THE 2010 INVESTIGATIONS : MACROPHYTE BEDS AND FILAMENTOUS ALGAE

Scientists and students from SUNY Geneseo sampled several macrophyte beds in Conesus Lake during 2010, in an effort to determine whether the northward diversion of North Gully had brought about decreases in the biomass of macrophytes and filamentous algae in North Gully Cove. The study was designed to compare North Gully conditions with reference locations in Conesus Lake nearshore regions in 2010, and also with historic data. The rerouting of the North Gully outflow presents an opportunity to test this particular management practice and to examine the influence of streams on local plant growth.

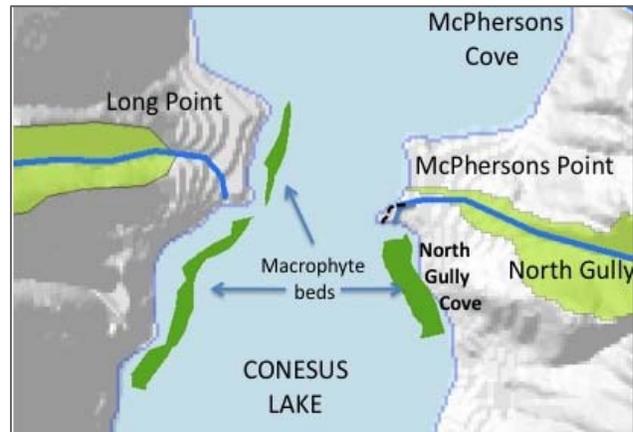


Image courtesy: SUNY-Geneseo.

The results of the 2010 monitoring study confounded interpretation of the post-stream diversion trends. Filamentous algal cover was at a record high in the North Gully Cove. Cover was also very high in the three reference beds, indicating this was a lake-wide problem in 2010. A major delivery of sediments and nutrients from South Gully (450 meters to the south of North Gully Cove) may also have contributed to the algal bloom at North Gully Cove.

The trends in macrophyte biomass at North Gully Cove are more encouraging. While total bed area and standing crop were comparable to previous years, there has been a major decrease of Eurasian watermilfoil in the community. This was evident in terms of total milfoil coverage, biomass, and reduction of milfoil abundance within the areas where the species was still dominant. The same pattern of milfoil loss was seen to varying degrees at Sutton Point (large losses) and Sand Point (moderate losses).



Clumps and clouds of filamentous algae as well as macrophytes (eelgrass and Sago pondweed) can be seen in the photograph.

Image courtesy: SUNY Geneseo.

Cottonwood Gully, however, experienced substantial increases in milfoil biomass, consistent with recent increases in nitrogen loading reported for Cottonwood Gully by Makarewicz and Lewis (2010). This reverses a trend of milfoil reductions at Cottonwood Gully that began in 2004 after management practices were implemented in the watershed as part of the USDA project.

We cannot conclude that the reduced milfoil biomass in North Gully Cove in two of the previous three years was caused solely by reduced nutrient input from North Gully stream. Nevertheless, there are indications that some improvement has taken place in North Gully Cove and it may be useful to continue occasional monitoring of this site to document any additional improvement as funding allows.

**FINDINGS OF THE 2010 INVESTIGATIONS :
STATUS OF CONESUS LAKE ECOSYSTEM HEALTH**

Bacteriological Monitoring The Livingston County Department of Health samples nearshore waters at designated bathing beaches in Conesus Lake each summer for the presence of fecal coliform bacteria. This class of bacteria is used to indicate the potential presence of pathogenic (disease-causing) microorganisms. In 2010, samples were collected at three sites: Long Point Beach, Southern Shores Beach and Camp Stella Maris. Results are compared to the state ambient water quality standard for bacteria, which is used by the Department of Environmental Conservation to evaluate water quality and by the Department of Health to evaluate suitability for swimming at designated beaches.

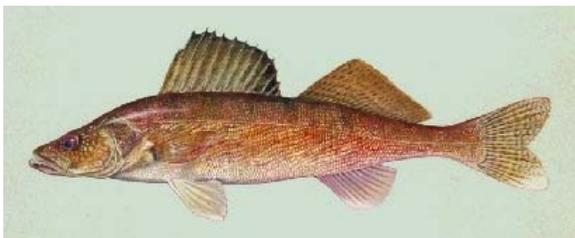


Image courtesy: Livingston County Planning Department

The state’s ambient water quality standard for fecal coliform bacteria standard, 200 colony forming units per 100 ml of lake water, is calculated as the geometric average of at least five samples per month. The 2010 results for the three Conesus Lake beaches indicate consistent compliance with the standard.

NYSDEC Fisheries Monitoring During 2010, the New York State Department of Environmental Conservation (NYSDEC) aged the fish collected in 2009 using both fish scales and *otoliths* (fish ear bones). Fish scales and otoliths form yearly rings, much like those on a tree, which can be counted to get the age of the fish. Once the data analysis is complete, NYSDEC will prepare a comprehensive report on the Conesus Lake fish community from 2000-2009.

In October 2010, Dr. Lars Rudstam, from the Cornell Biological Field Station, supported the work of Region 8 biologists with a hydroacoustical survey of Conesus Lake’s alewife population. Dr. Rudstam is one of the Cornell biologists investigating walleye as a tool to manage alewife populations in Cayuta and Canadarago Lakes. This research, funded by NYSDEC, is designed to investigate the compensatory responses of alewife to walleye predation, the effects on the Canadarago Lake ecosystem and sportfish from increasing alewife populations, and the possibility of using walleye stocking as a management tool to control alewife in Cayuta Lake. Initial findings suggest that, although alewife abundance declined following walleye stocking in Cayuta Lake, the adult walleye population could not maintain a level that would permanently decrease alewife abundance.



Walleye. Image Courtesy: U.S. Fish and Wildlife Service

Comparison of walleye population and stocking rates in two lakes.

Lake	Estimated Population (per hectare)	Fingerling Stocking Rate (per acre)
Cayuta (2002-2006)	12-14	250
Conesus (2002)	15	20

Despite higher stocking rate in Cayuta Lake over 5 years, the population of walleye was essentially the same as Conesus Lake. (Conesus Lake population estimate courtesy Matt Sanderson, Region 8 biologist).



2010 FOCUS ON PUBLIC INFORMATION

Phosphorus (P) Free Lawn Fertilizer Project. Runoff from fertilized lawns has been cited as a potential source of phosphorus, and thus a factor promoting the growth of weeds and algae, in lakes throughout New York State. A cooperative demonstration project, led by the Conesus Lake Association in partnership with Cornell Cooperative Extension, Geneseo School District, Livingston County Planning Department, and the Livingston County Department of Health, measured phosphorus in near-shore areas of the Lake. In August 2010, New York State passed a law effectively eliminating phosphorus in dishwasher detergents (effective immediately) and in lawn fertilizers (effective in 2012).

Public education kiosk at Vitale Park. The Planning Department issued a request for proposals for construction of a kiosk at Vitale Park. Three proposals were received, and all exceeded the budgeted funds. The Town of Livonia considered other options, and decided to partner with the Boy Scouts and a local business and construct the sign as an Eagle Scout project. Planning Staff have met with the Eagle Scout, his parents, and a local contractor to discuss the design. Construction and installation of the kiosk will be completed in May 2011.

Outreach. The Watershed Manager, Watershed Inspector and Planning Assistant participated in the "Forgotten 4 Festival" at the Chip Holt Nature Center in June. In July, the Watershed Manager participated in the CLA Arts & Craft Show.

Invasive Species. Livingston County continues to participate in the Finger Lakes PRISM, an information-sharing group that was created by New York State to foster a regional approach to managing invasive species, both aquatic and terrestrial. The recent discovery of the Emerald Ash Borer (EAB) in Caledonia has prompted the Planning Department and the Department of Health to issue joint public education materials.



Image courtesy: Livingston County Planning Department



CONESUS LAKE WATERSHED MANAGEMENT PLAN IMPLEMENTATION STATUS REPORT—2010 YEAR IN REVIEW

# in Plan	Recommendation	Priority	Action Taken
A-1	Review and amend zoning regulations to improve consistency in near-lake areas.	High	Planning Dept. continued working with Town of Conesus on zoning update. Technical assistance provided as needed to all watershed towns. We will be working with the four Lake towns on an EPF application in 2010 or 2011 for the development of consistent land use regulations.
A-3	Develop public education campaigns on BMPs for lake and watershed residents.	Medium	<ul style="list-style-type: none"> • <i>Phosphorus (P) Free Lawn Fertilizer Project.</i> NYS recently adopted a law prohibiting the use of phosphorus-containing lawn fertilizers. This cooperative demonstration project, led by the CLA in partnership with Cornell Cooperative Extension, Geneseo School District, Planning, and Dept. of Health, measured the phosphorus in near-shore areas of the Lake. • Livingston County has contracted with the Town of Livonia on construction of a public education kiosk at Vitale Park. Planning. Construction/installation to be completed May 2011. • The Watershed Manager, Watershed Inspector and Planning Assistant participated in the "Forgotten 4 Festival" at the Chip Holt Nature Center in June. • The Watershed Manager participated in the CLA Arts & Craft Show in July.
B-1	Secure funding to help mitigate the financial impacts of changes in agricultural practices on the producers.	High	In progress. Agencies will continue these activities annually as part of their existing programs.
B-2	Implement practices that will reduce non-point source pollution from farms.	High	<ul style="list-style-type: none"> • Nutrient Trap technology was studied by the Ag and Tech committees at the December 11, 2009 joint meeting. No further action was recommended. • Agricultural BMPs continue to be implemented by watershed farmers, the Livingston County SWCD, and the USDA NRCS.
B-3	Develop and implement programs and partnerships to facilitate removal of waste materials from farms.	High	<ul style="list-style-type: none"> • There are no existing GLOW programs. GLOW is willing to participate in new program development. • The impact on the new NYSDEC regulation on open burning was discussed with the Agriculture Committee at the 12/11/2009 meeting.
B-4	Develop programs for public education and outreach for both the agricultural and the non-agricultural community.	High	<ul style="list-style-type: none"> • Creation of a photo album of before/after agricultural BMP installation is in progress; photos have been provided by NRCS to the PE&O Committee.

Key to Acronyms:

BMPs - Best Management Practices
 CLWC - Conesus Lake Watershed Council
 GLOW - Genesee/Livingston/Ontario/Wyoming Counties
 GLRI - Great Lakes Restoration Initiative
 SWCD - Soil and Water Conservation District

CLA - Conesus Lake Association
 EPF - Environmental Protection Fund
 NRCS - Natural Resource Conservation Service
 PRISM - Partnership for Regional Invasive Species Management
 USDA - United States Department of Agriculture



CONESUS LAKE WATERSHED MANAGEMENT PLAN IMPLEMENTATION STATUS REPORT—2010 YEAR IN REVIEW

# in Plan	Recommendation	Priority	Action Taken
C-1	Develop and implement program to restore and stabilize stream banks in the watershed.	High	<ul style="list-style-type: none"> • The draft contract with revised scope from the State for Phase I is undergoing finalization. • The Town of Livonia was awarded an EPF grant for \$358,132 for Phase II of the streambank remediation project. The draft contract is undergoing finalization.
C-3	Develop public education campaigns on the impact of human activities on the health of the Lake.	Medium	<ul style="list-style-type: none"> • The CLA Water Quality Committee recently initiated the Conesus Lake campaign - a project designed to encourage lakeside residents to be good lake stewards. A report on this initiative was given at the August CLWC meeting.
D-3	Municipal Highway Departments should develop a plan, subject to available funding, to remediate ditches in poor condition.	Medium	<ul style="list-style-type: none"> • EPF Road Ditch Grant: The NYSDOS approved the preliminary plans for road ditch remediation. The first payment request was submitted to the State in September 2010 for work on East Lake Road and Pennemite Road in Livonia, Camel Road in Conesus, David Grey Road and Rosebrugh Road in Groveland, and Conesus Sparta Townline Road in Sparta.
G-1	Investigate and implement effective methods to control the spread of non-native (exotic) organisms.	High	<ul style="list-style-type: none"> • Livingston County continues to participate in the Finger Lakes PRISM, an information-sharing group that was formally created by New York State to look at the problem of aquatic and terrestrial invasive species on a regional level. • The recent discovery of the Emerald Ash Borer (EAB) in Caledonia has prompted Planning Department and the Department of Health to issue joint public education materials to the public.
G-2	Initiate a leaf cleanup program for lakeside and near shore residents of Conesus Lake	High	<ul style="list-style-type: none"> • A leaf pick-up program was included in the 2010 GLRI grant application. We received notice that this proposal was not funded.
G-3	Initiate effort to determine if alum treatment to control release of phosphorus from deep lake sediments would be effective in Conesus Lake. Proceed with plans for implementation if effectiveness is warranted and monitor for environmental impacts.	High	<ul style="list-style-type: none"> • CR Environmental completed a bathymetric survey of the lake in 2009. Presentation of the results was provided to the CLWC at the February 26, 2010 meeting. • The Technical Committee heard a presentation by Ontario County Planning Department staff and Honeoye Lake Association officials at the November 19th meeting to hear the latest on Honeoye Lake's alum treatment.

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**CONESUS LAKE WATERSHED MANAGEMENT PLAN
IMPLEMENTATION STATUS REPORT—2010 YEAR IN REVIEW**

# in Plan	Recommendation	Priority	Action Taken
G-4	Initiate effort to determine if increased stocking of walleye fingerlings, or other species, would be an effective biological control in Conesus Lake.	High	<ul style="list-style-type: none"> • Results of the 2009 zooplankton monitoring show that the large zooplankton population has not rebounded since the introduction of the alewife. CLA continues to work on its caged walleye rearing project. • Walleye fingerlings were stocked in the lake in June (65,000 2-inch length) and August (1,500 4- to 6-inch length) of 2010. • NYS DEC/CLA Joint Grant to upgrade the Northern Pike Habitat Area is in progress. This new project, funded through the Great Lakes Restoration Initiative, will improve water control structures that facilitate fish spawning. CLA and DEC officials reported on this project at the August CLWC meeting.
H-1	Conduct an annual monitoring program of Conesus Lake and its watershed. An annual monitoring meeting should be held to coordinate the monitoring program.	High	Meeting to discuss annual monitoring was held in February 2010. Summer 2010 monitoring and reporting were completed by SUNY Brockport, SUNY Geneseo, and Livingston County Department of Health.
H-2	Prepare and distribute an annual Conesus Lake and Watershed Report Card.	High	2009 Report Card completed and presented to the CLWC.



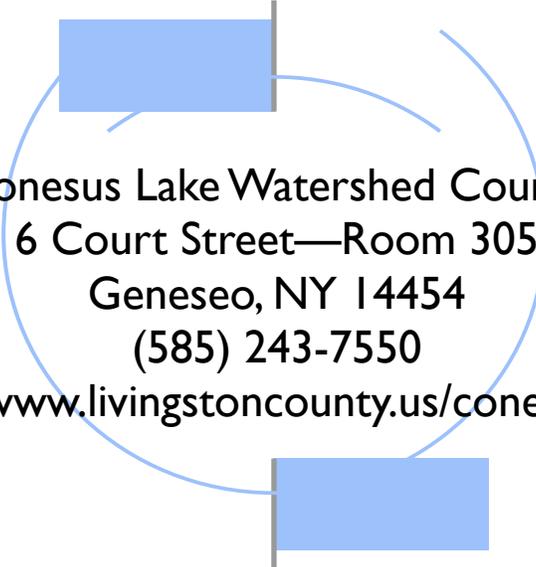
Image courtesy: Livingston County Planning Department

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For additional information contact: :
Livingston County Planning Department
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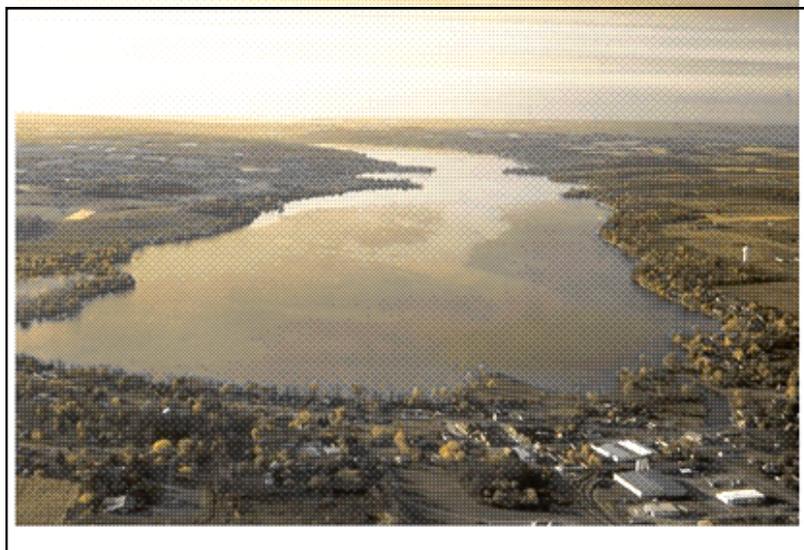
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Conesus Lake and Watershed Report Card

Assessment of the Conesus Lake Watershed
Management Plan in 2009

Conesus Lake Watershed Council

February 2010

PURPOSE OF THIS DOCUMENT

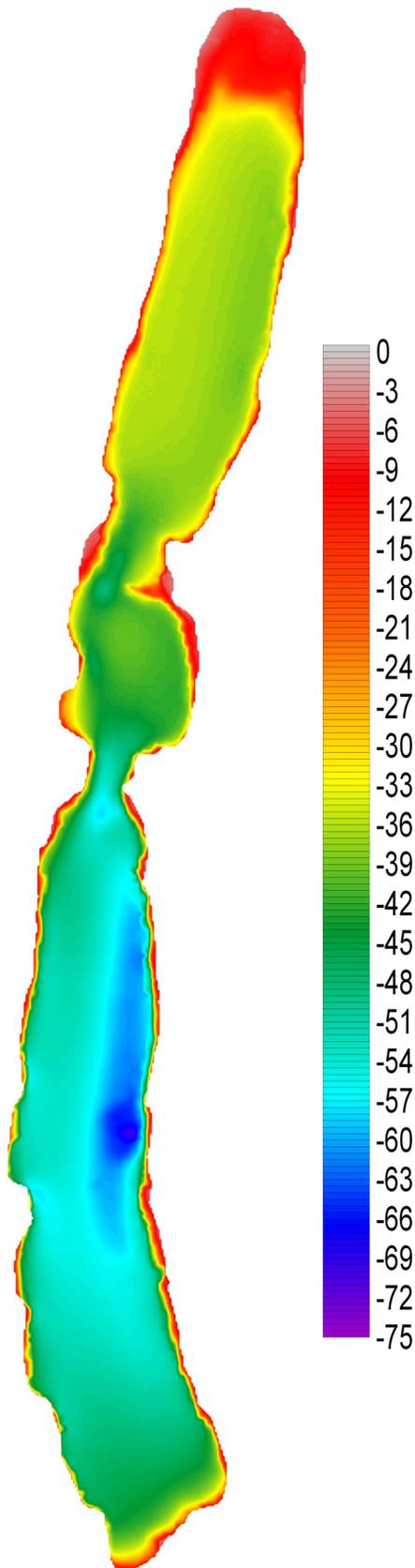
One of the recommendations of the Conesus Lake Watershed Management Plan (CLWMP) is to prepare an annual update summarizing the status of activities in the watershed designed to reduce nonpoint source pollution. In addition, the annual summary provides a forum for tracking conditions in Conesus Lake and highlighting new information.

MAJOR ACCOMPLISHMENTS

Since its formation in 2003, the Conesus Lake Watershed Council has coordinated implementation of the recommendations of the CLWMP. The Watershed Council is an intermunicipal organization with a dual mission: first, to coordinate actions for restoring the health of Conesus Lake and its watershed, and second, to communicate progress to the watershed community and other stakeholders. Restoring the health of the lake and its watershed requires a sustained effort and a focus on many inter-related issues. There was substantial progress in 2009 on several fronts.

- **Completion of a high resolution bathymetric survey (lake bottom map).** The depth of Conesus Lake was last mapped in detail in 1939-1940, prior to construction of the outlet dam. An updated bathymetric map was completed by CR Environmental Inc. to provide an accurate estimate of lake volume, indicate changes in depth and habitat conditions and identify regions of sediment deposition.
- **Update of the lake's phosphorus inputs,** comparing estimates of the annual phosphorus load from external (watershed) and internal (lake bottom sediment) sources.
- **Stream testing** to measure the concentration of nutrients and sediments flowing into Conesus Lake. Sampling the agricultural subwatersheds that were part of the USDA-funded program was led by Dr. Joseph Makarewicz of SUNY Brockport; the 2009 data represent a seven year record.
- **Characterization of the zooplankton community.** Examination of the species composition, relative abundance and size structure of the zooplankton community (tiny aquatic animals that feed on algae) provides a window into the lake's food web and how it is changing.
- **Mapping the abundance and distribution of macrophytes.** Dr. Sid Bosch of SUNY Geneseo continued his long-term sampling and analysis of Conesus Lake's aquatic plant community.
- **Streambank Remediation.** The Town of Livonia was awarded a grant from the state's Environmental Protection Fund for \$358,132 for Phase II of the streambank remediation project.
- **Public education and outreach.** The Public Education and Outreach Committee prepared a laminated education piece "Your Guide to Conesus Lake" describing homeowner best management practices. Storm water inlets in the Village of Livonia were stenciled to raise awareness of the connections between the streets and the lake.
- **U. S. Army Corps of Engineers Inspection.** Personnel from the ACOE toured Conesus Lake and learned of the ongoing efforts to improve water quality and control invasive plant species.

**FINDINGS OF THE 2009 INVESTIGATIONS :
BATHYMETRIC MAP**



During a week of beautiful October weather, CR Environmental of Falmouth Massachusetts completed a bathymetric survey of Conesus Lake. The process integrated digital GPS technology with a precise depth measurement to create a high resolution map of the lake bottom. A color scale version of the map is displayed, along with the depth scale (in feet).



The bathymetric data acquisition system consisted of a laptop computer running HYPACK hydrographic survey software, a precision single-beam echosounder and a Trimble DGPS. Depth measurements were collected using an ODOM CV-100 precision echosounder equipped with an 8-degree 200-kHz transducer. The echosounder digitized and recorded the lake bottom and exported depth values to HYPACK. The echosounder transducer was mounted to the rail of the survey vessel amidships using a high-strength adjustable boom. The DGPS antenna was attached to the top of the transducer boom.

This bathymetric map allows managers to accurately assess the lake volume at specific depth intervals. Note the relatively shallow northern basin and the large extent of littoral habitat - areas less than 20 feet deep - where light can penetrate to the bottom sediments and support plant growth.

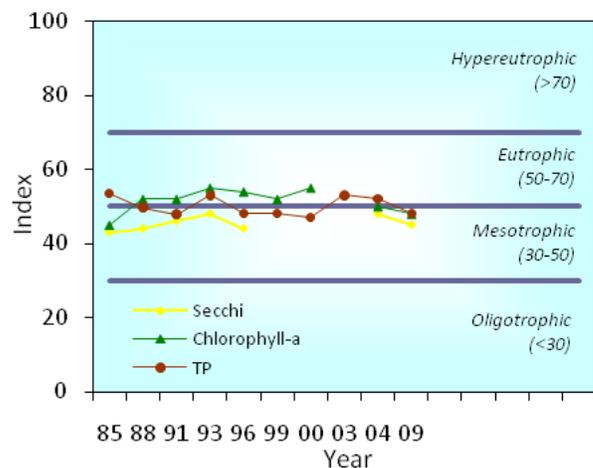
**FINDINGS OF THE 2009 INVESTIGATIONS :
STATUS OF CONESUS LAKE ECOSYSTEM HEALTH**



During the summer of 2009, scientists and students from SUNY Brockport completed a comprehensive “check-up” of the lake’s health. Several elements of the lake and watershed were examined: a trophic state assessment, an estimate of the magnitude of internal phosphorus loading (sediment flux), an estimate of external phosphorus loading (from streams), an analysis of trends in water quality, an evaluation of size structure of the zooplankton community, and the continued long-term evaluation of nutrient and soil losses from eight agricultural subwatersheds.

Trophic State Assessment Conesus Lake continues to be in the mesotrophic—eutrophic range, based on measurements of total phosphorus (TP), chlorophyll-a and Secchi disk transparency (an indicator of water clarity), as displayed in the graph below. Profiles of dissolved oxygen concentrations indicate that dissolved oxygen depletion of lake waters below 10 m (about 33 feet) occurs by June. The lake’s trophic state has been stable for decades.

Phosphorus Inputs Phosphorus is the limiting nutrient for the growth of plants and algae in Conesus Lake, and efforts to stabilize the lake’s trophic state consequently focus on reducing phosphorus inputs. Once in the lake, phosphorus can continue to cycle between the bottom sediments and the overlying waters, complicating efforts to improve water quality by reducing external loading. Phosphorus release from the sediments is significant; estimated to be over 8,000 kg/yr, it is likely equal to or above the external annual input from the watershed.



Zooplankton community The biomass, species composition and size structure of the zooplankton community was consistent with conditions last measured in 1993. Larger zooplankton, notably Daphnids, which are efficient grazers of phytoplankton, comprise only a small fraction of the zooplankton community. In the 1970s, Conesus Lake exhibited markedly clearer water and abundant daphnids. The loss of the larger zooplankton is attributed to the presence of the alewife, a forage fish that has become firmly established in Conesus Lake. Recent efforts to reduce the alewife population by enhanced stocking of walleye have not yet resulted in a resurgence of larger zooplankton.



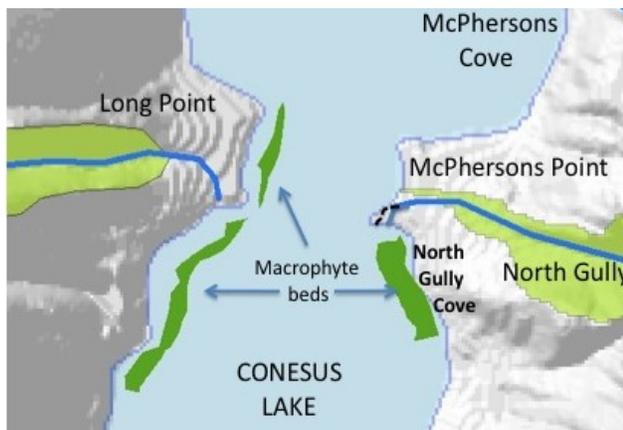
Trends in water quality Overall, the 2009 monitoring program did not detect significant trends in lake water quality conditions, with one important exception. The concentration of sodium in the lake water has increased in recent decades, from approximately 15 mg/l to 25 mg/l; the increase is attributed to application of deicing chemicals to roads in the watershed.

FINDINGS OF THE 2009 INVESTIGATIONS : STATUS OF CONESUS LAKE ECOSYSTEM HEALTH

Watershed Monitoring In 2009, SUNY Brockport scientists collected a seventh consecutive year of data from subwatersheds included in the USDA study. Substantial increases in the concentrations of nutrients and soil particles were measured in 2009; this unexpected result followed several years of a general decrease. Several factors may have contributed to the increase in the concentration of dissolved and particulate material; some are natural (variation in rainfall amount and intensity); others are affected by human actions (changes in land use or management practices). Although the increases observed in the monitored streams in 2009 may be related to changes in management practices, the significant rainfall in the spring and early summer cannot be ruled out as the cause. North McMillan Creek, which was used as the reference watershed throughout the study due to its low impact from human activities, also exhibited an increase in 2009; this result supports the hypothesis that the intense rainfall events led to the increased loss of material from the landscape.

Macrophyte Beds and Filamentous Algae Scientists and students from SUNY Geneseo sampled several macrophyte beds in Conesus Lake during 2009, in an effort to determine whether the northward diversion of North Gully had brought about decreases in the biomass of macrophytes and filamentous algae in North Gully Cove. The study was designed to compare North Gully conditions with reference locations in Conesus Lake nearshore regions in 2009, and also with historic data.

In 2009, macrophyte density and standing crop in North Gully Cove were higher than the average for the years 2000 -2007, indicating that the macrophyte biomass was not affected by the stream diversion. Similarly high abundance of macrophytes were measured in the Sand Point Gully and Sutton Point Gully reference sites, but not in Cottonwood Gully, where macrophyte growth has declined considerably since agricultural management practices were implemented.



However, the percent surface cover of filamentous algae at North Gully Cove was moderate to low relative to algal cover in four reference sites and to the site's historical record (2001-2007). As discussed above, streams in 2009 exhibited elevated concentrations of nutrients and sediment. Therefore the most plausible explanation for the reduced cover of filamentous algae at North Gully Cove in 2009 was the diversion of the tributary runoff into open water and the accompanying reduction in nutrient delivery into the cove.

***FINDINGS OF THE 2009 INVESTIGATIONS :
STATUS OF CONESUS LAKE ECOSYSTEM HEALTH***

Bacteriological Monitoring The Livingston County Department of Health samples nearshore waters at designated bathing beaches in Conesus Lake each summer for the presence of fecal coliform bacteria. This class of bacteria is used to indicate the potential presence of pathogenic (disease-causing) microorganisms. In 2009, samples were collected at three sites: Long Point Beach, Southern Shores Beach and Camp Stella Maris. Results are compared to the state ambient water quality standard for bacteria, which is used by the Department of Environmental Conservation to evaluate water quality and by the Department of Health to evaluate suitability for swimming at designated beaches.

The state's ambient water quality standard for fecal coliform bacteria standard, 200 colony forming units per 100 ml of lake water, is calculated as the geometric average of at least five samples per month. The 2009 results for the three Conesus Lake beaches indicate consistent compliance with the standard.

Army Corps of Engineers Tour As part of an evaluation of the adverse impacts of invasive species throughout the Finger Lakes region, representatives of the Army Corps of Engineers Buffalo district office toured Conesus Lake with Dr. Sid Bosch of SUNY Geneseo, Gene Bolster of the Conesus Lake Association, and Angela Ellis and Heather Ferrero of the Livingston County Planning Department.

NYSDEC Fisheries Monitoring In September 2009, Region 5 biologists conducted a fish stock assessment as part of an evaluation of their walleye management program. Preliminary data describing the length frequency distribution of the important fish species indicate that stocked walleye fingerlings are surviving and recruiting to the fishery quite well, but it's still not apparent whether natural reproduction is taking place. Once the 2009 scales have been aged and all of data have been analyzed, NYSDEC will prepare a comprehensive report on the Conesus Lake fish community from 2000-2009.



2009 FOCUS ON PUBLIC INFORMATION

Scientific Recognition In June, 2009 the Journal of Great Lakes Research published a special issue on Watershed Management and Nearshore Lake Water Quality: The Conesus Lake Watershed Study. This international journal reaches a wide audience of academic scientists, lake managers, researchers and members of the regulatory community. Dr. Makarewicz and Dr. Bosch served as guest editors for the special edition and guided preparation of a series of articles related to the restoration and protection of Conesus Lake, including an analysis of the formation and successes of the Watershed Council. Effectiveness of the agricultural best management practices on reducing inflows of nutrients and sediment are highlighted, as are the impacts of the reduced loads on the nearshore macrophyte beds. Articles are available online at www.sciencedirect.com.

Your Guide to Conesus Lake The Watershed Council's Public Education and Outreach Committee prepared a guide for shoreline and watershed residents highlighting the connections between watershed activities and the quality of the lake water. This laminated document was distributed to shoreline property owners and renters and provides guidance on residential best management practices including lawn care and managing pet waste. Additional information on fishing, boating practices and agency contact phone numbers was included.

Storm Drain Stenciling Program The Conesus Lake Association and the Village of Livonia are co-sponsors of a project to stencil storm drains in the Village of Livonia with the notice "Please Don't Pollute— Drains to Conesus Lake." As his Eagle Scout project, Matt Kelly of Livonia Boy Scout Troop 174 took on the task of managing volunteers and his fellow scouts to stencil the 393 storm drains in the Village. The project was completed in November 2009. Congratulations Matt!

Your Guide to Preserving Conesus Lake

The Conesus Lake Watershed Council has produced this guide to provide lake residents and property renters with useful information about "Best Management Practices" that we all must follow if we are to protect and preserve Conesus Lake.

Property owners are encouraged to make this guide available to all of their household members as well as visitors and renters.

Additional copies of this guide, as well as copies of the more comprehensive Conesus Lake Watershed stewardship booklet ("Conesus Lake: Is It Worth Protecting?"), may be obtained at no charge by contacting the Conesus Lake Association or the Livingston County Planning Department. (Please refer to their phone numbers below.)

A great deal of information about the lake and its watershed is also available online. Please visit these websites, developed and updated by Livingston County and the Conesus Lake Association respectively:
www.livingstoncounty.us/planning.htm
www.conesuslake.org

See the other side of this guide for more useful information.

Never put anything into the lake that you wouldn't want in your child's next glass of water.



The same applies to pulling anything into creeks, streams, culverts or ditches that eventually run into Conesus Lake. Why? Because our lake is a drinking-water source for more than 20,000 people in our county.

This means:

- No human or pet waste
- No fishing waste
- No hazardous materials (e.g., fertilizers, herbicides, household chemicals, poisons)
- No garbage
- No leaves or grass clippings
- No oil, gas, fuels, paints or solvents

Important Telephone Numbers:

- All emergency calls: 911
- Conesus Lake Association Office: 585-346-6864
- Conesus Lake Watershed Inspector: 585-243-7280
- Conesus Lake Watershed Manager: 585-519-7509
- Livingston County Planning Department: 585-243-7550
- NYSDEC (for reportable fish kills only): 585-226-5343

Public Restroom Facilities Around Conesus Lake:

- Vitale Park, Lakeville (Rts. 15 and 20A, north end of lake)
- Long Point Park, Town of Genesee (Rt. 256, West Lake Rd.)
- NY State Boat Launch, Town of Livonia (East Lake Rd.)
- NY State Boat Launch (portable toilet only) Town of Conesus (Rt. 256, West Lake Rd.)

Please Don't Pollute— Drains to Conesus Lake

**CONESUS LAKE WATERSHED MANAGEMENT PLAN
IMPLEMENTATION STATUS REPORT—2009 YEAR IN REVIEW**

# in Plan	Recommendation	Priority	Action Taken
A-1	Review and amend zoning regulations to improve consistency in near-lake areas.	High	Planning Dept. working with Town of Conesus on zoning update. Technical assistance provided as needed to all watershed towns. We will be working with the four Lake towns on an EPF application in 2010 for the development of consistent land use regulations.
A-3	Develop public education campaigns on BMPs for lake and watershed residents.	Medium	Created a laminated public information piece that was distributed in early May 2009 to approximately 2,000 lake and near-lake (directly uphill from the Lake Roads) residents.
B-1	Secure funding to help mitigate the financial impacts of changes in agricultural practices on the producers.	High	In progress. Agencies will continue these activities annually as part of their existing programs.
B-2	Implement practices that will reduce nonpoint source pollution from farms.	High	<ul style="list-style-type: none"> • The CLWC sent letters of appreciation to agricultural producers in July 2009. • Agricultural BMPs continue to be implemented by watershed farmers, the Livingston County SWCD, and the USDA NRCS.
B-3	Develop and implement programs and partnerships to facilitate removal of waste materials from farms.	High	There are no existing GLOW programs. GLOW is willing to participate in new program development.
B-4	Develop programs for public education and outreach for both the agricultural and the non-agricultural community.	High	<ul style="list-style-type: none"> • Public education fact sheet on agriculture in the watershed was completed. An article was published in the Laker News. • Creation of a photo album of before/after agricultural BMP installation is in progress.
C-1	Develop and implement program to restore and stabilize stream banks in the watershed.	High	<ul style="list-style-type: none"> • The NRCS is working with individual farmers to map streams and focus efforts on watershed areas that are not currently buffered. • Waiting for contract with revised scope from the State for Phase 1. The Town of Livonia was awarded an EPF grant for \$358,132 for Phase II of the streambank remediation project.
C-3	Develop public education campaigns on the impact of human activities on the health of the Lake.	Medium	<ul style="list-style-type: none"> • Worked in partnership with the CLA on a campaign to raise public awareness of connection between stormwater drainage and the health of Conesus Lake. • Recommendation C-3 was adopted by CLWC March 26, 2009. Storm drain stenciling project was completed in November, 2009.

Key to Acronyms

BMPs - Best Management Practices
 CLWMP - Conesus Lake Watershed Management Plan
 GLOW - Genesee/Livingston/Ontario/Wyoming Counties
 OPRHP - Office of Parks, Recreation and Historic Preservation
 SWCD - Soil and Water Conservation District

CLWC - Conesus Lake Watershed Council
 EPF - Environmental Protection Fund
 NRCS - Natural Resource Conservation Service
 PRISM - Partnership for Regional Invasive Species Management
 USDA - United States Department of Agriculture

**CONESUS LAKE WATERSHED MANAGEMENT PLAN
IMPLEMENTATION STATUS REPORT—2009 YEAR IN REVIEW**

# in Plan	Recommendation	Priority	Action Taken
D-3	Municipal Highway Departments should develop a plan, subject to available funding, to remediate ditches in poor condition.	Medium	<ul style="list-style-type: none"> Towns are in the process of returning their Memorandum of Agreement for the administration of the EPF road ditch grant. Work plans were submitted to the State. NYSDOS has approved the work plans.
E-5	Winterize facilities at the State Boat Launch on East Lake Road and at the Town of Geneseo's Long Point Park to permit year-round use of public toilets.	Medium	<ul style="list-style-type: none"> Contacted Rich Parker of NYS OPRHP to determine interest in boat launch facility. NYS not interested for boat launch. Town of Geneseo and Livingston County SWCD worked cooperatively on efforts to winterize the facilities at Long Point Park
F-2	Extend sewer system	Medium	During the first quarter of 2009, hamlets were defined in Census 2010 to assist in public infrastructure extensions.
G-1	Investigate and implement effective methods to control the spread of non-native (exotic) organisms.	High	Livingston County continues to participate in the Finger Lakes PRISM, an information-sharing group that was formally created by New York State to look at the problem of aquatic and terrestrial invasive species on a regional level.
G-3	Initiate effort to determine if alum treatment to control release of phosphorus from deep lake sediments would be effective in Conesus Lake. Proceed with plans for implementation if effectiveness is warranted and monitor for environmental impacts.	High	<ul style="list-style-type: none"> CR Environmental completed a bathymetric survey of the lake in mid-October, and produced maps and electronic files. Presentation by Tom Harvey (Ontario County Planning Department) on Honeoye Lake Year 2 alum treatment was given at the June 26 Technical Committee meeting.
G-4	Initiate effort to determine if increased stocking of walleye fingerlings, or other species, would be an effective biological control in Conesus Lake.	High	<ul style="list-style-type: none"> CLA purchased approximately 1,700 walleye fingerlings and NYSDEC stocked 9,000 tiger musky during the third and fourth quarters of 2009. Zooplankton monitoring was conducted as part of the summer 2009 annual program.
H-1	Conduct an annual monitoring program of Conesus Lake and its watershed. An annual monitoring meeting should be held to coordinate the monitoring program.	High	Meeting to discuss phosphorus loading investigation and zooplankton monitoring was held in Spring 2009. Monitoring started in mid-May, and continued through September 2009.

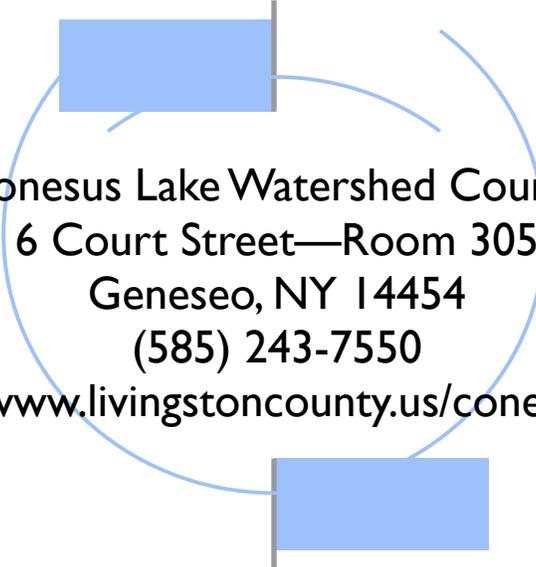
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For additional information contact: :

Conesus Lake Watershed Manager
(585) 243-7550 or (585) 519-7509



Conesus Lake Watershed Council
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Geneseo, NY 14454
(585) 243-7550

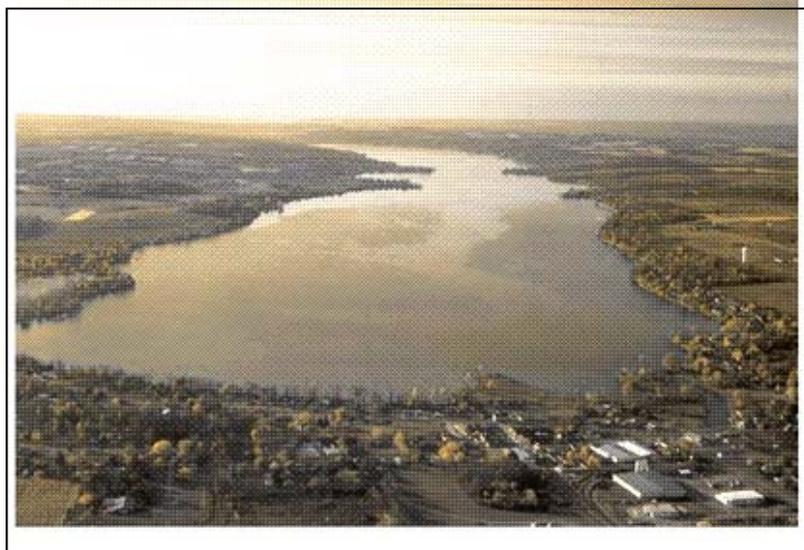
<http://www.livingstoncounty.us/conesus.htm>

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Conesus Lake and Watershed Report Card

Assessment of the Conesus Lake Watershed
Management Plan in 2008

Conesus Lake Watershed Council

March 2009



PURPOSE OF THIS DOCUMENT

One of the recommendations of the Conesus Lake Watershed Management Plan (CLWMP) is to prepare an annual update summarizing the status of activities in the watershed designed to reduce nonpoint source pollution. In addition, the annual summary provides a forum for tracking conditions in Conesus Lake and highlighting new information.



MAJOR ACCOMPLISHMENTS

The Conesus Lake Watershed Council (CLWC) was created in December 2003 when nine watershed partners signed an Intermunicipal Agreement to implement the recommendations of the Conesus Lake Watershed Management Plan (CLWMP). The Watershed Council has met quarterly since its founding and is effective in coordinating projects and reporting on overall progress. Restoring the lake and its watershed requires a sustained effort to address multiple issues. Progress continues on many fronts. Some highlights of 2008 accomplishments are summarized below, along with the CLWMP recommendation they address.

Reduce inputs of nutrients, sediments, microorganisms, and other substances that can degrade the quality of Conesus Lake.

- Continue to advance whole farm planning and support the agricultural community with best management practices (BMPs).
- Project to install sanitary sewers in the Hamlet of Conesus near completion.
- Town of Livonia received a notice of an Environmental Protection Fund (EPF) grant award to remediate stream bank erosion in the Towns of Conesus and Livonia.
- Continue to stabilize eroding roadside ditches in the watershed as funding allows.

Modify in-lake processes in ways that will improve recreational quality.

- CLA funded the continued stocking of the lake with walleye fingerlings reared at the Finger Lakes Community College and from private pond operation.
- Continued evaluation of the effectiveness of an alum treatment program for Conesus Lake, learning from the experience of Honeoye Lake.

Track water quality conditions and evaluate the effectiveness of control measures.

- Monitor nutrient and sediment export from subwatersheds as improved agricultural practices are implemented.
- Measure near-shore growth of weeds and algae.
- Continue funding the positions of Watershed Inspector and Watershed Manager.
- Continue directing funds to lake and watershed monitoring activities.

Inform the public of watershed management activities.

- Professor Joseph Makarewicz of SUNY-Brockport has led a successful effort to publish a special issue of the Journal of Great Lakes Research devoted to Conesus Lake. The journal, which will be published in early 2009, includes articles highlighting the success of the agricultural BMPs, as measured by improved quality of Conesus Lake and its tributary streams. The collaborative science-based planning effort that resulted in the Conesus Lake Watershed Management Plan will also be discussed in this special issue.



2008 UPDATE:

WATER QUALITY MONITORING OF THE TRIBUTARIES TO CONESUS LAKE

Monitoring Priorities

Early each spring, members of the Technical Committee meet to discuss the annual monitoring program. This meeting, held annually since work began on the CLWMP in 2000, is an opportunity to identify priority issues and find ways to coordinate efforts. A rotating focus examines conditions in the lake monitoring, watershed-wide, and in special focus areas. Flexibility is key; monitoring priorities are shifted to address emerging issues and special topics. For example, the SolarBee monitoring program in 2006 and 2007 directed monitoring resources to the lake to evaluate whether these solar-powered mixing devices could bring about discernable improvement in lake water quality. The 2008 monitoring priorities returned to the watershed. Three projects were completed: evaluation of the continued effectiveness of agricultural BMPs; baseline data collection for the Stream Bank Restoration Project; and evaluation of effectiveness of relocating the North Gully tributary on macrophyte and algae abundance in the cove south of McPhersons Point.

Are the Agricultural Best Management Practices Continuing to be Effective?

In 2007, the USDA-funded research program led by Professor Joseph Makarewicz of SUNY Brockport came to an end. The program, which was designed to quantify the effectiveness of best management practices, brought together a consortium of researchers from local academic institutions and agricultural support agencies for a six-year program of intensive monitoring and analysis.

To evaluate whether the BMPs implemented over the course of the program continued to provide water quality benefits, Professor Makarewicz and his associates collected water quality samples during summer 2008 from six of Conesus Lake's tributary streams: Graywood Gully, Long Point Gully, Sand Point Gully, Cottonwood Gully, Sutton Point Gully, and North McMillan Creek. Findings were encouraging. In those subwatersheds with BMPs, substantial decreases in nutrient and sediment loss continued to be documented. In general, reductions observed from 2003 to 2007 were maintained into 2008 following the formal end of the USDA project. The one exception was Long Point Gully where major increases in the concentrations of phosphorus, suspended solids, and organic nitrogen in the stream were detected. This merits continued monitoring.

Baseline data collected for Stream Bank Restoration Project

One of the CLWMP recommendations is to stabilize eroding stream banks to help reduce sediment washing into the lake. These remedial measures are costly, and will be implemented on a worst-first basis as funds become available. One of the 2008 projects was to evaluate baseline conditions in several stream reaches considered high priority for restoration. These data will serve as a baseline to determine the effectiveness of future restoration projects. This effort was led by Professor Makarewicz.



2008 UPDATE: MONITORING OF CONESUS LAKE TRIBUTARIES (CONTINUED)

Water samples were collected from Wilkins Creek, Densmore Creek, North Gully, and North McMillan Creek over the summer of 2008 and analyzed for total suspended solids. Total suspended solids are a measure of suspended particles - soil and sediment - being carried by the water. After remedial measures have been implemented, a similar study will be conducted to document the effectiveness of the restoration.

Has relocating the North Gully tributary reduced the abundance of macrophytes and filamentous algae in the cove south of McPhersons Point?

Over the last decade, the cove south of McPhersons Point (North Gully Cove) has been characterized by dense growth of Eurasian watermilfoil and an extensive cover of filamentous algae. North Gully Creek flowed into this cove, and carried large amounts of dissolved and particulate nutrients. Approximately 45% of the land within the North Gully watershed is in active agricultural use, primarily dairy farms and row crops.

In February 2008, the North Gully creek channel was diverted northward along the McPhersons Point shoreline to disperse the stream flow into the more open waters of Conesus Lake and away from North Gully Cove.

Professor Isidro Bosch, Lindsey Campana and Peter Radlowski of the SUNY Geneseo Department of Biology investigated whether the diversion of North Gully was effective in reducing the amount of plant growth in North Gully Cove. The size of the macrophyte bed, the density of milfoil plants, and the percent cover of filamentous algae were measured during the peak of the growing season in 2008 and compared to the long term record for the site. Macrophyte beds at Sutton Point and at Sand Point were monitored as reference sites to account for lake-wide changes in plant growth that might influence trends at North Gully Cove.



Macrophyte and filamentous algal biomass in North Gully Cove during the 2008 growing season seemed to follow lake-wide trends, as indicated by comparisons with data from the reference sites and by observations in other littoral areas of Conesus Lake. The 2008 data did not provide definitive evidence that the diversion of North Gully affected plant growth in the cove. These results were not unexpected given the short time elapsed since completion of the diversion project. Additional monitoring in the next few years should provide better insights on the effectiveness of this effort to manage nutrient runoff.



CONESUS LAKE WATERSHED MANAGEMENT PLAN IMPLEMENTATION STATUS REPORT—2008 YEAR IN REVIEW

# in Plan	Recommendation	Priority	Action Taken
B-1	Secure funding to help mitigate the financial impacts of changes in agricultural practices on the producers.	High	The CLWC Agricultural Committee reviewed all agricultural recommendations in the Conesus Lake Watershed Management Plan and put together action items for the 2009 CLWMP work plan.
B-2	Implement practices that will reduce nonpoint source pollution from farms.	High	<ul style="list-style-type: none">• A tour for agricultural producers, agricultural agency personnel, crop advisors, and local officials was held on August 19, 2008. This tour highlighted BMPs being implemented on farms associated with the USDA grant. A boat tour was also included in the activities, in partnership with the Conesus Lake Association.• The CLWC Agricultural Committee reviewed all agricultural recommendations in the Conesus Lake Watershed Management Plan and put together action items for the 2009 CLWMP Work Plan.
B-3	Develop and implement programs and partnerships to facilitate removal of waste materials from farms.	High	The CLWC Agricultural Committee reviewed all agricultural recommendations in the Conesus Lake Watershed Management Plan and put together action items for the 2009 CLWMP Work Plan.
C-1	Develop and implement program to restore and stabilize stream banks in the watershed.	High	<ul style="list-style-type: none">• The McPherson's Point Project/North Gully Straightening Project was completed in February 2008.• The Town of Livonia received notice of an EPF grant award for stream bank remediation in the amount of \$382,869. This is a 50/50 matching grant.
D-3	Municipal Highway Departments should develop a plan, subject to available funding, to remediate ditches in poor condition.	Medium	<ul style="list-style-type: none">• Conesus Highway Department received a grant to conduct road ditch remediation on Henderson Hill Road, which was completed in 2008.• Conesus Highway Department is in the process of preparing additional EPF grants for road ditch remediation.• Livingston County Planning Department, the Town of Groveland, and the Highway Superintendents of the Towns of Groveland, Geneseo, Conesus and Sparta met with the CLWC Technical Committee and the NYS Department of State on July 11, 2008 for an EPF road ditch grant kick-off meeting.

Key to Acronyms

BMPs - Best Management Practices
CLWMP - Conesus Lake Watershed Management Plan
USDA - United States Department of Agriculture

CLWC - Conesus Lake Watershed Council
EPF - Environmental Protection Fund



**CLWMP IMPLEMENTATION STATUS REPORT—2008 YEAR IN REVIEW
(CONTINUED)**

# in Plan	Recommendation	Priority	Action Taken
F-2	Extend sewer system	Medium	Hamlet of Conesus Sanitary Sewer System will be completed in 2009. The project does not cover Dacula Shores; instead, the project was routed down East Lake Road. The route was selected due to the opposition to sanitary sewers by the residents of Dacula Shores.
G-1	Investigate and implement effective methods to control the spread of non-native (exotic) organisms.	High	Livingston County is a participant in the Finger Lakes PRISM, an information-sharing group that was formally created by New York State to look at the problem of aquatic and terrestrial invasive species on a regional level.
G-2	Develop and implement a program for cleaning accumulated aquatic plants and algae along the shoreline of Conesus Lake.	High	A comprehensive Fish Kill Contingency Plan was adopted by the CLWC in February 2008 to address cleanup of large fish kills.
G-3	Initiate effort to determine if alum treatment to control release of phosphorus from deep lake sediments would be effective in Conesus Lake. Proceed with plans for implementation if effectiveness is warranted and monitor for environmental impacts.	High	At the August 8, 2008 CLWC meeting, the Council evaluated the action taken on alum and directed the Planning Department, Watershed Manager, and Technical Committee to conduct further research into phosphorus loading from the watershed and to look into conducting a bathymetric survey of Conesus Lake.
G-4	Initiate effort to determine if increased stocking of walleye fingerlings, or other species, would be an effective biological control in Conesus Lake.	High	<ul style="list-style-type: none">• In Summer 2008, Conesus Lake was stocked with approximately 250 advanced walleye fingerlings from the FLCC walleye rearing ponds.• The Conesus Lake Association purchased approximately 2,000 advanced walleye fingerlings, which were stocked in the lake in Summer 2008.
H-1	Conduct an annual monitoring program of Conesus Lake and its watershed. An annual monitoring meeting should be held to coordinate the monitoring program.	High	EcoLogic, LLC, Dr. Makarewicz, Dick Davin (Watershed Inspector), and Dr. Bosch collaborated on the preparation of a plan for 2008 monitoring activities.

Key to Acronyms

CLWC - Conesus Lake Watershed Council

FLCC—Finger Lakes Community College

PRISM - Partnership for Regional Invasive Species Management



CLWMP IMPLEMENTATION STATUS REPORT—2008 YEAR IN REVIEW
PUBLIC EDUCATION RECOMMENDATIONS

# in Plan	Recommendation	Priority	Action Taken
A-3	Develop public education campaigns: <ul style="list-style-type: none">• Encourage planting and protection of streamside vegetation• Discourage use of herbicides, pesticides, and fertilizers on shoreline properties• Erosion control and lake-friendly landscaping	Medium	The CLWC Public Education and Outreach Committee reviewed all public education recommendations in the Conesus Lake Watershed Management Plan and put together action items for the 2009 CLWMP Work Plan.
B-4	Develop programs for public education and outreach for both the agricultural and the non-agricultural community.	High	
D-5	Develop public education campaigns: <ul style="list-style-type: none">• Sensible winter driving• Why and when are road ditches cleaned• Need to keep yard debris and trash out of road ditches	Low	
E-2	Develop a public education campaign: <ul style="list-style-type: none">• Effect of boat speed on weeds (creates weed-chop)• Precautions to follow when discarding unused bait or transporting bait from one water body to another (exotic species introduction).• Need to clean and inspect boat (body, bilge, coolant system, etc.) and trailer when transporting from one water body to another (exotic species introduction).• Existing boat and personal watercraft laws.	High	

Key to Acronyms

CLWC - Conesus Lake Watershed Council

CLWMP - Conesus Lake Watershed Management Plan

For additional information contact :

Conesus Lake Watershed Manager
(585) 243-7550 or (585) 519-7509



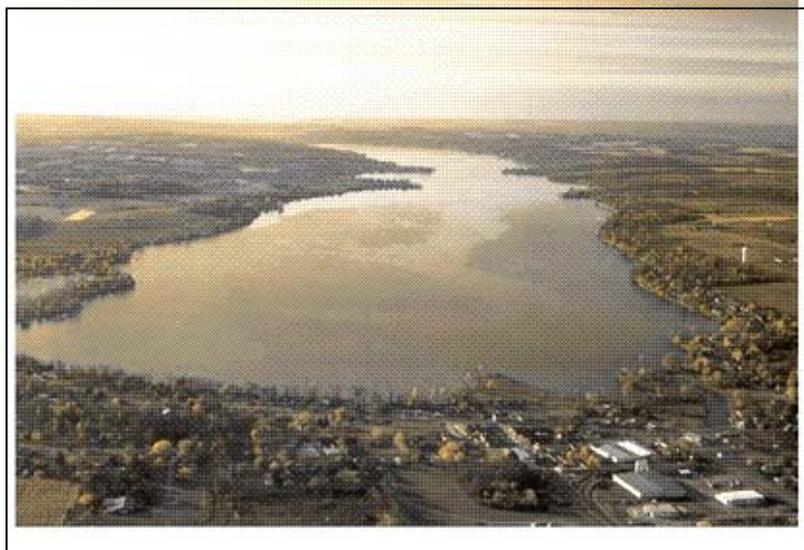
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Conesus Lake and Watershed Report Card

Assessment of the Conesus Lake Watershed
Management Plan in 2007

Conesus Lake Watershed Council

May 2008



PURPOSE OF THIS DOCUMENT

One of the recommendations of the Conesus Lake Watershed Management Plan (CLWMP) is to prepare an annual update summarizing the status of activities in the watershed designed to reduce nonpoint source pollution. In addition, the annual summary provides a forum for tracking conditions in Conesus Lake and highlighting new information.



MAJOR ACCOMPLISHMENTS

The Conesus Lake Watershed Council was created in December 2003 when nine watershed partners signed an Intermunicipal Agreement to implement the recommendations of the Conesus Lake Watershed Management Plan (CLWMP). The Watershed Council has met quarterly since its founding and is effective in coordinating projects and reporting on overall progress. Restoring the lake and its watershed requires a sustained effort to address multiple issues. As summarized below, progress is continuing on many fronts.

Objective: Reduce inputs of nutrients, sediments, microorganisms, and other substances that can degrade the quality of Conesus Lake.

- Continue to advance whole farm planning and prepare for CAFO implementation.
- Implement Best Management Practices (BMPs) on watershed farms.
- Install sanitary sewers in the Hamlet of Conesus.
- Request NYS Department of Health approval of watershed rules and regulations.
- Survey streambanks and find effective measures to reduce erosion.
- Continue to implement improvements to watershed roadside ditches.

Objective: Modify in-lake processes in ways that will improve recreational quality.

- Pilot test a solar-powered mixing device (SolarBee[®]) and assess its effectiveness.
- Supplement population of weevils in an effort to control Eurasian watermilfoil.
- Continue stocking with walleye fingerlings reared at the Finger Lakes Community College.
- Presentation by the Ontario County Planning Department on the Honeoye Lake alum treatment program.
- Addition of the Fish Kill Contingency Plan to the Livingstone County Emergency Management Plan

Objective: Track conditions and evaluate the effectiveness of control measures.

- Monitor nutrient and sediment export from subwatersheds as improved agricultural practices are implemented.
- Measure near-shore growth of weeds and algae in experimental and control areas.
- Continue watershed inspection, watershed manager, and monitoring activities.

Objective: Informing the public of watershed management activities.

- Continue public education through distribution of educational material at public functions, and through written newspaper articles in the CLA newsletter on CLWMP initiatives.

Completion of the USDA-funded monitoring of tributary subwatersheds

In late 2007, the final water quality samples and flow measurements were collected in the tributary subwatersheds included in the USDA-funded research program. This highly-regarded research effort was led by Professor Joseph Makarewicz of SUNY Brockport and brought together a consortium of researchers from local academic institutions and agricultural support agencies. The program was designed to quantify the effectiveness of best management practices in reducing the loss of nutrients and other chemicals, sediment, and bacteria from the agricultural landscape. Related research initiatives examined how reductions in loading from the subwatersheds affect nearshore water quality and habitat conditions. The proliferation of macrophytes and macroalgae and the abundance of Eurasian watermilfoil were a focus of the in-lake work.

The researchers are now completing their data analysis and preparing technical articles for publication in a special Conesus Lake issue of the Journal of Great Lakes Research. A forum to present the results to the Conesus Lake community is being discussed for summer of 2008.

Lake-wide Phosphorus and Algae Levels

One element of the CLWMP is a monitoring framework to enable managers to assess long-term changes in the lake's health while responding to new issues.

Tracking total phosphorus concentrations and algal abundance over time is an important component of lake management. Phosphorus is the limiting nutrient for algal growth in the Finger Lakes, and the summer average concentration of this nutrient in the open waters of the lake helps managers evaluate effectiveness of control actions. 2007 results indicate improved water quality conditions.

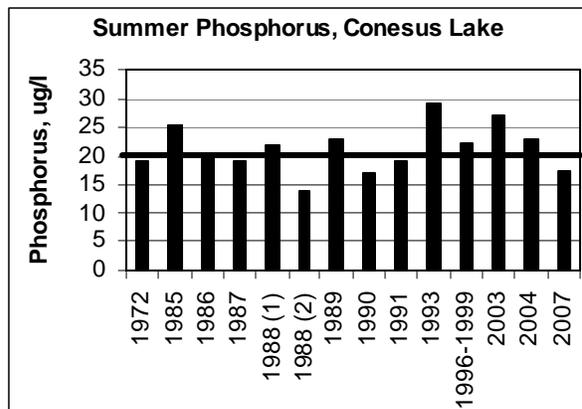


Figure 1. Average total phosphorus measured in summer (June-August) in the upper waters of Conesus Lake. NYSDEC uses 20 µg/l (summer average, upper waters) as the threshold for impaired waters. When phosphorus concentrations exceed this level there is a risk of algal blooms. Concentrations in 2007 are below this threshold.

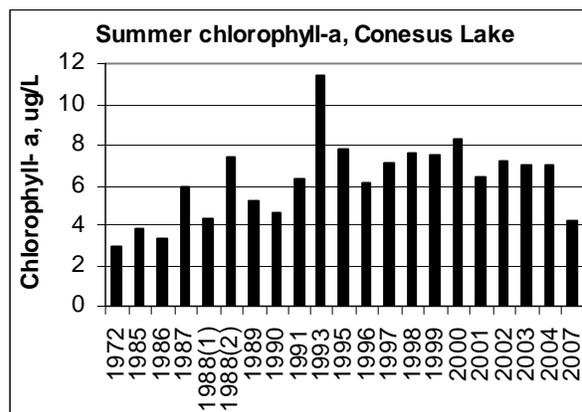


Figure 2. Average chlorophyll-a levels measured during summer (June-August) in surface waters of Conesus Lake. Summer average chlorophyll-a concentrations indicate the abundance of algae suspended in the open waters; these tiny plants make the water appear green. Chlorophyll-a concentrations have been relatively stable over the past decade. The decline in 2007 is consistent with the reduced TP levels.



2007 UPDATE: THE SOLARBEE PILOT STUDY

The Conesus Lake Watershed Council agreed to implement a pilot test of the SolarBee technology during the summers of 2006 and 2007. Funds for the pilot test and monitoring were contributed by Livingston County, using grant funds from the Finger Lakes—Lake Ontario Watershed Protection Alliance, the Conesus Lake Association, the Town of Geneseo, the Town of Livonia, the Town of Groveland and the Town of Conesus. Other volunteers and contractors supported this effort, notably Professor Sid Bosch of SUNY-Geneseo, and the Livingston County Sheriff's Office Marine Patrol.

Three SolarBee units were installed by Pump Systems International (PSI) in late April 2006 and kept in the lake over the winter and re-started in the spring of 2007. Water quality conditions were monitored throughout both summer seasons. Control areas, distant from the SolarBees, were used as a baseline for comparison.

Results of the first year (2006) monitoring program indicated that the solar-powered mixing devices did not result in significant improvements for the majority of parameters measured. However, some parameters did show improvement in regions of the lake adjacent to the solar-powered mixing devices; notably, water clarity increased and blue-green algae decreased in the northern basin of the lake as compared with reference areas. The measured improvement was supported by public perception of clearer water. The magnitude of improvement was small compared with the variability in these parameters typically measured in Conesus Lake. The conclusion of the 2006 effort was that the SolarBee units did not appear to be an effective alternative for consistent improvements to nearshore areas of Conesus Lake.

However, the localized improvements in water quality in 2006 were sufficient for the project partners to authorize a second year of deployment and monitoring. Most parameters measured in 2006 were measured in 2007, except bacteria.

Results of the 2007 program were very similar to 2006. Overall, there were no statistically significant differences between sites where SolarBees were deployed and reference locations. Consistent improvements in water clarity and filamentous algae were not achieved in 2007.

There were statistically significant differences in data collected along transects at one site (Sacketts Harbor) for one month (August). In addition, there were slight positive effects measured for a few variables, consistent with improved water quality. However, these effects were not statistically significant and could not be attributed to the SolarBee units. Water quality at the SolarBee sites were not distinguishable from natural daily and weekly changes in Conesus Lake.

Ultimately, the limited benefits of the SolarBees did not justify the costs and the program was terminated.



SolarBee deployed in Conesus Lake, Summer 2006

PART B: CLWMP RECOMMENDATIONS STATUS UPDATE

Recommendation	# in Plan	Priority	Completed	Underway	No Action
1. Creation of a Conesus Lake Watershed Council and contracting with a Watershed Manager		High	X		
2. Review and amend zoning regulation	A-1	High		X	
3. Secure funding to help mitigate the financial impacts of changes in agricultural practices on the producers.	B-1	High		X	
4. Implement practices that will reduce non-point source pollution from farms.	B-2	High		X	
5. Develop and implement programs and partnerships to facilitate removal of waste materials from farms.	B-3	High			X
6. Develop programs for public education and outreach for both the agricultural and the non-agricultural community.	B-4	High	X (Ongoing)		
7. Develop and implement program to restore and stabilize streambanks in the watershed.	C-1	High		X	
8. Provide training on erosion control practices for Municipal Highway Depts.	D-1	High	X (Ongoing)		
9. Revise Watershed Rules and Regulations	E-1, E-6	High		X	
10. Develop a public education campaign: <ul style="list-style-type: none"> • Effect of boat speed on weeds (creates weed-chop) • Precautions to follow when discarding unused bait or transporting bait from one water body to another (exotic species introduction). • Need to clean and inspect boat (body, bilge, coolant system, etc.) and trailer when transporting from one water body to another (exotic species introduction). • Existing boat and personal watercraft laws. 	E-2	High	X (Ongoing)		
11. Continued enforcement of existing boat and personal watercraft laws.	E-3	High	X (Ongoing)		
12. NYSDEC should review and update its 1994 safe yield allocation calculation for Conesus Lake, and make any necessary revisions to water allocations for public supply and wastewater dilution.	F-1	High		X	
13. Investigate and implement effective methods to control the spread of non-native (exotic) organisms.	G-1	High		X	
14. Initiate effort to determine if increased stocking of walleye fingerlings, or other species, would be an effective biological control in Conesus Lake.	G-4	High		X	

Table continued on next page

PART B: CLWMP RECOMMENDATIONS STATUS UPDATE

Recommendation	# in Plan	Priority	Completed	Underway	No Action
15. Develop and implement a program for cleaning accumulated aquatic plants and algae along the shoreline of Conesus Lake.	G-2	High		X	
16. Initiate effort to determine if alum treatment to control release of phosphorus from deep lake sediments would be effective in Conesus Lake. Proceed with plans for implementation if effectiveness is warranted and monitor for environmental impacts.	G-3	High		X	
17. Determine if new technologies would be effective in Conesus Lake to improve water quality or enhance the recreational use of the Lake. Proceed with plans for implementation if effectiveness is warranted and monitor for environmental impacts.	G-8	High		X	
18. Initiate effort to determine if water circulation devices, including, but not limited to, SolarBee, would be effective in Conesus Lake to decrease algae and nuisance aquatic plant concentrations. Proceed with plans for implementation if effectiveness is warranted and monitor for environmental impacts.	G-9	High	X		
19. Conduct an annual monitoring program of Conesus Lake and its watershed. An annual monitoring meeting should be held to coordinate the monitoring program.	H-1	High		X (Ongoing)	
20. Prepare and distribute an annual Conesus Lake and Watershed Report Card	H-2	High	X (Ongoing)		
21. Create an integrated aquatic plant management plan for Conesus Lake		High		X	
22. Adopt local sediment and erosion control laws based on the CLWMP Model Erosion and Sediment Control Law	A-2	Medium	X (Lakeshore towns)		
23. Develop public education campaigns <ul style="list-style-type: none"> • Encourage planting and protection of streamside vegetation • Discourage use of herbicides, pesticides, and fertilizers on shoreline properties • Erosion control and lake-friendly landscaping 	A-3	Medium	X (Ongoing)		
24. Implement best management practices, such as hydroseeding or other approved methods, as soon as possible after road construction or maintenance activities occur in the watershed.	D-2	Medium		X (Ongoing)	
25. Municipal Highway Departments should develop a plan, subject to available funding, to remediate ditches in poor condition.	D-3	Medium		X	

Table continued on next page

PART B: CLWMP RECOMMENDATIONS STATUS UPDATE

Recommendation	# in Plan	Priority	Completed	Underway	No Action
26. Amend Town dock laws to add the provision of 24-hour access to toilet facilities to the list of requirements for granting a Special Use Permit.	E-4	Medium		X	
27. Winterize facilities at the State Boat Launch on East Lake Road and at the Town of Geneseo's Long Point Park to permit year-round use of public toilets.*	E-5	Medium		X	
28. Extend sewer system	F-2	Medium		X	
29. Control sanitary sewer overflows within the collection system.	F-3	Medium		X	
30. Initiate an experimental program for control of aquatic weeds using the aquatic moth and/or weevil.	G-5	Medium	X		
31. Identify and develop sites for regional storm-water treatment areas in cooperation with NYSDEC and other stakeholders.	C-2	Low		X	
32. Develop plan to phase-in computer-controlled spreaders on trucks used for winter deicing (includes training, funding, and use of the equipment). Promote sensible deicing practices: develop incentives and/or disincentives.*	D-4	Low			X
33. Develop public education campaigns: <ul style="list-style-type: none"> • Sensible winter driving • Why and when are road ditches cleaned • Need to keep yard debris and trash out of road ditches 	D-5	Low	X (Ongoing)		
34. Develop protocol and timeline to inventory septic/sanitary systems within the watershed.	F-4	Low		X	
35. Develop program for suctioning aquatic weeds from designated public areas that are too shallow for harvester to maneuver.	G-6	Low		X	
36. Develop a weed harvesting program either by contracting with outside vendor or purchasing equipment.*	G-7	Low			X

*These recommendations were not targeted for implementation in 2007

Key to Acronyms

CLA—Conesus Lake Association

CLWMP—Conesus Lake Watershed Management Plan

FLCC—Finger Lakes Community College

FSA—Farm Services Agency

G/FLRPC—Genesee/Finger Lakes Regional Planning Council

NYSDEC—New York State Department of Environmental Conservation

NYSDOH—New York State Department of Health

SEQR—State Environmental Quality Review

SWCD—Soil and Water Conservation District

TMDL—Total Maximum Daily Load

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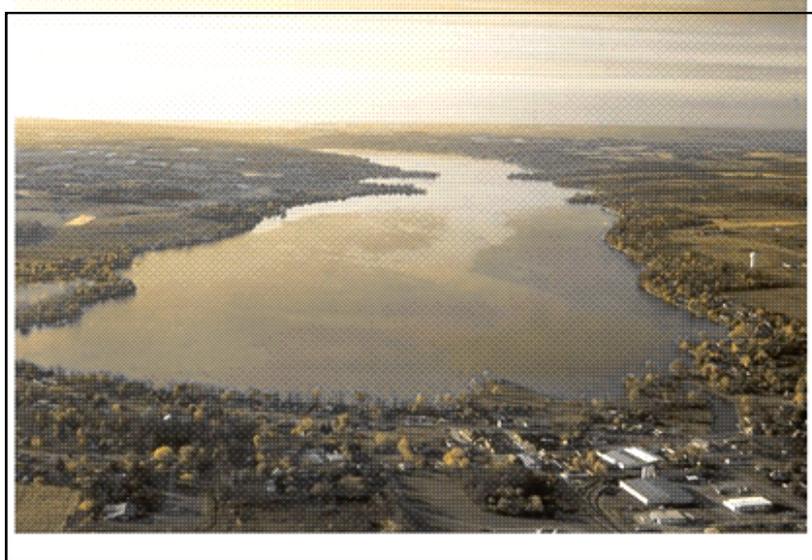
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Conesus Lake and Watershed Report Card

Assessment of the Conesus Lake Watershed
Management Plan in 2006

Conesus Lake Watershed Council

May 2007



PURPOSE OF THIS DOCUMENT

One of the recommendations of the Conesus Lake Watershed Management Plan (CLWMP) is to prepare an annual update summarizing the status of activities in the watershed designed to reduce nonpoint source pollution. In addition, the annual summary provides a forum for tracking conditions in Conesus Lake and highlighting new information.



MAJOR ACCOMPLISHMENTS

The Conesus Lake Watershed Council was created in December 2003 when nine watershed partners signed an Intermunicipal Agreement to implement the recommendations of the Conesus Lake Watershed Management Plan (CLWMP). The Watershed Council met quarterly in 2006. Substantial progress was made on a number of CLWMP objectives, as summarized below. Three of these initiatives (starred) are described in detail on the pages that follow.

Objective: Reduce inputs of nutrients, sediments, microorganisms, and other substances that can degrade the quality of Conesus Lake.

- Completion of the Local Laws project, which identifies ways to modify local zoning and site planning laws to effectively reduce nonpoint source pollution.
- Review and revision of local sediment and erosion control laws for watershed towns.
- Continue to advance whole farm planning and prepare for CAFO implementation.
- Implement Best Management Practices (BMPs) on watershed farms.* Funds have been awarded from federal, state, and private foundation sources to help offset the costs.
- Continued progress with sanitary sewers in the Hamlet of Conesus.
- Continue to work towards New York State Department of Health approval of watershed rules and regulations.
- Survey streambanks and find effective measures to reduce erosion.*
- Continue to implement improvements to watershed roadways.

Objective: Modify in-lake processes in ways that will improve recreational quality.

- Pilot test a solar-powered mixing device (SolarBee®) and measure effects. *
- Supplement population of weevils in an effort to control Eurasian watermilfoil.
- Continue stocking with walleye fingerlings reared at the Finger Lakes Community College.

Objective: Track conditions and evaluate the effectiveness of control measures.

- Monitor nutrient and sediment loss and growth of weeds and algae in areas affected by BMPs; compare with control areas.
- Continue watershed inspection and monitoring activities.



FOCUS ON AGRICULTURAL BEST MANAGEMENT PRACTICES (BMP)

In 2006, the Livingston County Soil and Water Conservation District completed nine whole farm nutrient management plans for farms in the Conesus Lake watershed. These plans detail farm-specific agricultural BMPs for more than 5,000 acres within the lake watershed. Funding for this effort was provided through New York State Agricultural Nonpoint Source Funds. The nutrient management plans will be used as the basis for future grant requests for funds to implement the recommended practices.

In addition, as reported by Nathan Herendeen, Extension Educator-Field Crops and Soils, Cornell Cooperative Extension, several agricultural BMPs were completed in 2006. A farm located within the western portion of the Conesus Lake watershed invested in construction and operational changes that will reduce the potential for loss of materials to waterways. A portion of the costs were shared under the USDA-funded grant to Dr. Joe Makarewicz of SUNY-Brockport. Other watershed farms are progressing with BMPs as well.

Four BMPs were completed during 2006 on a dairy farm located in the Graywood Creek subwatershed.

- Tile (sub-surface drainage) outlets were modified to reduce erosion at the discharge to Graywood Creek. Additional sub-surface drainage was installed on an area of the farm within the Hanna's Creek subwatershed.
- A small grass filter strip was planted on the southeast corner of the farm where gully erosion occurred during the extreme storms of Summer 2005.
- A runoff control standpipe and basin were installed on the northwest corner of the farm. This allows runoff to be conveyed sub-surface to the highway drainage ditch and eliminates standing water in the heifer pasture.
- The heifers are now watered at a watering tub at least 200 feet from the drainage area.

Other BMP activity on area farms include:

- The second year of a "Nitrogen Fertilizer Rate for Corn Following Sod" research trial was completed on a farm in the Conesus watershed in conjunction with Cornell Crops and Soils staff.
- A whole farm plan was initiated by the Livingston County Soil and Water Conservation District on a dairy farm that is not participating in the USDA Grant Project.
- Separation of roof water from barnyard runoff was completed on two east side farms. The barnyard elimination project was started on one east side farm, but not completed in 2006.



FOCUS ON THE SOLARBEE PILOT STUDY

The Conesus Lake Watershed Council agreed to implement a pilot test of the SolarBee technology in Conesus Lake during summer 2006. Funds for the pilot test and monitoring were contributed by Livingston County, using grant funds from the Finger Lakes—Lake Ontario Watershed Protection Alliance, the Conesus Lake Association, the Town of Geneseo, the Town of Livonia, the Town of Groveland and the Town of Conesus. Other volunteers and contractors supported this effort, notably Professor Sid Bosch of SUNY-Geneseo, and the Livingston County Sheriff's Office Marine Patrol.

Three SolarBee units were installed by Pump Systems International (PSI) in late April 2006. Water quality conditions were monitored throughout the summer season. Control areas, distant from the SolarBees, were used as a baseline for comparison.

The summer monitoring program focused on parameters identified as likely to show improvement. Bacterial levels, water clarity, algal abundance, and metaphyton (filamentous algae) were monitored. In addition, perception of the lake's suitability for recreational use was tracked. According to Pump Systems International, the abundance of aquatic macrophytes, such as Eurasian watermilfoil, would not respond to the first year of operation.

Results of the 2006 pilot program were promising, but not conclusive. Water clarity improved in the northern lake basin near the units. This improvement was measurable by the testing program and by the public perception of crystal clear water during the middle of the summer. This improvement in water clarity was not evident at the Sacketts Harbor site on the lake's western shoreline. The monitoring data support a finding of small and transient differences consistent with improved water quality conditions in close proximity to the devices deployed at the northern site. However, the size of Conesus Lake and its many tributary inflows make it challenging to attribute improvements to the presence of the SolarBee. Natural lake processes, such as wind-induced mixing and continued inputs of nutrients and sediment from the watershed, have the potential to overwhelm the small positive effect of the units.

The three SolarBee units were left in the lake over the winter. Monitoring and analysis of conditions during the second year of deployment will begin in Spring 2007.



SolarBee deployed in Conesus Lake, Summer 2006



FOCUS ON THE STREAMBANK SURVEY

Sediment loading to Conesus Lake from tributary streams and rivulets has been determined to have significant detrimental effects to lake water quality. Livingston County was awarded a grant from the New York State Quality Communities Program. The grant funds from New York State will be used primarily for professional services directed at identifying the underlying causes of the high sediment transport through the watershed tributaries. The consultant will also recommend effective remedial actions for the most unstable stream segments.

Stantec Consulting Services, Inc. was selected to complete the stream corridor assessment. Staff engineers and scientists surveyed over 52,000 linear feet of stream corridor (about 10 miles), including rivulets. In total, 12 streams and rivulet areas have been surveyed, photographed, and geo-referenced.

- Wilkins Creek
- Unnamed tributary to Wilkins Creek
- Densmore Creek
- Central Creek
- North Gully
- South Gully
- Southwest Creek
- North McMillan
- Groveland (Raschi) Rivulet
- Long Point Creek
- Sand Point Creek
- Eagle Point Creek

The report generated by this streambank study will be used as a basis for future grant requests to implement the recommended remedial projects.



Photo of bank erosion along the upper middle reach of Wilkins Creek.

[Stantec Consulting Services, Inc. September 2006]

PART B: CLWMP RECOMMENDATIONS STATUS UPDATE

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1. Creation of a Conesus Lake Watershed Council and contracting with a Watershed Manager		High	X		
2. Review and amend zoning regulation	A-1	High		X	
3. Secure funding to help mitigate the financial impacts of changes in agricultural practices on the producers.	B-1	High		X	
4. Implement practices that will reduce nonpoint source pollution from farms.	B-2	High		X	
5. Develop and implement programs and partnerships to facilitate removal of waste materials from farms.*	B-3	High			X
6. Develop programs for public education and outreach for both the agricultural and the non-agricultural community.	B-4	High	X (on-going)		
7. Develop and implement program to restore and stabilize streambanks in the watershed.	C-1	High		X	
8. Provide training on erosion control practices for municipal highway departments.	D-1	High	X (on-going)		
9. Revise Watershed Rules and Regulations	E-1, E-6	High	X		
10. Develop a public education campaign: <ul style="list-style-type: none"> • Effect of boat speed on weeds (creates weed-chop) • Precautions to follow when discarding unused bait or transporting bait from one waterbody to another (exotic species introduction). • Need to clean and inspect boat (body, bilge, coolant system, etc.) and trailer when transporting from one waterbody to another (exotic species introduction). • Existing boat and personal watercraft laws. 	E-2	High	X (on-going)		
11. Continued enforcement of existing boat and personal watercraft laws.	E-3	High	X (on-going)		
12. NYSDEC should review and update its 1994 safe yield allocation calculation for Conesus Lake, and make any necessary revisions to water allocations for public supply and wastewater dilution.	F-1	High		X	
13. Investigate and implement effective methods to control the spread of non-native (exotic) organisms.	G-1	High		X	
14. Initiate effort to determine if increased stocking of walleye fingerlings, or other species, would be an effective biological control in Conesus Lake.	G-4	High		X	

Table continued on next page

PART B: CLWMP RECOMMENDATIONS STATUS UPDATE

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18. Initiate effort to determine if water circulation devices, including, but not limited to, SolarBee, would be effective in Conesus Lake to decrease algae and nuisance aquatic plant concentrations. Proceed with plans for implementation if effectiveness is warranted and monitor for environmental impacts.	G-9	High		X	
19. Conduct an annual monitoring program of Conesus Lake and its watershed. An annual monitoring meeting should be held to coordinate the monitoring program.	H-1	High		X (on-going)	
20. Prepare and distribute an annual Conesus Lake and Watershed Report Card	H-2	High	X (on-going)		
21. Create an integrated aquatic plant management plan for Conesus Lake		High		X	
22. Adopt local sediment and erosion control laws based on the CLWMP Model Erosion and Sediment Control Law	A-2	Medium	X (lakeshore towns)		
23. Develop public education campaigns <ul style="list-style-type: none"> • Encourage planting and protection of streamside vegetation • Discourage use of herbicides, pesticides, and fertilizers on shoreline properties • Erosion control and lake-friendly landscaping 	A-3	Medium	X (on-going)		
24. Implement best management practices, such as hydroseeding or other approved methods, as soon as possible after road construction or maintenance activities occur in the watershed.	D-2	Medium		X (on-going)	
25. Municipal Highway Departments should develop a plan, subject to available funding, to remediate ditches in poor condition.	D-3	Medium		X	

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31. Identify and develop sites for regional storm-water treatment areas in cooperation with NYSDEC and other stakeholders.	C-2	Low		X	
32. Develop plan to phase-in computer-controlled spreaders on trucks used for winter deicing (includes training, funding, and use of the equipment). Promote sensible deicing practices: develop incentives and/or disincentives.*	D-4	Low			X
33. Develop public education campaigns: <ul style="list-style-type: none"> • Sensible winter driving • Why and when are road ditches cleaned • Need to keep yard debris and trash out of road ditches 	D-5	Low	X (on-going)		
34. Develop protocol and timeline to inventory septic/sanitary systems within the watershed.	F-4	Low		X	
35. Develop program for suctioning aquatic weeds from designated public areas that are too shallow for harvester to maneuver.	G-6	Low		X	
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*These recommendations were not targeted for implementation in 2006

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For additional information contact: :
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Conesus Lake and Watershed Report Card

Assessment of the Conesus Lake Watershed
Management Plan in 2005

Conesus Lake Watershed Council

May 7, 2006



PURPOSE OF THIS DOCUMENT

One of the recommendations of the Conesus Lake Watershed Management Plan (CLWMP) is to prepare an annual update summarizing the status of activities in the watershed designed to reduce nonpoint source pollution. In addition, the annual summary provides a forum for tracking water quality conditions in Conesus Lake and highlighting new information.



MAJOR ACCOMPLISHMENTS

Since completion of the CLWMP in 2003, the Livingston County Planning Department and the Board of Supervisors have taken steps to implement the plan's recommendations. The first step was forming the Conesus Lake Watershed Council. The Watershed Council was created in December 2003. Nine watershed partners: three Villages, five Towns, and Livingston County signed an Intermunicipal Agreement to implement the recommendations of the CLWMP. The Watershed Council met quarterly in 2005 and made significant progress on several CLWMP initiatives.

- In 2004, a detailed analysis authorized by The Watershed Council and the Livingston County Board of Supervisors demonstrated that alum treatment would be an environmentally safe and effective means of reducing phosphorus and algae in Conesus Lake. The State Environmental Quality Review (SEQR) process was followed, and the Final EIS was approved by the Board of Supervisors in December 2004. In 2005, the Livingston County Planning Department received a Special Projects Fund grant through Finger Lakes-Lake Ontario Watershed Protection Alliance (FL-LOWPA) to fund a benthic survey, which was required per NYSDEC comment on the alum FEIS. A benthic survey was completed by Dr. Sid Bosch of SUNY Geneseo in the summer of 2005.
- A booklet on watershed stewardship issues was published late in 2004, under the direction of Watershed Manager Don Wetzel. The booklet was distributed by the Conesus Lake Association (CLA) and the Planning Department in 2005. Copies are available from the Conesus Lake Watershed Manager, Livingston County Office Building Room 305, phone 585-243-7917.
- A. Stephen Kronquest of Eagle Point in Geneseo organized a citizen pledge, where all of the residents of Eagle Point agreed to forgo use of fertilizers and broadly applied weed killers. The CLA expanded the Eagle Point pledge to all CLA members with the Winter 2005 membership renewal information. The initial response from CLA members was been positive, with members of 460 households – almost 700 individuals – signing the lake-friendly pledge.

- The Towns of Conesus and Sparta submitted an application for funding to the NYS Environmental Protection Fund. Monies obtained through this grant would be used for road ditch repair and maintenance work. In June 2005, EPF application was expanded to include Livingston County and the Towns of Conesus, Geneseo, Groveland, Livonia and Sparta. As of the date of this Report Card, the application is pending.
- In May 2005, the CLA received a grant through Boats US to update and reprint 10,000 Conesus Lake boating brochures. The updated brochures were distributed in July 2005.
- In 2004, the Watershed Manager presented materials to the Technical Committee about the use of weevils for the control of Eurasian watermilfoil. In July 2005, the CLA sponsored a weevil pilot test in the 4000 block of East Lake Road using 7,000 weevil larvae. SUNY Geneseo will be monitoring results of this pilot program, which will be completed in Spring 2006. Results of the pilot program will help determine whether weevils could be an effective control measure for Conesus Lake.
- Support for walleye rearing and stocking continued in 2005. One of the recommendations for improving water clarity in Conesus Lake is to increase the walleye population. Walleye are an important native fish that, if present in high enough numbers, could reduce the population of the alewife. This non-native fish has caused changes in the lake's food web leading to higher algal abundance and turbid water. The cooperative walleye rearing program was initiated in 2004 between the Finger Lakes Community College (FLCC) and New York State Department of Environmental Conservation (NYSDEC), with additional support from the Conesus Lake Association through funding from Senator McGee.
- Activities to reduce nonpoint source pollution from farms continued through 2005:
 - SUNY Brockport received a grant through Altria (parent company of Kraft Foods) for agricultural BMPs on the east side of Conesus Lake.
 - A second USDA grant application has been funded to increase the number of participating farms for 2005-2006.
 - The Livingston County Soil and Water Conservation District has completed four whole farm plans for farms in the Conesus Lake watershed. Five more whole farm plans are underway.
- Livingston County has also obtained grant funding for the following projects:
 - NYS Quality Communities Program to develop streambank mitigation plans for several streams in the watershed.

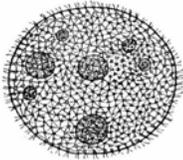
PART A: CONESUS LAKE WATER QUALITY STATUS UPDATE

Weed growth

Weed growth remains a major issue affecting recreational use of Conesus Lake. Dr. Sid Bosch (SUNY Geneseo) published the results of his program of detailed measurements of the type and abundance of macrophytes at defined beds of dense vegetation located around the lake.

Algae and water clarity

Summer phosphorus levels, algal abundance, and water clarity continue to be problematic. In 2004, Conesus Lake was moved to a category of the 303(d) list requiring preparation of a Total Maximum Daily Load (TMDL) allocation. The TMDL, to be prepared by NYSDEC, will identify the sources of phosphorus and sediment affecting the lake and define measurable targets for reduction.



Volvox is a type of algae

Sedimentation

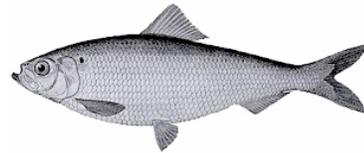
Since August 2002, investigators have made weekly measurements of stream flow and the loss of nutrients and sediment at seven watershed locations. This program is part of the USDA research program led by Dr. Joseph Makarewicz (SUNY Brockport) and Dr. Sid Bosch (SUNY Geneseo). The monitoring program continues to highlight areas of concern. Lakeshore towns have taken steps to control sedimentation from development projects by adopting sedimentation and erosion control laws.

Sodium and chloride (salt) concentrations

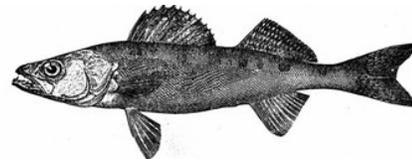
Sodium and chloride concentrations in Conesus Lake have steadily increased as the watershed developed. Efforts are underway to control road salt. As of 2004, all salt piles in the watershed are covered.

Fisheries

Biologists from NYSDEC Region 8 conducted a Fish Stock Assessment Survey in September 2004. These surveys are conducted at three-year intervals. The next NYSDEC Region 8 survey is anticipated for 2007. Raising and stocking of walleye fingerlings to control alewives in Conesus Lake continued during 2005.



Alewife



Walleye

Benthic (bottom-dwelling) animals

Zebra mussels continue to be an important component of the lake's benthic community. Dr. Sid Bosch and associates studied spawning and larval production of zebra mussels in the lake during 2004. The final data report on this study was released in the spring of 2005.

The Planning Department received Special Project Funds from the Finger Lakes-Lake Ontario Watershed Protection Alliance (FL-LOWPA) to complete a benthic survey in 2005. This benthic survey was requested by NYSDEC as part of the Final EIS for the potential alum project.

Pathogen indicators (coliform bacteria)

The Conesus Lake Watershed Inspector samples at bathing beaches permitted by LCDOH during the recreational season. Recent sampling indicates that bacteria levels in the lake are within safe levels for recreation.

NEW INVESTIGATIONS—2005

Several new investigations were initiated in 2005 to support ongoing efforts to implement the recommendations of the Watershed Management Plan. Interpretive reports for sampling activities in 2004 were also made available in 2005.

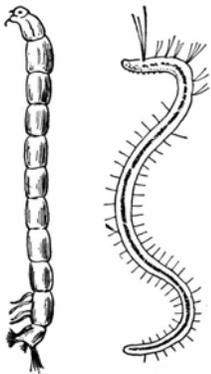
Alum Treatment Project

One recommendation of the Watershed Management Plan was to determine if alum treatment to control release of phosphorus from deep lake sediments would be effective in Conesus Lake. This nutrient becomes a food source for water column algae, which in high numbers can cloud the water and turn it green. Lower phosphorus concentrations in the water would mean less abundant water column algae.

Alum application to treat in-lake phosphorus has been under evaluation since 2003. An initial report by EcoLogic in 2003 indicated that alum treatment would be environmentally safe and effective. In 2004, the State Environmental Quality Review process for alum treatment was initiated, and the Final Environmental Impact Statement was approved in December 2004.

Benthic Survey

A baseline macroinvertebrate benthic survey was requested by NYSDEC Region 8 as part of the Final EIS. Through FL-LOWPA, a Special Projects grant funded a benthic survey in the summer of 2005, conducted by Dr. Sid Bosch with associates from SUNY Geneseo and SUNY Brockport. This was the most comprehensive deep-water benthic macroinvertebrate community study to date in Conesus Lake.



Left: midge larvae
Right: aquatic worm

Dr. Bosch and his associates reported that the deep-water areas of the lake, below 8 meters (26 feet), were dominated by species of aquatic worms and midge larvae that are tolerant of low oxygen conditions and high levels of organic enrichment. Shallower waters, with more oxygen, supported a higher diversity of organisms dominated by zebra mussels.

Dose Testing

Jar tests were conducted by Dr. Mark Noll of SUNY Brockport during summer 2005. The tests allow scientists to calculate a dose of alum for the lake that would reduce phosphorus while protecting water quality and fish populations. The tests measure phosphorus removal and changes in pH and aluminum concentrations under a range of alum dosage. Results confirm that alum could be applied at concentrations that would remove phosphorus while keeping pH and aluminum within safe levels.

Aquatic Weeds

While alum is being investigated to control algal growth, other studies are underway to control weed beds.



Milfoil

Weevil Pilot Program for Eurasian Watermilfoil Control

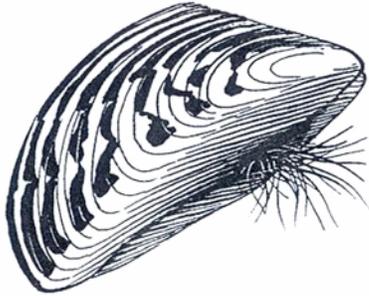
Another recommendation of the Watershed Management plan was to investigate control of aquatic weeds using the aquatic moth and/or weevil. In July 2005, the CLA sponsored a weevil pilot test in the 4000 block of East Lake Road using 7,000 weevil larvae. SUNY Geneseo will be monitoring results of this pilot program, which will be completed in Spring 2006.



Milfoil weevil

Zebra mussels

During the summer of 2004, Dr. Bosch and his associates studied the timing of spawning and larval production by zebra mussels in Conesus Lake relative to lunar cycles and compared the numerical production of larvae to records from previous summers. Their findings were released in 2005.



Zebra mussel

This study identified a pattern of low-level reproductive activity punctuated by mass spawning events, consistent with previous studies on Conesus Lake and elsewhere. The peak spawning events coincided with times of the full moon, consistent with the hypothesis that moonlight may provide a synchronizing cue for zebra mussel reproduction. Larval production in 2004 was close to the highest levels recorded in previous summers.

RESEARCH PROGRAMS UNDERWAY AS PART OF USDA GRANT

Funds were awarded in 2002 to a group of researchers and cooperating agencies led by Dr. Makarewicz of SUNY Brockport. The three-year project is designed to test the effectiveness of agricultural Best Management Practices (BMPs) in reducing loss of soils, nutrients, bacteria, and other pollutants.

A second USDA grant application has been funded to increase the number of participating farms for 2005-2006. SUNY Brockport received a grant through Altria (parent company of Kraft Foods) for agricultural BMPs on the east side of Conesus Lake.

The Livingston County Soil and Water Conservation District has completed four whole farm plans for farms in the Conesus Lake watershed. Five more whole farm plans are in progress.

BMP Status

Three participating farms are implementing BMPs to keep soil and applied materials on the landscape and prevent their loss to the streams and, ultimately, to Conesus Lake. Nate Herendeen and Nancy Glazier of Cornell Cooperative Extension (CCE), and Pete Kanouse of Livingston County Soil and Water Conservation District (SWCD) are working directly with farms in instituting BMPs.

Stream Monitoring

Stream monitoring tracks the export of water and materials in subwatersheds with and without participating farms. Streams are monitored year-round. These data are posted on the project web site http://www.envsci.brockport.edu/Conesus_Project. Data analysis confirms that the BMPs are having a beneficial effect.

Algal Growth and Runoff

Investigating how the BMPs affect the lake's weed beds is also part of the USDA-funded program. Nuisance growth of filamentous algae (metaphyton) in nearshore areas is a major issue affecting recreational use of Conesus Lake. Dr. Sid Bosch and associates studied the lake to document the distribution of filamentous algae growing in weed beds around the lake. Filamentous algae are free-floating green algae that form mats within weed beds and create unsightly conditions.

The results of this study indicate that filamentous algal growth was enhanced by runoff from the watershed during the spring and summer of 2004. The influence of in-lake nutrients may have been relatively limited.

Bacterial monitoring

Dr. Robert Simon of SUNY Geneseo is monitoring bacteria in watershed streams. Again, data analysis is underway; preliminary results suggest that the BMPs are effective in reducing the numbers of bacteria washed off the landscape.

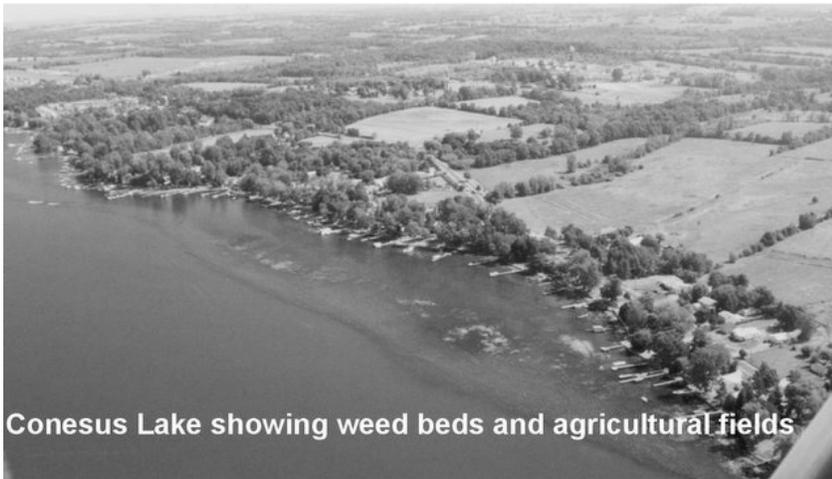
Another interesting investigation by Dr. Makarewicz and his graduate students relates to source typing of bacteria; that is, determining whether fecal bacteria are coming from humans, cattle, geese, or other wildlife. Results differ for each stream. However, geese turn out to be to be an important source. This is particularly true during the winter.

Hydrodynamic Modeling

Researchers from Rochester Institute of Technology have produced detailed bathymetric maps (maps of the lake bottom) and constructed a hydrodynamic model showing how water moves and transports materials within the lake. The model is able to simulate the lake's water temperatures and predict where sediment will be deposited.

Publications

The SWCD, Farm Services Agency, and CCE provide technical services and training to the agricultural community. A brochure describing agricultural BMPs in the Conesus Lake watershed was distributed in 2005.



Conesus Lake showing weed beds and agricultural fields

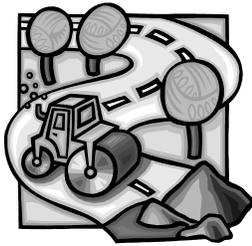


Dr. Sid Bosch (SUNY Geneseo) and Nate Herendeen (Cornell Cooperative Extension) lead an agricultural tour of Conesus Lake weedbeds, summer 2004

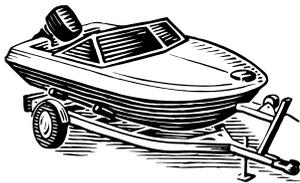
PART B: CLWMP RECOMMENDATIONS STATUS UPDATE

No.	Recommendation	Priority	Percent Completed	Comments
	Creation of a Conesus Lake Watershed Council and its Committees, and the hiring of a Conesus Lake Watershed Manager	High	100%	Council activities are on-going
A-1	Review and amend zoning regulations to make them more lake-friendly	High	30%	G/FLRPC local laws project completed
A-2	Adopt local sediment and erosion control laws based on the CLWMP Model Erosion and Sediment Control Law	Medium	100% (lakeshore Towns)	Enforcement on-going
A-3	Develop public education campaigns: <ul style="list-style-type: none"> • Encourage planting and protection of streamside vegetation • Discourage use of herbicides, pesticides, and fertilizers on shoreline properties • Erosion control and lake-friendly landscaping 	Medium	60%	On-going effort; distribution of lake and watershed stewardship booklet in 2005; monthly news articles by Watershed Manager.
B-1	Secure funding to help mitigate the financial impacts of changes in agricultural practices on the producers.	High	20%	USDA grants, SWCD, and FSA programs
B-1, B-2	Implement practices that will reduce nonpoint source pollution from farms	High	15%	USDA funded program; 4 whole farm plans completed.
B-3*	Develop & implement programs for waste removal from farms	High	0*	
B-4	Develop programs for public education and outreach for both the agricultural and the non-agricultural community	High	20%	<ul style="list-style-type: none"> • On-going effort; distribution of stewardship booklet in 2005 • Citizen pledge • Monthly news articles
B-5	Recruit additional agricultural producers to serve on advisory committee during implementation phase of watershed management plan	High	100%	On-going
C-1	Develop and implement program to restore and stabilize streambanks in the watershed	High	5%	NYS QCP grant received
C-2	Identify & develop sites for regional stormwater treatment areas	Low	5%	Grant funding being pursued

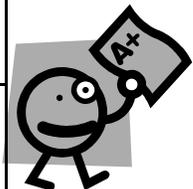
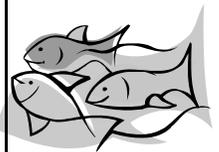
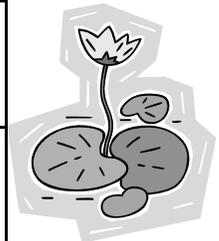
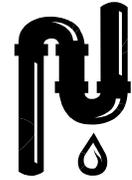




No.	Recommendation	Priority	Percent Completed	Comments
D-1	Provide training on erosion control practices for Municipal Highway Departments	High	100%	On-going
D-2	Implement best management practices, such as hydroseeding or other approved methods, as soon as possible after road construction or maintenance activities occur in the watershed	Medium	25%	Environmental Protection Fund application submitted
D-3	Municipal Highway Departments should develop a plan, subject to available funding, to remediate ditches in poor condition	Medium	5%	Remediation occurs as funding allows
D-4*	Develop plan to phase-in computer controlled spreaders on trucks used for winter de-icing	Low	0*	Not practical at this time
D-5	Develop public education campaigns: <ul style="list-style-type: none"> • Sensible winter driving • Why and when are road ditches cleaned. Need to keep yard debris and trash out of road ditches 	Low	60%	On-going effort; distribution of stewardship booklet in 2005; monthly news articles by Watershed Manager
E-1, E-6	Revise Watershed Rules and Regulations	High	100%	Submitted to NYS-DOH for approval; awaiting response
E-2	Develop a public education campaign: <ul style="list-style-type: none"> • Effect of boat speed on weeds (creates weed-chop) • Precautions to follow when discarding unused bait or transporting bait from one waterbody to another (exotic species introduction) • Need to clean and inspect boat (body, bilge, coolant system, etc.) and trailer when transporting from one waterbody to another (exotic species introduction) • Existing boat and personal watercraft laws 	High	60%	On-going effort; distribution of lake and watershed stewardship booklet in 2005; distribution of new boating brochures in 2005.
E-3	Continued enforcement of existing boat and personal watercraft laws	High	100%	On-going
E-4	Amend Town dock laws to add the provision of 24-hour access to toilet facilities to the list of requirements for granting a Special Use Permit	Medium	0%	Part of G/FLRPC local laws project
E-5	Winterize toilet facilities at State Boat Launch and Long Point Park	Medium	0%	



No.	Recommendation	Priority	Percent Completed	Comments
F-1	Request NYSDEC to review and update safe water yield calculations for Conesus Lake.	High	100%	Submitted to DEC 2004; awaiting response
F-2	Extend sewer system	Medium	0%	NYS CW/CA Bond Act grant received
F-3	Control sanitary sewer overflows within the collection system.	Medium	15%	On-going; NYS CW/CA Bond Act grant received
F-4	Develop protocol and timeline to inventory septic/sanitary systems in watershed.	Low	5%	
G-1	Investigate and implement effective methods to control the spread of non-native (exotic) organisms.	High	5%	Distribution of boating brochure and stewardship booklet.
G-2	Develop and implement a program for cleaning accumulated aquatic plants and algae along the shoreline of Conesus Lake.	High	5%	
G-3	Initiate effort to determine if alum treatment to control release of phosphorus from deep lake sediments would be effective in Conesus Lake. Proceed with plans for implementation if effectiveness is warranted and monitor for environmental impacts.	High	20%	FL-LOWPA benthic survey grant received; benthic survey completed
G-4	Initiate effort to determine if increased stocking of walleye fingerlings, or other species, would be an effective biological control in Conesus Lake.	High	35%	CLA financial support of NYSDEC/FLCC walleye rearing continued in 2005.
G-5	Initiate an experimental program for control of aquatic weeds using the aquatic moth and/or weevil.	Medium	10%	Weevil pilot project started in July 2005; will be completed Spring 2006.
G-6	Develop program for suctioning weeds from shallow public areas	Low	5%	Technical Committee heard presentation at June 2005 meeting.
G-7	Develop weed harvesting program	Low	0%	
H-1	Conduct an annual monitoring program of Conesus Lake and its watershed. An annual monitoring meeting should be held to coordinate the monitoring program.	High	100%	On-going
H-2	Prepare and distribute an annual Conesus Lake and Watershed Report Card	High	100%	On-going



*These recommendations were not targeted for work in 2005.

Key to Acronyms

CLA—Conesus Lake Association
 CLWMP—Conesus Lake Watershed Management Plan
 FLCC—Finger Lakes Community College
 FSA—Farm Services Agency
 G/FLRPC—Genesee/Finger Lakes Regional Planning Council

NYSDEC—New York State Department of Environmental Conservation
 NYSDOH—New York State Department of Health
 SEQR—State Environmental Quality Review
 SWCD—Soil and Water Conservation District
 TMDL—Total Maximum Daily Load

For additional information contact: :

Conesus Lake Watershed Manager

(585) 243-7917



Conesus Lake Watershed Council

6 Court Street—Room 305

Geneseo, NY 14454

(585) 243-7550

<http://www.livingstoncounty.us/conesus.htm>



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Conesus Lake and Watershed Report Card

Assessment of the Conesus Lake Watershed
Management Plan in 2004

Conesus Lake Watershed Council

February 24, 2005



EcoLogic



PURPOSE OF THIS DOCUMENT

One of the recommendations of the Conesus Lake Watershed Management Plan (CLWMP) is to prepare an annual update summarizing the status of activities in the watershed designed to reduce nonpoint source pollution. In addition, the annual summary provides a forum for tracking water quality conditions in Conesus Lake and highlighting new information.



MAJOR ACCOMPLISHMENTS

Since completion of the CLWMP in 2003, the Livingston County Planning Department and the Board of Supervisors have taken steps to implement the plan's recommendations. The first step was forming the Conesus Lake Watershed Council. The Watershed Council was created in December 2003. Nine watershed partners: three Villages, five Towns, and Livingston County signed an Intermunicipal Agreement to implement the recommendations of the CLWMP. The Watershed Council met quarterly in 2004 and made significant progress on several CLWMP initiatives.

- The Livingston County Board of Supervisors contracted for services of a Conesus Lake Watershed Manager to assist the Planning Department with Plan implementation. Don Wetzel, a resident of Livonia, was selected to provide these professional services.
- The Watershed Council and the Livingston County Board of Supervisors authorized a detailed analysis of the feasibility, benefits, and costs of an alum treatment program to reduce phosphorus and algae in Conesus Lake. EcoLogic LLC of Cazenovia completed a feasibility analysis and Draft Environmental Impact Statement (DEIS) for this lake restoration alternative. The analysis demonstrated that an alum treatment program would be an environmentally safe and effective means of reducing phosphorus and algae. The State Environmental Quality Review (SEQR) process was followed to ensure public input, and the Final EIS was approved by the Board of Supervisors in December 2004 following review and comment.
- A booklet on watershed stewardship issues was published late in 2004. Watershed Manager Don Wetzel directed this effort to provide information to all watershed residents and users of Conesus Lake. Copies are available from the Conesus Lake Watershed Manager, Livingston County Office Building Room 305, phone 585-243-7917.

- The Towns of Conesus and Sparta submitted an application for funding to the NYS Environmental Protection Fund. Monies obtained through this grant would be used for road ditch repair and maintenance work. As of the date of this Report Card, the application is pending.
- The Conesus Lake Association (CLA) conducted a pilot program for pickup of aquatic weeds removed from the lake. The pilot program was held in August 2004 and met with mixed success. The CLA identified several factors that would improve the program prior to its full-scale implementation. The Lakeshore Cleanup Work Group will investigate this issue further in 2005.
- One of the recommendations for improving water clarity in Conesus Lake is to increase the walleye population. Walleye are an important native fish that, if present in high enough numbers, could reduce the population of the alewife. The alewife is an invasive species that has brought about changes in the lake's food web that have made the lake more prone to algal blooms and turbid water.

A cooperative walleye rearing program was initiated in 2004 between the Finger Lakes Community College (FLCC) and New York State Department of Environmental Conservation (NYSDEC). The Conesus Lake Association provided additional support for the program through funding from Senator McGee. Walleye rearing ponds were constructed on the grounds of the FLCC Muller Field Station at the southern end of Honeoye Lake. These ponds are used to grow young walleye from the fry stage to the fingerling stage in a protected environment. Stocking older, larger fingerling walleye in Conesus Lake helps the survival of the fish, as larger fish are better able to avoid predation.

- A tour for agricultural producers and agricultural agency personnel was held on August 27, 2004. This tour highlighted the BMPs being implemented on farms associated with the USDA grant. A boat tour of Conesus Lake and a tour of the water quality monitoring station at Long Point Park were also part of the August 27th activities.



Photo on left shows example of feed management to maximize quality and minimize waste. Photo on right shows water management efforts to keep clean water separate from wastewater. (Photos from USDA agricultural BMPs brochure for Conesus Lake, prepared by Cornell Cooperative Extension.)

PART A: CONESUS LAKE WATER QUALITY STATUS UPDATE

Weed growth

Weed growth remains a major issue affecting recreational use of Conesus Lake. Dr. Sid Bosch (SUNY Geneseo) continued his program of detailed measurements of the type and abundance of macrophytes at defined beds of dense vegetation located around the lake.

Algae and water clarity

Summer phosphorus levels, algal abundance, and water clarity continue to be problematic (Figures 1-3). In 2002, Conesus Lake was placed on the State and Federal biannual list of impaired waters (the 303(d) list). In 2004, Conesus Lake was moved to a category of the 303(d) list requiring preparation of a Total Maximum Daily Load (TMDL) allocation. The TMDL, to be prepared by NYSDEC, will identify the sources of phosphorus and sediment affecting the lake and define measurable targets for reduction.

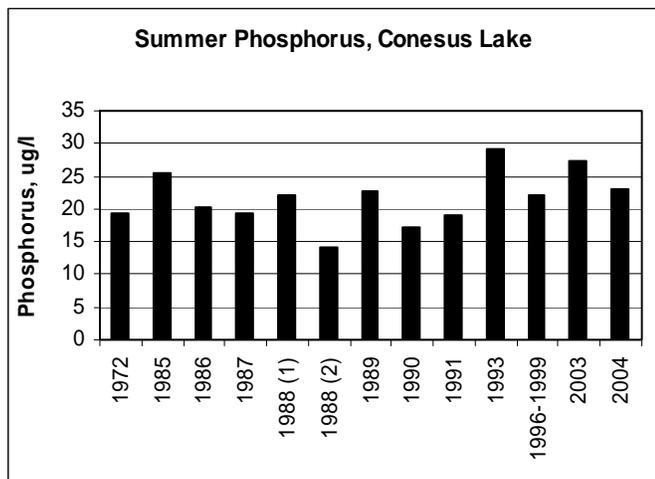


Figure 1. Average total phosphorus measured in summer (June-August) in the upper waters of Conesus Lake. NYSDEC uses 20 $\mu\text{g/l}$ (summer average, upper waters) as the threshold for impaired waters. When phosphorus concentrations exceed this level there is a risk of algal blooms. Concentrations in 2004 are above this threshold, indicating the need for additional controls on phosphorus loading. Total P has been over the 20 $\mu\text{g/l}$ threshold for more than a decade.

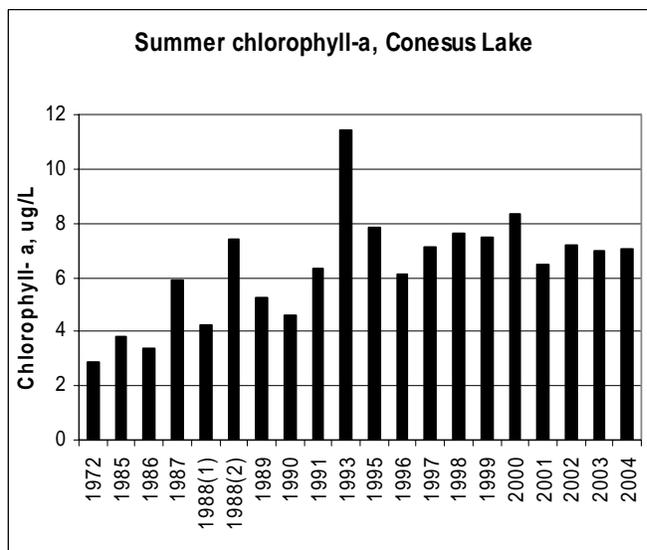


Figure 2. Average chlorophyll-a levels measured during summer (June-August) in surface waters of Conesus Lake. Summer average chlorophyll-a concentrations are a good indicator of the abundance of algae suspended in the open waters; these tiny plants make the water appear green. Chlorophyll-a concentrations have been relatively stable over the past decade, and are substantially higher than values measured in the early 1970s.

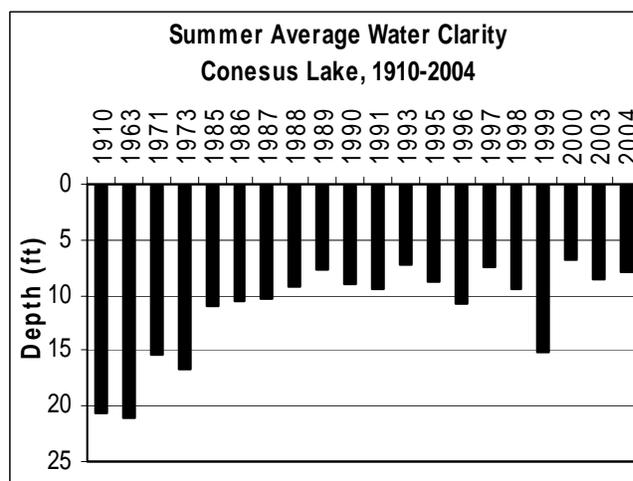


Figure 3. Bars indicate average depth to which a Secchi disk was visible during summer months (June-August). Water clarity remains variable from year to year. The 2004 data are within the range of measurements in recent years. This is consistent with the chlorophyll-a results, suggesting that algae are the major factor affecting the clarity of Conesus Lake.

Sedimentation

Since August 2002, investigators have made weekly measurements of streamflow and the loss of nutrients and sediment at seven watershed locations. This program is part of the USDA research program led by Dr. Joseph Makarewicz (SUNY Brockport) and Dr. Sid Bosch (SUNY Geneseo). The monitoring program continues to highlight areas of concern. Lakeshore towns have taken steps to control sedimentation from development projects by adopting sedimentation and erosion control laws.

Increasing sodium and chloride (salt) concentrations

Sodium and chloride concentrations in Conesus Lake have steadily increased as the watershed developed. Salt levels measured at the water intakes confirm that these concentrations continue to rise. Efforts are underway to control road salt. As of 2004, all salt piles in the watershed are covered.

Fisheries

Biologists from NYSDEC Region 8 conducted a Fish Stock Assessment Survey in September 2004. These surveys are conducted at three-year intervals. A total of 783 fish comprising 12 species were caught. Bluegill, pumpkinseed, rock bass, and brown bullhead made up the majority of the catch. According to NYSDEC Biologist Web Pearsall, fewer alewives were caught during the 2004 survey than in 2001 or 1998. A total of 102 walleyes were caught; 42 were juveniles that were stocked as fingerlings within the last four years. No juvenile walleyes had been caught during the 2001 survey. The catch of juveniles in 2004 is a good indication that the recent fingerling walleye stockings have been successful. In addition, 19 northern pike and 23 smallmouth bass were caught. Only one yellow perch was caught, indicating that the yellow perch fishery has not recovered from its collapse in the late 1980s.

Pathogen indicators (coliform bacteria)

The Conesus Lake Watershed Inspector samples at bathing beaches permitted by LCDOH during the recreational season. Recent sampling indicates that bacteria levels in the lake are within safe levels for recreation (Figure 4).

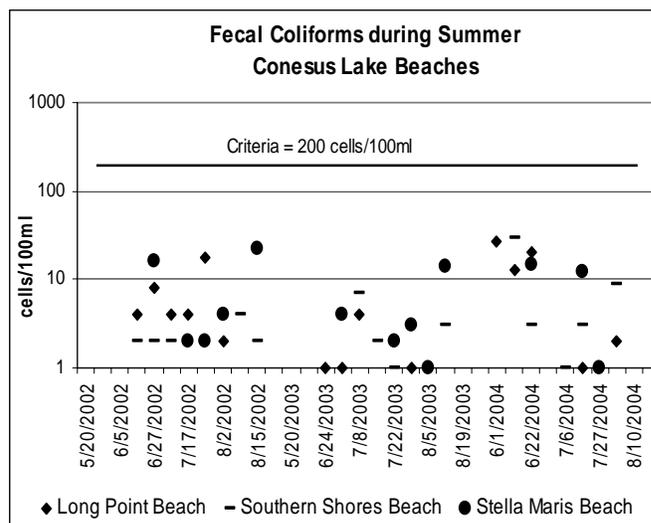


Figure 4. Plot shows count of fecal coliforms sampled at bathing beaches on Conesus Lake permitted by the Livingston County Department of Health, May - August 2002 to 2004. Note values are plotted using a logarithmic scale. Highest count was 22 cells/100ml, which is below the NYS standard for safe swimming of 200 cells/100 ml.

Zebra mussels

Zebra mussels continue to be an important component of the lake's benthic community. NYSDEC has been monitoring the Finger Lakes for water quality and environmental factors potentially affecting (and affected by) zebra mussels. Data have been collected each year since 1995 to assess the communities of phytoplankton and zooplankton, calcium concentrations of the lake water, and nutrient levels.

The Planning Department submitted a proposal to the Finger Lakes-Lake Ontario Watershed Protection Alliance (FL-LOWPA) requesting special project funds to complete a benthic survey in 2005.

NEW INVESTIGATIONS—2004

Water quality data were collected in 2004 by Professors Joe Makarewicz and Sid Bosch (SUNY Brockport and SUNY Geneseo) to refine estimates of external and internal phosphorus loading into the lake. This special testing is part of the continuing evaluation of the potential benefits of an alum treatment program.

In addition, samples were taken to characterize the algal and zooplankton communities in Conesus Lake. Data were published in November 2004; an interpretive report is pending. This study is part of the long-term lake and watershed monitoring program recommended in CLWMP.

RESEARCH PROGRAMS UNDERWAY AS PART OF USDA GRANT

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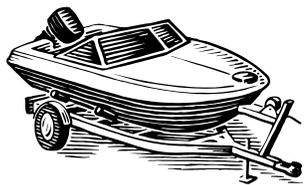
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The SWCD, Farm Services Agency, and CCE provide technical services and training to the agricultural community. A brochure describing agricultural BMPs in the Conesus Lake watershed has just been produced.

PART B: CLWMP RECOMMENDATIONS STATUS UPDATE

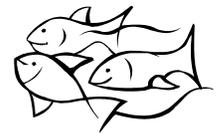
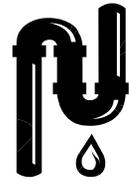
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A-1	Review and amend zoning regulations to make them more lake-friendly	High	30%	In progress as part of G/FLRPC local laws project
A-2	Adopt local sediment and erosion control laws based on the CLWMP Model Erosion and Sediment Control Law	Medium	100% (lakeshore Towns)	Enforcement on-going
A-3	Develop public education campaigns: <ul style="list-style-type: none"> • Encourage planting and protection of streamside vegetation • Discourage use of herbicides, pesticides, and fertilizers on shoreline properties • Erosion control and lake-friendly landscaping 	Medium	60%	On-going effort; publication of lake and watershed stewardship booklet in 2004
B-1	Secure funding to help mitigate the financial impacts of changes in agricultural practices on the producers.	High	20%	USDA grants, SWCD, and FSA programs
B-1, B-2	Implement practices that will reduce nonpoint source pollution from farms	High	15%	USDA funded program
B-3*	Develop & implement programs for waste removal from farms	High	0*	
B-4	Develop programs for public education and outreach for both the agricultural and the non-agricultural community	High	60%	<ul style="list-style-type: none"> • On-going effort; publication of lake and watershed stewardship booklet in 2004 • Creation of ag BMPs brochure
B-5	Recruit additional agricultural producers to serve on advisory committee during implementation phase of watershed management plan	High	100%	On-going
C-1	Develop and implement program to restore and stabilize streambanks in the watershed	High	5%	Investigating funding opportunities
C-2	Identify & develop sites for regional stormwater treatment areas	Low	5%	Grant funding being pursued





No.	Recommendation	Priority	Percent Completed	Comments
D-1	Provide training on erosion control practices for Municipal Highway Departments	High	100%	On-going
D-2	Implement best management practices, such as hydroseeding or other approved methods, as soon as possible after road construction or maintenance activities occur in the watershed	Medium	25%	
D-3	Municipal Highway Departments should develop a plan, subject to available funding, to remediate ditches in poor condition	Medium	5%	Environmental Protection Fund application submitted
D-4*	Develop plan to phase-in computer controlled spreaders on trucks used for winter de-icing	Low	0*	
D-5	Develop public education campaigns: <ul style="list-style-type: none"> • Sensible winter driving • Why and when are road ditches cleaned • Need to keep yard debris and trash out of road ditches 	Low	60%	On-going effort; publication of lake and watershed stewardship booklet in 2004
E-1, E-6	Revise Watershed Rules and Regulations	High	100%	Submitted to NYS-DOH for approval; awaiting response
E-2	Develop a public education campaign: <ul style="list-style-type: none"> • Effect of boat speed on weeds (creates weed-chop) • Precautions to follow when discarding unused bait or transporting bait from one waterbody to another (exotic species introduction) • Need to clean and inspect boat (body, bilge, coolant system, etc.) and trailer when transporting from one waterbody to another (exotic species introduction) • Existing boat and personal watercraft laws 	High	60%	On-going effort; publication of lake and watershed stewardship booklet in 2004
E-3	Continued enforcement of existing boat and personal watercraft laws	High	100%	On-going
E-4	Amend Town dock laws to add the provision of 24-hour access to toilet facilities to the list of requirements for granting a Special Use Permit	Medium	0%	Part of G/FLRPC local laws project
E-5	Winterize toilet facilities at State Boat Launch and Long Point Park	Medium	0%	

No.	Recommendation	Priority	Percent Completed	Comments
F-1	Request NYSDEC to review and update safe water yield calculations for Conesus Lake.	High	100%	Submitted to DEC; awaiting response
F-2	Extend sewer system	Medium	15%	
F-3	Control sanitary sewer overflows within the collection system.	Medium	15%	On-going
F-4	Develop protocol and timeline to inventory septic/sanitary systems in watershed.	Low	5%	
G-1	Investigate and implement effective methods to control the spread of non-native (exotic) organisms.	High	5%	
G-2	Develop and implement a program for cleaning accumulated aquatic plants and algae along the shoreline of Conesus Lake.	High	25%	CLA pilot program, August 2004
G-3	Initiate effort to determine if alum treatment to control release of phosphorus from deep lake sediments would be effective in Conesus Lake. Proceed with plans for implementation if effectiveness is warranted and monitor for environmental impacts.	High	20%	Feasibility analysis and SEQR process completed. Finding of no significant impact.
G-4	Initiate effort to determine if increased stocking of walleye fingerlings, or other species, would be an effective biological control in Conesus Lake.	High	35%	Construction of NYSDEC/FLCC rearing ponds. Summer 2004, approximately 87,000 walleye fingerlings were stocked in the lake.
G-5	Initiate an experimental program for control of aquatic weeds using the aquatic moth and/or weevil.	Medium	10%	Technical Committee has met with weevil vendor
G-6	Develop program for suctioning weeds from shallow public areas	Low	5%	
G-7	Develop weed harvesting program	Low	0%	
H-1	Conduct an annual monitoring program of Conesus Lake and its watershed. An annual monitoring meeting should be held to coordinate the monitoring program.	High	100%	On-going
H-2	Prepare and distribute an annual Conesus Lake and Watershed Report Card	High	100%	On-going



*These recommendations were not targeted for work in 2004.

Key to Acronyms

CLA—Conesus Lake Association
 CLWMP—Conesus Lake Watershed Management Plan
 FLCC—Finger Lakes Community College
 FSA—Farm Services Agency
 G/FLRPC—Genesee/Finger Lakes Regional Planning Council

NYSDEC—New York State Department of Environmental Conservation
 NYSDOH—New York State Department of Health
 SEQR—State Environmental Quality Review
 SWCD—Soil and Water Conservation District
 TMDL__Total Maximum Daily Load

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Conesus Lake and Watershed Report Card

Technical Version

**Assessment of the Conesus Lake Watershed
Management Plan in 2003**

Conesus Lake Watershed Council

February 10, 2004

PURPOSE OF THIS DOCUMENT

One of the recommendations of the Conesus Lake Watershed Management Plan (CLWMP) is to prepare an annual update summarizing the status of activities in the watershed designed to reduce nonpoint source pollution. In addition, the annual summary provides a forum for tracking water quality conditions in Conesus Lake and highlighting new information. Some material in this technical summary will also appear in a condensed version of the Report Card tailored for the interested public.

PART A: CONESUS LAKE WATER QUALITY STATUS UPDATE

Weed growth

Visual observations and community comments indicate that weed growth continues to be a major issue affecting recreational use of Conesus Lake.

Dr. Sid Bosch and colleagues investigated the biomass of Eurasian watermilfoil in beds adjacent to tributary streams and reported a correlation between rainfall event loading of phosphorus (Oct – Dec 2000) and biomass of the milfoil beds in summer 2000.

Ref: Johnson, D.A., I. Bosch, and M.D. Valentino. 2001. *SUNY Geneseo Journal of Science and Mathematics*. 2 (1):1-6.

As part of the USDA agricultural Best Management Practices (BMP) evaluations (program led by Dr. Joseph Makarewicz), Dr. Sid Bosch is measuring weed growth adjacent to the “control” and “treatment” subwatersheds. Work is ongoing (no data to report).

SUNY Geneseo biologists reported on experiments demonstrating that growth of the filamentous green alga *Spirogya* is stimulated by phosphorus and nitrogen. This species of macroalgae is common in Conesus Lake and forms green clouds in near-shore areas.

Ref: McKernan, P. and S. Juliano. 2001. *SUNY Geneseo Journal of Science and Mathematics*. 2(1):19-25.

Algae and loss of clarity

Recent data indicate that summer phosphorus levels, algal abundance, and water clarity continue to be problematic.

The NYSDEC continued to sample Conesus Lake, as well as the other Finger Lakes, to track water quality conditions. The focus of this monitoring is on “trophic state indicators”, defined as measurements that help managers interpret the level of nutrients and algal growth. Plots that were included in the Characterization Report and the Management Plan are updated with new data from the various monitoring programs.

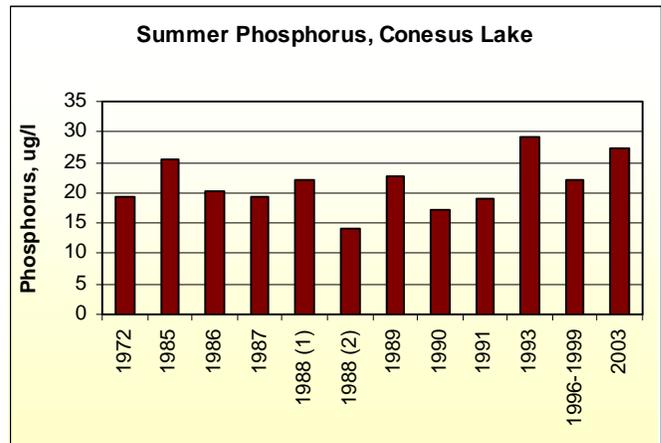


Figure 1. Average total phosphorus measured in summer (June-August) in the upper waters of Conesus Lake.

Phosphorus measurements were obtained in 2003 as part of Livingston County’s evaluation of the magnitude and importance of internal (sediment) phosphorus loading. The 2003 summer average concentrations measured in the lake’s upper waters are plotted on **Figure 1** with historical summer data collected at comparable depths. Overall, there is no trend evident in phosphorus concentration.

NYSDEC uses 20 µg/l (summer average, upper waters) as the threshold for impaired waters. When phosphorus concentrations exceed this level there is a high risk of algal blooms and unattractive, turbid waters. Phosphorus concentrations over 20 µg/l was the basis for the placement of Conesus Lake on a section of the state's 303(d) list in 2002.

Unfortunately, the 2003 measurement of 27 µg/l continued to be well above this threshold. This result indicates that additional controls on phosphorus loading are needed to improve the lake's attractiveness for recreation and long-term suitability as a high quality water supply.

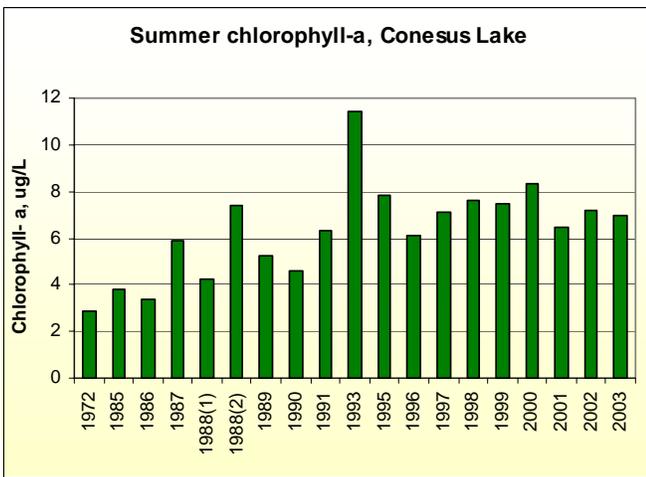


Figure 2. Average chlorophyll-a levels measured during summer (June-August) in surface waters of Conesus Lake.

Summer average chlorophyll-a concentrations are a good indicator of the abundance of algae suspended in the open waters; these tiny plants make the water appear green. Region 8 NYSDEC has been measuring chlorophyll-a concentration as part of their zebra mussel program. Data from 2001 – 2003 are displayed in **Figure 2** along with historical data. There is no trend evident in chlorophyll-a data.

Water clarity (as measured by the Secchi disk) remains variable from year to year. The 2003 data (collected by Dr. Sid Bosch and students as part of the alum evaluation) are within the range of measurements in recent years, as displayed in **Figure 3**.

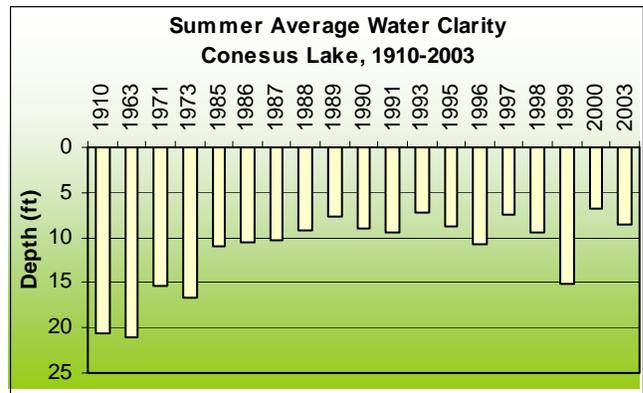


Figure 3. Bars indicate average depth to which Secchi disk was visible during summer months (June-August).

Pathogen indicators (coliform bacteria)

Recent sampling indicates that bacteria levels in the lake are within safe levels for recreation and drinking water supply.

There have been no violations of safe drinking water standards for indicator bacteria levels reported by the water purveyors.

The Watershed Inspector samples for bacteria in nearshore areas of Conesus Lake during the summer to assess whether the waters are safe for recreational use. Results from 2002 and 2003 indicate that bacteria levels were very low, well below levels considered safe (**Figure 4**).

A research project conducted by one of Dr.

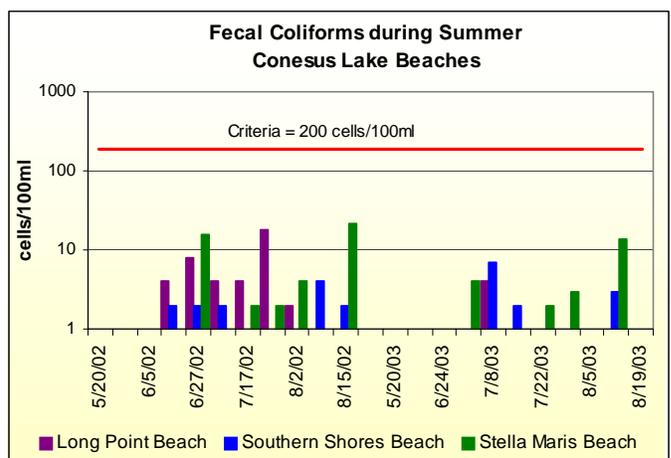
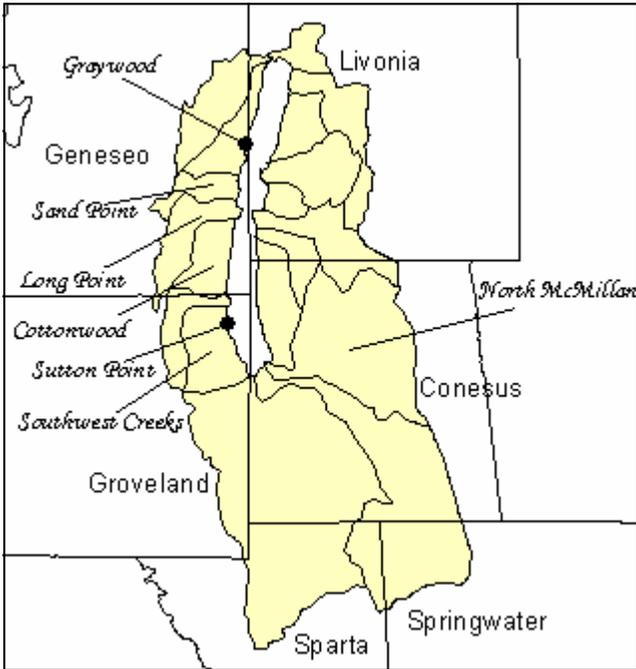


Figure 4. Plot shows count of fecal coliforms sampled in public beaches along Conesus Lake shore, May—August 2002 and 2003. Notice values are plotted using a logarithmic scale.

Makarewicz's graduate students is creating a DNA library of coliform bacteria for use in identifying the source of bacteria. Once complete, this library will help investigators pinpoint whether bacteria are from waterfowl, cattle, domestic pets, or wildlife such as deer and raccoons. With source identification, appropriate management measures can be selected.



Sedimentation

Since August 2002, investigators have made weekly measurements of streamflow and the loss of nutrients and sediment at seven locations around Conesus Lake. This comprehensive program is part of the USDA research program led by Dr. Makarewicz. The monitoring program continues to highlight geographical areas of concern around the lake. In addition to monitoring, program includes implementation of agricultural Best Management Practices.

Lakeshore Towns have taken action to control erosion and sedimentation associated with development areas by adopting local laws based on the CLWMP Model Erosion and Sedimentation Control Law.

Sites used in the USDA research program include:

Graywood Gully, Sand Point, Cottonwood, Long Point, North McMillan, Sutton Point, Southwest Creeks. Data are posted weekly to the project web site (http://www.envsci.brockport.edu/Conesus_Project/Hydrologic_Data.htm).

Data analysis is likely to include both “before and after” analysis on treatment subwatersheds (where agricultural BMPs have been installed) and treatment vs. control areas.

Figures 5 and 6 show area loading for the seven subwatersheds in the USDA study. It is important to notice that both figures are based on preliminary data and may be subject to revision. (Data source: SUNY Brockport project web site http://www.envsci.brockport.edu/Conesus_Project/Hydrologic_Data.htm).

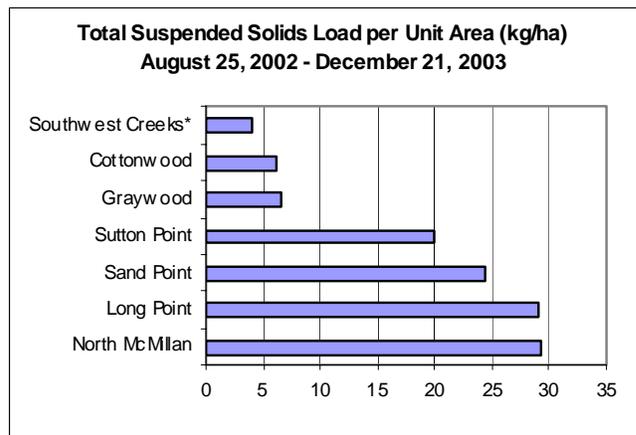


Figure 5. PRELIMINARY DATA SUBJECT TO REVISION..

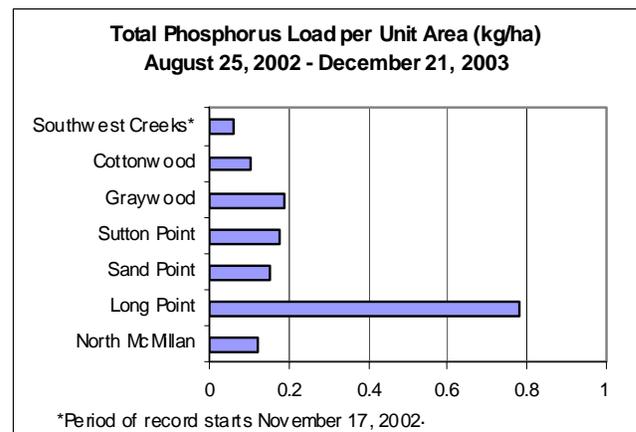


Figure 6. PRELIMINARY DATA SUBJECT TO REVISION.

Pesticides

The open waters of Conesus Lake continue to have detectable concentrations of pesticides and their breakdown products. Concentrations have remained relatively constant (neither increased nor decreased) since the initial sampling in 1997-1998. No pesticides exceeded health-based water quality standards.

The USGS sampled the Village of Avon water intake in Conesus Lake on ten occasions between May 16, 2000 and January 29, 2002 to test for pesticides and metabolites. Specialized analytical techniques were used to test for the presence of these chemicals at trace concentrations. According to David Eckhardt of USGS the program will not continue due to budget cuts.

Results indicate that the suite of pesticides present at the water intakes has remained constant (no new chemicals detected) and that concentrations have remained comparable over the 5 years of monitoring. A summary table from the Characterization Report has been updated to present the new USGS data. As evident from comparing the column “maximum concentration detected” with the column “criteria or standard”, concentrations remain well below levels considered safe for human and environmental health.

Compound Detected	Percent of Observations with Detectable Concentration	Maximum Concentration Detected (µg/l)	Criteria or Standard (µg/l)
Simazine	100	0.058	0.5
Prometon	70	0.036	50
De-ethyl atrazine	90	0.041	50
Cyanazine	70	0.01	1
Metalochlor	100	0.034	50
Atrazine	100	0.114	3
Alachlor ESA	90	0.22	50
Alachlor OXA	20	0.06	50
Metalochlor ESA	100	0.34	50

Source: http://nwis.waterdata.usgs.gov/usa/nwis/qwdata?site_no=424937077422101

Zebra mussels

The invasive species, the zebra mussel, continues to be an important component of the benthic community of Conesus Lake.

Increasing chloride (salt) concentrations

As noted in the Watershed Characterization Report, chloride concentrations in Conesus Lake have steadily increased as the watershed became more developed. No recent lake-wide data is available to report on whether this trend has slowed or been reversed. However, efforts are underway to control chloride inputs to the lake. As an example, the Town of Conesus is planning to complete construction of their salt storage structure by the end of 2004.

NEW INVESTIGATIONS—2003

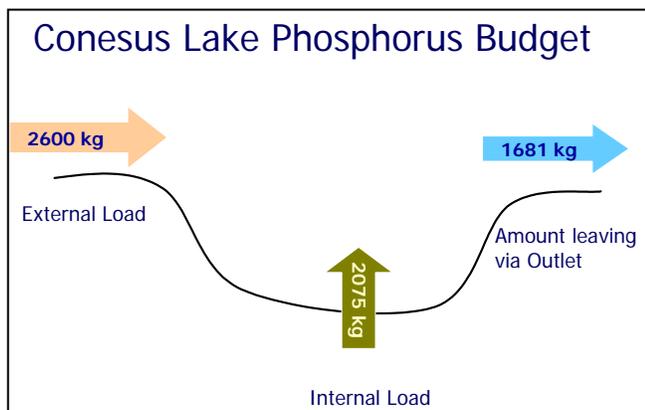
Sampling and analysis in support of the alum evaluation

The CLWMP included a recommendation to investigate the feasibility of nutrient inactivation using alum to control algae and improve water clarity. Sampling and analysis during 2003 were conducted to help define the magnitude and importance of internal phosphorus loading. Results indicate that phosphorus release from the sediments (estimated at 2100 kg per year) is comparable to phosphorus coming in from the watershed (estimated at 2600 kg/yr).

One recommendation of the Conesus Lake Watershed Management Plan was to evaluate the potential effectiveness of an alum application. This evaluation was completed in 2003 and has provided new insights into the magnitude and importance of the two sources of phosphorus to the lake: external (from the watershed) and internal (from the sediments). Alum application is directed at controlling phosphorus recycled from the lake sediments.

Surface runoff (which includes streamflow and stormwater runoff) is the primary external source of phosphorus to Conesus Lake. Monitoring data suggest that the external phosphorus load is on the order of 2600 kg/yr. The external loading varies each year depending on the amount of rainfall and extent of land disturbance in the watershed.

For the first time, detailed monitoring was completed in summer 2003 to quantify the magnitude of internal phosphorus loading to Conesus Lake water quality. Results indicated that the sediment contribution of phosphorus is approximately 2100 kg/yr, an amount comparable to the external loading.



Because internal phosphorus loading is significant in Conesus Lake, controlling this source with an alum application would effectively reduce the amount of phosphorus available for algal growth. This is expected to measurably improve water quality and result in improved water clarity and reduced frequency of algal blooms. The alum dose being proposed for Conesus Lake is based on an expected useful life of approximately 10 years. The useful life will depend on a number of factors including how effectively external phosphorus loading is controlled.

Analysis of calcium carbonate levels in lake water and sediment

Recent investigations of the geochemistry of the Finger Lakes indicate that the surface waters of many lakes, including Conesus, are now supersaturated with calcium carbonate (calcite) during the summer. This appears to be a direct result of acid precipitation. In

1972, Conesus Lake was undersaturated with calcite; by 1999 the lake waters had become supersaturated. This finding has implications on the lake's water clarity. The excess calcite can precipitate as the lake waters warm and pH increases with photosynthetic activity. Algal cells may act as nucleation sites for precipitation of the calcite. This leads to cloudy, turbid water.

Based on recent lake water quality data, the surface waters of many of the Finger Lakes are now supersaturated with calcium during the summer. According to researchers, the elevated concentrations of calcium carbonate present in many of the Finger Lakes are a result of the region's geology. A recent publication presents compelling data that the calcium concentrations in the lakes' waters are increasing as a result of acid precipitation (Lajewski et al. 2003).

During most of the year, calcium carbonate remains dissolved in the cold water of the Finger Lakes, but as the lakes warm up, the solubility of calcium carbonate is lowered. As a result, the calcium carbonate may precipitate out of the water, forming clouds of very small solid particles. These are referred to as "whiting events".

Algal cells may trigger whiting events, along with increased calcium concentrations and higher water temperatures. In addition, pH increases during photosynthesis can cause precipitation of dissolved calcium. Because of the relationship between warm temperatures, algal cells, and pH increases during photosynthesis, whiting events are typically seen during the summer.

Source: Lajewski, C.K., H.T. Mullins, W.P. Patterson, and C.W. Callinan. 2003. *Historic calcite record from the Finger Lakes, New York: Impact of acid rain on a buffered terrane. GSA Bulletin: 115 (3) p. 373-384.*

PART B: CLWMP RECOMMENDATIONS STATUS UPDATE

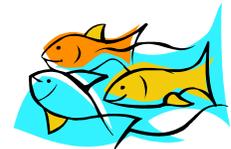
No.	Recommendation	Priority	% Completed	Comments
	Creation of a Conesus Lake Watershed Council and its Committees.	High	100%	
A-1	Review and amend zoning regulation.	High	10%	In progress as part of G/FLRPC local laws project
A-2	Adopt local sediment and erosion control laws based on the CLWMP Model Erosion and Sediment Control Law	Medium	100% (lakeshore Towns)	
A-3	Develop public education campaigns: <ul style="list-style-type: none"> • Encourage planting and protection of streamside vegetation • Discourage use of herbicides, pesticides, and fertilizers on shoreline properties • Erosion control and lake-friendly landscaping 	Medium	5%	
B-1	Secure funding to help mitigate the financial impacts of changes in agricultural practices on the producers.	High	15%	USDA grants, SWCD, and FSA programs
B-1, B-2	Implement practices that will reduce nonpoint source pollution from farms.	High	10%	
B-3*	Develop & implement programs for waste removal from farms	High	0*	
B-4	Develop programs for public education and outreach for both the agricultural and the non-agricultural community.	High	0%	
B-5	Recruit additional agricultural producers to serve on advisory committee during implementation phase of watershed management plan	High	25%	
C-1	Develop and implement program to restore and stabilize streambanks in the watershed.	High	0%	
C-2*	Identify & develop sites for regional stormwater treatment areas	Low	0*	





No.	Recommendation	Priority	% Completed	Comments
D-1	Provide training on erosion control practices for Municipal Highway Departments	High	100%	On-going annually
D-2	Implement best management practices, such as hydroseeding or other approved methods, as soon as possible after road construction or maintenance activities occur in the watershed.	Medium	15%	
D-3	Municipal Highway Departments should develop a plan, subject to available funding, to remediate ditches in poor condition.	Medium	5%	
D-4*	Develop plan to phase-in computer controlled spreaders on trucks used for winter de-icing	Low	0*	
D-5	Develop public education campaigns: <ul style="list-style-type: none"> • Sensible winter driving • Why and when are road ditches cleaned • Need to keep yard debris and trash out of road ditches 	Low	0%	
E-1, E-6	Revise Watershed Rules and Regulations	High	100%	Sent to NYSDOH for approval
E-2	Develop a public education campaign: <ul style="list-style-type: none"> • Effect of boat speed on weeds (creates weed-chop) • Precautions to follow when discarding unused bait or transporting bait from one waterbody to another (exotic species introduction) • Need to clean and inspect boat (body, bilge, coolant system, etc.) and trailer when transporting from one waterbody to another (exotic species introduction) • Existing boat and personal watercraft laws 	High	15%	
E-3	Continued enforcement of existing boat and personal watercraft laws	High	100%	On-going annually
E-4	Amend Town dock laws to add the provision of 24-hour access to toilet facilities to the list of requirements for granting a Special Use Permit.	Medium	0%	Part of G/FLRPC local laws project
E-5*	Winterize toilet facilities at State Boat Launch and Long Point Park.	Medium	0*	

No.	Recommendation	Priority	% Completed	Comments
F-1	Request NYSDEC to review and update safe water yield calculations for Conesus Lake.	High	0%	
F-2	Extend sewer system	Medium	15%	
F-3	Control sanitary sewer overflows within the collection system.	Medium	15%	On-going
F-4*	Develop protocol and timeline to inventory septic/sanitary systems in watershed.	Low	0*	
G-1	Investigate and implement effective methods to control the spread of non-native (exotic) organisms.	High	5%	
G-2	Develop and implement a program for cleaning accumulated aquatic plants and algae along the shoreline of Conesus Lake.	High	0%	
G-3	Initiate effort to determine if alum treatment to control release of phosphorus from deep lake sediments would be effective in Conesus Lake. Proceed with plans for implementation if effectiveness is warranted and monitor for environmental impacts.	High	10%	
G-4	Initiate effort to determine if increased stocking of walleye fingerlings, or other species, would be an effective biological control in Conesus Lake.	High	20%	
G-5	Initiate an experimental program for control of aquatic weeds using the aquatic moth and/or weevil.	Medium	0%	
G-6*	Develop program for suctioning weeds from shallow public areas	Low	0*	
G-7*	Develop weed harvesting program	Low	0*	
H-1	Conduct an annual monitoring program of Conesus Lake and its watershed. An annual monitoring meeting should be held to coordinate the monitoring program.	High	100%	On-going annually
H-2	Prepare and distribute an annual Conesus Lake and Watershed Report Card	High	100%	



*These recommendations were not targeted for work in 2003.

Key to Acronyms

CLWMP—Conesus Lake Watershed Management Plan
 FSA—Farm Services Agency
 G/FLRPC—Genesee/Finger Lakes Regional Planning Council

NYSDEC—New York State Department of Environmental Conservation
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 SWCD—Soil and Water Conservation District
 USDA—United States Department of Agriculture



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