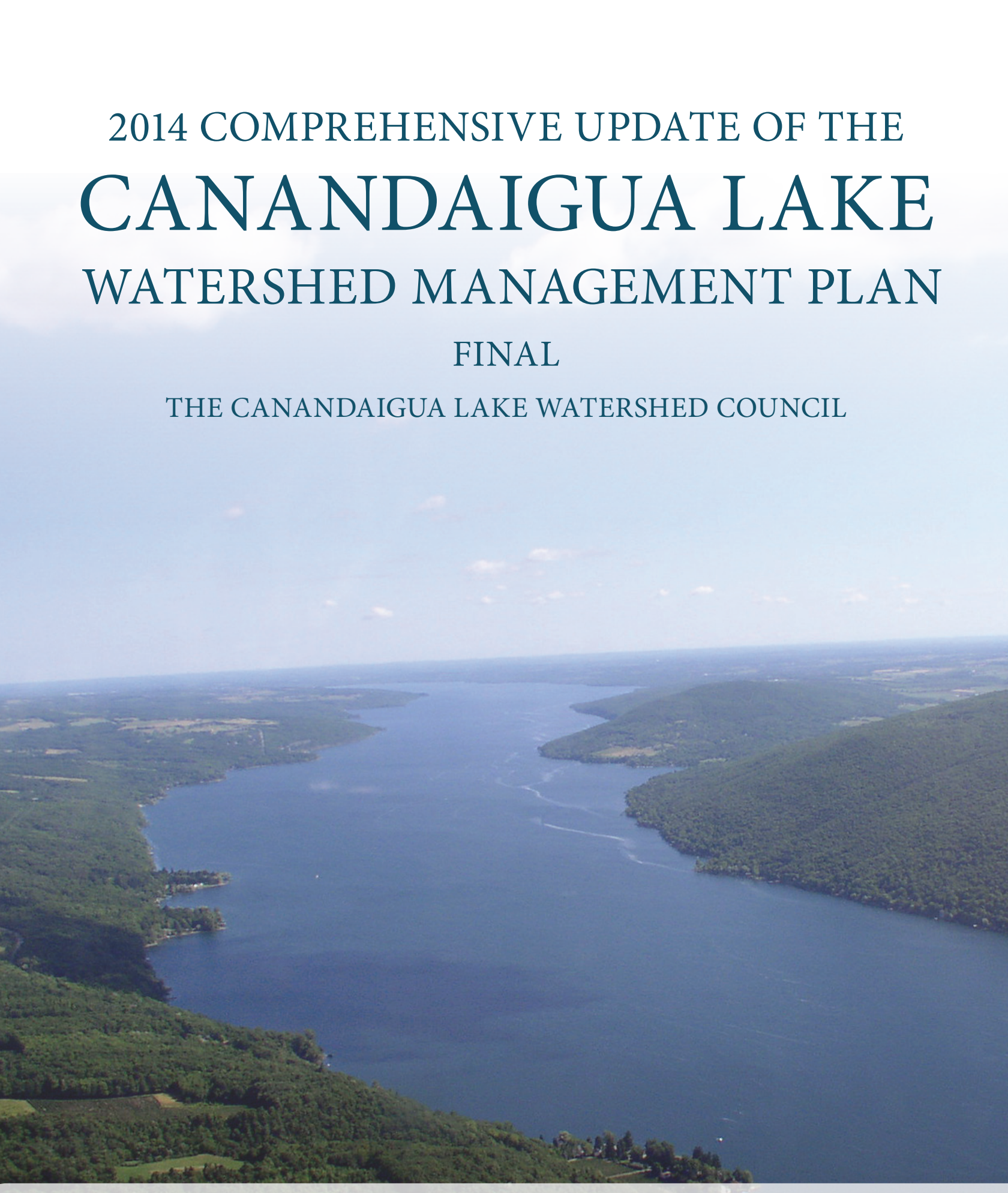
2014 COMPREHENSIVE UPDATE OF THE CANANDAIGUA LAKE WATERSHED MANAGEMENT PLAN

FINAL

THE CANANDAIGUA LAKE WATERSHED COUNCIL



PROTECTING THE LIFEBLOOD OF OUR REGION

Acknowledgments

Funding for the update of the Canandaigua Lake Watershed Management Plan was provided through the New York State Department of State Division of Coastal Resources under Title 11 of the Environmental Protection Fund. Additional funding was provided through the Canandaigua Lake Watershed Council and its member municipalities.

The update of the Canandaigua Lake Watershed Management Plan was prepared by the diligent efforts of the following government officials, agencies, community advisors and consultants.

CANANDAIGUA LAKE WATERSHED COUNCIL

Co-chair Fred Lightfoote, Supervisor, Town of Gorham
Co-chair Robert Green, Supervisor, Town of Bristol
Treasurer Ellen Polimeni, Mayor, City of Canandaigua
Margaret Hilton, Supervisor, Town of Hopewell
Pamela Helming, Supervisor, Town of Canandaigua
Barbara Welch, Supervisor, Town of South Bristol
June Pendleton, Councilwoman, Town of Potter
Mary Mueller, Councilwoman, Town and Village of Naples
Mike Gonzalez, Head Operator, Village of Newark
Peter Gerbic, Councilman, Town of Middlesex
Allan Button, Councilman, Town f Middlesex
Chuck Elwell , Trustee, Village of Rushville
Ruth Craig, Councilwoman, Town of Italy
Marty Aman, Executive Director, Wayne County Water and Sewer Authority

Watershed Program Manager: Kevin Olvany
205 Saltonstall St.
Canandaigua, NY 14424
585 396-3630
Kevin.Olvany@canandaiguanewyork.gov
www.canandaigualake.org

Watershed Council Interns who provided extensive writing and research:
Kimberly Falbo
Nadia Harvieux

Recent Watershed Council members:
Sam Casella
Dan Marshall
Dan Paddock
Corky Timerson

Canandaigua Lake Watershed Commission:
George Barden, Watershed Inspector - for over 20 years

Canandaigua Lake Watershed Association:
Significant assistance on educational and protection programs

State of New York
Tracey O'Malley, Coastal Resource Specialist, New York State Department of State (DOS)
Ken Smith, New York State Department of State (DOS)
Peter Austerman, Fisheries Specialist, New York State Department of Environmental Conservation (NYSDEC)

Ontario and Yates County
Dr. Bruce Gilman, FLCC - substantial writing in the Water Quality section and many years of field and consulting assistance
Maria Rudzinski, Ontario County Planning Department
Russell Welser, Ontario County Cornell Cooperative Extension
Sheri Norton, Ontario County Information Services
Kerry Haefele, Ontario County Soil and Water Conservation District
Tom Eskilson, Yates County Soil and Water Conservation District
Betsy Landre, Ontario County Planning Department
Finger Lakes Land Trust- open space GIS datasets and Open Space Plan
Steve Lewandowski, Canandaigua Lake Watershed Association

Graphic Design: Kimberly Falbo & Kevin Olvany

Photo Credits:
Finger Lakes Visitors Connection
Nadia Harvieux
Bill Banasewski
Kevin Olvany
Finger Lakes Land Trust
And many more!

Canandaigua Yacht Club at sunrise

TABLE OF CONTENTS

1. INTRODUCTION

This most recent update of the Canandaigua Lake Watershed Management Plan builds on the knowledge gained and projects completed over the last fourteen years to develop a more comprehensive strategy to protect Canandaigua Lake and its surrounding watershed from existing and emerging threats. National, State and local research have all documented that the watershed area surrounding the lake plays a critical role in the overall water quality of the lake. Therefore, protection at the watershed level is vital in protecting all that a healthy Canandaigua Lake ecosystem provides the region.

Canandaigua Lake is one of New York's eleven renowned Finger Lakes, which are nestled between the glacially-carved rolling hills that are iconic to this part of New York State. State and local research have documented that Canandaigua Lake continues to be a high quality water resource (See Water Quality section). Municipal surveys have documented time and again that the beauty and quality of Canandaigua Lake is, without question, one of the main reasons most people live in or visit the region.

Map of the Finger Lakes Region in Central New York.

MUNICIPAL SURVEYS HAVE DOCUMENTED TIME AND AGAIN THAT

THE BEAUTY AND QUALITY OF CANANDAIGUA LAKE

IS, WITHOUT QUESTION, ONE OF THE MAIN REASONS MOST PEOPLE LIVE IN OR VISIT THE REGION

This most recent update of the Watershed Plan makes the protection and restoration of critical areas a major area of focus, utilizing a wide array of strategies. Some examples of these critical areas include: wetlands, shorelines, streamside/roadbank buffer areas, floodplains, forested areas and other areas that filter and reduce stormwater runoff. Protecting and restoring these critical areas provides substantial beneficial services to individuals and the overall community within and beyond the watershed boundaries.

These critical land areas are our natural assets and therefore are considered our Natural Capital due to the stream of economic and quality of life benefits these areas provide to the greater public. Natural Capital is defined as "consisting of those components of the natural environment that provide a long-term stream of benefits and services to individual people and to society as a whole" (Costanza et. al, 2010). Natural Capital areas can range in size from an individual one-thousand square foot rain garden/stream buffer to the landscape scale one-hundred plus acre forests. Protecting, restoring and enhancing the functional value of these Natural Capital areas utilizing the five main management approaches of research, education, open space protection, restoration and regulation are identified throughout the implementation section.

Canandaigua Lake is considered a major economic engine to the region based on the ecosystem services that a healthy lake and watershed provides the region. The Natural Capital of the watershed provides the following ecosystem services to the region:

- High quality drinking water supply for approximately 70,000 people that has low water filtration costs and ultimately low water supply rates. Higher quality raw water reduces the potential for contaminants/pathogens to get through the filtration process.
- Major recreation and tourism destination that includes boating, sailing, kayaking, canoeing, sightseeing, fishing and swimming; generating millions for the region each year. The latest estimates from DEC show that the lake is the 23rd most fished waterbody in New York State with an estimated $2.3 million dollar boost to the local economy from fishing in the lake.
- The value of the lake-influenced tax base is over $1 billion, helping to reduce the overall local/school and county tax rate. The market based assessed value for shoreline property is over $11,000 per foot of shoreline in some areas. Numerous studies have linked the market value of shoreline properties to the quality of the lake that those properties adjoin.
- Numerous municipal surveys have documented that the beauty and quality of Canandaigua Lake is, without question, one of the main reasons most people live in or visit the region. In addition, these surveys also document that residents place a great value on protecting the water quality of Canandaigua Lake. These surveys are buttressed by the actual population increases that are occurring around Canandaigua Lake, which is counter to the overall population trend in the Genesee Finger Lakes region.

> NATURAL CAPITAL: consisting of those components of the natural environment that provide a long-term stream of benefits and services to individual people and to society as a whole
> Costanza et. al, 2010

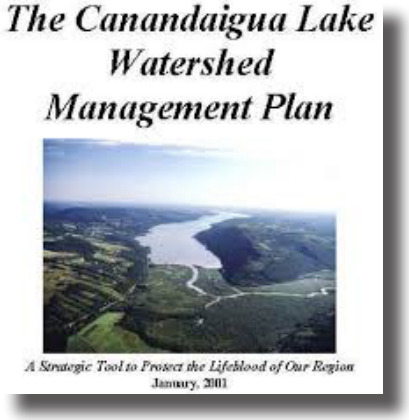
Based on this list, it is obvious that the natural capital of the watershed contributes greatly to the economy and overall quality of life. If the watershed ecosystem remains in good health, then the region can expect a high rate of return from the Natural Capital that is provided. People truly do come here for our unique area and there will be a high demand for these services as long as the natural capital is protected and enhanced. Canandaigua Lake is not only a financial driver for communities within the watershed, but also improves the quality of life for local residents through its beauty and intrinsic value. For these reasons, Canandaigua Lake is considered the lifeblood of this region.

WATERSHED PLANNING OVER TIME

Watershed protection has been a community focus since the late 1980s, when community leaders and county agencies formed the Canandaigua Lake Watershed Task Force with the goal of raising awareness about the issues facing Canandaigua Lake. In 1994, the Task Force developed the State of the Canandaigua Lake Watershed, a comprehensive inventory of the watershed that identified potential pollution sources and provided recommendations to improve and protect the Canandaigua Lake ecosystem. From this report, the Task Force asked the fourteen municipalities that are within the watershed or that draw water from the lake, to come together to review the recommendations and to ultimately take the lead on implementing these strategies.

The Canandaigua Lake Watershed Council in 2005

The Task Force was successful in this Call to Action by gaining municipal involvement and leadership in the planning process. In 1998, the municipalities received a grant from the New York State Department of State to hire a consultant to work with the municipalities and other interest groups to develop these recommendations into a formal Watershed Management Plan. In 1999, the Watershed Plan was finalized and the fourteen municipalities adopted the Plan. The municipalities also agreed to a funding formula to distribute the costs of Watershed Program and formed the Canandaigua Lake Watershed Council through Intermunicipal Agreement to lead the partnership effort in implementing this comprehensive watershed strategy.



The Canandaigua Lake Watershed Council is now in its 15th year of existence in implementing the comprehensive watershed protection program. The Watershed Council consists of the fourteen watershed and water purveying municipalities (Towns of Canandaigua, Bristol, South Bristol, Potter, Naples, Gorham, Italy, Middlesex and Hopewell, Villages of Newark, Palmyra, Naples and Rushville and the City of Canandaigua), with each municipality sending their chief elected official or other elected municipal board member to Watershed Council meetings. The Watershed Manager, who is overseen by the Council, is responsible for recommending and implementing management decisions approved by the Watershed Council, along with coordinating with all the various partners.

The Watershed Council provides a base level of funding to support the watershed program through a fair share formula that equitably divides the costs of the program among the fourteen municipalities. The Watershed Council and its member municipalities have been successful in obtaining over $1 million in grant funding through various agencies, including NYS Dept. of State and NYS Dept. of Environmental Conservation, to help implement many priority actions that will be highlighted throughout this Plan update. Through successful grants and wise spending, the total municipal contributions to the Watershed Council has only increased by 4% in fourteen years. The intermunicipal agreement that brings the municipalities together has been reaffirmed every five years since 2000, most recently in 2014.

Based on the intermunicipal leadership of the program, the Watershed Council has also received the prestigious NYS-DEC Environmental Excellence Award and the EPA Clean Water Partner for the 21st Century Award based on the intermunicipal success of the program.

The Council received the first annual Environmental Excellence Award in 2004 from DEC Commissioner Erin Crotty.

PARTNERSHIP APPROACH

Although the Watershed Council was established to lead the watershed protection effort, no single entity can provide comprehensive protection of the lake. Continuing and enhancing the partnerships with a wide range of organizations will be what ultimately make this effort successful.

In addition to the Watershed Council, there are two other entities that share the first three words (Canandaigua Lake Watershed) in their names and play an instrumental role in the watershed program's success: The Canandaigua Lake Watershed Commission and the Canandaigua Lake Watershed Association.

The **Watershed Commission** consists of the five municipal water purveyors (City of Canandaigua, Villages of Newark, Palmyra and Rushville and Town of Gorham) that are required to implement the State Health Law derived Watershed Rules and Regulation to protect the water supply. These regulations focus mainly on Onsite Wastewater Treatment Systems, but also have a general pollution clause. They employ a full time Watershed Inspector to make sure the rules and regulation are implemented. The Watershed Inspector and Watershed Program Manager partner on many activities and investigations to make sure pollution sources are eliminated.

The **Watershed Association** is a citizen advocacy organization that provides the non-governmental voice in Watershed Management. They have over 800 members and have passionate volunteers along with part-time paid staff. They help to fund specific components of the protection effort, with an emphasis on education. The Association also helps to co-fund implementation projects. In addition, they play an important role in lobbying for specific legislation to be approved by local municipalities.

A wide spectrum of additional organizations at the local, regional and state/federal levels are integral to the comprehensive watershed effort.

Marcus Whitman Eco-school Program participating in the Naples Creek willow planting program.

PARTNERS

LOCAL LEVEL:

- Finger Lakes Community College
- Ontario and Yates County Soil and Water Conservation Districts
- Ontario and Yates County Cornell Cooperative Extension
- Ontario and Yates County Planning
- Ontario and Yates County Information Services
- Ontario and Yates County Public Works/ Highway Departments
- Ontario County Water Resources Council

REGIONAL LEVEL:

- Finger Lakes Land Trust
- Finger Lakes Institute
- Genesee Finger Lakes Regional Planning Council

STATE/FEDERAL LEVEL:

- Dept. of Environmental Conservation (DEC)
- Dept. of Health (DOH)
- Dept. of Transportation (DOT)
- Natural Resource Conservation Service/ Farm Service Agency
- The Nature Conservancy
- U.S. Fish and Wildlife Service

The projects completed either by or in partnership with these entities over the last decade will be highlighted throughout the Plan, along with the future potential partnerships to complete the strategies identified in this comprehensive update of the Watershed Plan.

WATERSHED EDUCATION

Fostering a community focused on watershed stewardship requires strong partnerships and effective collaboration between all stakeholder groups, ranging from individual citizens to municipalities to community organizations to regional/state entities. Watershed education is a key component to generating support for the strategies that need to be implemented by these stakeholder groups. Here in the Canandaigua Lake watershed, we are fortunate to have those strong community relationships and many successful stewardship initiatives are centered on education, outreach and service activities.

Getting information out to the general public and raising awareness about water quality issues and solutions is vital to protecting the Canandaigua Lake watershed. Through these stewardship activities, we are creating a community of individuals who are informed about water quality threats and care about protecting the Canandaigua Lake watershed. Described next are two specific projects that highlight the type of partnerships and collaborations that are working towards creating a community dedicated to watershed stewardship:

Sharon Radak of the Canandaigua Lake Education Program discussing watershed protection with kids using the Enviroscape.

THE WATERSHED EDUCATION PROGRAM

The Canandaigua Lake Watershed Association and Watershed Council have worked together since 2006 to co-sponsor the Watershed Education Program, which provides watershed-focused curricular enrichment activities and workshops to the three school districts within the watershed: Naples, Marcus Whitman and Canandaigua. Combined, the program's environmental educators teach nearly 2,000 K-12 students each year about the Canandaigua Lake watershed, the relationship between land use/stormwater runoff and water quality, ways to prevent water pollution and the importance of a healthy aquatic ecosystem. Additionally, the program's Mini-Newsletter is published twice a year and is sent home to families with updates on lake issues, such as, stormwater management, aquatic invasives, and tips for preventing water pollution around landowner's homes, such as proper fertilizer use and application.

STORM DRAIN MARKING PROGRAM

CLWA and the Watershed Council also partner on the Storm Drain Marking Project, which works with local schools and youth service groups to place markers on storms drains within the Canandaigua Lake Watershed boundaries. This project is critical to educating the public on the direct connection between stormwater runoff and lake water quality.

These stewardship programs are just two of the many examples of the types of collaborations that exist within the Canandaigua Lake Watershed community and should serve as models for future stewardship initiatives.

Children installed the storm drain markers throughout the watershed.

Overlooking Bare Hill

INTEGRATED WATERSHED MANAGEMENT APPROACH

INTEGRATED WATER RESOURCES MANAGEMENT

Integrated water resources management (IWRM) is the coordinated planning, development, protection, and management of water, land, and related resources in a manner that fosters sustainable economic activity, improves or sustains environmental quality, ensures public health and safety, and provides for the sustainability of communities and ecosystems.

Operationally, IWRM approaches involve applying knowledge from various disciplines as well as the insights from diverse stakeholders to devise and implement efficient, equitable, and sustainable solutions to water and development problems.

-American Water Resources Association

The existing plan and this comprehensive update embody the principles of integrated watershed management and adaptive management, focusing on multiple aspects to protect not only the lake, but also all of the tributaries and lands within the watershed that contribute to the overall lake health. Key to implementing the plan is collaboration, partnership and stakeholder involvement from existing agencies, organizations and individuals. The plan seeks to protect, improve, and sustain the environmental resources and all of the important services these ecosystems provide, while continuing to provide high quality drinking water and recreation for the surrounding communities.

Water quality protection in the Canandaigua Lake Watershed is achieved by the following management approaches: Research, Education, Restoration/Remediation, Open Space Protection and Regulation.

RESEARCH

A comprehensive monitoring program documents the health of the lake and its tributaries and helps to identify sources of pollution. Computer modeling is also used and has the ability to estimate pollution sources and loads. Where possible, research also helps measure the success of management.

EDUCATION

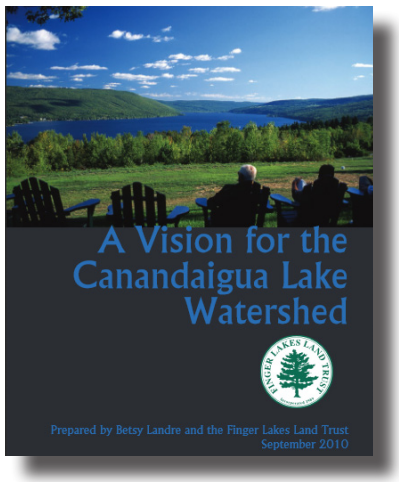
Empowering citizens to be stewards of the watershed is essential, as approximately 90% of the watershed is privately owned. Education prevents seemingly insignificant actions of an individual from accumulating across the watershed into a larger problem. Also, citizen involvement and investment in the watershed bolsters support for management activities.

RESTORATION/REMEDIATION

The most efficient management is pollution-prevention of existing resources. However, restoration and remediation are essential tools to reverse past damage and to mitigate the effects from new impacts. This category includes stream stabilization projects, wetland creation projects, stormwater retrofits, and other approaches to provide tangible water quality improvements.

OPEN SPACE PROTECTION

Permanent protection of sensitive areas can provide critical water quality protection and can be achieved through partnerships with land owners, municipalities, land trusts and state agencies. In particular, the Finger Lakes Land Trust plays a critical role in protecting open space in the watershed. They have made numerous land acquisitions and easements throughout the watershed. They have developed an open space strategy entitled: "A Vision for the Canandaigua Lake Watershed" to help guide and prioritize their land protection efforts.



REGULATION

Land use regulations such as zoning, subdivision, site plan review, building codes, stormwater and floodplain management, and onsite wastewater are just a few ways municipalities can ensure development and human activity minimally impact the lake. These regulations are particularly important for reducing non-point source pollution. The municipalities have primary land use control in New York State. The Watershed Council provides assistance to the municipalities in developing regulations and technical assistance in implementing regulations.

2. CHARACTERISTICS OF THE LAKE AND WATERSHED

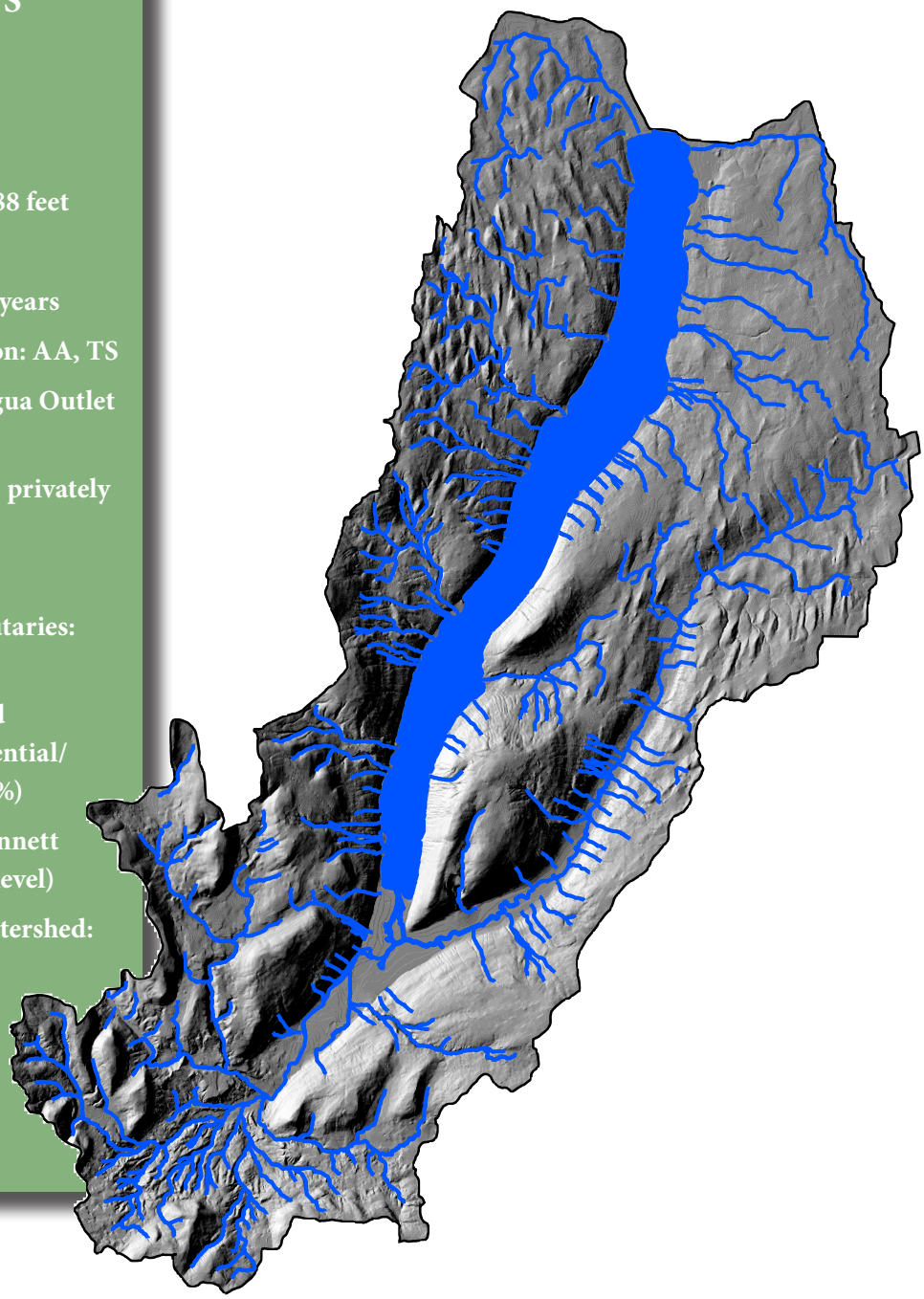
OVERVIEW

Canandaigua Lake is the third largest of the Finger Lakes in terms of volume, containing about 433 billion gallons of water. The lake is 15.5 miles long, averages 1.1 miles wide, and a maximum of 276 feet deep. The lake itself covers about 10,553 acres, making it the fourth largest in terms of surface area. The mean elevation of the Canandaigua outlet(s) is 688 feet above sea level.

CANANDAIGUA LAKE WATERSHED FACTS

- Lake Length: 15. 5 miles
- Average Width: 1.1 miles
- Maximum Depth: 276 feet
- Mean Lake Surface Elevation: 688 feet
- Volume: 433 billion gallons
- Hydraulic Retention Time: 13.4 years
- DEC Water Quality Classification: AA, TS
- Water Level Control: Canandaigua Outlet and Feeder Canal—35 cfs/day
- Shoreline Length: 36 miles (97% privately owned)
- Subwatersheds: 34
- Estimated Total Length of Tributaries: 350 miles
- Watershed Land Cover: Forested (45%), Agriculture (26%), Residential/ Commercial (10%), Wetlands (5%)
- Highest Point in Watershed: Gannett Hill (2,256 feet above mean sea level)
- Major Municipalities within Watershed: 12
- Water Purveyors: 6 (City of Canandaigua, Palmyra, Newark, Gorham, Rushville and Bristol Harbor)

CANANDAIGUA LAKE WATERSHED SHOWING LANDSCAPE RELIEF



INFLOWS:

Most of the water reaching the lake arrives from the surrounding watershed through the vast network of watercourses. Principal streams flowing into Canandaigua Lake include: West River, Naples Creek, Menteth Gully, Seneca Point Creek, Tichenor Gully, Sucker Brook, Deep Run Creek, Fall Brook, and Vine Valley Creek. The watershed also has over a hundred smaller tributaries that enter directly into the lake. The watershed area has been broken into 34 subwatersheds and direct drainage basins for study and management purposes.

OUTFLOWS:

Canandaigua Lake is drained by two outlet channels. The eastern channel, called the Canandaigua Outlet, is the main flood control channel that flows through Lagoon Park. The western channel, the Feeder Canal, was excavated by the City in the early 1900s to convey treated wastewater downstream from the City of Canandaigua. The Feeder Canal converges with the Outlet between County Road 46 and County Road 4. The City of Canandaigua was given the authority to manage the flow from the lake in 1886 by New York State and has control gates on both channels (Feeder Canal and Outlet). A flow of 35 cubic feet per second is required in the Feeder Canal in order to properly assimilate the wastewater discharges from the City Wastewater Treatment Plant and other plants downstream.

Outlet gates , located behind Wegmans, in the closed position

SEASONAL LAKE CHANGES:

Seasonal changes occur in the lake. The lake levels vary due to the balance of inflows, outflows and evaporative losses along with outlet gate management by the City of Canandaigua. The levels are highest in the spring due to rain and snowmelt events. The levels then decline through the summer and fall, reaching the lowest level in the winter. Additionally, the lake's temperature profile changes through the seasons. The lake is thermally stratified during the summer, i.e. has a layer of warmer water floating above a layer of colder water. During the fall, typically between late November and early December, the lake "turns over", where it is fully mixed again. During most winters, large ice-free zones help keep the lake well mixed and prevent the lake from thermally stratifying during the winter. However, in 2014, extensive ice cover caused the lake to freeze and to stratify through the late winter months.

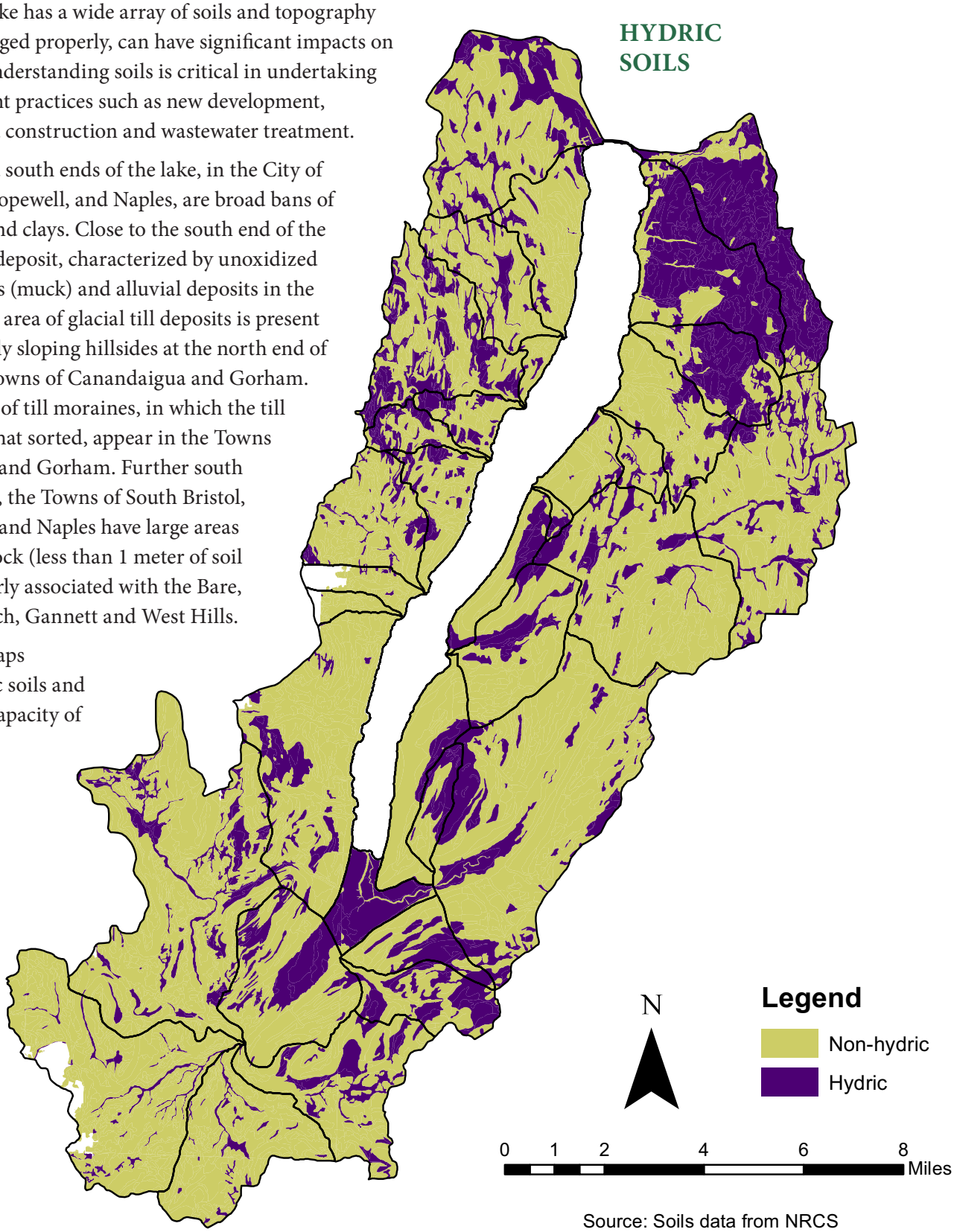
Location of the Feeder Canal and the Main Outlet Gates

SOILS

Canandaigua Lake has a wide array of soils and topography that, if not managed properly, can have significant impacts on water quality. Understanding soils is critical in undertaking land management practices such as new development, agriculture, road construction and wastewater treatment.

At the north and south ends of the lake, in the City of Canandaigua, Hopewell, and Naples, are broad bans of lacustrine silts and clays. Close to the south end of the lake is a swamp deposit, characterized by unoxidized organic materials (muck) and alluvial deposits in the lake bed. A large area of glacial till deposits is present on the moderately sloping hillsides at the north end of the lake in the Towns of Canandaigua and Gorham. Small inclusions of till moraines, in which the till has been somewhat sorted, appear in the Towns of Canandaigua and Gorham. Further south in the watershed, the Towns of South Bristol, Middlesex, Italy and Naples have large areas of exposed bedrock (less than 1 meter of soil cover), particularly associated with the Bare, South, East, Hatch, Gannett and West Hills.

The following maps document hydric soils and the infiltration capacity of the soil.



Source: Soils data from NRCS

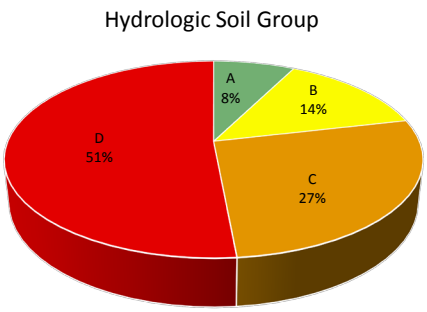
HYDROLOGIC SOIL GROUP

"A" SOILS: Soils with low runoff potential (very high infiltration). These soils have high infiltration rates and consist chiefly of deep, well drained to excessively well- drained sands or gravels.

"B" SOILS: Soils having moderate infiltration rates, consisting chiefly of deep, moderately well drained soils with somewhat coarse textures.

"C" SOILS: Soils having slow infiltration rates consisting chiefly of soils with a layer that slows downward movement of water, or soils with moderately fine to fine textures.

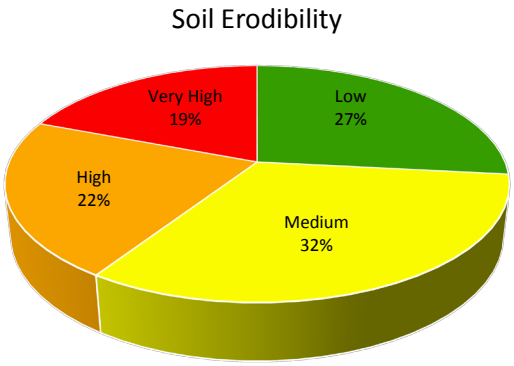
"D" SOILS: Soils with high runoff potential (very low infiltration rates), consisting chiefly of clay soils with a high swelling potential, soils with a permanent high water table, and shallow soils over nearly impervious material.



Source: Soils data from NRCS

SOIL ERODIBILITY

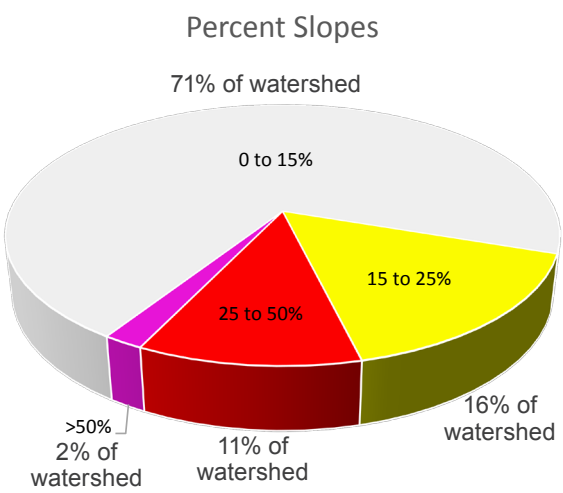
Soils differ in how susceptible they are to erosion. A soil's erodibility is affected by many different factors, including its texture and structure. The map below shows soil erodibility for Ontario and Yates Counties.



Source: Soils data from Ontario and Yates County Soil Survey.

TOPOGRAPHY

The topographic variation changes from the north to the south within the watershed. The southern half of the watershed is characterized by higher elevations, reaching 2,256 feet above mean sea level along the western edge (at Gannett Hill). The hillsides are glacially scoured by steep ravines. The watershed is bisected by the northern extent of the Appalachian Plateau. Traveling north, the topography gradually flattens out, with the northern area characterized by much lower elevations and slopes.



PERCENT SLOPES WITHIN THE WATERSHED

LAND USE/LAND COVER

Canandaigua Lake has many different human dominated land uses and natural land cover within its watershed boundaries. Detailed land use/land cover classifications are available for the entire watershed as a result of the work of Dr. Bruce Gilman, the Watershed Council and Ontario County Planning. Watershed land cover falls into the following categories: forested (42%), agriculture (30%), residential/commercial (10%), and wetlands (5%). The land cover map clearly shows that land use/land cover is a mosaic of patterns in the watershed.

Forested areas in the watershed are found primarily on steeper slopes in the southern half of the watershed. These areas also have shallow soils that are prone to erosion. Maintaining a forested cover is key to protecting water quality by reducing runoff and sediment. Today, little old growth forest remains in the watershed. The present forests consist of second and third-growth stands of the native tree species, and much is in an early stage of succession.

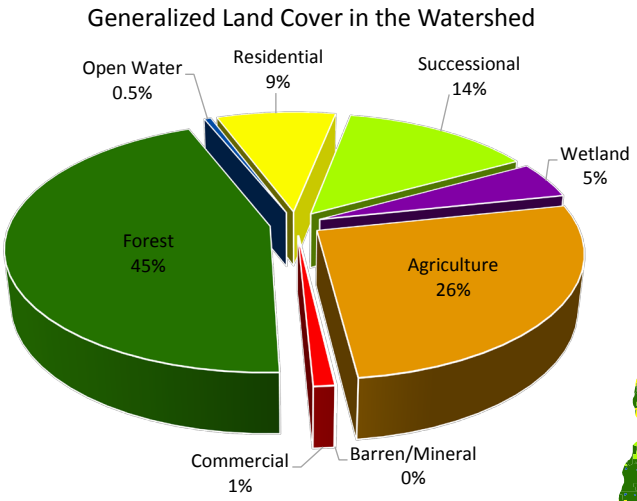
About 30% of watershed land is in some form of active agriculture and is concentrated along the north and east sides of the watershed with pockets of agricultural land use throughout the rest of the watershed. The current higher profits for row crops such as corn and soybeans along with an influx of Mennonite farmers have opened up more land than had been used in recent years.

Residential development is concentrated in the City of Canandaigua, Villages of Naples and Rushville, various hamlets and Bristol Harbour. In addition, a high density ring of residential development hugs the lake's shoreline, creating a suburban corridor around the lake. Over 50% of the land within 500 feet of the lake is in some form of residential or commercial land cover. Residential development continues to grow and development trends include the development of "difficult" sites (steep and wet), summer cottage conversion to year-round use, redevelopment of sites (demolish existing structure and re-build), and development of woodland and lake-view parcels. The Town of Canandaigua and to a lesser extent Gorham is experiencing substantial population growth extending from the City of Canandaigua.

Wetlands are a particularly important land cover due to their many beneficial functions, especially protection of water quality. Current wetlands make up approximately 5% of the watershed and are only a fraction of the historic extent in the watershed, as many were filled and/or drained for development and agriculture. The 1,500 acres of Hi Tor marshes at the south end of the lake are a significant resource to the watershed. The wetlands at the north end of the lake were lost to development in late 1800s and early 1900s.

Commercial/industrial development covers less than 1% of the watershed, concentrated in the City of Canandaigua and the Village of Naples. However, these sites can pose significant threats if not managed properly.

GENERALIZED LAND COVER



Note:

The land classification is based on aerial imagery from 2004. Ground truthing was completed by Dr. Bruce Gilman. Some updates were made to residential areas in 2013. Land cover was classified using the Natural Heritage Classification System and then generalized for the purpose of this map.

This land cover data was produced by the Canandaigua Lake Watershed Council, Finger Lakes Community College and the Ontario County Planning Department.

0 0.75 1.5 3 4.5 6 Miles

N

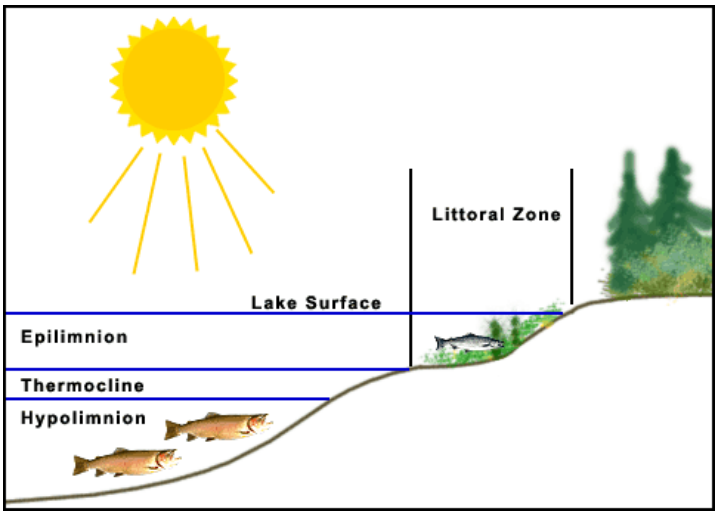
FISH AND WILDLIFE

Diverse fish and wildlife populations provide residents and visitors with tremendous opportunities for nature study, hunting, fishing and trapping. The Canandaigua Lake watershed encompasses a wide variety of habitats which support diverse wildlife communities. Habitats range from wetlands to large blocks of unbroken forests to successional lands. Game species found in the watershed include deer, turkey, goose, pheasant, grouse, squirrel, rabbit, coyote and fox. Many non-game species such as song birds, hawks, falcons, owls and occasionally ospreys and eagles visit and are now residing in the watershed. Wetlands in the watershed are important habitats that support waterfowl, mink, muskrats, beaver and amphibian production.

The lake's fisheries are important for ecosystem balance and recreational opportunities. The lake trout is the primary cold water game fish in Canandaigua Lake. It is supported primarily by stocking, but also includes a 19% natural reproduction rate as documented in 2009 by DEC Region 8 Fisheries. Rainbow trout provide an excellent tributary fishery in Naples Creek and a fair to good lake fishery. Rainbow trout were introduced from the western US. Today, a naturally reproducing population is being maintained in the lake, with Naples Creek as the single significant spawning tributary for the fishery. Naples Creek has become a very popular and productive fishing site. Stocked domestic brown trout also provide a significant contribution to the fishery and add species diversity. The historic lake trout-cisco association has been replaced by the association between lake trout, brown trout, and rainbow trout with alewife and rainbow smelt. The alewife and rainbow smelt populations have declined, due in part to the impact of Zebra and now Quagga Mussels.

The lake also supports many warm water fish species. The smallmouth bass fishery is excellent and the rocky-gravelly substrate, an essential element for spawning success of smallmouths, is moderately abundant. Largemouth bass and chain pickerel are found in good numbers at both the north and south ends of Canandaigua Lake. Rooted aquatic plants there provide excellent habitat for these fish. Yellow perch, bluegills, sunfish, and rock bass are available along shoreline weedbeds throughout the summer. The West River, at the lake's south end, provides an excellent fishery for largemouth bass, black crappies, and brown bullheads. Yellow perch continue to provide a popular fishery throughout the entire year.

Source: A Strategic Fisheries Management Plan for Canandaigua Lake, Thomas L. Chiotti, Bureau of Fisheries, Division of Fish and Wildlife, NYSDEC, March 23, 1981 with updates by Peter Austerman- written communication, 2013.



Two story fish community.


Chain Pickerel


Largemouth Bass


Bluegill


Smallmouth Bass


Yellow Perch

Lake Trout

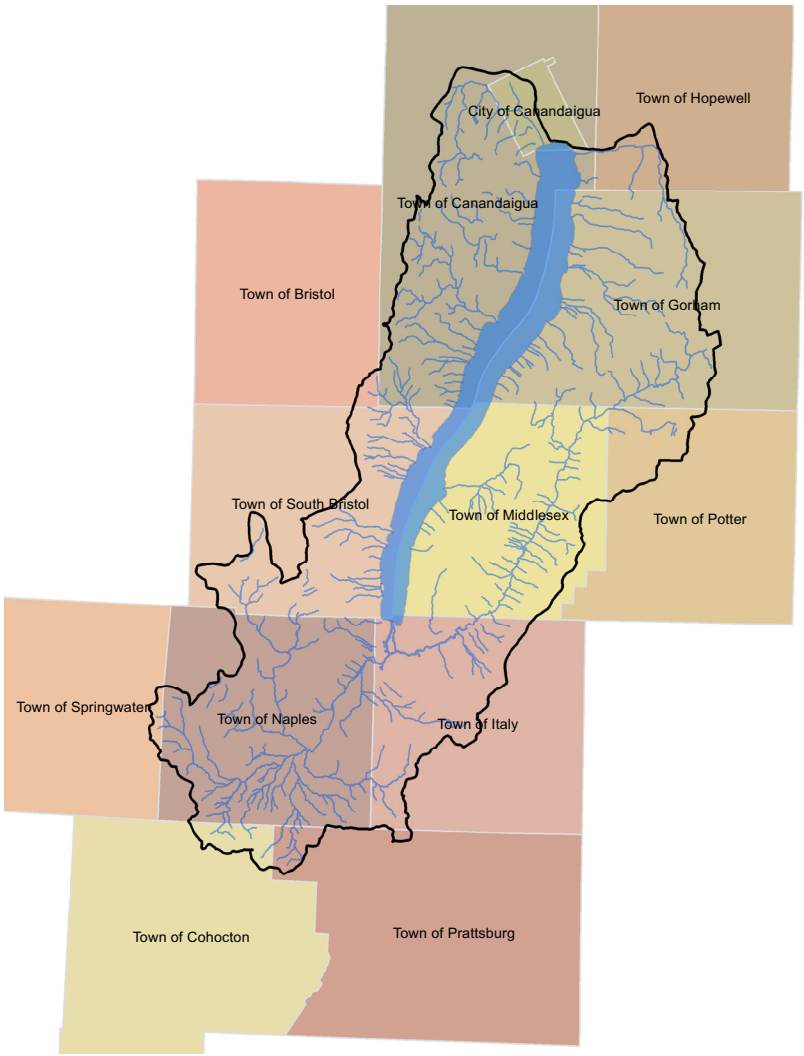
MUNICIPAL BOUNDARIES

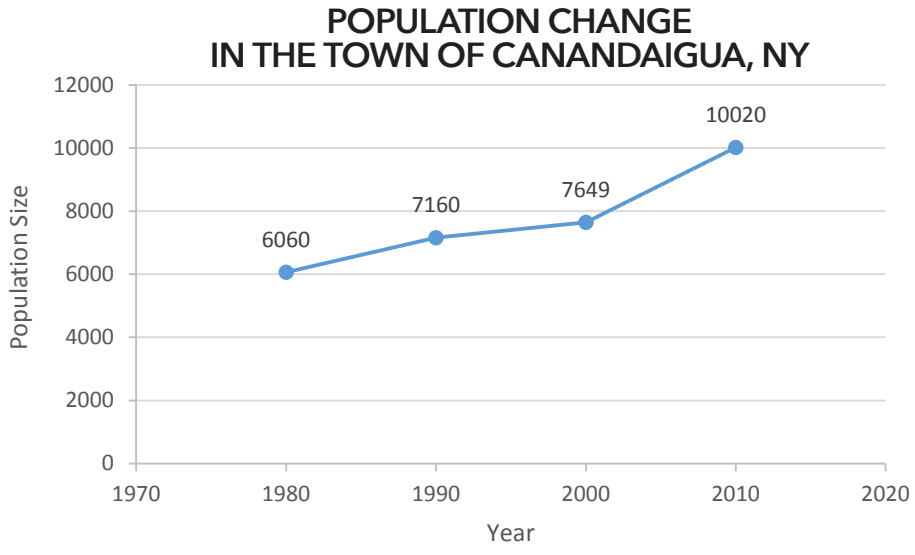
There are 15 municipalities and 4 counties within the Canandaigua Lake Watershed. Most of the watershed lies within Yates and Ontario Counties, with small areas within Livingston and Steuben Counties. Municipalities that cover the largest area in the watershed are the Town of Canandaigua (16,096 acres, 16.0%), the Town of Gorham (17,625, acres, 17.5%), the Town of Middlesex (18,496 acres, 18.4%), and the Town and Village of Naples (19,304 acres, 19.2%).

POPULATION

Many people work, live and play in the Canandaigua Lake Watershed. Based on spatial data layers and data from the 2010 Census, it is estimated that approximately 23,000 people live in the watershed, with approximately 14,000 housing units, showing that many of these homes are second or seasonal residences. Population has increased over the last ten years most significantly in the Town of Canandaigua (over 30%- see graph from 2011 Town of Canandaigua Comprehensive Plan). This growth is counter to the overall trend in upstate New York and helps to document that people enjoy all that this area offers. However, with the increasing population comes water pollution challenges that need to be properly managed.

MUNICIPALITIES IN THE WATERSHED





Data from the Town of Canandaigua Comprehensive Plan.

3. WATER QUALITY OF THE LAKE AND ITS WATERSHED

Sediment discharge from a development site.

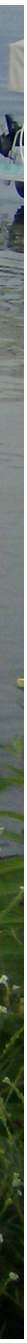
Even small pollutant discharges can have negative impacts on a cumulative basis.

THE POLLUTANTS OF CONCERN FOR CANANDAIGUA LAKE INCLUDE:

- SEDIMENT
- PHOSPHORUS
- NITROGEN
- HEAVY METALS
- HYDROCARBONS
- OTHER TOXIC SUBSTANCES
- PERSONAL CARE PRODUCTS
- PATHOGENS
- DEICING SALT

* Based on the water quality monitoring program and State and national research.

With every storm event, water that doesn't infiltrate into the ground will travel across the landscape into a drainage ditch, stream, or lake shoreline. This runoff can pick up pollutants such as sediments, phosphorus, bacteria, oil and grease, litter, dog waste, heavy metals and more. Ultimately, these pollutants can find their way into adjacent waterbodies, diminishing their water quality.



Canandaigua Lake serves as a catch basin for runoff and pollutants delivered directly to it via pipes (point source) and those washed from the surrounding watershed into tributaries or groundwater (non-point source). Therefore, the quality of the lake is influenced by human activities that degrade the quality of runoff within the 109,000 acre watershed. Understanding the water quality conditions in the lake and its tributaries is important for developing an effective, efficient and scientifically-based watershed management program.

The NYS DEC Priority Waterbodies List (PWL) and associated NYS Water Quality Classification are broad characterizations of the potential threats and water quality status of each water body in New York State. Canandaigua Lake is classified as an AA (TS) waterbody and is considered threatened (see side bar for more information). In order to more thoroughly understand the water quality threats to the lake, a comprehensive monitoring program is needed.

Over the last two decades, the Watershed Council and its partners have conducted a comprehensive in-lake and tributary sampling and monitoring program to better understand the overall quality of the lake and the stream systems that drain to the lake. Lake research, coupled with watershed-wide stream pollutant monitoring and follow-up pollutant source investigations, are essential steps in managing water quality and sources of pollution.

The long term water quality monitoring program results, along with NYS DEC Priority Waterbodies List analysis, identifies the lake as a high quality water resource that is relatively pollution-free. However, the tributary analysis also documents the impacts of human-intensive watershed land uses that can have cumulative long term implications if not managed properly.

The pollutants of concern for Canandaigua Lake include sediment, phosphorus, nitrogen, heavy metals, hydrocarbons, other toxic substances, personal care products, pathogens and deicing salt. Runoff from rain and snowmelt carry these pollutants from the land, through the tributaries and down to the lake, causing episodic pulses of high pollutant loading into the lake. The Watershed Council utilizes this information in the selection of watershed best management practices (BMPs) and to assist local municipalities in policy decisions designed to protect water quality.

The Waterbody Inventory/Priority Waterbodies List (PWL), prepared by the NYS DEC, is a statewide inventory (database) of New York State waterbodies which characterizes water quality, the degree to which water uses are supported, progress toward the identification of water quality problems and sources, and activities to restore and protect each individual waterbody.

NYS DEC Classification:
Canandaigua Lake - AA, TS
AA = Designate Best Use for Drinking Water Supply
TS = Trout Spawning Area

NYS DEC, through its Waterbody Inventory/Priority Waterbodies List, did not find any impairments to Canandaigua Lake. However, it classifies the lake as threatened because of its high quality resource value and the need to provide additional protection for now and the future.

3.1 IN-LAKE WATER QUALITY MONITORING PROGRAM

While certain aspects of lake quality have been studied since the early 1900's (Birge and Juday 1914, 1921) and in the 1970's (Eaton and Kardos 1978), overall scientific research efforts had been sporadic. To gain a more thorough understanding of modern lake water quality, monitoring has been conducted since 1996 by Dr. Bruce Gilman of Finger Lakes Community College (FLCC). Annual reports and presentations have documented the quality of the lake each year, as well as trends over this nearly 20 year timeframe.

The lake sampling and monitoring program consists of monthly visits, April through November, to six locations within the lake (two mid-lake and four near shore sites). The two mid-lake stations are in the center of the lake off Deep Run and Seneca Point, and several water quality measures are recorded at each site. Water clarity is assessed as secchi disk depth. A water quality profile from the surface to a maximum depth of 55 meters is completed for temperature, dissolved oxygen, pH and conductivity. In addition, an integrated water column sample is collected for chlorophyll *a* analysis back in the FLCC laboratory and grab samples are collected at three different depths (2, 25 and 50 meters below the surface) for determination of total phosphorus concentration at Life Sciences Laboratory. The four near shore stations are sampled for chlorophyll *a* and total phosphorus, and are located just offshore at Hope Point, Vine Valley, Fall Brook Stream and the West River.

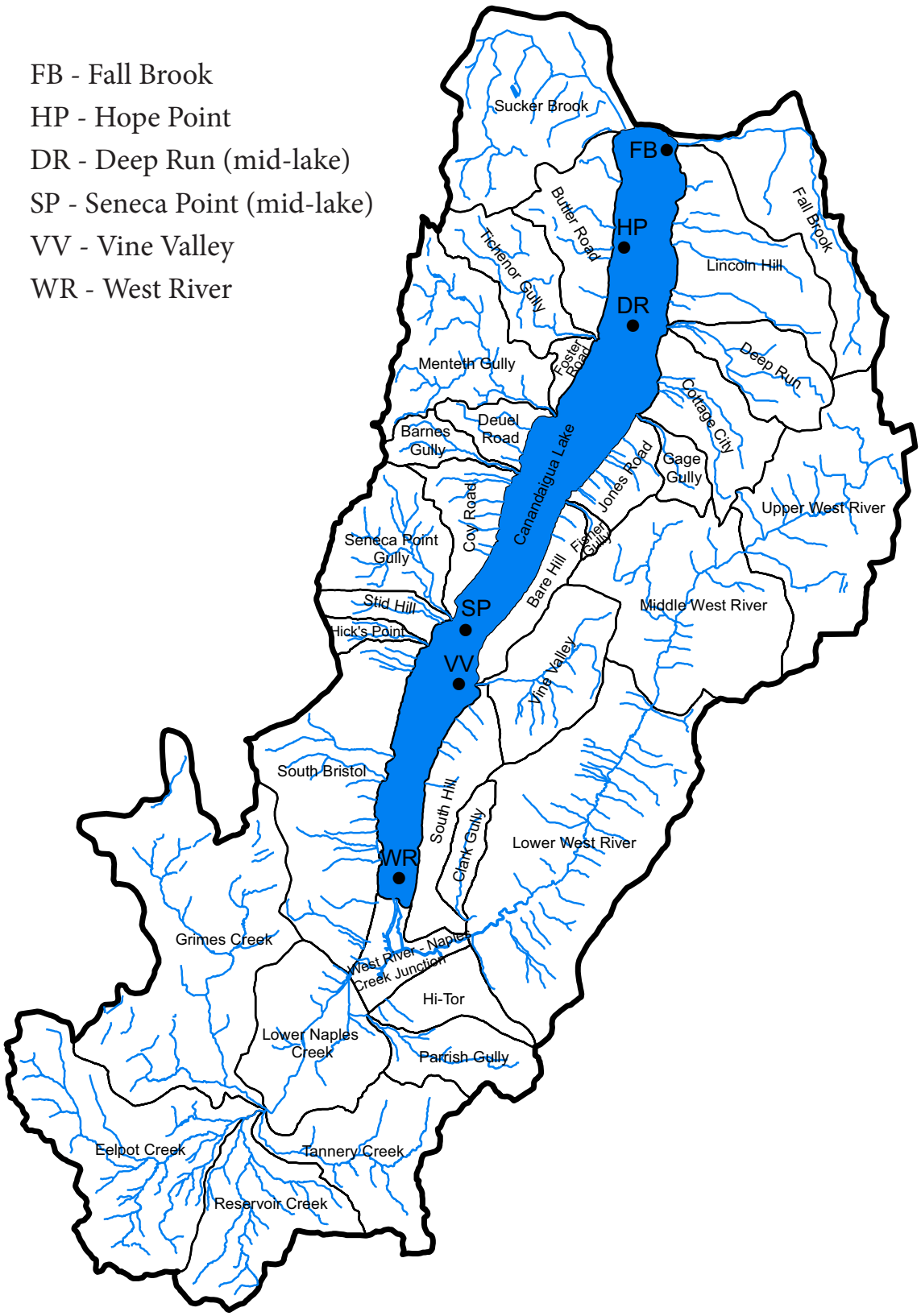
A total of 80 phosphorus samples and 48 chlorophyll *a* samples are collected and analyzed each year, as well as in-lake monitoring that yields sixteen water quality profiles.

Across nearly two decades of lake water quality sampling and monitoring, the health of Canandaigua Lake has remained good to excellent. This conclusion is based on the results of measuring various parameters: water clarity, dissolved oxygen, pH, temperature, chlorophyll *a*, and total phosphorus. The 2013 data and long-term trends for each parameter are summarized below.

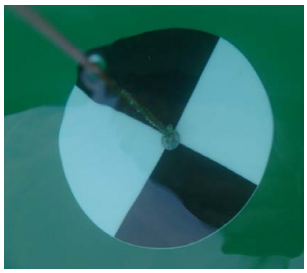
Dr. Bruce Gilman collecting an integrated sample for chlorophyll *a* analysis.

CANANDAIGUA LAKE
IN-LAKE SAMPLING SITES

FB - Fall Brook
HP - Hope Point
DR - Deep Run (mid-lake)
SP - Seneca Point (mid-lake)
VV - Vine Valley
WR - West River



WATER CLARITY

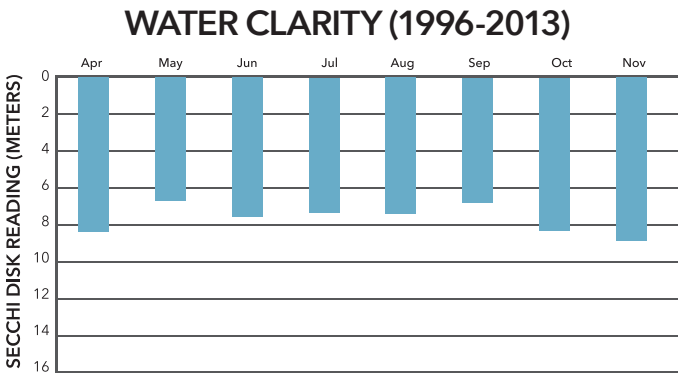


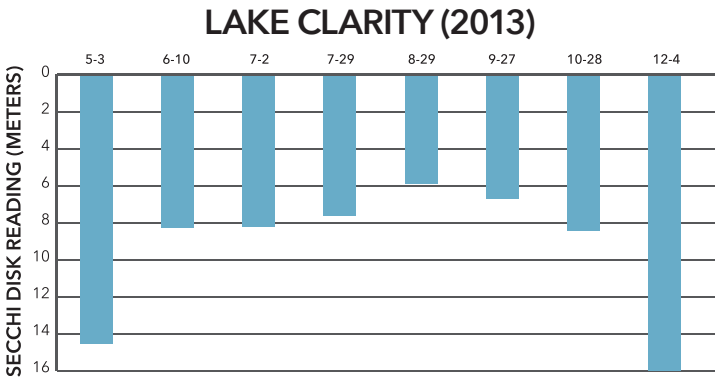
This parameter addresses the mid-day depth of light penetration in the surface waters of a lake. It defines the thickness of the surface zone where photosynthesis (primary production) can occur. It is measured with a circular disk composed of alternating black and white quadrants, called a secchi disk, and is recorded as the secchi disk depth (m). The reading approximates the depth where five percent of the initial surface sunlight remains. This is the compensation level, or threshold for photosynthesis, for most aquatic plants. In the Finger Lakes, it is estimated that all surface light is gone somewhere between two and three times the secchi disk depth reading. Lake water clarity is influenced by suspended sediment and planktonic organisms as well as weather conditions, especially cloud cover, at the time of sampling.

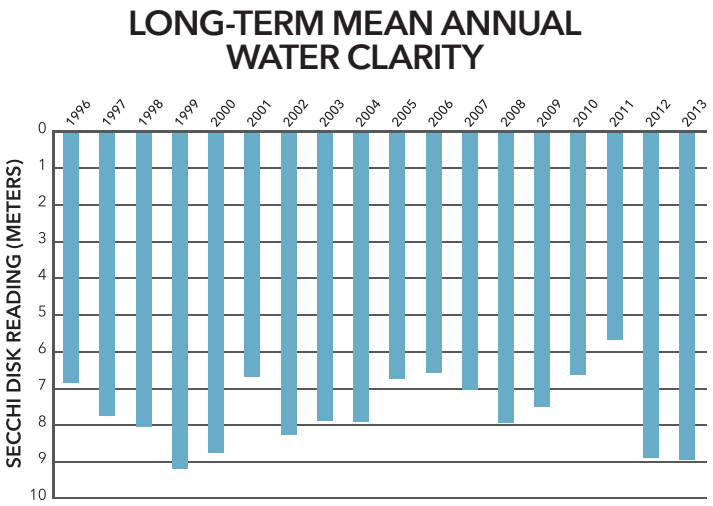
During 2013, monthly water clarity at the two mid-lake stations began with exceptional readings approaching 14 meters, and ended with clarity exceeding 15 meters, an all-time record for the years of the sampling and monitoring program. Lower clarity during the late spring and early summer months of 2013 were associated with sudden storm events delivering suspended sediment to the lake through tributary streams. These same storms delayed the end of month sampling by several days into the first week of the following month. Lower clarity during the summer months of 2013 was associated with higher density of suspended planktonic organisms in the upper zone (epilimnion) of the lake.

The long-term monthly means for lake water clarity follow a similar pattern, highest in spring and fall, but without as strong a monthly difference as in 2013. The recent increases in lake water clarity in April and November may be related to recent changes in lake biota, especially the invasion and establishment of large populations of quagga mussels (*Dreissena bugensis*) that filter feed on algae.

The long-term annual means for water clarity fall in the range of 5.6 to 9.2 meters. The low annual reading in 2011 was affected by an exceptionally low secchi disk reading of 2.6 meters during the month of April when clarity readings have historically been much higher. The April 2011 reading correlated with a major series of storms that caused substantial sediment loss and flooding. The high annual reading in 1999 resulted from every monthly value exceeding 8 meters, even during the summer months when clarity is typically lower. That year may represent when zebra mussels (*Dreissena polymorpha*) reached maximum carrying capacity in the lake, followed by a lake-wide population collapse in 2001.





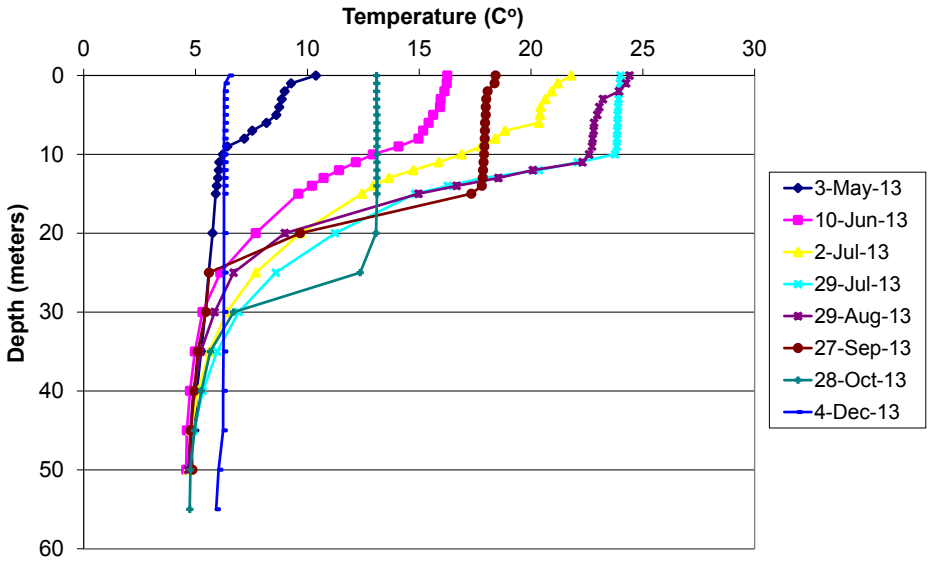


WATER TEMPERATURE

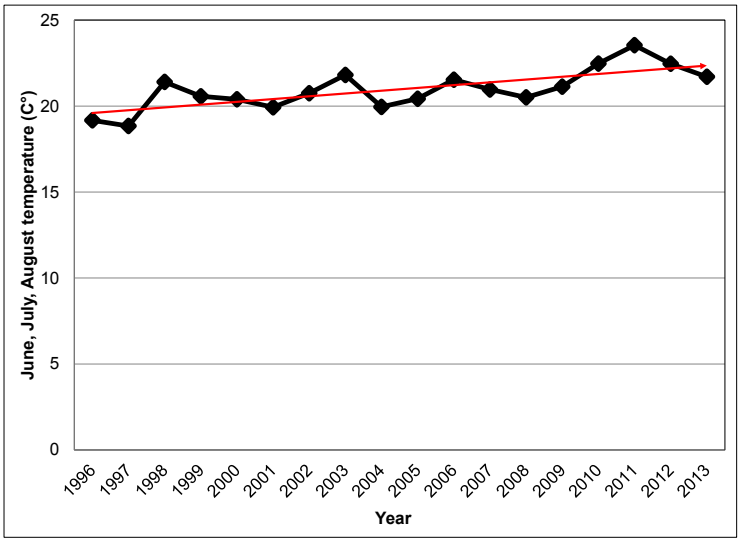
Perhaps no other single natural factor has as strong an influence on the limnology of Canandaigua Lake as temperature. Nutrient solubility, water density, water circulation patterns, photosynthesis and biological respiration are all directly regulated by changes in water temperature. On any given day, water temperature helps describe the heat content of the lake expressed in Centigrade degrees (˚C). Heat content is important to water circulation patterns in the lake (e.g., seiches and fall turnover or mixing events), stability of lake stratification, prediction of the extent of winter ice cover, metabolic rate of lake organisms, buoyancy afforded to the planktonic community, and overall habitat diversity within the lake basin. Patterns in lake temperature through the water column document the depth of the summer warm water zone at the surface (epilimnion) and the remaining cold water zone near the bottom (hypolimnion).

Monthly water temperature profiles for 2013 are typical for all years of record. At both the Deep Run and Seneca Point mid-lake sampling stations, water temperatures are nearly isothermal through the water column in April. It begins to stratify soon thereafter, as some sunlight striking the lake is transformed to heat that will produce warmer and less dense surface waters. The strongest stratification is observed in late summer when the lake basin contains two volumes of water, the warm epilimnion and the cold hypolimnion, which are separated by a thermocline (15-20 meters deep) that prevents them from mixing at this time of the year. Surface water heat content is gradually lost to the atmosphere during the fall months so that by December, the lake is again isothermal and winds can produce a fall turnover event. Canandaigua Lake usually has only a fall turnover, so it is classified as a warm monomictic lake. When complete ice cover forms during severely cold winters, the lake will also winter stratify beneath the ice and have a spring turnover. Then it would be classified as a dimictic lake.

2013 DEEP RUN TEMPERATURE PROFILE



SUMMER AVERAGE SURFACE TEMPERATURES

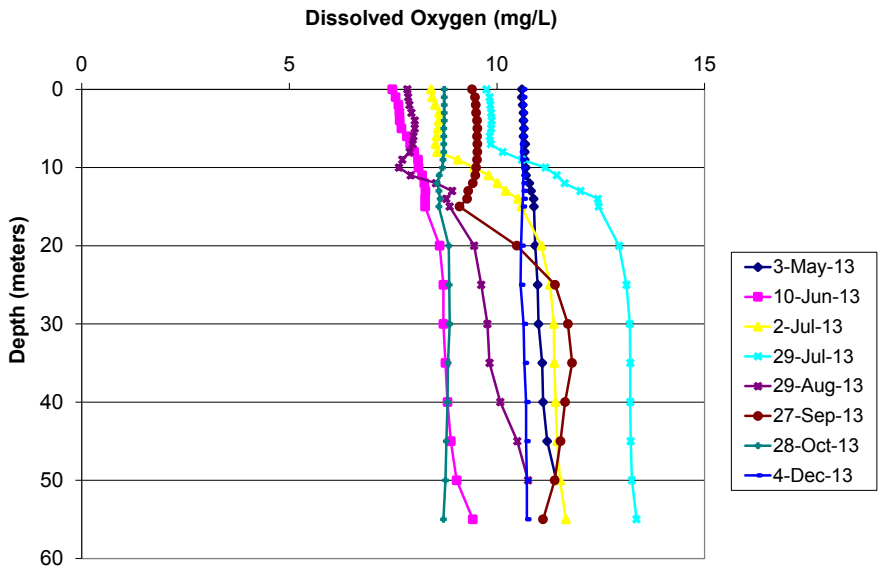


Average summer surface water temperatures, calculated as the mean of surface water temperatures during the end of June, July and August at both mid-lake stations, have shown a variable but gradual increase over the years of record. Fitting a trend line to the data reveals a 2.6 ˚C increase since 1996, thus providing local documentation for the extent of recent climate change in western New York. Waterbodies are thought to be less susceptible to local weather changes and, therefore, a better monitor of the degree of global warming. Trends of warmer surface water are thought to alter biological relationships among lake organisms, often leading to conditions that favor blue-green algae within the phytoplankton community. This trend will continued to be monitored.

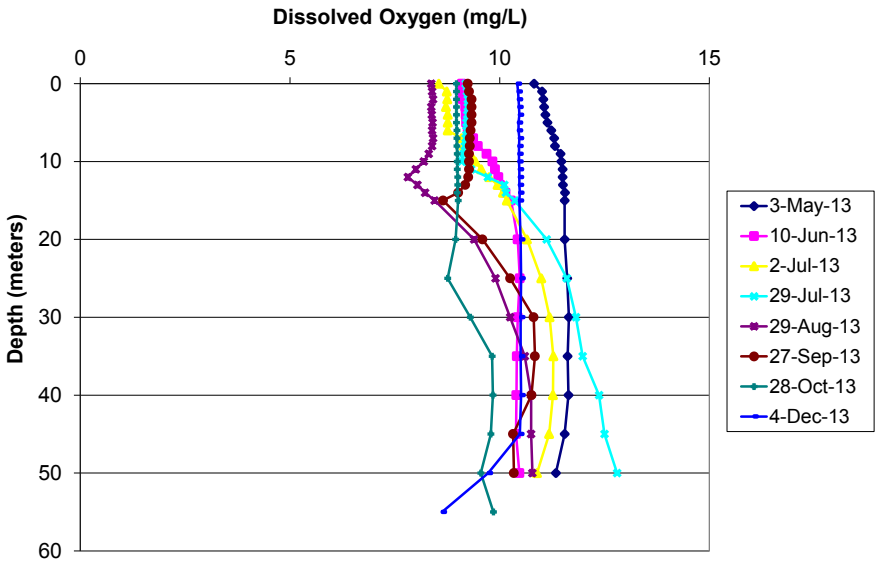
WATER DISSOLVED OXYGEN

Oxygen is essential for the respiration of all aerobic aquatic life forms, including plants, invertebrates and fish. This parameter measures the oxygen present as small gas bubbles (O_2) dissolved in the lake water. The solubility of oxygen in water is inversely related to lake water temperature. Cold water has the potential to hold greater amounts of dissolved oxygen (DO). Absolute content of DO is measured as parts per million (ppm) or its equivalent, milligrams per liter (mg/L). Relative content of DO is measured as percent saturation. Values near 100% saturation are preferred for good lake health.

SENECA POINT DISSOLVED OXYGEN



DEEP RUN DISSOLVED OXYGEN



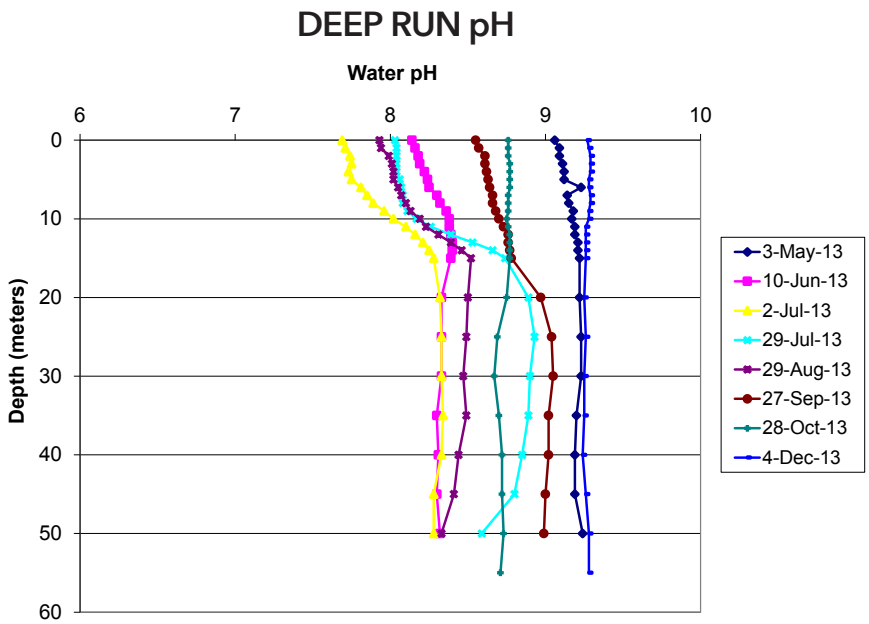
Gases have low solubility in water, and for dissolved oxygen, maximum amounts are about 14.6 mg/L. Cold water fish species like trout require a minimum DO of 7 to 8 mg/L. Warm water fish species like bass are more tolerant but still require at least 5 mg/L. Dissolved oxygen levels are influenced by replenishment rates (contribution from aerated tributary streams, surface exchange with the atmosphere, oxygen production from aquatic plant photosynthesis, wave action) and consumption factors (respiratory demands of all lake organisms, amount of oxygen demanding wastes, rate of decomposition). If DO levels drop to less than 1 mg/L, the lake water is termed anoxic, and temporarily trapped plant nutrients are released from bottom sediments and undesirable anaerobic microbes may dominate. Such conditions have not been observed in Canandaigua Lake.

Dissolved oxygen was available throughout the water column at all 2013 monitoring times and often was at or near 100% saturation, ideal conditions for the survival of aquatic life. Because DO levels often increase with depth below the surface, Canandaigua Lake exhibits orthograde dissolved oxygen profiles. In recent years, including 2013, some months at both mid-lake stations have a slight oxygen depression associated with the thermocline. It is believed this may be the result of increased respiration, possibly by quagga mussels or forage fish, that are feeding on the plankton rain that drops down to this density barrier. Monitoring at Deep Run can reach the bottom of the lake (about 55 meters deep at this station with a 60 meter cable on the water quality probe) when the lake surface is calm. Another slight oxygen depression has been recorded near the lake bottom, probably resulting from microbial respiration of organic waste products that accumulate there.

WATER pH

The water pH is known by scientists as the negative logarithm of the hydrogen ion concentration. It may be thought of as a measurement of the acidic components found in the lake water. These components may be derived from atmospheric processes (normal rainfall and acidic precipitation), natural watershed erosion of soil and bedrock minerals, and through the respiratory processes of aerobic aquatic life. The neutral point for lake water pH is a value of 7.00, with lower numbers indicating acidic conditions and higher numbers indicating alkaline conditions. The watershed of Canandaigua Lake is underlain by calcareous shales, limestones and slightly alkaline glacial deposits that served as the parent materials for modern soils. Over thousands of years of natural erosion, the lake has acquired buffering compounds from the watershed and, as a result, the lake water has a stable, slightly alkaline pH. The Finger Lakes region receives acidic precipitation, but lake buffers absorb the acids and eliminate the strong effect they might otherwise have on water pH.

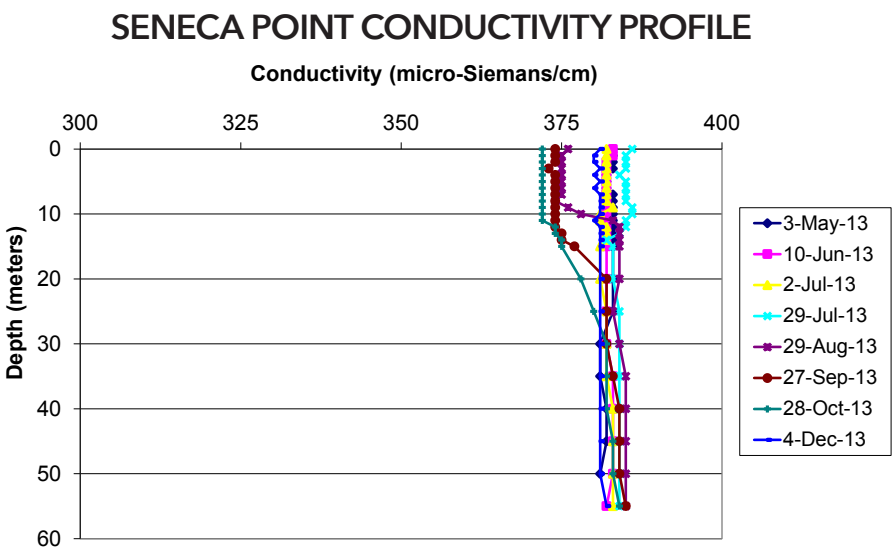
The 2013 lake water pH was always above the neutral point of 7.00 due to the water's high buffer capacity and, in fact, the 2013 average pH, based on numerous measurements through the water column, was 8.63.



WATER CONDUCTIVITY

This parameter measures the ability of water to support an electrical current. It is strongly influenced by ionic concentrations (Ca^{++}, Mg^{++}, Na^{+} and K^{+}) and water temperature. Data are expressed as micromhos/cm or its equivalent, microsiemens (µS/cm). Addition of suspended sediment from storm runoff and human caused watershed erosion activities will temporarily increase conductivity. Lake seiches, waves and currents that re-suspend bottom sediments may also locally increase conductivity readings.

During 2013, lake water conductivity readings ranged between 370 and 390 µS/cm, values that generally reflect the calcium (Ca^{++}) concentration of the water. For this reason, Canandaigua Lake is called a hard water lake.

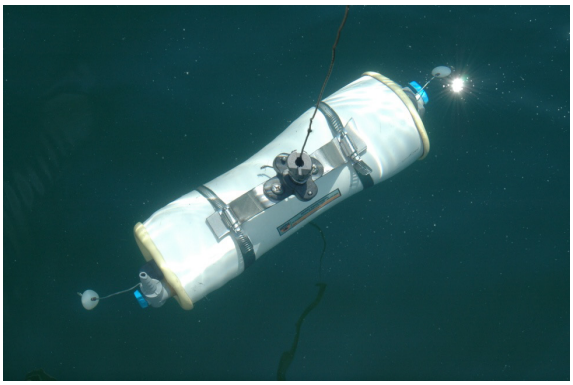


YSI IN-SITU WATER QUALITY MONITORING PROBE

This probe is used to create lake profiles of temperature, dissolved oxygen, conductivity and pH.

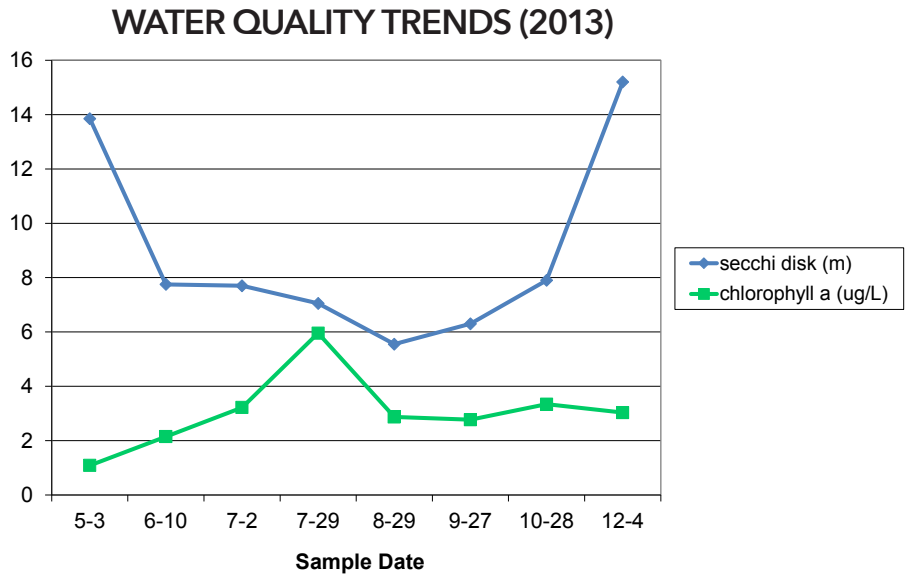
VAN DORN SAMPLER

This sampler is used to take grab samples at different depths in the lake. The water is then analyzed for nutrients.

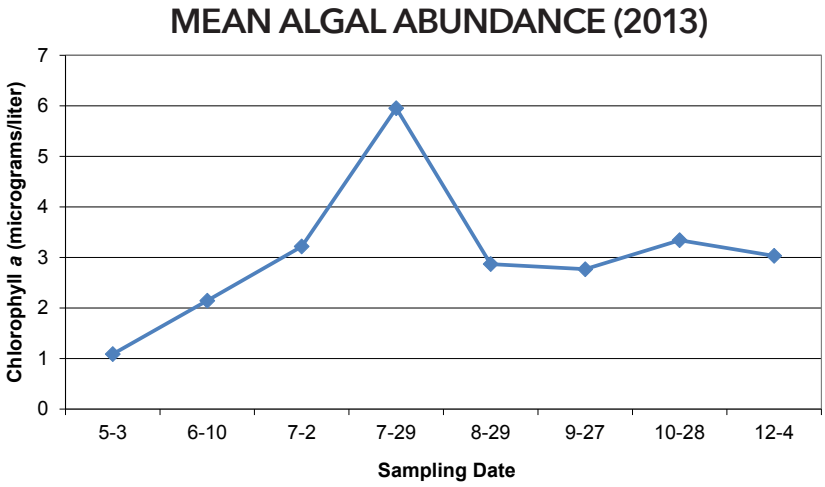


WATER CHLOROPHYLL *A*

This parameter is based on a plant pigment (chlorophyll *a*) found in all types of phytoplankton, including green algae, diatoms and cyanobacteria, commonly called blue-green algae. This algal pigment is essential for capturing certain wavelengths of sunlight used in the photosynthetic production of organic molecules that become the basis of growth in lake ecosystems. The concentration of this pigment estimates algal abundance and, therefore, indicates aquatic plant growth conditions. Data are measured in micrograms per liter (µg/L) or its equivalent milligrams per cubic meter (mg/m^3).



In 2013, chlorophyll *a* concentrations were low at the beginning of the growing season but reached a peak of 6 µg/L in the warm waters of mid-summer. The dominant surface algae during this time period was the blue-green algae, *Microcystis aeruginosa*.

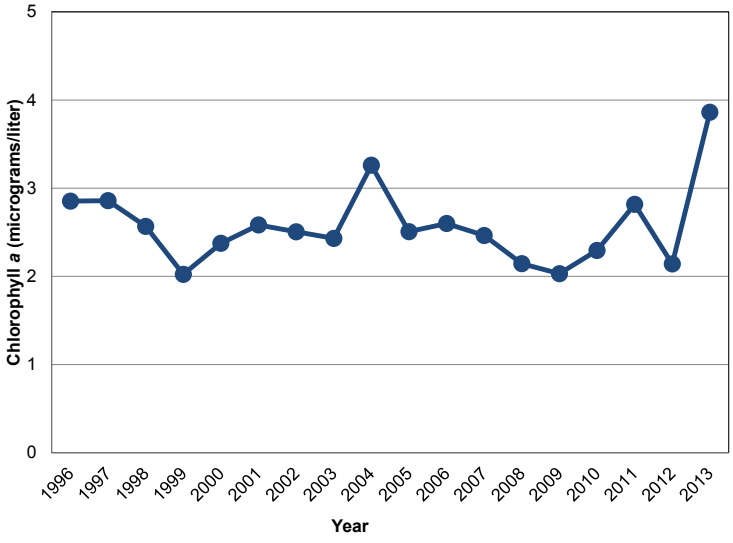


A close inverse relationship exists between water clarity and chlorophyll *a* concentrations in lake water. For 2013, declines in water clarity were associated with an increase in algal abundance during April, May, June and July. Improving clarity corresponded with declining algal abundance in September, October and November.

Compared to all previous years, mean annual algal abundance at the two mid-lake stations in 2013 was the highest for the years of record, reaching a value of 3.86 µg/L. This value falls below a threshold of human health concern (10 µg/L). However, slight increases in algal levels increases the cost for filtering water and negatively impacts swimming and other recreational and aesthetic uses. The value was strongly influenced by chlorophyll *a* concentrations measured at the end of July, presumably during the peak of the *Microcystis aeruginosa* bloom. Our citizen volunteers also identified a substantial decrease in the weekly secchi disk measurements (3-4 meters on average) at various locations on the lake during this timeframe, further correlating this algal bloom.

Like most blue-green algae, *Microcystis* is distasteful to and regurgitated by quagga mussels during their filter feeding. As a direct result of this selective herbivory, blue-green algae have been observed to dominate in lakes that Dreissenid mussels have invaded. Future sampling of mussels and chlorophyll *a* will reveal if this trend continues.

LONG-TERM MEAN ANNUAL ALGAL ABUNDANCE

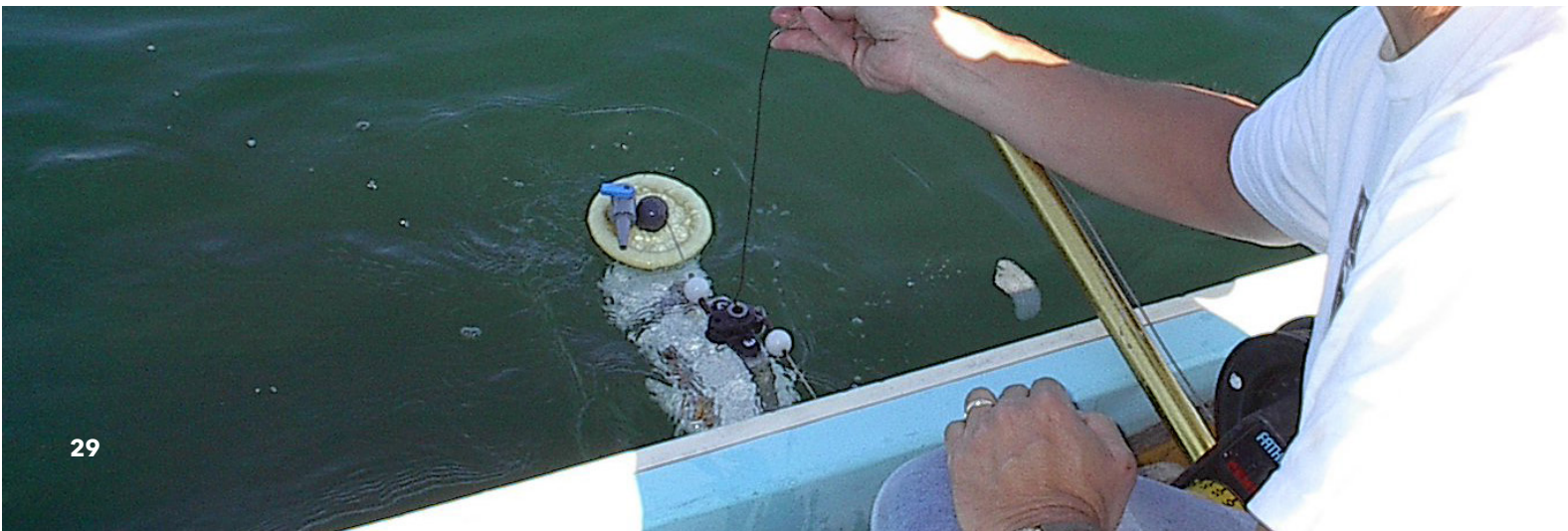


Most algae do not impact human health, however, certain blue-green algal species (including *Microcystis aeruginosa*) have strains that are capable of producing toxins. When the concentrations of these algae are high, as evidenced by a visible scum layer, they can pose a risk to human, pet, and wildlife health. The health threat depends on the type of toxin produced and level of exposure, and symptoms can range from skin rashes to liver and neurological problems.

It is well understood that increased nutrient loading from the surrounding watershed directly enhances algal abundance. However, other research around the country is aimed at determining what conditions trigger the development of toxins in these algae. A recent hypothesis suggests the ratio of phosphorus to nitrogen may play an important role. Toxins are released when algal cells die, so application of algaecide is not an appropriate in-lake management technique. Federal or NYS guidelines on safe concentrations of blue-green algae have not yet been formally established, though they are under development.

In 2013 and previous years, Canandaigua Lake has experienced months with increased chlorophyll *a* levels and algal abundance dominated by blue-green algae. A case study occurred in late August of 2013. Secchi disk readings dropped below 3 meters, raw water turbidity at the City of Canandaigua Water Treatment Plant doubled (algae based) and samples examined microscopically by Dr. Bruce Gilman documented that *Microcystis aeruginosa* was the dominant algae in the water. The DOH and DEC were notified and samples were sent to Dr. Greg Boyer of SUNY-ESF. The concentrations of microcystin, a toxin produced by *Microcystis*, were not high enough to be considered a public health concern. Both the increasing dominance of quagga mussels and watershed phosphorus delivered to the lake during runoff events have created conditions for blue-green algae to continue to thrive in the phytoplankton community. Minimizing phosphorus use in the watershed may be the only manageable way to curtail blue-green algae levels in the lake. Continued testing for blue-green algal toxins will be a priority.

Nuisance aquatic vegetation has affected boating and swimming in some areas of the lake, particularly along the southeastern shoreline and near tributary mouths into the lake. In recent years, there are more calls from lakeshore residents about aquatic weeds impacting their use of the lake. The accumulation of nutrient-enriched sediment from the surrounding watershed significantly contributes to this problem, along with other factors such as Dreissenid mussels cycling nutrients from the water column into the benthic zone, thus fertilizing bottom substrates and promoting aquatic vegetation growth in shallow waters along the shoreline.



WATER TOTAL PHOSPHORUS

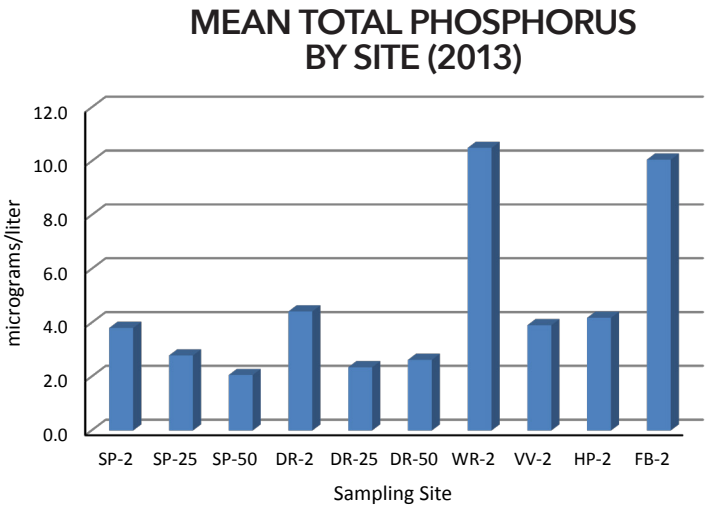
Nutrients are substances that promote biological growth in lake water. Several elements are considered essential, but the critical macro-nutrients in lakes are phosphorus and nitrogen. Phosphorus is often considered the limiting factor for biological productivity in freshwater ecosystems and the element most responsible for increasing aquatic plant and algal growth. It is estimated that one-pound of phosphorus entering a phosphorus limited waterbody can generate 500 pounds of plant life (both algae and aquatic plants). Phosphorus is required for the synthesis of cellular energy compounds like adenosine triphosphate (ATP). Major sources of phosphorus include agricultural fertilizers, urban/suburban stormwater runoff, residential wastes and decomposition of natural organic material.

Phosphorus is present in both inorganic and organic molecules, including particulate and dissolved forms. Total phosphorus (TP) includes dissolved and particulate forms. It is expressed as parts per billion (ppb) or its equivalent, micrograms per liter (µg/L). State and federal research have suggested a desirable threshold for oligotrophic lakes at less than 10 µg/L. TP concentrations that exceed this threshold tend to see significant increases in algae and aquatic plants. Sampling across the Finger Lakes region correlates with this threshold, where lakes that tend to have greater than 10µg/L have higher levels of algae and aquatic plants.

Up to ten percent of the TP is likely to be found in a dissolved form known as soluble reactive phosphorus (SRP). Most phosphorus is biologically absorbed by aquatic organisms or temporarily bound to bottom sediments from which it is released back to the water if benthic anoxia occurs. During rapid growth of aquatic plants, all of the SRP can be absorbed. Then, lake processes would slow until phosphorus again became available through biological decay and recycling, lake bottom release and/or watershed runoff contributions. Recycling of phosphorus in small lakes has been estimated to be a matter of days to weeks, while for larger lakes it can take months.

Also a macronutrient, nitrogen contributes to protein synthesis in lake organisms. Nitrogen compounds commonly enter lakes through fertilizer runoff and biological decay. Decomposition processes release ammonia (NH_3), which may be harmful to aquatic life in high concentrations. In most lakes, ammonia is oxidized to inorganic nitrite (NO_2) and then nitrate (NO_3). Their combined measure is expressed as milligrams of nitrogen per liter (mg N/L) and levels exceeding 10 mg N/L suggest pollution from anthropogenic sources.

In 2013, the total phosphorus concentrations varied by sampling location (near shore vs. mid-lake stations), as well as by depth below the surface. In Canandaigua Lake, the mid-lake stations (Deep Run [DR] and Seneca Point [SP]) are sampled at 2 meters, 25 meters and 50 meters below the lake surface. In 2013, they had consistently low TP concentrations. The same finding was reached for the near shore stations that are not located near a tributary stream (site off Vine Valley swim beach [VV] and site north of Hope Point near the City of Canandaigua Water Treatment Plant [HP]). The near shore stations associated with perennial stream mouths (West River [WR] and Fall Brook [FB]) had high mean total phosphorus for the year. The West River station is influenced by land use/land cover patterns in the West River sub-basin of the lake watershed, including agricultural lands in the Middlesex Valley, an extensive wetland complex in the High Tor wildlife management area, and residential activities in the Village of Naples. On a regular basis, the highest TP readings

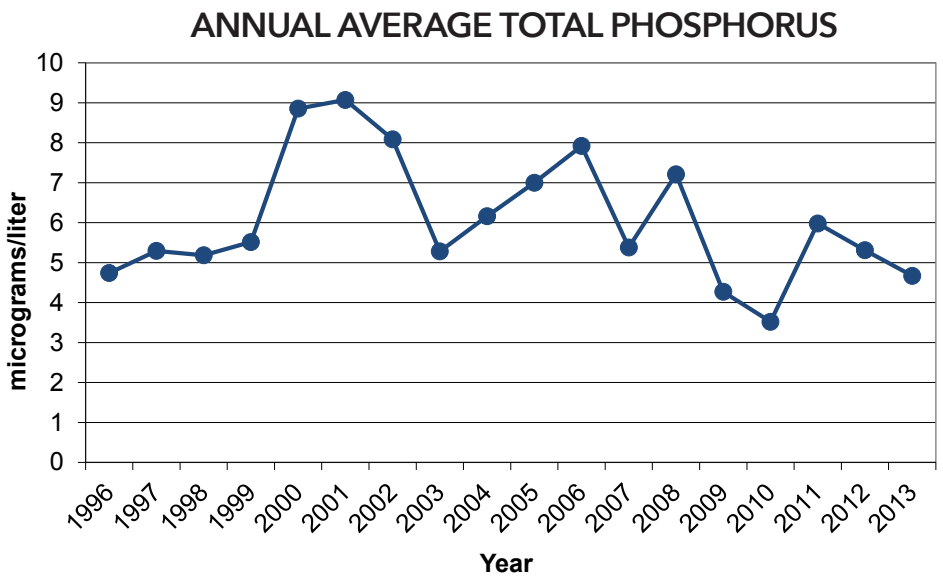


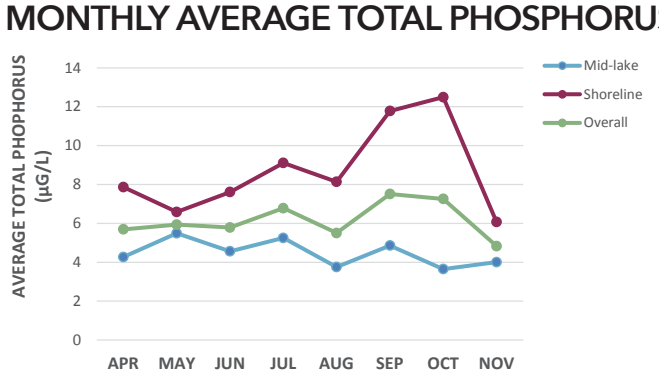
are detected at the West River near shore station. Likewise, the Fall Brook station is influenced by agricultural lands in the Town of Gorham, as well as commercial developments along the Routes 5 & 20 travel corridor. The lake-based TP data corroborates the priority stream ranking based on data generated in the tributary sampling and monitoring program and emphasizes the direct connection between best watershed management practices and overall lake health. Understanding this relationship is the basis of holistic lake management.

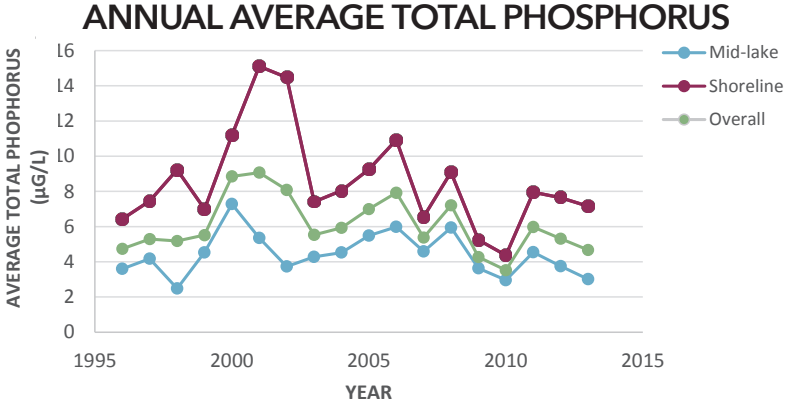
Total phosphorus concentrations vary monthly due to changing levels of biological absorption by lake organisms, as well as differing watershed contributions based on storm runoff conditions and growth status of watershed vegetation. For the years of record, overall lake water TP ranges between 5 and 8 µg/L from April to November, with the highest concentrations occurring during the months of September and October. This corresponds with the end of the growing season in the watershed when plants are senescing and contributing organic matter to the lake. This impact is magnified where the watershed touches the lake, that is, along the shoreline where autumnal spikes in TP are evident. Shoreline TP has a monthly average of 8.6 µg/L, while mid-lake TP averaged only 4.4 µg/L. In the deeper waters of the mid-lake stations, the effect is diluted and seasonal patterns are not evident. Variations in lake water TP during the summer may be related to pulses of phosphorus recycled as some lake biota die, decay and are then replaced by others. This is called a seasonal species replacement concept and is best known for occurring in the zooplankton community of lakes.

Annual trends in mean TP are variable and although 80 samples are analyzed each year, a full understanding of the causes behind these trends have proven elusive due to the many complex factors interacting to form the pattern. Despite these wide fluctuations in TP, fortunately it has never exceeded the threshold of 10 µg/L. Therefore, the lake to date does not appear to be negatively impacted by nutrient eutrophication as observed in other nearby Finger Lakes. However, slight increases in phosphorus levels can have significant impacts to water quality by increasing algae and aquatic weed growth.

In 2008, there was concern that the long term trend for phosphorus was going to continue to increase. The results of 2010 and 2011 showed record low levels of phosphorus. These record low levels of phosphorus correlate with the discovery of and major population increase in quagga mussels. A team of DEC, FLCC and Watershed Council staff inventoried the Dreissenid mussel populations and found that quagga mussels were the dominant mussel and had largely replaced zebra mussels. Quagga mussels filter feed more than zebra mussels, are able to reproduce at a faster rate, potentially live longer, and can grow on more substrates. The theory is that the growing population of quagga mussels are temporarily sequestering phosphorus through their increased filter feeding of algae, then returning the nutrients through their feces to the benthic zone.







Boaters and swimmers at the north end of Canandaigua Lake.

OTHER IN-LAKE WATER QUALITY ISSUES

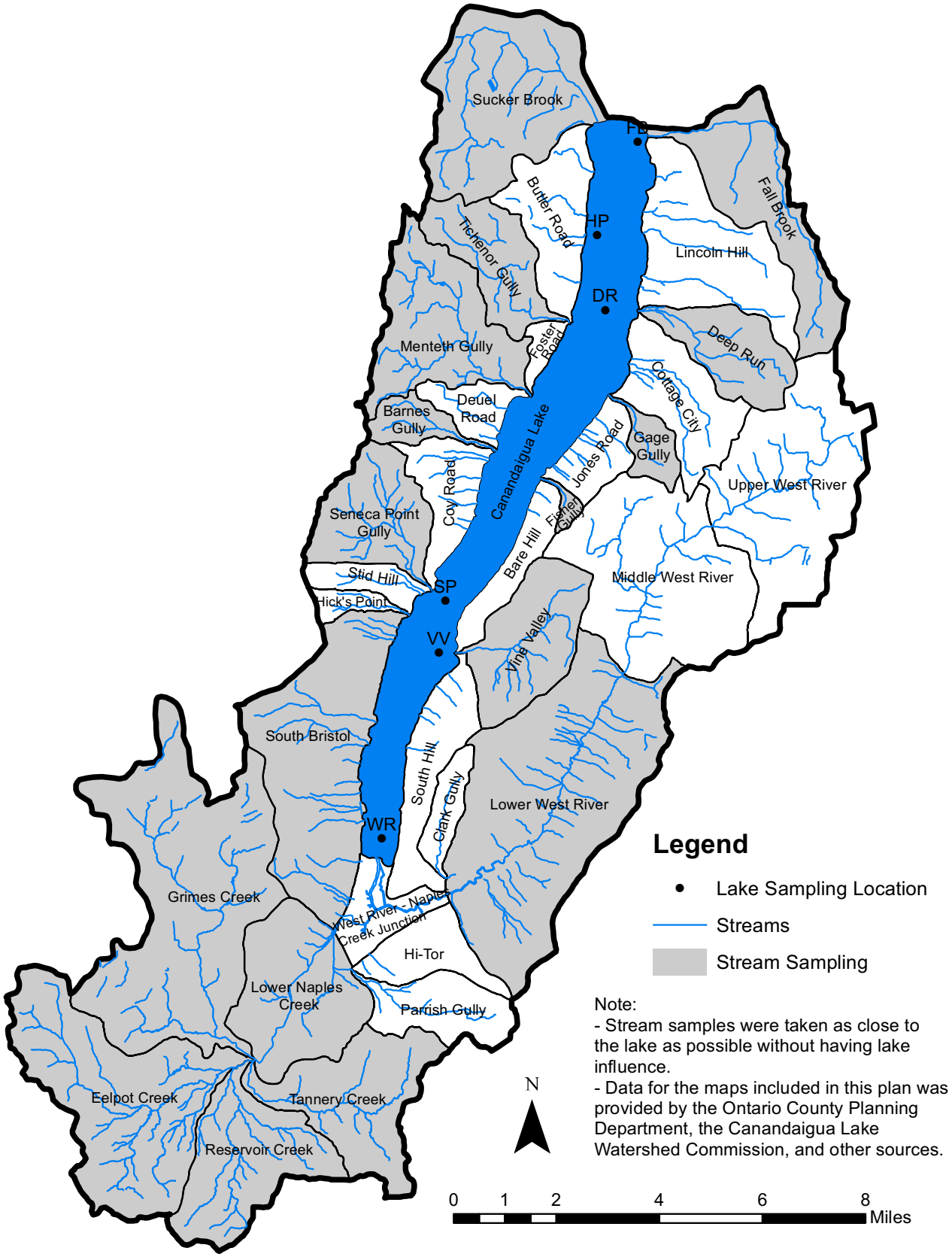
HYDROCARBON POLLUTION

In 2010, the Watershed Council partnered with SUNY ESF Chemistry professor Dr. John Hassett and a doctoral student to study the impacts of boats at the north end of Canandaigua Lake. Samples were collected during times of heavy and light boat traffic and analyzed for numerous components of hydrocarbons. The results documented a clear and distinct increase of several of these hydrocarbon parameters during heavy boat traffic days near the Kershaw Swim Beach area, with some pollutant levels getting close to the state water quality thresholds during the busiest weekends. The information was used to help document the impact that boat traffic can have on water quality as part of an overall boat carrying capacity study for Canandaigua Lake and the need to adopt revised Docks and Moorings regulations.

The summer 2012 discovery of a tar-like substance at Kershaw Swim Beach at the north end of Canandaigua Lake brought the issue of toxic substances to the forefront of water quality protection within the Canandaigua Lake Watershed. The City and Watershed Council consulted with Dr. John Hassett to analyze the contaminated material collected. It was determined that the material was a heavy oil, most likely a crankcase oil based on estimation of the history of filling (1920s and 1930s). To remediate this problem, the existing sand beach was excavated down to the native clay layer and replaced with new, clean sand. Monitoring wells were put in place for continued assessment of water quality in the area.

It is important to point out that the 2010 hydrocarbon testing program documented the correlation with boat traffic as the main cause of the elevated levels of hydrocarbons, not the buried contaminated material. However, based on the close proximity of the contaminated material to the lake, there was possibly some low level contamination of the water column. Based on the success of the remediation project, the NYS DOH allowed the Kershaw Park swimming area to be opened for the 2013 season on Memorial Day weekend as normally scheduled. Periodic monitoring of the beach will occur by the City, DOH and DEC.

CANANDAIGUA LAKE
STREAM AND LAKE SAMPLING LOCATIONS



3.2 TRIBUTARY WATER QUALITY

The US EPA estimates that nationwide, over 80% of the remaining water pollution problems are from non-point sources. In the Canandaigua Lake watershed, that percentage is higher because few industrial and municipal wastewater treatment facilities discharge to the lake.

National and NY State level water quality research has demonstrated that most non-point sources of pollution are carried into our waterways during precipitation events (i.e. rain or snow melt).

Our local tributary water quality sampling program has verified that in the Canandaigua watershed, the vast majority of nutrients, bacteria and sediment entering the lake occurs during storm/melt events. Based on the comprehensive water quality sampling program, tributary water quality varies across the watershed. Understanding differences among tributaries helps highlight pollutant hotspots and sources of pollution to the lake.

Between 1997-2010, water quality samples were collected in 17 streams during 55 storm events and 48 baseline conditions and analyzed for total phosphorus, total suspended solids and nitrate-nitrite. These 17 streams represent 79% of the total watershed drainage area.

Menteth Gully during a storm event

In 2002/2003 multiple rivulets within three direct drainage basins (Lincoln Hill, Butler Road and Cottage City-see map), representing an additional 10% of the total drainage area, were sampled on multiple occasions. The results from the direct drainage analysis demonstrate that these smaller rivulets with similar land use characteristics contribute comparable concentrations of nutrients and sediment to the lake.

Streams contributing significant pollutants to the lake have been studied through segment analysis to further understand the sources of pollution. In addition, water quality analysis also occurs at specific locations of suspected pollution sources, such as failing septic systems and development sites, to document levels of the pollutants associated with these land uses.

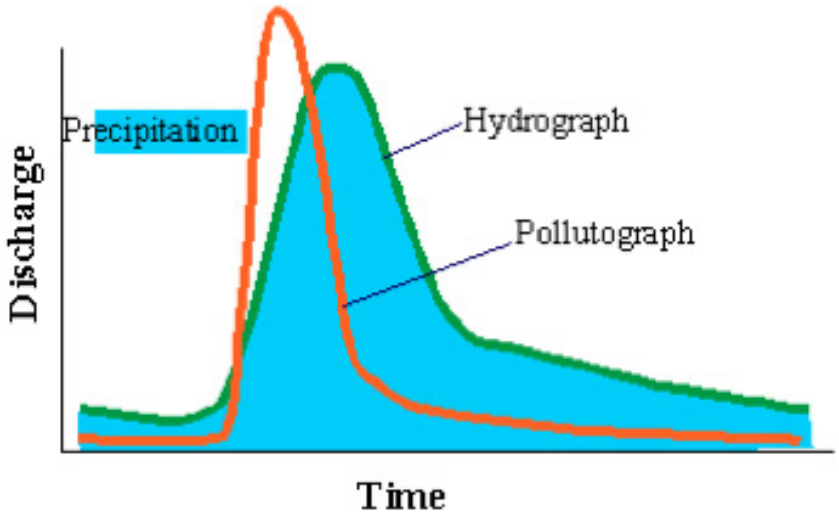
Between 2011-2013, watershed staff used the monitoring information to conduct visual/photo inspections of specific subwatersheds or land areas during storm events that could cause significant runoff issues. Water quality monitoring and visual inspections in combination have been integral in identifying individual areas and/or drainage pathways causing water quality problems for more targeted management.

STORM EVENT SAMPLING RESULTS AND DISCUSSION

The 55 storm/melt events sampled span a broad cross section of precipitation/melt events from minor storm events to large runoff events. This comprehensive set of samples helps to reduce the major variability that can occur with the grab sampling method. Grab samples are one snapshot in time for that stream in that particular subwatershed. Every storm event and even every sampling year is different based on a multitude of factors. It is important to understand these variables when drawing conclusions, because they can substantially affect sample results for an individual storm event or even an individual year. Some of the major variables in storm event grab sampling include:

- Time of year — similar sized storm events can yield very different results based on the time of year. Evapo-transpiration rates and ground conditions (frost) are just a couple factors that change throughout the year and impact results.
- Time sampled within a storm event — sampling during the "first flush" or early part of storm can yield very different results then sampling during the later stages of a storm event (Figure 2-1). Some storm events begin later in the evening and sampling crews are not able to sample until the early morning hours for safety reasons. It takes approximately 5-6 hours to get around the watershed and sample each of the streams and possibly complete a segment analysis. This amount of time can significantly impact the validity of comparing results among streams.
- Antecedent moisture conditions — pre-existing soil moisture during a precipitation event can have a major influence on the amount of runoff. Questions that should be researched are when it rained previously and what are moisture conditions in the ground. The impact that the level of soil moisture has on runoff amounts can be seen by comparing to storm events: August 31, 2005 and April 2-3, 2005. On August 31, 2005, the remnants of Hurricane Katrina came through our area and a total of 3 inches of rain fell over 24 hour period. Based on our water balance model, only 2% of that rain or 0.07 inches of runoff ended up as streamflow. On April 2-3, 2005, a rain event with no snow cover totaled 2.15 inches with 86% of that rain or 1.85 inches of runoff ending up as streamflow. Soil moisture levels was the major factor that dramatically increased runoff.
- Storm intensity, duration, and amount — a one inch rain event over 12 hours vs. 2 hours not only impacts the amount of runoff but also the timing of pollutants in the stream and the timing of when the sample is taken. A three inch rain event can yield very different results than a 1 inch rain event. In addition, during melt events, there is a tendency to have a substantially greater snow pack in the hills during the main spring melt which will increase runoff rates and thus pollutant loads.
- Time of Concentration (Tc) for each subwatershed — the Tc is the time it takes for the whole subwatershed to be contributing to stream flow during a runoff event. The Tc is unique for each subwatershed and can impact the pollutant loading at the time of the grab sample.
- Different precipitation amounts/intensities throughout the watershed on a particular event — there is one constant in a rain event…no two areas in the watershed receive the same amount of rain or the same intensity of rain. These differences make it difficult to interpret results among subwatersheds for the same event. We use multiple rain gages and visual observations to try to understand the level of variability throughout the watershed.
- Temporary land use change and timing of sample — temporary land use changes, such as fall plowing, manure spreading/fertilization and winter wheat cover rotation, can have substantial impacts on the concentrations of pollutants from agricultural land.

Muddy runoff coming from a development site.



THESE FIGURES SHOW A GENERALIZED POLLUTOGRAPH DEMONSTRATING THE VARIABILITY OF CONCENTRATIONS THROUGHOUT A STORM EVENT AND THE VARIABILITY OF PRECIPITATION AMOUNT AND INTENSITY DURING A STORM EVENT.

These are all important limitations of the grab sampling program that need to be understood when drawing conclusions. The monitoring program utilized is not capable of detecting subtle changes or year to year trends in streams. As described in Makarewicz's 1997-2000 report, the sampling design started sixteen years ago does not allow us to scientifically document annual trends in the data. "Trend analyses would require sampling the discharge of streams continuously with appropriate nutrient sampling during events and baseline conditions." Documenting year to year trends on 17 streams would require automated sampling and flow equipment at each site and a much higher frequency of sample analysis. The costs to do this on a yearly basis would easily exceed $100,000. All variables would still not be accounted for, thus still requiring some estimation and assumptions in the interpretation of the data that would be collected.

Even with these limitations, there is great value in the grab sampling program. The large data set sampled over the last 12 years helps to reduce the variability, and consequently provide us a high level of confidence that the long term averages and rankings reflect an accurate estimate of the nutrient, sediment and bacteria levels in these subwatersheds. It also allows us to document long term changes in trends and to identify areas where we need to work in subwatersheds to identify potential sources of the higher concentrations.

Although the current sampling program does not provide reliable year to year trends, it does allow us to observe trends that are maintained over multiple years. The sampling program also allows us to prioritize streams based on multiple events and years of sampling. Finally, it allows us to make rough comparisons between the results from our streams to national research.

BENCHMARKS

Table 2.1 in the NYS Stormwater Manual (2010) lists the National Median Concentrations for Chemical Constituents in Stormwater. This data came from the comprehensive National Urban Runoff Program (NURP) that sampled urban type streams across the United States during storm events during the late 1970s. The results from the NURP study document that the median concentration of total phosphorus (TP) was 0.26 mg/L, total suspended solids (TSS) was 54.5 mg/L, and nitrate/nitrite concentrations was 0.53 mg/L. Although there are multiple variables involved with comparing these concentrations to our sampling effort, the NURP study provides a decent benchmark to use as a guide when comparing watershed streams to national level research.

National research has documented that urban type streams usually have elevated levels of phosphorus, sediment, nitrates, and bacteria when compared to streams with rural land cover, so if we come close to these levels, there is cause for concern. Also, the NURP study was completed back in the 1970s and early 1980s when many of the treatment technologies for point sources of pollution were being upgraded and most of the non-point source pollution control techniques were not in place. Therefore, the levels reported in the NURP study should be higher than the sample data collected within the Canandaigua Lake Watershed during the 1997-2010 timeframe.

SUBWATERSHED NUMBER	TRIBUTARY	TOTAL PHOSPHORUS (mg/L)	TOTAL SUSPENDED SOLIDS (mg/L)	NITRATE-NITRITE (mg/L)
T-1	Sucker Brook	0.221	131.2	1.47
T-2	Tichenor Gully	0.185	151.2	1.06
T-3	Menteth	0.154	225.1	0.56
T-4	Barnes Gully	0.157	233.0	0.36
T-5	Seneca Pt.	0.219	268.0	0.50
T-27A	Cook's Pt- Mouth	0.198	248.4	0.39
T-7	Grimes Ck.	0.118	141.3	0.49
T-8	Eelpot Ck.	0.201	353.7	0.91
T-9	Reservoir Ck.	0.205	256.8	0.78
T-10	Tannery Ck.	0.144	167.2	0.24
T-12	Naples Ck- 245	0.208	309.6	0.52
T-13	L. West R.- Sunnyside	0.087	75.1	0.57
T-17	Vine Valley	0.237	280.3	1.26
T-18	Fisher Gully	0.161	362.5	0.61
T-19	Gage Gully	0.224	271.2	4.18
T-20	Deep Run	0.187	222.4	2.74
T-21	Fall Brook	0.144	153.8	2.23

Long term average concentrations based 55 storm event samples.

RANKINGS

Grab samples are snapshots in time and a few samples that are either substantially higher or lower can skew averages (even with many samples). Therefore, the long term average data is supplemented by providing a long term average ranking of each of the individual storm events. Each of the 55 storm events are ranked from 1 (lowest concentration) to 17 (highest concentration) and then averaged. This ranking approach was used in order to try to reduce the impact of extremely high or low individual storm event results that are outliers and may be skewing the raw average data. Additionally, the ranking approach documents which streams are more consistently high or low regardless of the event intensity and grab sample timing.

The ranking approach is used for each of the parameters. Finally, a cumulative ranking is also provided for the long term average ranking for phosphorus, TSS, nitrate/nitrite and fecal coliform. This cumulative ranking provides an overall stream pollution index for the subwatershed.

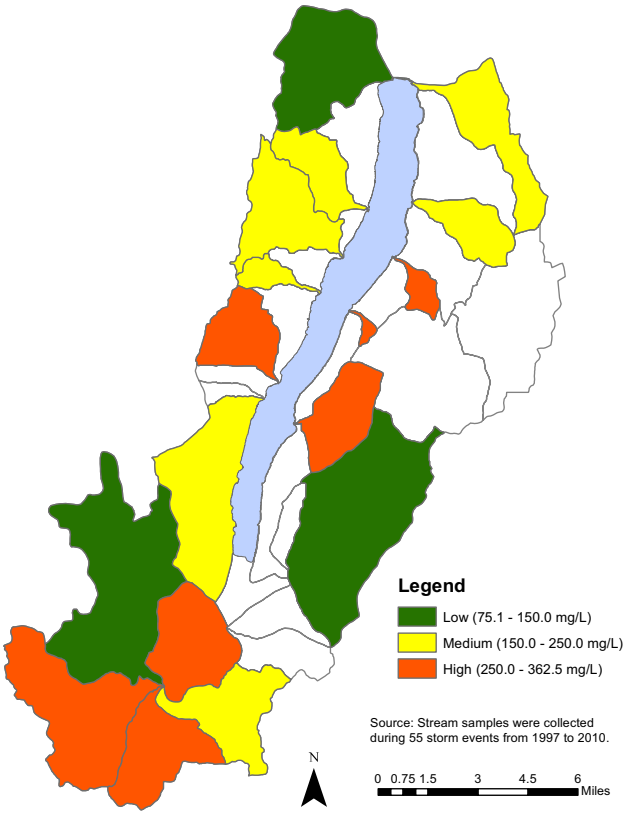
POLLUTION INDEX

To create an overall pollution index, the rankings from the phosphorus, nitrogen, TSS, and baseline fecal coliform concentrations were averaged for each stream. The higher pollution index in these streams corresponds to high rankings for multiple pollutants. Sucker Brook, Vine Valley, Deep Run, Fall Brook and Eelpot Creek are in the upper tier of the overall pollution ranking index.

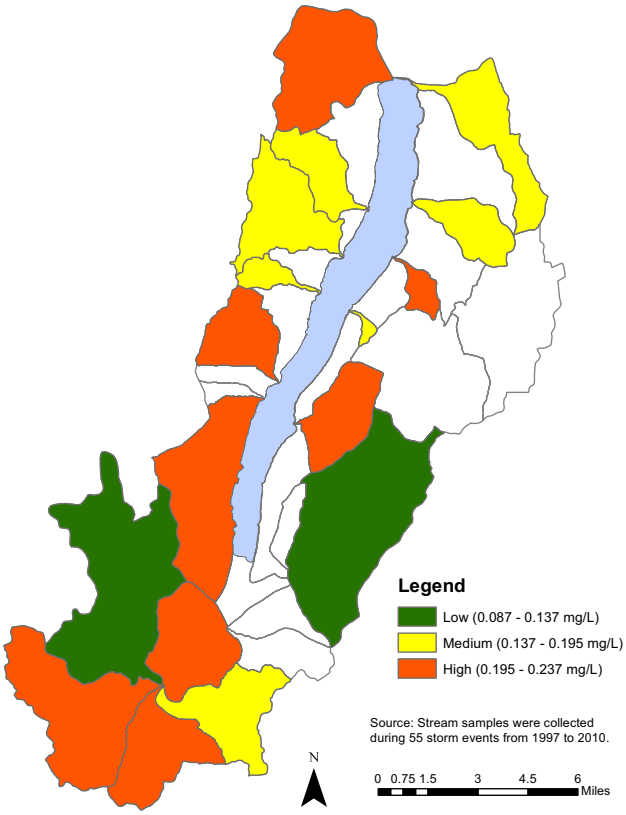
SUBWATERSHED NUMBER	TRIBUTARY	TOTAL PHOSPHORUS	NITRATE/ NITRITE	TOTAL SUSPENDED SOLIDS	FECAL COLIFORM	STREAM AVERAGE
T-1	Sucker Brook	12.4	11.8	9	17	12.6
T-2	Tichenor Gully	9.2	10.1	8.6	7	8.7
T- 3	Menteth	7.6	7.1	9.1	6	7.5
T-4	Barnes Gully	5.3	3.8	6.2	9	6.1
T-27A	Seneca Pt.	10.3	6.9	10.1	10	9.3
T-7	Cook's Pt- Mouth	9	5.2	9.9	13	9.3
T-8	Grimes Ck.	4.4	5.9	7.0		5.8
T-8	Eelpot Ck.	10	10.7	12.3		11.0
T-9	Reservoir Ck.	9.6	9.2	9.4		9.4
T-10	Tannery Ck.	6.3	1.9	8.8		5.6
T-12	Naples Ck- 245	9.9	7.3	11.7	12	10.2
T-13	L. West R.-Sunnyside	6.3	5.6	3.6	5	5.1
T-17	Vine Valley	10.6	10.8	8.4	16	11.5
T-18	Fisher Gully	7.2	5.9	6.7	8	6.9
T-19	Gage Gully	9.6	16.1	6.6	11	10.8
T-20	Deep Run	9.3	14.1	8.2	14	11.4
T-21	Fall Brook	7.4	13.3	8.2	15	11.0

Stream Pollution Rankings and Stream Pollution Index.

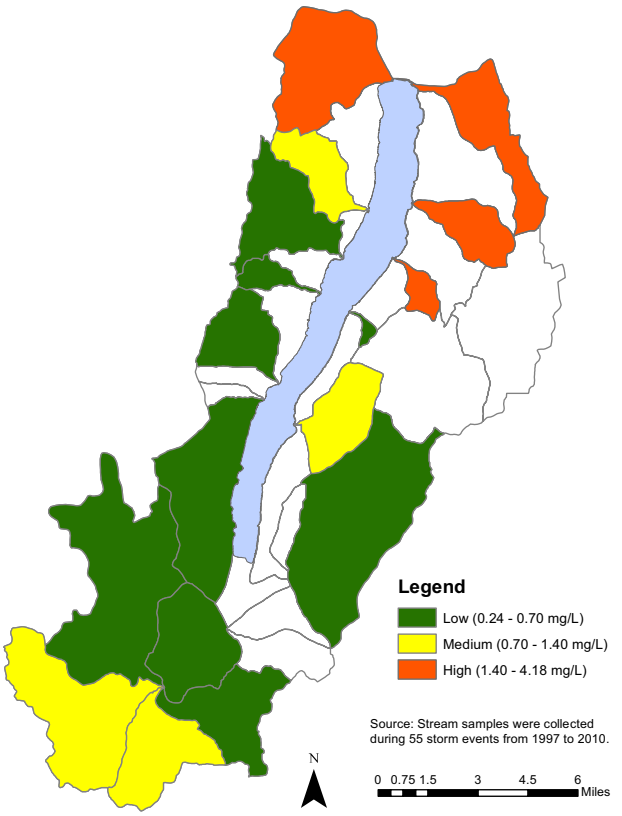
Total Suspended Solids Stream Concentrations

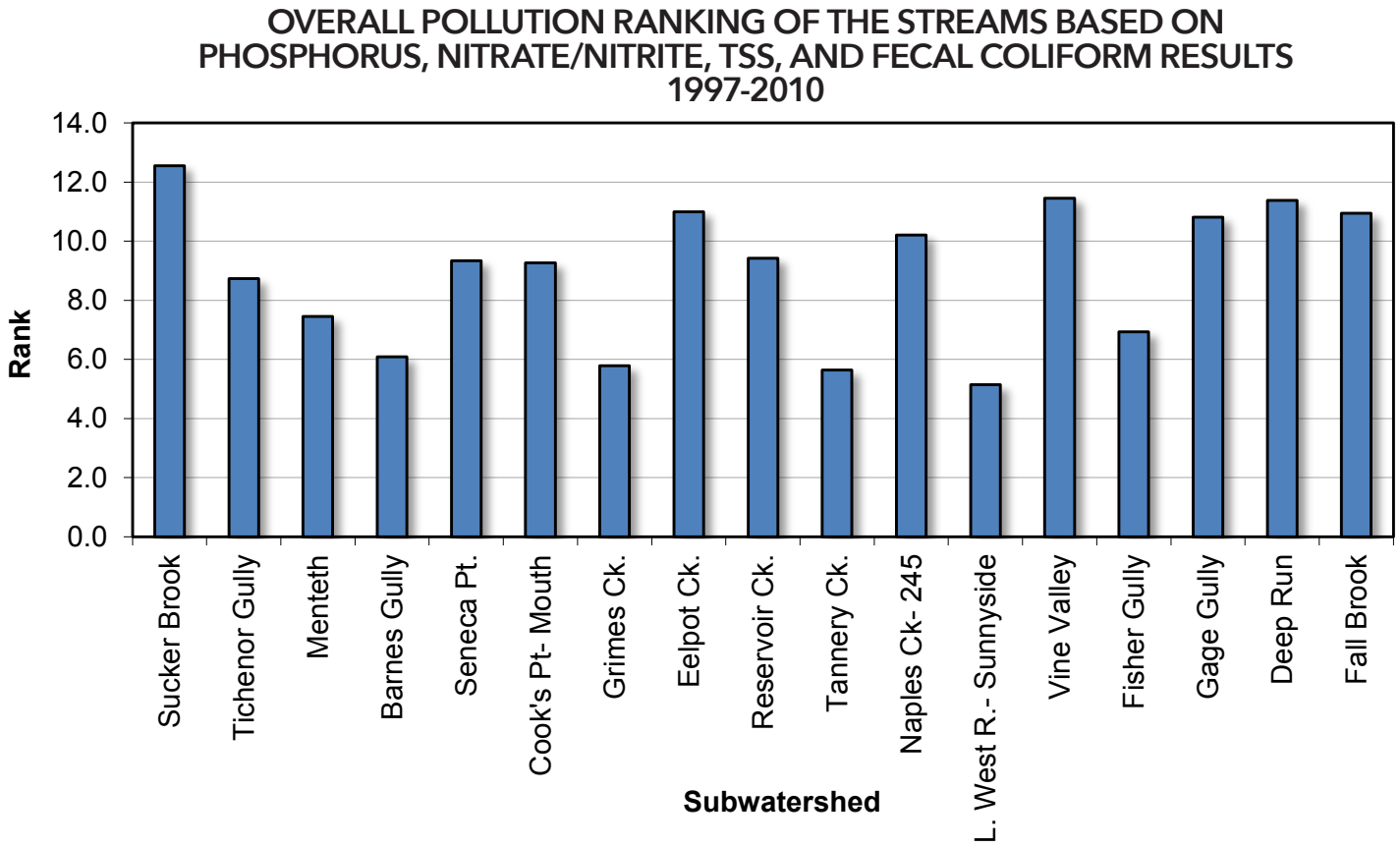


Total Phosphorus Stream Concentrations



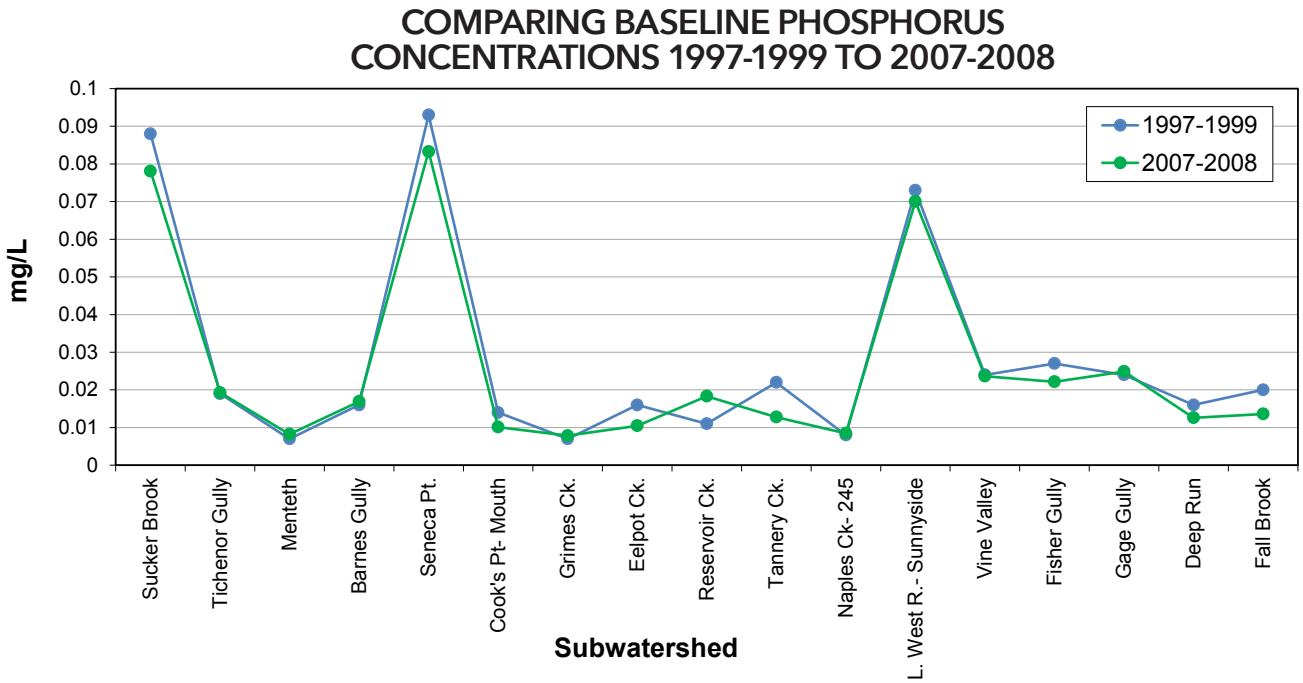
Nitrate/Nitrite Stream Concentrations





TRIBUTARY BASELINE SAMPLING

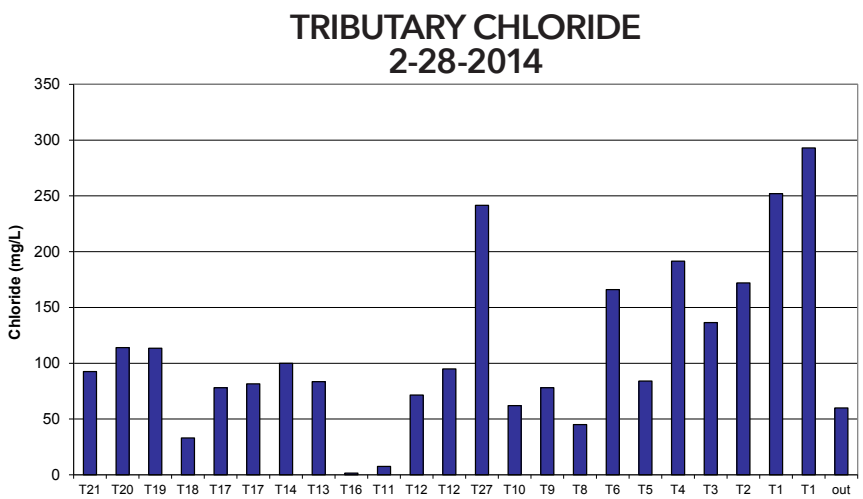
Baseline sampling shows a consistent pattern between the 1997-1999 dataset and the 2007-2008 dataset. There was a decrease in the baseline nitrate levels at Gage Gully of approximately 0.5 mg/L from the 1997-1999 to 2007/2008. This is consistent with the reduction in storm event nitrate concentrations. Overall averages still document that Fall Brook, Deep Run, Gage Gully, Eelpot and Sucker Brook are all substantially over the 0.53 mg/L benchmark that is referenced in the NYS stormwater manual report.



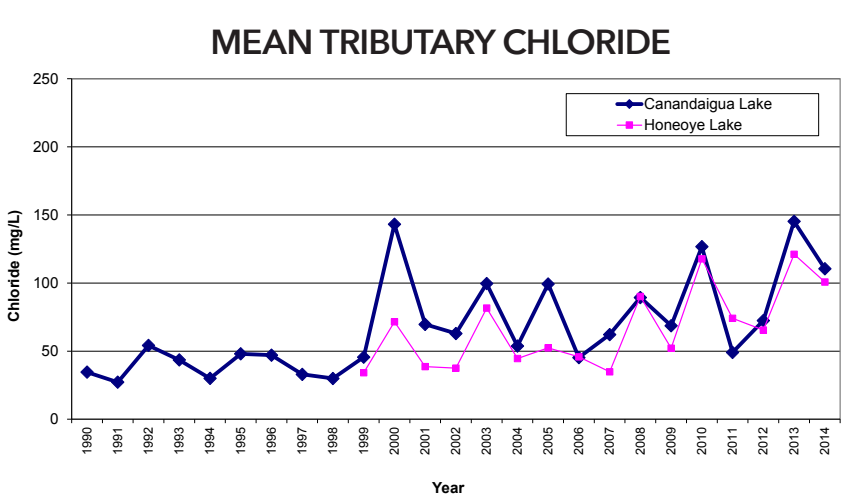
TRIBUTARY CHLORIDE

Chloride is a corrosive substance that may be found in water as a result of the application of de-icing agents to watershed highways as well as from natural leaching of bedrock salts. Chloride concentrations are expressed in parts per million (ppm) or its equivalent, milligrams per liter (mg/L). A critical threshold of 250 mg/L is thought to be damaging to sensitive stream and lake organisms.

Major tributary streams to Canandaigua Lake have been sampled since 1990 as part of an environmental science class at FLCC. Larger streams are sampled at multiple locations and the determination is made following the standard methods procedure. The FLCC class work was expanded to Honeoye Lake tributaries in 1999 allowing for a contrast with an adjacent watershed.



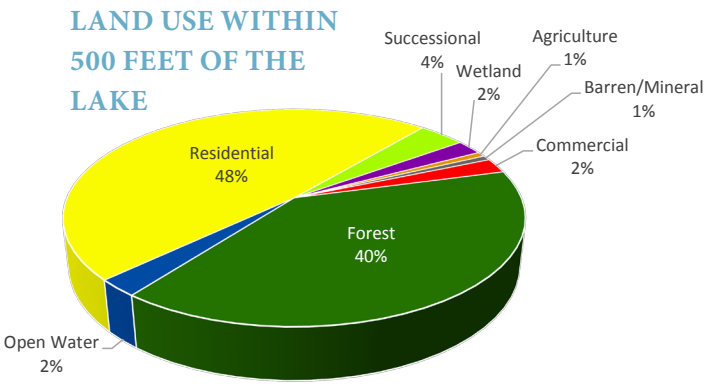
Water samples from the tributary streams have routinely been collected during the last week of February and they provide a snapshot of chloride concentrations during that small time period. On any given day, concentrations are influenced by road salt application rates, frequency of recent freeze-thaw cycles and stream flow volumes. Initial road surface runoff will increase tributary chloride levels but prolonged watershed runoff events may produce a chloride dilution effect in the streams.



Every year, certain streams register high chloride levels and the 2014 data fit that pattern. Sucker Brook (T1 in the chart), flowing through the City of Canandaigua, has the greatest highway mileage in its subwatershed and consequently has high chloride concentrations. Cook's Point Stream (T27) also has high chloride levels due to the amount of salt applied to steep roads within its subwatershed. Barnes Gully (T4), Hick's Point Stream (T6), Tichenor Point Stream (T2) and Menteth Gully (T3) often contain moderate levels of chloride. With little development in their subwatersheds, Conklin's Gully (T11) and Clark's Gully (T16) have the lowest concentrations of chloride. Levels in the lake, estimated from samples collected in the lake outlet at Kershaw Park average about 50 mg/L, well below the critical threshold of 250 mg/L. Annual patterns since 1990 may reflect severity of the winter season for any given year. It is interesting to note that beginning in the year 2000, chloride levels exhibited greater yearly fluctuation as compared to the previous decade. That same pattern was also observed in the Honeoye Lake tributaries suggesting a regional, rather than local phenomenon, may be responsible.

SHORELINE PROPERTY INFLUENCE

The tributary/direct drainage monitoring program is very useful in understanding what is entering the lake from the surrounding watershed. However, one limitation with the program is that it cannot account for the runoff that directly enters the lake from the dense ring of residential properties that surround much of the 36 miles of shoreline of the lake. The overwhelming majority of precipitation landing on these 1,500 plus properties will not enter a stream or rivulet where pollution levels can be measured before eventually entering the lake. Upland sources of pollution may be reduced by wetlands and in-stream processes, but lakeside pollution can only be diluted by the lake itself. In lake dilution of pollution is not a solution.



One method to estimate the shoreline-ring pollution impact is to compare the land use/land cover of the adjacent shoreline area (within 500 feet of the lake) to a tributary with similar land cover that is actively sampled. When looking at the land cover statistics, the City portion of the Sucker Brook subwatershed is most similar to the shoreline land cover/land use. The tributary and stressed stream analysis information identifies Sucker Brook as having some of the highest nutrient and bacteria concentrations. In addition, pollutant modeling and national level research have also documented that these suburban watersheds with higher impervious cover produce other contaminants such as heavy metals, pesticides and hydrocarbons. The area of land within 500 feet of the lake equals approximately 2,200 acres. Although this area is only 2% of the watershed, its proximity and pollution loading makes it a high priority area for protection and management.

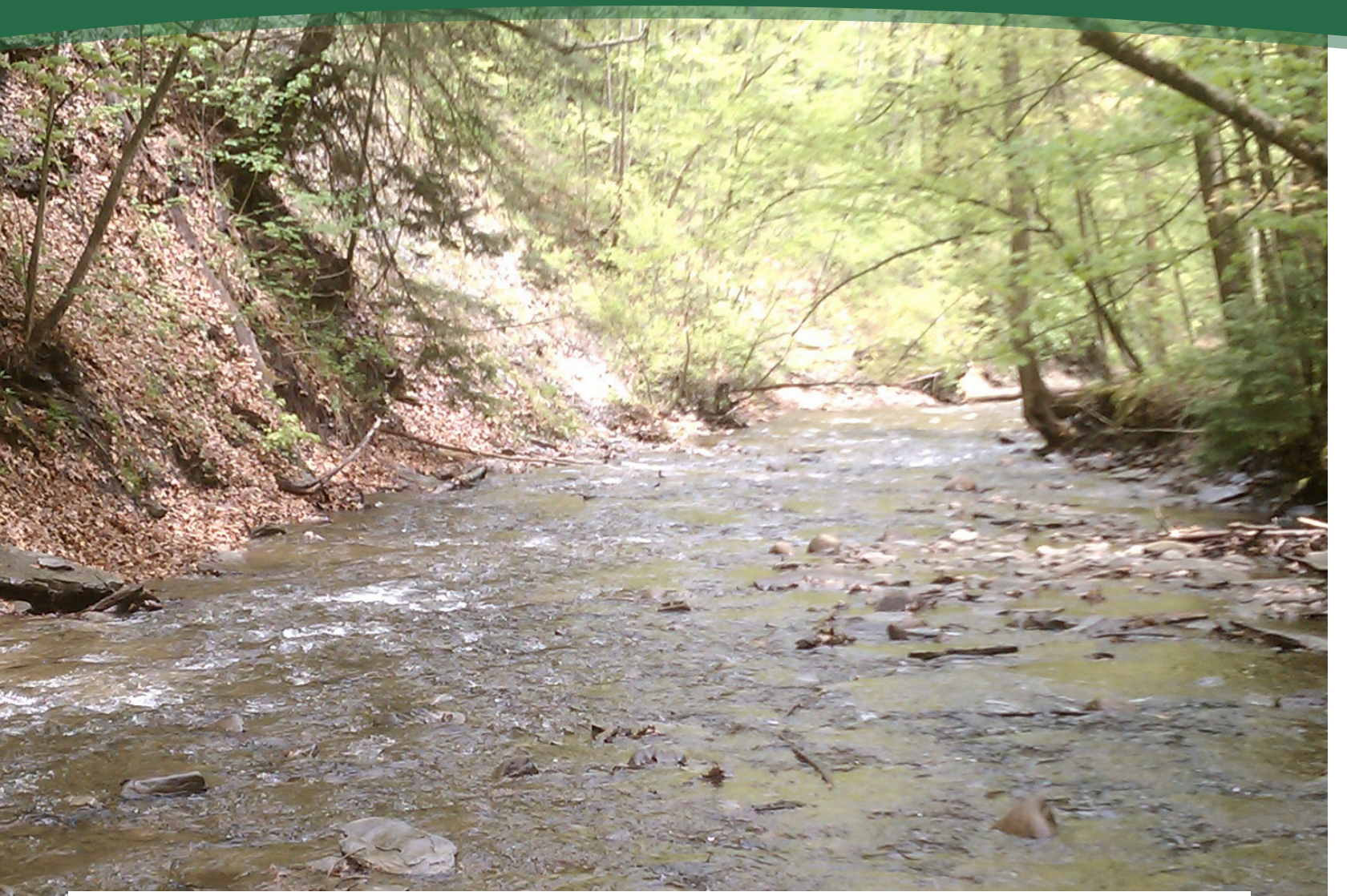
CONCLUSION:

Canandaigua Lake continues to remain a high water quality resource. The active Watershed Management work of the Watershed Council and all its various partners have kept the levels of phosphorus and other contaminants at low levels.

As identified in the Canandaigua Lake Watershed Plan (Olvany, 2000), non-point sources of pollution are the major source of concern in the Canandaigua Lake watershed. Although there are two small wastewater treatment plants (Rushville, Bristol Harbour) discharging from point sources, the vast majority of pollution comes from non-point sources. No single non-point source contributes the vast majority of pollution to Canandaigua Lake. However, it is the cumulative effect of all non-point sources that ultimately does impact the quality of Canandaigua Lake. Higher concentrations of a specific pollutant can reveal which streams have the greatest likelihood of being impacted by human activities that need to be mitigated. The following chapter, focusing on implementation, utilizes this water quality information to devise a strategy to reduce the source of pollution.

May 15, 2014 storm event. Plume from West River and Naples Creek extending several miles up the lake.

4. WATERSHED MANAGEMENT IMPLEMENTATION STRATEGIES



Since its formation in 1999, the Canandaigua Lake Watershed Council has coordinated the implementation of the endorsed actions identified in the existing Watershed Plan. The 2000 Canandaigua Lake Watershed Management Plan provided a substantial list of actions to implement to provide comprehensive level protection. The Plan has served as an effective framework to guide the implementation of projects utilizing the five management approaches:

Research, Education, Restoration/Remediation, Open Space Protection & Regulation

Substantial progress has been made on those actions. In addition, actions were implemented that went beyond actions identified in the Watershed Plan based on new information and ideas. Highlights of the progress that has been obtained over the last fourteen years is summarized in this section and organized under the five management approach categories.

PROGRESS SUMMARY

RESEARCH

Research is the foundation for watershed management. It provides insight on existing conditions in the watershed and helps evaluate the effectiveness of management practices.

- 1997-2012: Monitored 55 storm events in 17 tributaries and completed direct drainage studies on subwatersheds 22, 33 and 34. Since 2001, Watershed Manager has collected tributary samples and assisted on lake sampling. Partners included: SUNY Brockport (tributary sampling program from 1997-2000), FLCC- Bruce Gilman tributary chloride sampling (1996- present), Watershed Association and Watershed Inspector.
- Conducted stressed stream analysis on several streams including Sucker Brook, Fall Brook, and Vine Valley. Also conduct visual inspections of watersheds during storm events. Partners included: SUNY Brockport, FLCC, Watershed Association and Watershed Inspector.
- Watershed Council completed a Boat Carrying Capacity Study for Canandaigua Lake that reviewed the current peak boat usage on the lake and developed recommendations based on four different methodologies.
- Dr. Bruce Gilman of FLCC implements the Lake Monitoring program (1996-present). Watershed Council provides funding and assists in the implementation of the Lake Monitoring program.
- Watershed Council obtained funding to complete a map of the City Storm Sewer System including the drainage areas that influence each outlet. Partnered with City to complete project.
- Watershed Council obtained funding, hired an RIT graduate student and provides coordination for the Natural Capital Study. Partners include Watershed Association and Dr. Bruce Gilman of FLCC.
- Land cover mapping of the entire watershed utilizing the Natural Heritage Classification System. Partners: FLCC (Bruce Gilman), County Planning, RIT interns, Watershed Council and FLLOWPA.
- Watershed Council obtained grant funding for the 2006 LiDAR contour mapping of the Yates County portion of the watershed to match the Ontario County mapping.
- Watershed Council funded and assisted Bruce Gilman in completing a macrophyte study- started initial investigation at potential Hydrilla Hotspots (boat launches and marinas).
- Watershed Council provided substantial assistance on Water Supply Study as part of the City Water Supply Permit- Completed Mass Balance Model/Report, three year Canandaigua Outlet monitoring and report, along with assisting DEC on completing Part III of the EAF.
- Watershed Council partnered with IAGT to complete non-point source pollution model through IAGT.

Bruce Gilman of FLCC monitoring the lake water quality.

Counting Quagga and Zebra Mussels by DEC, Dr. Gilman, and the Watershed Council.

EDUCATION

The success of the watershed program relies on the support of local citizens. Actions by individuals contribute to improved watershed conditions. Therefore, education is a keystone to the watershed program.

- Watershed Council created and installed new watershed boundary signs on local/county and state roads.
- Watershed Association and Council partner on the ongoing storm drain marking program.
- Completed a wide array of educational publications and presentations.
- Watershed Council co-funds the Watershed Education Program with Watershed Association. The Program utilizes two certified teachers to work in three school districts across the watershed to discuss watershed science and how individuals can protect the watershed. The two organizations won the 2011 Friend of Education Award from the Canandaigua City School District.
- Watershed Council co-authored Lawn and Landscape Management Policy with Chris Dorn (City Parks- retired, and Russell Welser CCE) for the City of Canandaigua Parks Department that establishes a model for other municipalities and commercial applicators to follow.
- Watershed Council has conducted presentations at many watershed conferences across the watershed and the state, educating the public on watershed issues and documenting the intermunicipal success of the program.
- Watershed Council developed and installed four educational kiosks around the lake that review the importance of Watershed Management, stormwater impacts and threats, and what individuals can do.
- Watershed Council is currently completing a substantial upgrade to the Watershed Council website to more comprehensively display and interact with the public.

Atwater Meadows Shoreline Planting with Canandaigua Tennis team.

Honduras Exchange Program meeting with the Watershed Program.

Eco School built Onanda Kiosk.

RESTORATION

Implementation of watershed management practices provides tangible improvements to water quality. It is a goal to maximize restoration efforts and focus on practices that are efficient, effective and provide a public benefit.

- Sucker Brook Dredge Project: removed over 8.4 million pounds of slightly contaminated sediment from a section of Sucker Brook between Parrish Street and 5 and 20 Bypass. Material was brought to landfill and used as daily cover. Watershed Council coordinated the project and partnered with County, Town and City to complete project. Improved water quality and reduced potential upstreaming flooding. Grant funding through DOS.
- Watershed Council hired MRB to complete a comprehensive stormwater model of Sucker Brook Watershed. Partnered with Town, City and School District. Grant funding through DOS.
- Watershed Council designed solution, provided funding and hired contractor to complete 400 foot sod/grassed waterway to minimize massive agricultural field erosion- eliminated 30 tons of erosion each year.

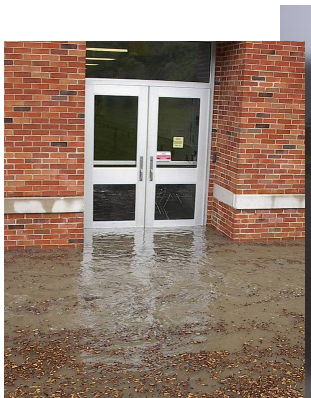
Sucker Brook before (upper left) and after (above) dredging.

Erosion on a farm field (left)

Sediment running into the lake (below)

Grassed waterway was installed to prevent erosion and filter runoff (above).

- Created two- acre stormwater wetland on Canandaigua School District property at Pearl St. Stormwater wetlands were created to solve flooding problems at the Primary School (17 classrooms flooded on two occasions). Partnered with Town, County, School and City. Grant funding through DOS. Major cost reductions were achieved through Town, County, and City forces.



Canandaigua School District flooding

Canandaigua School District stormwater wetland

- Town of Canandaigua created the Deuel Road stormwater management facility in partnership with the local farmer and Watershed Council to reduce flood related damage to Deuel Road.
- Watershed Council designed and provided funding for Middlesex Highway Garage bio-retention area in partnership with the Highway Department and Watershed Association.
- Watershed Council authored and administered an EFC green infrastructure grant for the City-owned Antis Street Parking Lot Bio-Retention project. The Watershed Council assisted the City in installing the plantings. The City provided the labor and equipment to complete the project at a much lower cost than if the project was completed by a private contractor.

Deuel Road erosion problems

Middlesex Highway Department Bio-retention Area

Antis Street - before (left) and with a bio-retention project in action (above)

- Watershed Council coordinated Deep Run outlet dredge project between the private landowner, contractor and Ontario County. The project improved flow into the lake. The delta had forced the flow along the public beach and directly at the intake pipe for the Town of Gorham.

Deep Run before dredging with significant sediment deposits at the outlet (left).

Deep Run dredging in progress (below).

- Watershed Council coordinated the Sunnyside Road Drainage Study and Culvert Project - obtained grant funding and permits.
- Watershed Council designed and managed the Deep Run/Gorham Water Treatment Plant stream stabilization project.
- Watershed Council designed and coordinated the Fall Brook/ Canandaigua Country Club stream stabilization project (1,200 feet on both sides). Partnered with Town of Canandaigua Highway Department to complete work.
- Watershed Council assisted in a grant applications to obtain $60,000 for the Village of Naples Sanitary Sewer Study/Design, partnering with Village and Watershed Commission.

Fall Brook at the Canandaigua Country Club before (left) and after stabilization (right)

- Watershed Council provided design and permit assistance on several FEMA projects (Bills Road, shoreline stabilization projects, culvert sizing and replacement).
- Creation of Village of Rushville Walking Trail and stream stabilization along West River. Watershed Council assisted in obtaining grant funding and volunteer assistance in trail clearing. Partnered with Gorham, Rushville and Ontario County to complete project.
- Watershed Council partnered with highway departments on numerous road bank stabilization projects.
- YMCA bio-retention facility- Watershed Council obtained grant funding, coordinated efforts and provided the in-kind assistance to work with County, Town and City forces to build the bio-retention area. Substantial cost savings were achieved for the YMCA.

YMCA bio-retention facility

- Menteth Creek/Goodale Road partnership with farmer, NRCS and Fish and Wildlife Service Partners Program to restore 1,000 + feet of stream using logs, vegetation and some stone.
- Watershed Council obtained funding and provided technical assistance for stormwater/ streambank stabilization work at Outhouse Town Park and Civic Center - 1,500 feet of vegetative stream stabilization and two stormwater ponds near Civic Center to solve drainage and parking issues. Partnered with Town, City and Civic Center.
- Watershed Council authored grant application for the Middlesex Salt Storage Barn. Partnered with Yates Soil and Water and Middlesex.
- Watershed Council partnered with landowners to complete Vine Valley Stream stabilization projects at two locations where major erosion was occurring.
- Watershed Council purchased stream arch culverts and currently loans them for use in timber harvesting operations.
- Ontario and Yates County Soil and Water Conservation Districts have been able to bring in over $2 million over the last 14 years to complete numerous farm level agricultural best management projects to protect water resources. Ontario and Yates County Soil and Water Conservation Districts are considered leaders throughout New York State. Watershed Council provided some limited local cost share funding assistance through the monitoring program and general funding for to help defray the local farmer share and encourage farmer participation.
- Watershed Council obtained $120,000 grant to assist City of Canandaigua in its purchase of a Street Sweeper.
- Watershed Council obtained funding and has started coordinating work on the Canandaigua Lake Water Trail project. Partners include Ontario County Tourism, Finger Lakes Land Trust, and others.
- Watershed Council worked with several partners to create the Lagoon Park Habitat Restoration Plan. Provided significant planting assistance and applied for two grants to help pay to implement the plan. Partners include: Botanical Society, City, Watershed Association, Soil and Water and FLCC students.

Outhouse Town Park stream stabilization project utilizing willow wattles.

High efficiency Street Sweeper removing collected material from City streets.

- Watershed Council assisted with the Onanda Park/Barnes Gully dredging project and Boat Launch stabilization in partnership with the Town of Canandaigua.
- DEC and Trout Unlimited completed substantial stream bank stabilization projects in Naples Creek to promote fish habitat and protect water quality. Watershed Council participated in the Willow Planting Project.

Atwater Meadow Project

- Watershed Council coordinated the Atwater Meadows Shoreline Stabilization Project where 100 feet of deteriorated wall was falling into the main channel for the nearby townhouse communities. Partnered with Town, City and HS Tennis Team to remove the wall and install a more natural combination of rock and vegetation to stabilize and restore this area.
- Watershed Council partnered with Ontario County Public Works and Highway Department to complete the Grimes Creek/County Road 36 bank stabilization project (350 feet). Grant funding purchased the stone and plantings that were utilized.

Parrish Street area before

Parrish Street Stabilization

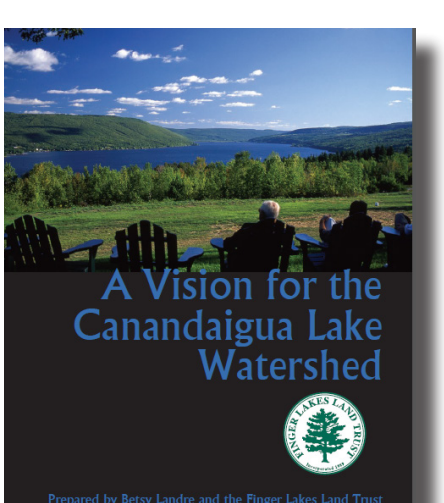
- Kershaw Park Remediation project: Watershed Council provided technical assistance, helped to organize Dr. John Hasselt's water quality analysis and public outreach for the Kershaw Beach remediation project.
- Completed several Sucker Brook stream restoration/stabilization projects in City: north of Parrish Street (400 feet), Ellis Place (250 feet), Gibson Street (100 feet), and West Avenue (250 feet). Watershed Council coordinated the projects, obtained permits and partnered with County, Town and City to complete the projects. Grant funding through DOS.

Streambank before stabilization

Streambank after stabilization

OPEN SPACE PROTECTION

Open space is a key component for water quality protection, providing benefits such as flood protection, increased infiltration, water filtering, and reduced erosion.



- Finger Lakes Land Trust developed: "Vision for the Canandaigua Lake Watershed" in 2010 as an open space protection plan for the watershed.
- Finger Lakes Land Trust has acquired numerous properties and conservation easements throughout the watershed totaling close to 900 acres. They have also provided project assistance on numerous projects. Watershed Council and other partners provided seed funding to Finger Lakes Land Trust for open space acquisitions in Gorham, Middlesex and Naples.
- Town of Canandaigua and Town of Gorham have dedicated open space funds to protect high priority lands which have been utilized on several locations.
- Nature Conservancy obtained land adjacent to Hi-Tor (Parrish Flats Road) and transferred it to NYS. They also manage other land within the watershed.

REGULATION

Local regulations help ensure watershed protection is implemented and enforced. There has been substantial progress in the watershed in the adoption of laws that balance land use and water quality protection.

- Watershed Council provides stormwater development reviews and inspection assistance in various towns in partnership with local Code Enforcement Officers and Watershed Inspector.
- Watershed Council promoted and obtained adoption of enhanced phosphorus treatment requirements in the Town and City of Canandaigua.
- Watershed Council partnered with Ontario County and other entities to assist municipalities in updating Docks and Moorings Law in 2002 and 2010.
- Watershed Council created Land Use Sub-committee that developed model laws for stormwater management, steep slopes and water course protection. Partnered with County Planning and Genesee Finger Lakes Regional Planning Council.
- Watershed Council developed MS4 Notice of Intent programs and provides technical assistance for both the City and Town of Canandaigua to meet and exceed MS4 requirements.
- South Bristol adopted a Steep Slope Law with assistance from the Watershed Council. Town of Middlesex is in the final stages of developing a Steep Slope Law with Watershed Council providing assistance.
- Obtained grant funding and helped to coordinate the work to create a GIS-based Onsite Wastewater System Database for the Watershed Inspector.
- Gorham and South Bristol adopted onsite wastewater system inspections at the time of property deed transfer. Other municipalities are considering the law.

Large scale residential development in the Town of Canandaigua

The 2014 Watershed Management Plan builds on the knowledge gained and projects completed over the last fourteen years to develop a more comprehensive strategy to protect the lake and its surrounding watershed from existing and emerging threats. The strategies outlined in this update continue the original goals of providing high quality drinking water and recreational enjoyment while protecting the ecological integrity of the lake and its watershed. This updated Plan maintains many of the existing programs and approaches of the existing Plan while supplementing it with new strategies and actions to more comprehensively meet the current and future challenges in the watershed.

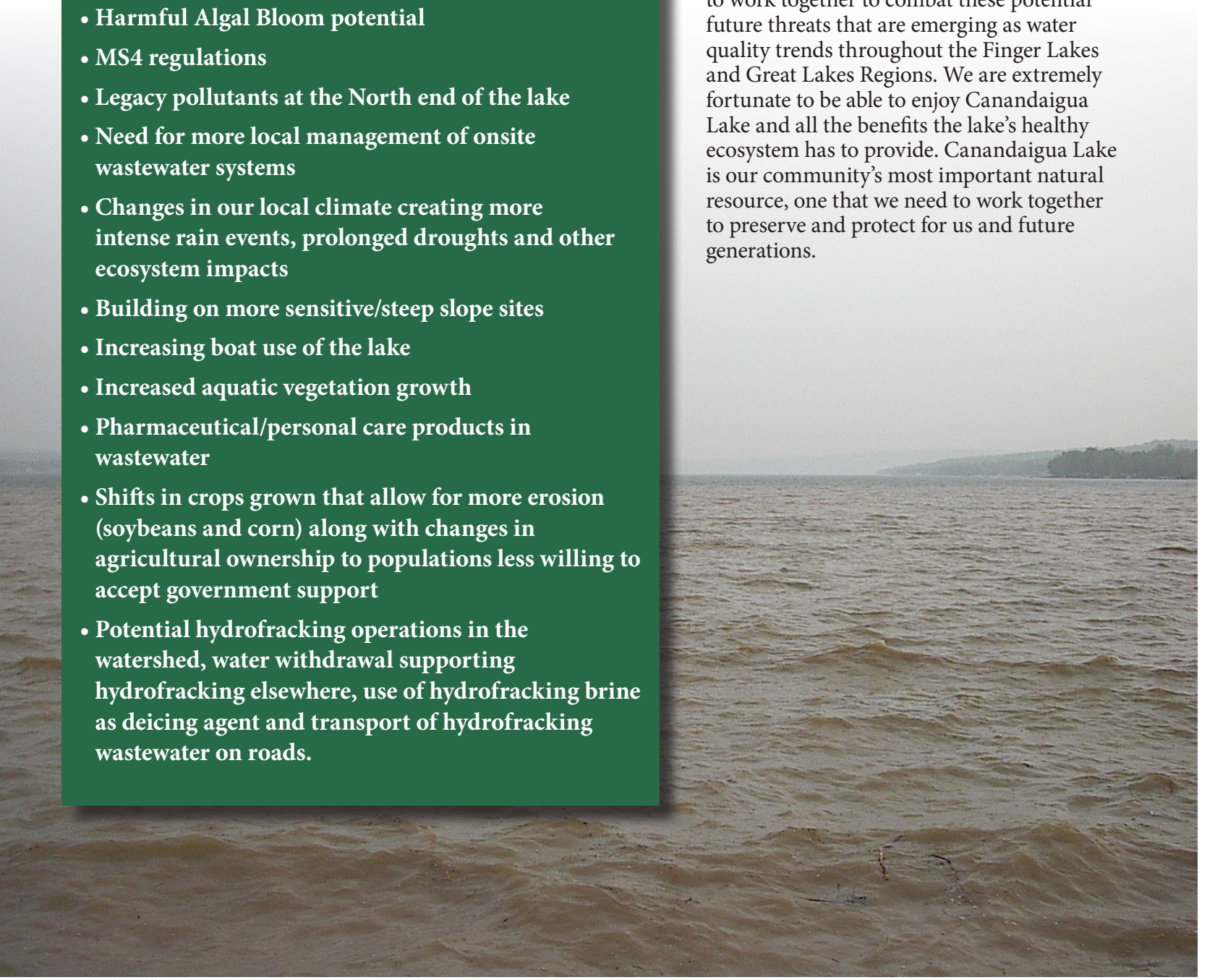
EXISTING AND EMERGING THREATS

In the past decade, numerous emerging threats and trends have created the need to update our watershed management plan in order to properly meet the goals of our watershed strategy, including :

- **Substantial development in the watershed creating increased populations and impermeable surfaces**
- **More intense use of the shoreline area**
- **New invasive species with the potential for additional species such as Hydrilla**
- **Harmful Algal Bloom potential**
- **MS4 regulations**
- **Legacy pollutants at the North end of the lake**
- **Need for more local management of onsite wastewater systems**
- **Changes in our local climate creating more intense rain events, prolonged droughts and other ecosystem impacts**
- **Building on more sensitive/steep slope sites**
- **Increasing boat use of the lake**
- **Increased aquatic vegetation growth**
- **Pharmaceutical/personal care products in wastewater**
- **Shifts in crops grown that allow for more erosion (soybeans and corn) along with changes in agricultural ownership to populations less willing to accept government support**
- **Potential hydrofracking operations in the watershed, water withdrawal supporting hydrofracking elsewhere, use of hydrofracking brine as deicing agent and transport of hydrofracking wastewater on roads.**

These existing and emerging threats and trends have the potential to significantly impact the water quality of Canandaigua Lake by increasing phosphorus and other pollutants of concern in the lake, increased intensity and duration of algae blooms, aquatic weed growth, increased difficulty for filtration of drinking water and potential beach closures.

It is critical for the watershed community to work together to combat these potential future threats that are emerging as water quality trends throughout the Finger Lakes and Great Lakes Regions. We are extremely fortunate to be able to enjoy Canandaigua Lake and all the benefits the lake's healthy ecosystem has to provide. Canandaigua Lake is our community's most important natural resource, one that we need to work together to preserve and protect for us and future generations.



WATERSHED MANAGEMENT CATEGORIES

Long-term, effective management strategies are outlined in the following section of the Management Plan to achieve watershed protection and water quality goals. Strategies include actions that individuals can take to improve water quality, recommendations for municipalities to adopt and projects that community organizations can collaborate on. Recommendations are based on the following thirteen management categories:

4.1 New and Existing Development
4.2 Lawn and Landscaping Practices
4.3 Municipal Roads and Highway Facilities
4.4 Stream and Shoreline Management
4.5 Wetlands and Floodplains
4.6 Wastewater Management
4.7 Agriculture
4.8 In-Lake Issues: Invasive Species, Harmful Algal Blooms and Fish Kill Management
4.9 Recreation
4.10 Lake Level Management
4.11 Forestry
4.12 Mining and Natural Gas Extraction
4.13 Chemical Contamination Prevention

Vine Valley in the fall.

Maintaining and enhancing the high water quality of this watershed requires a multifaceted approach that applies to the entire watershed and the successful implementation of a combination of actions that draw from each of these management categories. No one action alone will protect the Canandaigua Lake watershed. Embedded in each of the management category recommendations are actions that rely on research, restoration/remediation, protection, education and regulation approaches.

At the end of this chapter, a table summarizes each strategy and also provides the following information:

- Management approaches utilized to implement strategy: research, education, restoration/remediation, open space management and regulation
- Timeframe
- Potential Partners
- Cost
- Evaluation Criteria

4.1 EXISTING AND NEW DEVELOPMENT

THE ISSUE

Rain falling on a natural landscape will seep into the ground and will generate very little runoff. However, when natural landscapes are converted into development, the rain falls on impervious surfaces, such as roads, roofs, driveways, parking areas, and compacted manicured lawns. Instead of infiltrating into the ground, the rainfall accumulates on these hardened surfaces and becomes stormwater runoff. Stormwater runoff picks up these human signatures deposited on our landscape and transports them via pollution highways such as road ditches, culverts, storm drains and streams ultimately to Canandaigua Lake.

Antis Street before bio-retention areas

Antis Street bio-retention area

National, state and local water quality research studies have documented that stormwater discharges from impervious surfaces are a substantial concern because of the high concentration of pollutants that are found in these discharges including fertilizers, pesticides, sediment, automobile fluids, bacteria, dog waste and more. Stormwater also contributes to flooding and enhanced streambank erosion by both greatly changing the timing and increasing the amount of water entering the streams. Having as little as 10% of the watershed in impervious cover can negatively impact streams (Arnold and Gibbons 1996).

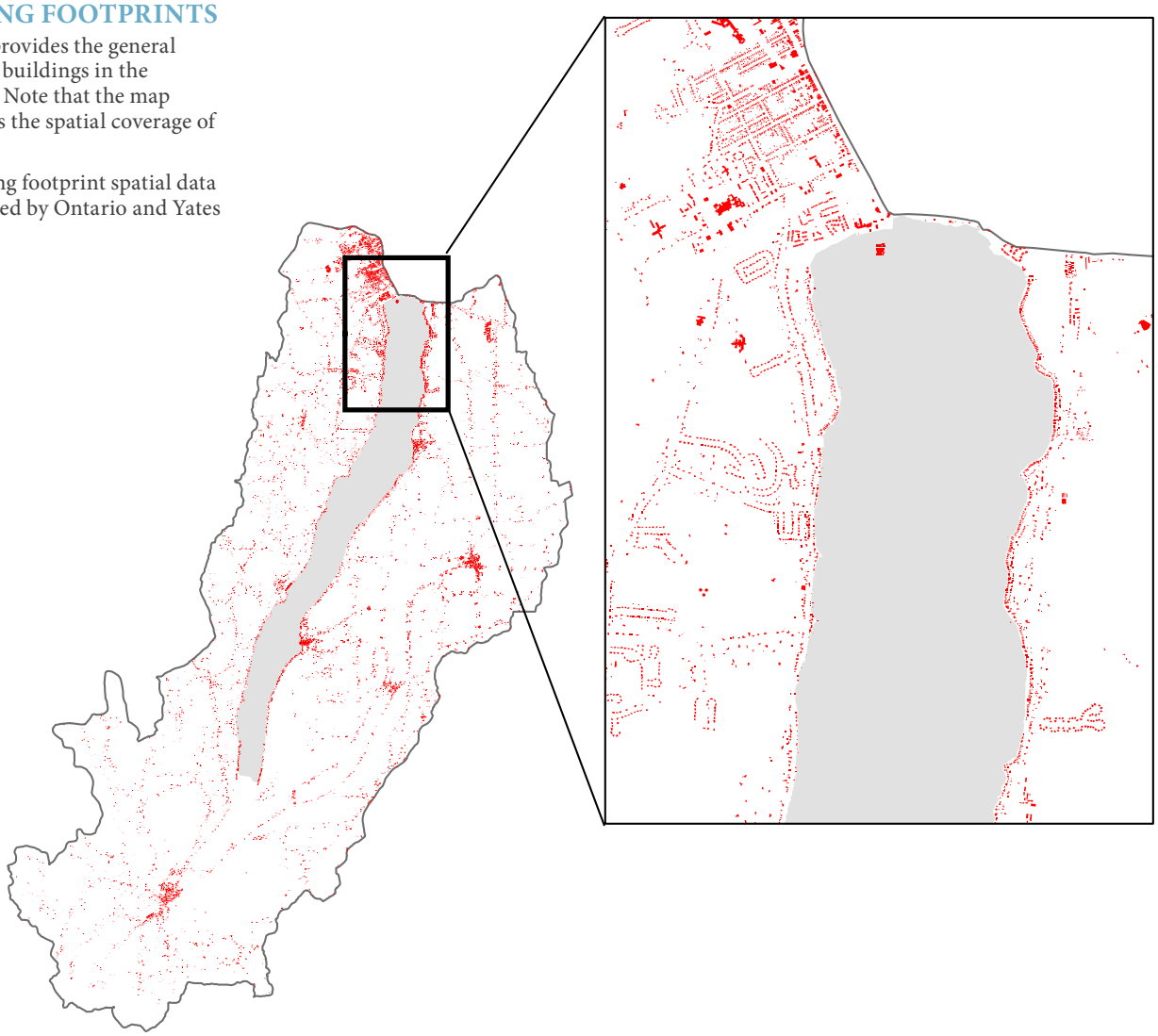
EXISTING DEVELOPMENT

Existing development that occurred prior to the late 1980s typically had no post-construction stormwater regulations in place to slow and filter the runoff produced by these developed areas. The watershed contains many areas where stormwater runoff from impervious cover/manicured lawns does not go through any stormwater treatment, including most of the City of Canandaigua, the 36 miles of shoreline development and numerous other villages, developments, hamlets and single lots. Only the more recent larger developments within the last 20 years receive some stormwater management through the routing of stormwater into detention/retention ponds before entering the lake. Therefore, the vast majority of the stormwater runoff generated by existing development in the 109,000 acre watershed goes into the lake unfiltered.

BUILDING FOOTPRINTS

This map provides the general location of buildings in the watershed. Note that the map exaggerates the spatial coverage of buildings.

The building footprint spatial data was provided by Ontario and Yates Counties.



NEW DEVELOPMENT

ON A PER ACRE BASIS, SEDIMENT DISCHARGE FROM A CONSTRUCTION SITE HAS BEEN DOCUMENTED TO BE 10 TIMES GREATER THAN TYPICAL AGRICULTURAL LAND AND 1000 TIMES GREATER THAN FOREST LAND US-EPA

The Canandaigua/Ontario County area is experiencing new development at a much greater level than in most other areas of upstate New York. This is having multiple positive impacts on the economy. However, runoff from new construction can negatively affect the water quality of the lake both during the construction process and after the development has been completed.

The actual construction process often requires excavation, digging, and soil stockpiling. Soil becomes exposed to rainfall and is no longer anchored by vegetation, making it prone to erosion. Pollutants that can be discharged during the construction process include: sediment, phosphorus, nitrogen, pesticides, hydrocarbons, oil and grease, concrete truck washout, construction chemicals and construction debris. On a per acre basis, sediment discharge from a construction site has been documented to be 10 times greater than typical agricultural land and 1000 times greater than forest land (US-EPA). Proper oversight of these developments is critical.

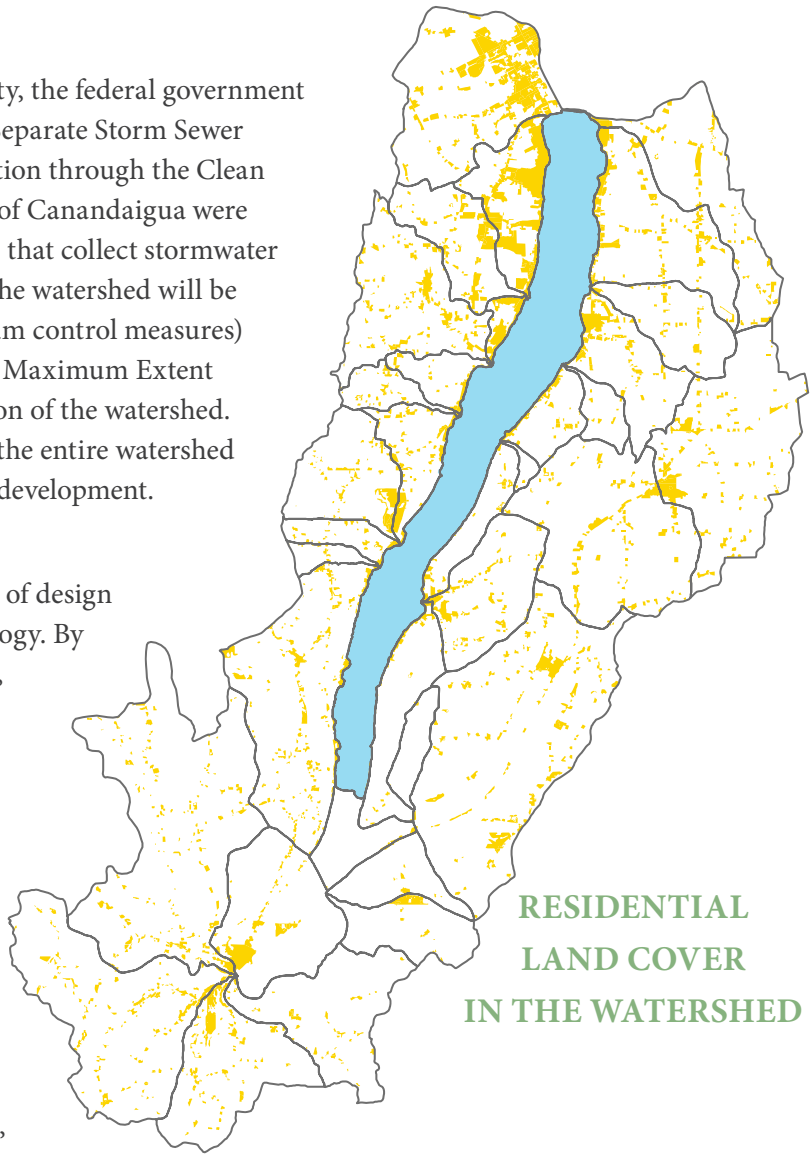
The watershed program assists the respective municipalities and DEC in inspecting construction sites during dry weather and storm event conditions to determine if their stormwater plan is working or not. When deficiencies or water quality violations occur, the municipalities and DEC have utilized stop work orders, fines, and holding up additional building permits to force developers to meet the regulations.

The post construction built out environment converts open space into developed land, increasing stormwater runoff and the various pollutants associated with development. State and local regulations have been enacted to reduce the impact from new development. Even with these regulations in place, there is still a net negative impact from new development on water quality. Therefore, it is imperative to go beyond these requirements to provide a greater level protection for Canandaigua Lake.

Discharge from a development site headed towards the lake.

MODERN SOLUTIONS:

Due to the impact of stormwater runoff on water quality, the federal government has put into place stormwater regulations (Municipal Separate Storm Sewer System- MS4) on local municipalities based on population through the Clean Water Act. In 2013, the City and portions of the Town of Canandaigua were included as regulated MS4s. MS4s are populated areas that collect stormwater and discharge it to surface water. The "MS4" areas of the watershed will be mandated to implement various measures (six minimum control measures) to reduce the impact from existing development to the Maximum Extent Practical. However, the MS4 area is only a small portion of the watershed. Therefore, implementing many of these actions across the entire watershed will help to reduce the impacts from existing and new development.



RESIDENTIAL LAND COVER IN THE WATERSHED

GREEN INFRASTRUCTURE (GI) is an umbrella of design techniques that seek to mimic pre-development hydrology. By encouraging rain to seep into the ground where it falls, green infrastructure harnesses the landscape's natural ability to slow runoff and filter out pollutants. Low Impact Development (LID) designs utilize many of the green infrastructure techniques, but gain additional benefits through thoughtful design and planning. In contrast to traditional stormwater management, which collects and transports stormwater to a large stormwater pond; LID and GI focus on managing stormwater on an individual parcel of land in addition to the landscape level approach.

Techniques include rain barrels, downspout diversions, bio-retention areas/rain gardens, pervious pavement, vegetated swales, wetland and floodplain expansion, green street and parking lot design, green roofing, urban tree planting, minimizing the area disturbed for construction, utilizing grassed swales, reducing impervious surface coverage, along with many more approaches.

Antis Street Parking Lot- bio-retention area

STRATEGIES

1. INCREASE MUNICIPAL EFFORTS TO BETTER MANAGE STORMWATER FROM EXISTING AND NEW DEVELOPMENT

A. Partner with the City and Town of Canandaigua along with the City of Canandaigua School District in complying with and exceeding the SPDES permit requirements for Municipal Separate Storm Sewer Systems (MS4s). Specifically, assist in developing their Annual Reports, Stormwater Management Program Plans and in implementing the six required Minimum Control Measures. Wherever possible, implement these measures across the entire watershed area.

B. The City and Town of Canandaigua have adopted Enhanced Phosphorus Treatment Standards for new development in the watershed. Encourage all municipalities to adopt these standards for new development (see City and Town websites for actual law).

C. Continue and enhance the partnership between the Watershed Program and municipalities in reviewing development plans and inspecting construction sites.

D. Assist municipalities to inventory all stormwater ponds on existing developments both within and outside of the MS4 area and determine if maintenance is needed. Consider enhancements to the existing ponds that will increase the level of water quality treatment.

E. Work with partners, such as Soil and Water, to host training events for code enforcement officials, developers/contractors, site plan reviewers and municipal employees on stormwater and erosion control regulations and BMPs.

F. Increase public awareness about the impacts from stormwater runoff and the use green infrastructure techniques by distributing educational publications to watershed residents and increasing public outreach efforts.

Students installing storm drain labels.

G. Continue and enhance the highly successful storm drain marking program in partnership with the Canandaigua Lake Watershed Association.

H. Partner with various entities to work with Planning Boards and Zoning Board of Appeals on important items to consider when reviewing Plans/Variances. Important questions that need to asked and analyzed relate to:

- reviewing whether the entire upstream drainage area was considered when conveying flow,
- what are the potential downstream impacts of the proposal,
- what are the cumulative impacts to granting approval/variances across the watershed,
- have the hardship thresholds truly been met.

2. MUNICIPALITIES AND WATERSHED COUNCIL SHOULD PARTNER WITH COUNTY AND REGIONAL PLANNING ENTITIES TO ENCOURAGE MORE COMPREHENSIVE LAND USE PLANNING AT THE LOCAL LEVEL THROUGH APPROACHES THAT:

A. Improve regulatory protection for: steep slopes, water courses, floodplains, shorelines and wetlands. Model laws have been produced to protect steep slopes and water courses.

B. Incorporation of green infrastructure, low impact development and urban forestry designs into local laws and site plan review requirements for larger developments and single lot development along the lake.

C. Develop standards for the maximum impervious surface coverage allowed on the developable portion of a parcel instead of the entire parcel, minimum parcel width of 100 feet along shoreline and numerous additional techniques.

Inadequate erosion and sediment control measures on the uphill portion of this steep slope development caused significant sediment to leave the site.

3. EXPAND THE USE OF GREEN INFRASTRUCTURE PROJECTS ON PUBLIC AND PRIVATE LAND ALONG WITH UTILIZING LOW IMPACT DEVELOPMENT DESIGNS ON BOTH NEW AND EXISTING DEVELOPMENT

A. Encourage municipalities and Land Trusts to prioritize open space projects to protect highly important lands such as streamside/gully areas, filter strips along roads, and wetland expansion/restoration projects.

B. Continue and enhance the use of green infrastructure and stormwater retrofit projects on municipal properties and on private land where the public benefit outweighs the private benefit. Green Infrastructure projects have been implemented on the Antis Street Parking Lot, YMCA, Canandaigua Primary School, Finger Lakes Community College (wetland weir) and Deuel Road along with several other sites.

C. Consider an incentives program for green infrastructure and LID designs on existing and new development that could include expedited permitting, density upgrades, stormwater fee discounts (if applicable), tax credits, rebates, and awards. This strategy will require more research before implementation.

D. Develop funding mechanisms for new green infrastructure projects, including stormwater management fees, grants, banking and credit systems. Utilize funds to implement green infrastructure measures in another part of the watershed in order to reduce the net negative impact on lake water quality from new development.

YMCA bio-retention area.

4.2 LAWN AND LANDSCAPING PRACTICES

THE ISSUE

Excessive use or improper application of lawn fertilizers and pesticides on all properties in the watershed can have a negative impact on water quality. The application of fertilizers and pesticides near our shoreline, watercourse areas, road ditches and other water runoff conduits can have the greatest likelihood of getting into Canandaigua Lake. As land uses within our watershed continue to shift towards more urban and residential use, management of lawn fertilizers and pesticides becomes increasingly important in protecting and preserving water quality.

LAWN FERTILIZERS

Urban and suburban runoff has been a major source of phosphorus and other nutrients within the Canandaigua Lake watershed; one pound of phosphorus entering our waterways can result in 500 pounds of aquatic plant growth! Increased phosphorus, along with the impact of Quagga Mussels, can create a situation where we see more intense Harmful Algal Blooms that can cause serious health problems, such as liver and neurological issues. In 2013, increased blue green algae was seen in the late summer with secchi disk readings below 3 meters. In addition, increased aquatic plant growth has been documented throughout the 36 miles of shoreline area. This entire process of nutrient loading of phosphorus and the negative impacts on water quality is known as eutrophication and can have long term negative impacts on our use and enjoyment of the lake.

ONE POUND OF PHOSPHORUS ENTERING OUR WATERWAYS CAN RESULT IN

500 POUNDS

OF AQUATIC PLANT GROWTH

PESTICIDE USE

Pesticide application can result in environmental contamination through diverse pathways. Some pesticides are persistent for long periods of time and collect in the tissue of plants and animals. Predators feeding on smaller prey accumulate these persistent pesticides. Those organisms higher up in the food chain bioaccumulate these toxins to a level that can alter reproductive success or cause other chronic toxicity problems. Many questions remain about the synergistic or combined effects of multiple toxins and pesticides interacting in a lake environment. Due to the substantial human health and environmental considerations, prudence dictates that the input of these chemicals into the lake should be minimized as much as possible.

The numbers above represent the nutrient concentrations in the bag of fertilizer- Nitrogen, Phosphorus and Potassium. Residents need to be educated to look at the middle number and make sure it is zero.

STRATEGIES

1. IMPROVE EDUCATIONAL PROGRAMS TO REDUCE FERTILIZER AND PESTICIDE USE IN THE WATERSHED

A. Partner with Watershed Association, Cornell Cooperative Extension, and Soil and Water Conservation Districts to better coordinate and enhance educational outreach regarding lawn and landscape practices. The most recent DOS grant will be utilized to comprehensively update our educational materials. In addition, utilize a wide array of promotional and distribution approaches to connect with our constantly changing and increasing watershed population.

B. Promote the NYS DEC fertilizer ban to the public. Make the general public and commercial businesses aware of the key components of the law (www.dec.ny.gov/chemical/67239.htm,) including:

- the application of any fertilizer on lawns or non-agricultural turf is prohibited between December 1st and April 1st
- fertilizers containing phosphorus are not permitted unless clear deficiency is shown by soil testing or on new lawns
- no fertilizer spreading within 20 feet of a waterbody or on paved surfaces

C. Promote the City of Canandaigua's 2010 Turf and Landscape Management Policy (TLMP) as a policy for other municipalities and commercial/educational institutions to adopt. The Policy identifies how the City minimizes their use of fertilizers and pesticides through proper irrigation, aeration, overseeding, mowing, soil testing and fertilizer application strategies along with limiting pesticide application to an average of once every 5 years.

D. Update Watershed Council website with easily accessed Integrated Pest Management (IPM) information and links, including the Cornell Cooperative Extension's office as a "hotline" resource.

E. Partner with MS4 municipalities to distribute educational materials regarding IPM strategies.

F. The Watershed Association, as a citizen group, should consider developing a lake friendly lawn care company standard and work with lawn care companies to meet that standard. In addition, homeowners should be encouraged to talk with their commercial landscapers to follow the City's policy of limiting pesticide usage to once every 5 years on average, instead of 4-5 times a year.

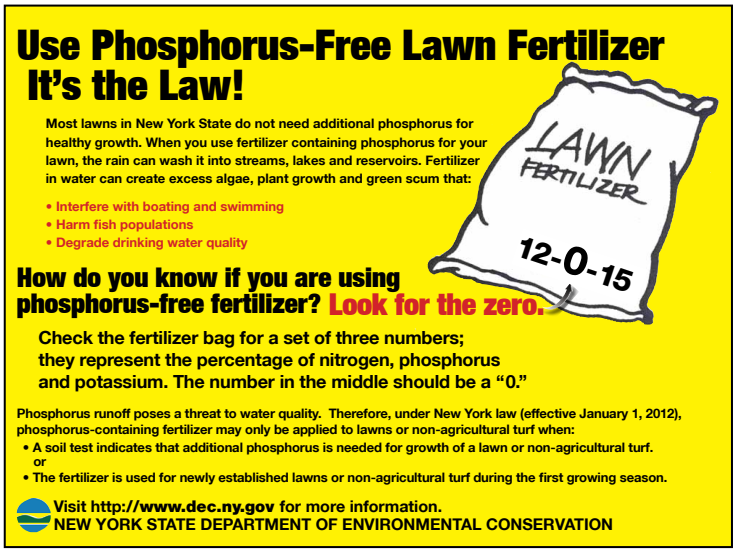
G. Encourage the use of rain gardens, native vegetation, downspout disconnection, rain barrels, cisterns, natural stream/shore buffers and other green infrastructure techniques.

2. MONITOR STREAMS AND THE LAKE FOR PESTICIDES

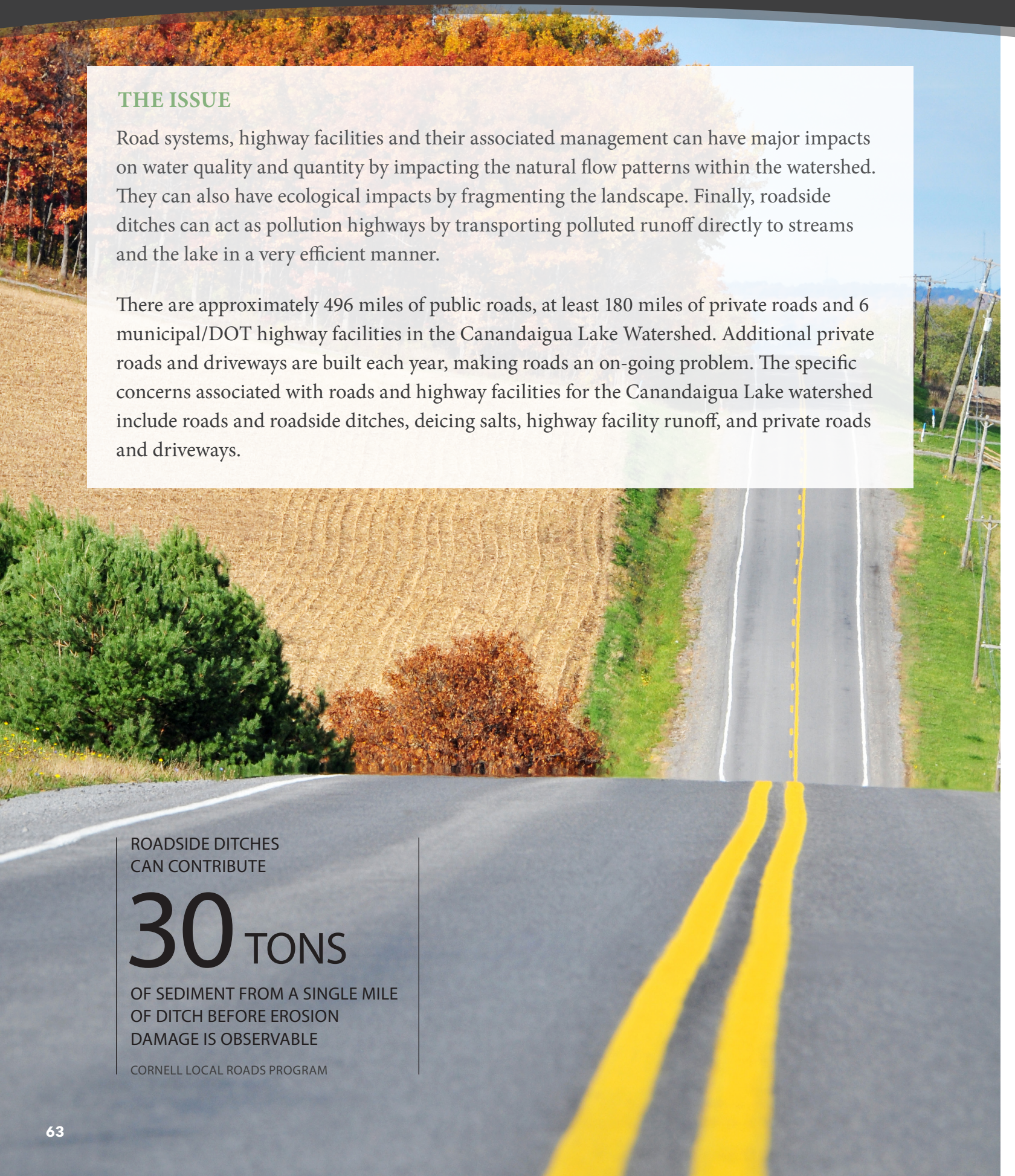
A. Partner with the DEC and USGS to conduct a baseline water quality study for pesticides in the lake and consider monitoring tributaries.

3. PROPER DISPOSAL OF HOUSEHOLD CHEMICALS

A. Unused pesticides and household chemicals need to be properly disposed of to prevent surface and groundwater contamination. Work with the Ontario County to hold more frequent household hazardous waste collection days to accept unused pesticides
(see Chemical Contamination section for more details).



4.3 MUNICIPAL ROADS AND HIGHWAY FACILITIES



THE ISSUE

Road systems, highway facilities and their associated management can have major impacts on water quality and quantity by impacting the natural flow patterns within the watershed. They can also have ecological impacts by fragmenting the landscape. Finally, roadside ditches can act as pollution highways by transporting polluted runoff directly to streams and the lake in a very efficient manner.

There are approximately 496 miles of public roads, at least 180 miles of private roads and 6 municipal/DOT highway facilities in the Canandaigua Lake Watershed. Additional private roads and driveways are built each year, making roads an on-going problem. The specific concerns associated with roads and highway facilities for the Canandaigua Lake watershed include roads and roadside ditches, deicing salts, highway facility runoff, and private roads and driveways.

ROADSIDE DITCHES CAN CONTRIBUTE

30 TONS

OF SEDIMENT FROM A SINGLE MILE OF DITCH BEFORE EROSION DAMAGE IS OBSERVABLE

CORNELL LOCAL ROADS PROGRAM

ROADSIDE DRAINAGE SYSTEMS

Roadside drainage systems include: ditches, gutters, catch basins and culverts. These unintentionally impact hydrology and water quality. The roadside drainage network intercepts both road runoff and water from the surrounding landscape. The ditches then move the water and any associated pollutants rapidly to the stream networks. In doing so, roadside ditch networks:

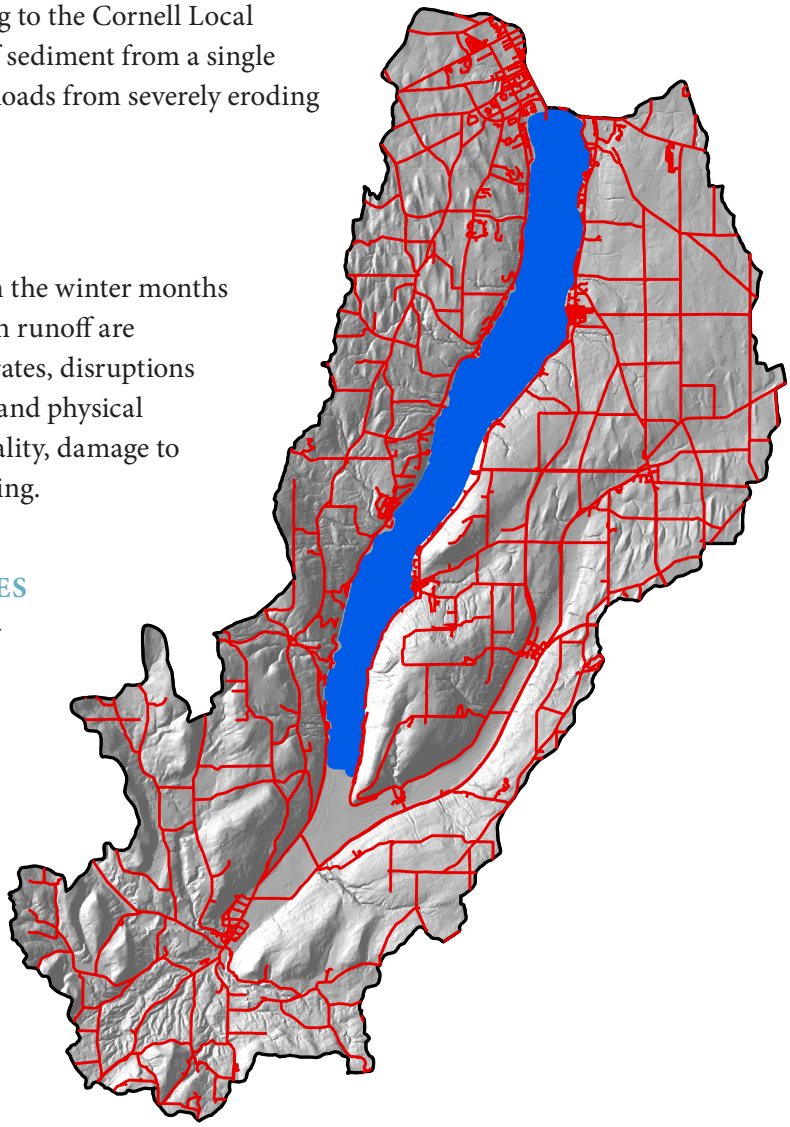
- Act as a pollution highway for pollutants,
- Reduce the landscapes' natural ability to filter pollutants and recharge groundwater,
- Contribute to higher peak and total flows in streams, and
- Affect stream geomorphology and stability

Roadside ditches, especially those that are not vegetated or are not artificially hardened, also contribute to sediment pollution. According to the Cornell Local Roads Program, roadside ditches can contribute 30 tons of sediment from a single mile of ditch before erosion damage is observable and the loads from severely eroding ditches are obviously much higher!

THE CANANDAIGUA LAKE WATERSHED HAS APPROXIMATELY

496 MILES OF ROADS

ROADS IN THE WATERSHED



DE-ICING SALTS

De-icing salts are widely used throughout the watershed in the winter months to keep our roads safe for travel. However, high salinities in runoff are associated with damage to vegetation and macro-invertebrates, disruptions to fish spawning, potential interference with the chemical and physical characteristics of the lake, degradation of groundwater quality, damage to pavement, and corrosion of metal bridges, cars and plumbing.

MUNICIPAL HIGHWAY DEPARTMENT FACILITIES

Municipal highway department facilities can be sources of hydrocarbons, trace metals, salts and other pollutants if improperly designed or managed. All highway facilities located in the watershed now have covered salt storage areas.

PRIVATE ROADS AND DRIVEWAYS

Improperly built and maintained private roads and driveways can cause many of the same issues as public roads. Many of these private roads/driveways are dirt/gravel roads and can be a significant source of sediment by eroding during storms.

STRATEGIES

1. INCREASE ACCESS TO EDUCATIONAL RESOURCES AND TECHNICAL SUPPORT FOR LOCAL HIGHWAY OFFICIALS

Culvert that is undersized and difficult for fish passage- needs to be embedded.

A. Highway officials should work with county engineers, Soil and Water Conservation Districts and the Watershed Council on proper culvert sizing and the necessary environmental permits. These entities can help review the design storm, the material, shape and length of the culvert, the slope, the allowable head, erosion control, and natural channel alignment.

B. Work with county Highway Associations to host Cornell Local Roads Program training events for highways officials within the Canandaigua Lake Watershed. Localized training will allow the program to be catered to the specific needs of the Canandaigua Lake Watershed.

C. Continually work on available grants for road and roadside ditch management with local, county and state highway officials.

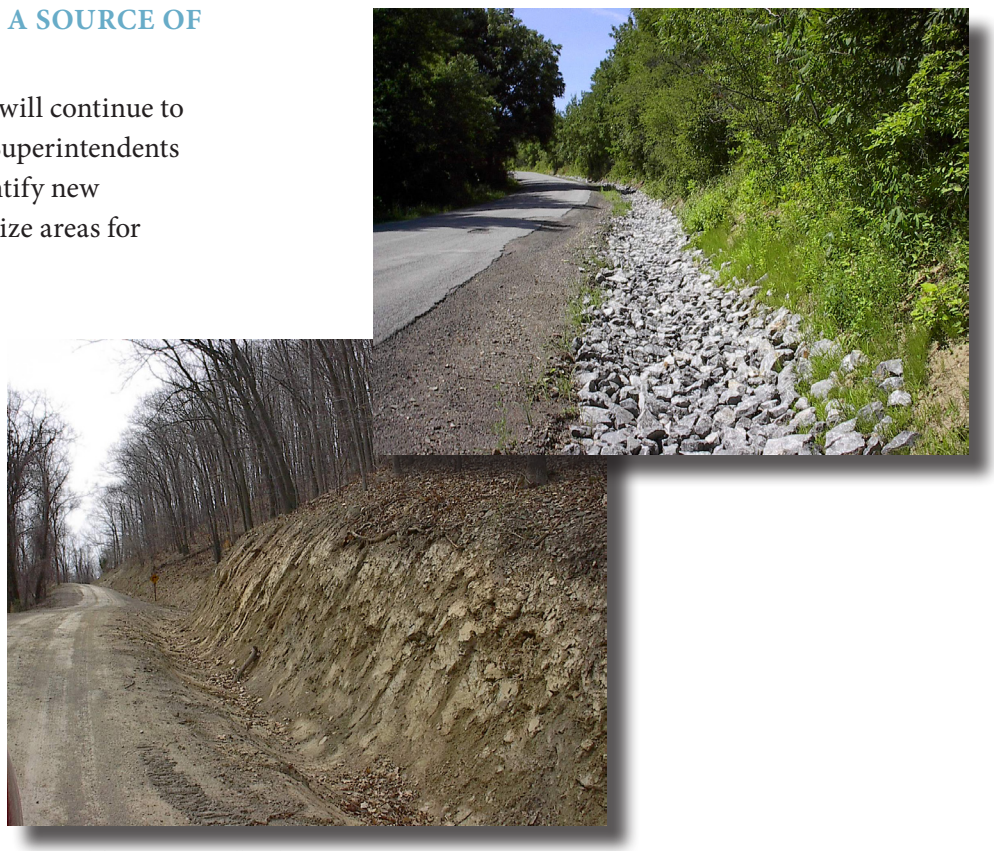
D. Discourage ditch cleaning unless absolutely necessary. Develop a ditch design and maintenance checklist for highway officials to encourage:

- mowing rather than scraping to increase capacity
- if scraping is necessary, schedule the work during the growing season and follow it immediately with hydroseeding to reduce erosion
- avoiding v-shaped ditches
- preventing over-ditching
- utilizing a vegetated buffer between the land and the roadside ditch

2. REDUCE ROADSIDE DITCHES AS A SOURCE OF SEDIMENT POLLUTION

A. The Watershed Manager and Inspector will continue to regularly communicate with Highway Superintendents regarding roadside ditch erosion to identify new and existing erosion risks and to prioritize areas for increased management.

B. Stabilize the identified highly eroding roadside ditch banks. Roadside ditch banks should be stabilized with vegetation whenever possible. However, rock rip rap solutions may be necessary on severely eroding banks that have slopes exceeding 8%.



Potential for major roadbank erosion.

3. BREAK, WHERE POSSIBLE, THE DIRECT HYDROLOGIC CONNECTION FROM THE LANDSCAPE TO THE ROADSIDE DITCHES TO THE STREAM NETWORK

A. Encourage landowners to provide on-site management/ infiltration of stormwater runoff from impervious cover through green infrastructure. See the New and Existing Development section for more detailed information.

B. Where appropriate, encourage the use of cross culverts and levelers to discharge flow from roadside ditches into open fields, wetlands, forests, and stormwater ponds to create diffuse rather than long concentrated flow paths. It is vital that water is not diverted from the natural flow path thus causing problems elsewhere.

C. Utilize existing outreach to educate landowners on the hydrologic connectivity between roadside drainage network and streams. The storm drain marker program is one opportunity to make that connection in suburban areas.

4. REDUCE THE IMPACT OF DE-ICING SALTS ON TRIBUTARY WATER QUALITY

A. Continue to work with Dr. Bruce Gilman of FLCC in monitoring the lake and its tributaries for salt concentrations to identify problem areas.

B. Ensure proper salt/sand mixing and loading. These areas should be indoors or contained. Encourage the continued calibration of salting trucks and the sensible salting requires sensible driving educational program.

5. PROPERLY MANAGE STORMWATER RUNOFF AND SPILLS AT MUNICIPAL HIGHWAY DEPARTMENT FACILITIES

A. Ensure all facilities include proper monitoring, storage, clean up, and disposal of chemicals, and proper floor drain design and maintenance.

B. Document that spill and leak prevention and response practices are in place and staff is adequately trained. Verify bulk storage of fuel and other chemicals meet DEC regulations.

C. Treat stormwater runoff from highway facilities utilizing bio-retention areas or other filtering practices. Utilize the Town of Middlesex bio-retention area as a model.

Major storm caused the water to overtop Dug Road in Naples and cause major damage and tremendous costs. A proper culvert was installed to handle the flow and debris load.

Undersized culvert caused substantial road bank flooding and re-routing of water.

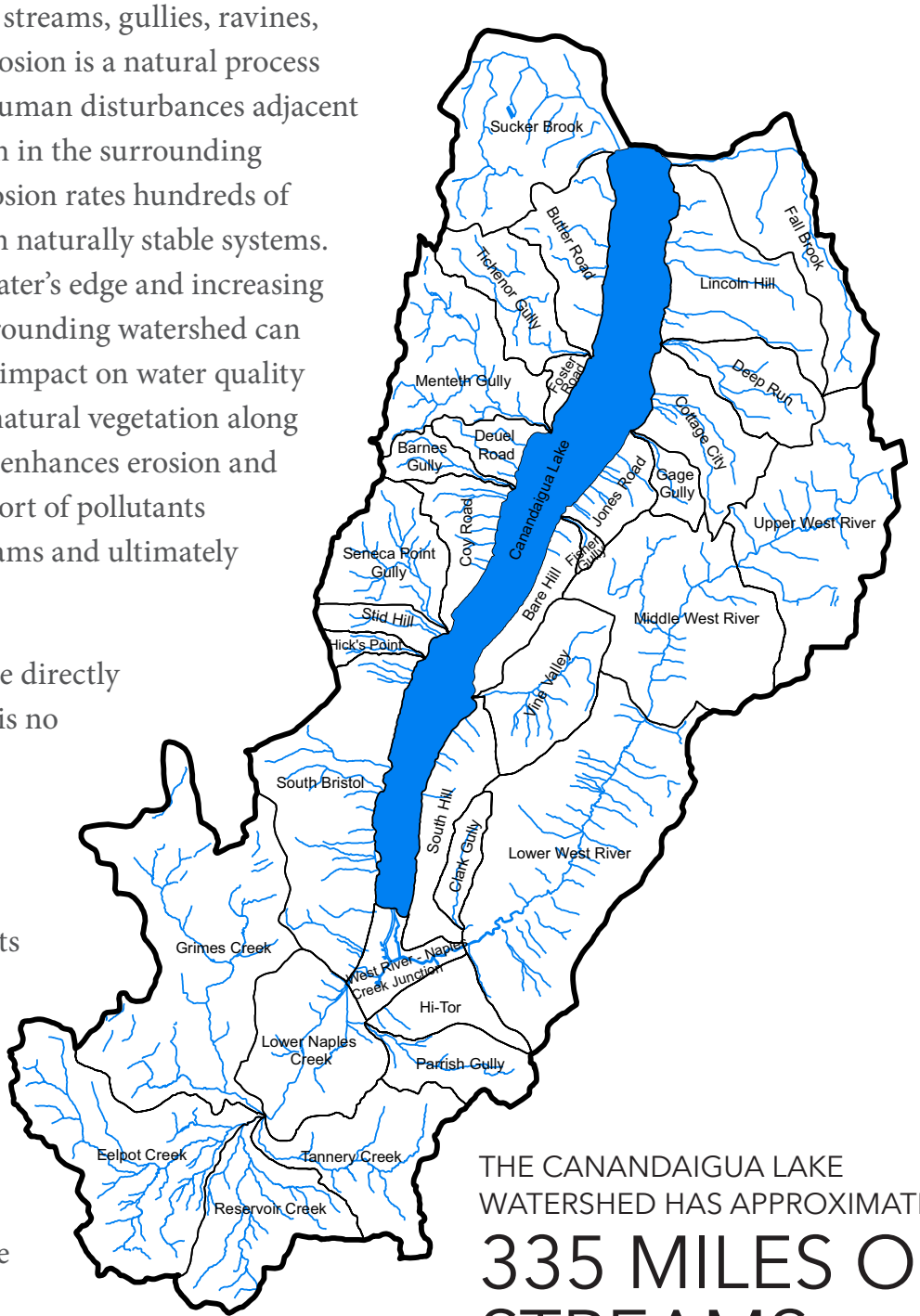
4.4 WATERCOURSE AND SHORELINE MANAGEMENT—PROTECTING THE WATER'S EDGE

Grimes Gully, an example of a natural stream channel with little disturbance.

THE ISSUE

Although watercourse (natural streams, gullies, ravines, ditches etc…) and shoreline erosion is a natural process that occurs in all watersheds, human disturbances adjacent to these natural systems or even in the surrounding drainage basin can result in erosion rates hundreds of times greater than those seen in naturally stable systems. Land management along the water's edge and increasing impervious surfaces in the surrounding watershed can have a disproportionately high impact on water quality and habitat health. Removing natural vegetation along streams, gullies and shorelines enhances erosion and allows for more efficient transport of pollutants from adjacent land uses to streams and ultimately the lake.

Watercourses and shorelines are directly connected to the lake, so there is no room for error. Disturbing the banks of watercourses and shorelines leads to increased amounts of sediment, phosphorus and other pollutants being exported, as well as the loss of land and damage to property. Many of the other management categories deal with reducing pollutants from getting into the streams and the lake. This section will focus on what we need to do at the water's edge.



THE CANANDAIGUA LAKE WATERSHED HAS APPROXIMATELY

335 MILES OF STREAMS

THIS NUMBER AND THE MAP DO NOT INCLUDE MANY OF THE SMALLER GULLIES IN THE WATERSHED.

WATERCOURSES

The Canandaigua Lake Watershed contains an estimated 350 miles of natural watercourses with over one hundred direct discharge points into the lake. Watercourses are like our arteries and veins, transporting approximately 1/3 of all precipitation (approximately 43 billion gallons of water per year) that lands in the watershed to the lake. Obviously, the quality of water in these systems directly affects the health of the lake.

Healthy streamside vegetation reduces streambank erosion, filters out sediment and nutrient pollution, provides wildlife habitat, regulates water temperatures, and supports aquatic food webs. Streams with severe streambank erosion and/or a lack of natural streamside vegetation can contribute huge loads of sediment and pollutants to the lake. Increased runoff from development and agricultural practices exacerbates these erosion problems. Thousands of residents in the watershed have a stream or gully on their property and therefore have a great influence on stream health and water quality. Their commitment to a healthy streamside will help reduce the potential of streams from becoming pollution highways.

BEFORE

AFTER

Project along Sucker Brook - project completed with the Town of Canandaigua installing toe stone protection and plantings on the upper two thirds of the bank.

LAKE SHORELINE

The lakeshore stretches 36 miles in length, with 97% of the land privately owned and totaling over 1,500 parcels adjoining the lake with an assessed value over $1 billion. The shoreline value is considered one of the highest in the nation with some areas of the lake assessed at $11,000 per foot of shoreline! The high water quality of Canandaigua Lake is obviously one of the main drivers that generates a large tax base for Ontario County and the six municipalities, thus reducing the overall tax rate.

The shoreline area also provides critical habitat for fish, wildlife and aquatic plants. Water quality, for both people and wildlife, is affected by activities along the shoreline and within the overall watershed. While some erosion is natural, the removal of natural vegetation along the shoreline, installation of artificial walls that deflect wave energy, boating, and increased runoff all exacerbate the problem. Establishing and protecting natural vegetation along shorelines can reduce shoreline erosion, provide wildlife habitat, improve fisheries, reduce noise pollution, provide privacy, and increase property value.

To stop this erosion, shorelines were traditionally stabilized by hardening with vertical structures. However, these methods can harm habitat quality, create a barrier to wildlife movement, deflect wave action to cause erosion nearby and reduce water quality (NYS DEC).

An example of a natural shoreline along the steep embankments of South Bristol.

Rock stabilization along an existing road was the only solution after the floods of 2011.

STRATEGIES

1. MONITOR STREAMBANKS AND SHORELINES FOR EROSION AND LACK OF BUFFERS

A. Complete a comprehensive update of the master GIS layer on streams within the watershed utilizing USGS Stream Stats, DEC Environmental Mapper, field level knowledge and local GIS datasets.

B. Continue to conduct visual surveys of streamside and shoreline areas during and after storm events. Focus will be placed on areas with known erosion problems, where land use/management has changed, and where there are citizen complaints.

2. PROTECT, RESTORE AND STABILIZE STREAMSIDE AREAS

A. Utilizing GIS, identify streamside and shoreline landowners throughout the watershed and provide educational resources on best management practices through mailings and field visits.

B. Continue to partner with private landowners on stream improvement projects through funding and/or technical assistance when there will be a tangible public benefit. Highlight the previously completed stabilization/ restoration projects on Sucker Brook, Vine Valley, and Naples Creek as success stories and examples for future projects. Techniques to protect streambanks include vegetation plantings, rock rip-rap, in-stream rock diversions, and engineered solutions.

C. Encourage municipalities to use their open space funds to partner with landowners to establish critical streamside areas through conservation easements or purchasing land. Consider partnering with conservation groups to maximize funding and project success.

D. Work with farmers to use fencing to exclude livestock from streams, expand vegetated riparian buffers in fields, and to reduce the ditching of streams that run through fields and wetlands. See the Agriculture section for more details.

E. Encourage municipalities to adopt setback or overlay ordinances to reduce development in streamside areas. The Watercourse Protection Model Ordinance for the Canandaigua Lake Watershed is available for use. The law needs to include a definition of watercourse that references the federal and state definitions.

Vine Valley stream project.

DEC project on Naples Creek.

In some cases, rock is the only way to stabilize a streambank. However, vegetative solutions are also encouraged.

3. PROTECT SHORELINE AREAS

A. Work with local planning boards to enact laws that favor softer vegetative/rock approaches to shoreline management over hard solutions such as vertical walls. Vertical walls transfer wave energy to adjacent properties exacerbating erosion issues.

B. Encourage municipalities to improve zoning ordinances to reduce imperious surface and limit new development within 100 feet of the lake.

C. Encourage Zoning Board of Appeals to refuse variances for stream and shoreline setbacks due to the cumulative impacts that individual variances create over time.

D. Encourage dock designs that do not contribute to water quality problems due to materials, maintenance or location.

E. Ensure the Uniform Docks and Moorings Law is uniformly enforced and variances are not granted throughout the six shoreline municipalities.

Example of a vegetated shoreline buffer. Photo from Natural Shorelines for Inland Lakes, a publication produced by Michigan Sea Grant and the Michigan Department of Environmental Quality.

Atwater Meadows shoreline stabilization project. Project completed with the Canandaigua Tennis team installing the plantings and coir rolls to stabilize the shoreline.

4.5 WETLANDS AND FLOODPLAINS

West River Valley

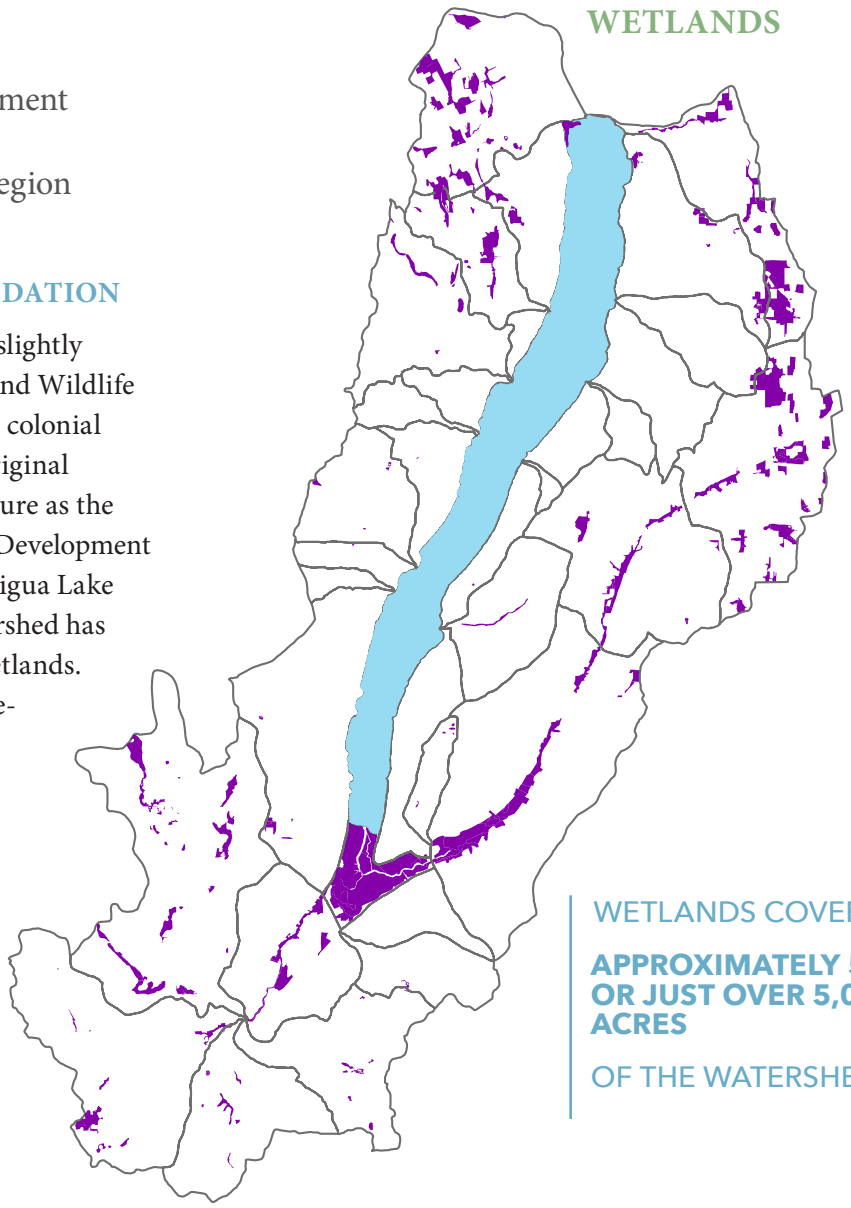
THE ISSUE

Wetlands and floodplains are critical Natural Capital assets that provide vital ecosystem benefits to the Canandaigua Lake watershed and all its beneficiaries, including:

- Reduce flooding and stream erosion by storing and slowly releasing stormwater
- Absorb nutrients, filter sediments and sequester some pollutants out of water
- Provide vitally important habitat to a wide array of fish and wildlife species
- Help recharge groundwater
- Provide recreation and public enjoyment
- Enhance the natural beauty of the region

WETLAND DESTRUCTION AND DEGRADATION

Currently, wetlands cover approximately 5% or slightly over 5,000 acres of the watershed. The US Fish and Wildlife Service and NYS DEC have estimated that since colonial times, New York State has lost over 50% of its original wetland acreage, with development and agriculture as the two major land uses that have created this loss. Development and agriculture play a large role in the Canandaigua Lake watershed, so it is safe to estimate that our watershed has lost somewhere in the range of 5,000 acres of wetlands. Although there is significant acreage in the State-owned Hi Tor wetlands, most of the wetland areas are privately owned. While Federal and State regulations protect some wetlands, small and isolated wetlands along with wetlands on agricultural lands remain largely unprotected. Protecting and expanding our wetland areas will help to mitigate and offset the negative impacts from existing and future human dominated land uses.



This map includes NYS DEC wetlands and those identified by the Natural Capital Study. This map does not include National Wetland Inventory wetlands.

FLOODPLAIN DEVELOPMENT

In terms of floodplains, only a small percentage of the watershed streams (mostly more urban areas) have floodplain mapping completed. The Flood Insurance Rate Maps (FIRMs) were created by FEMA in the 1970s and 1980s to identify locations that are at-risk for flooding. Development over the last 40 years and flood events in non-mapped areas of the watershed requires that these maps be updated to provide proper protection and regulation within the floodplain. Therefore, the current extent of floodplains in the watershed and their historic losses are largely unknown. However, we do know that during flood events, both mapped and unmapped streamside areas flood and structural damage occurs. In addition, floodplain filling has the unintended consequence of pushing flood waters downstream, leading to increased flooding and erosion downstream and in the lake.

Almost all watercourses, even the smallest gully, have the potential to have water flow exceed the capacity of its banks and thus flood adjoining areas. Flooding is a natural event and will inevitably occur. These floods are typically only considered a problem when they cause damage to any development within the floodplain. The frequency and magnitude of flooding can be exacerbated by human activities such as:

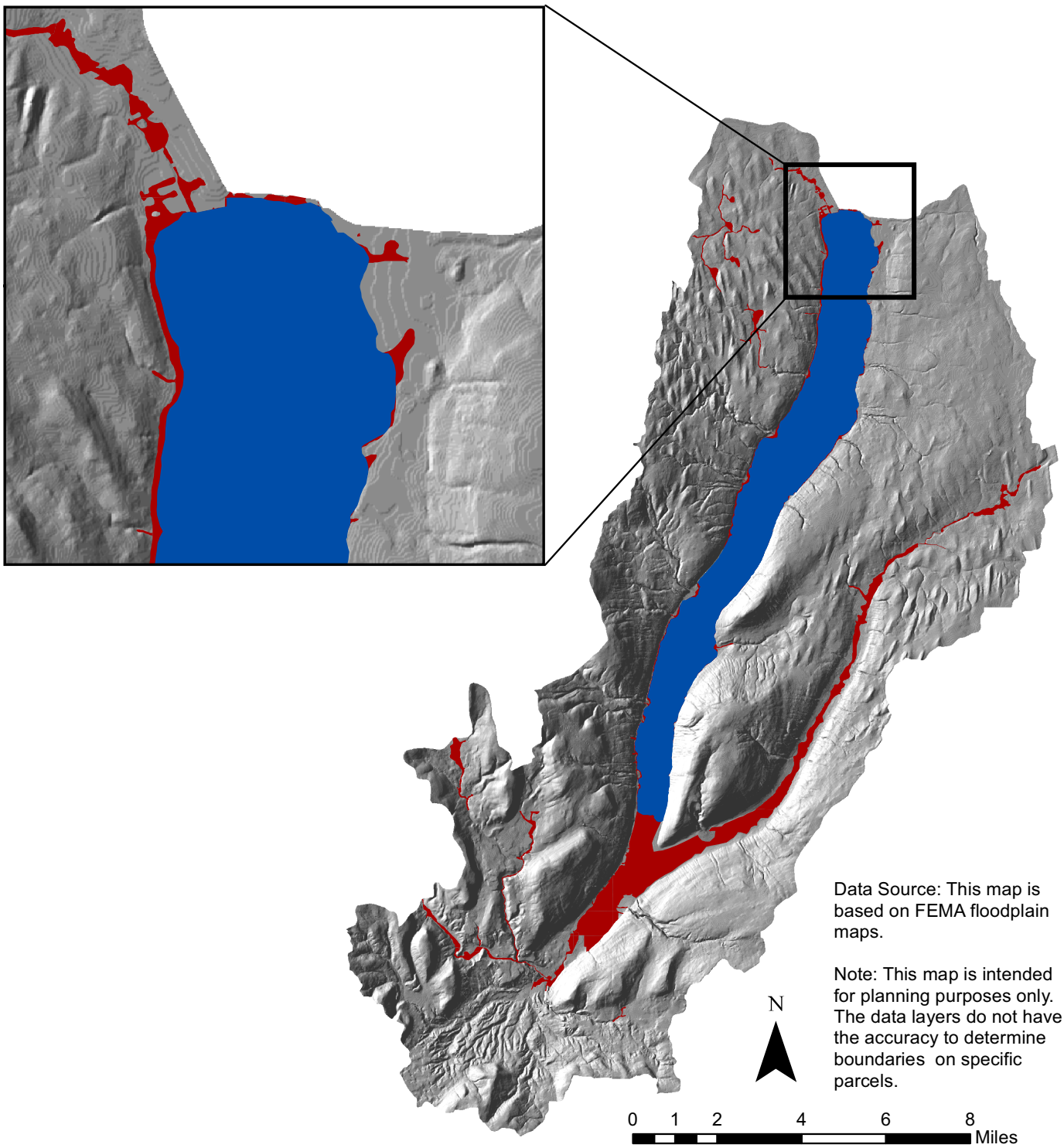
- development in the floodplain,
- additional impervious surface in the drainage basin,
- increasing the efficiency of the drainage basin to shed water through the creation of ditches
- the creation of bottlenecks such as bridges and culverts.

In addition, research by the USGS has identified that storm intensities have increased in the Great Lakes Basin and may also contribute to increased frequency and intensity of flooding problems. Local observations by watershed staff, highway superintendents and others concur with this study. Damaging floods can occur anywhere in the watershed, despite only a small portion of the watershed being in a FEMA mapped flood zone. In fact, most of the flooding events that have occurred over the last few years have been outside mapped areas.

Humans have either filled-in or drained watershed wetlands and floodplains, reducing their ability to provide storage and treat flood flows. It is increasingly important that these systems are protected, restored and enhanced in order to help build resiliency against the impacts from human land use.

Naples Creek flooding Parrish Flats Road during May 2014 storms

ESTIMATED FEMA FLOODZONES



Data Source: This map is based on FEMA floodplain maps.

Note: This map is intended for planning purposes only. The data layers do not have the accuracy to determine boundaries on specific parcels.

STRATEGIES

1. PROTECT, RESTORE AND CREATE WETLANDS AND FLOODPLAINS

A. Complete the Natural Capital Project and utilize this information to increase public knowledge on the vast ecosystem services that wetlands, floodplains and other natural features provide the public. This will help bolster support for government programs on wetland and floodplain protection.

B. Promote the use of municipal open space funds, grants, private donations along with existing incentives programs to protect, restore and create wetlands and floodplains. The Watershed Council, municipalities, NRCS, US Fish and Wildlife Service, Watershed Association, Land Trusts, Ducks Unlimited, National Audubon, etc. should partner to complete these high priority projects.

C. Encourage municipalities to proactively protect wetlands and floodplains through the adoption of local laws and/or through the site plan review process. The Center for Watershed Protection has published a model ordinance for wetland protection. The Canandaigua Lake Watershed Council produced a model stream buffer ordinance that could be adapted to include wetlands and floodplains.

D. Build partnerships with the Wetland Trust and other organizations to encourage wetland mitigation banking projects in the watershed to increase the extent and valuable function of wetlands in the watershed. The first wetland mitigation project was started in the headwaters of Hope Point Stream, which outlets to the lake in close proximity to the intake pipe for the City of Canandaigua. This project should be used as a demonstration project for other mitigation projects. The goal would be to see a substantial net increase in wetlands within the Canandaigua Lake watershed.

Above: High Tor Marsh

Left: Fall Brook Watershed wetlands

2. EXPAND FLOODPLAIN REGULATIONS

A. Ontario County is high on the list to get updated floodplain maps. However, the process has been delayed for years. Work with partners to get DEC and FEMA to update flood zone studies and mapping. Complete the Discovery process with FEMA and DEC.

B. Encourage municipalities to adopt local laws that are beyond the minimum requirements for participation in the National Flood Insurance Program. Examples could include prohibiting development within the mapped flood zones, additional freeboard requirements on bridges, enforcing "No Adverse Effect" standards, incorporating cumulative impacts, instituting mandatory setbacks, etc. The NYSDEC Model Local Law for Flood Damage Reduction is available for adoption.

C. Host training events for local floodplain administrators (typically the Code Officer) to enhance their ability to assess flood risks and enforce floodplain codes.

D. Encourage municipalities to participate in the Community Rating System, which provides flood insurance premium discounts in communities that implement flood mitigation practices beyond the minimum requirements. This may become more economical due to increased premiums associated with the Flood Insurance Reform Act of 2012. Actions could include:

- performing outreach programs to at-risk residents,
- providing residents with flood zone information on a case by case basis,
- requiring new and improved structures located in special flood hazard areas to be elevated above the risk level,
- providing flood retention through open space preservation program
- increasing staff knowledge by enrolling select employees in FEMA training programs and requiring national certification in floodplain management.

E. Educate homeowners, even those located outside of the mapped floodplain, on flood risks, flood insurance, flood proofing and other flood protection measures to help reduce flood damages. Many of the floods that occurred over the last few years were outside designated floodplain areas.

Flooding along Menteth Creek near Canandaigua Lake.

4.6 WASTEWATER MANAGEMENT

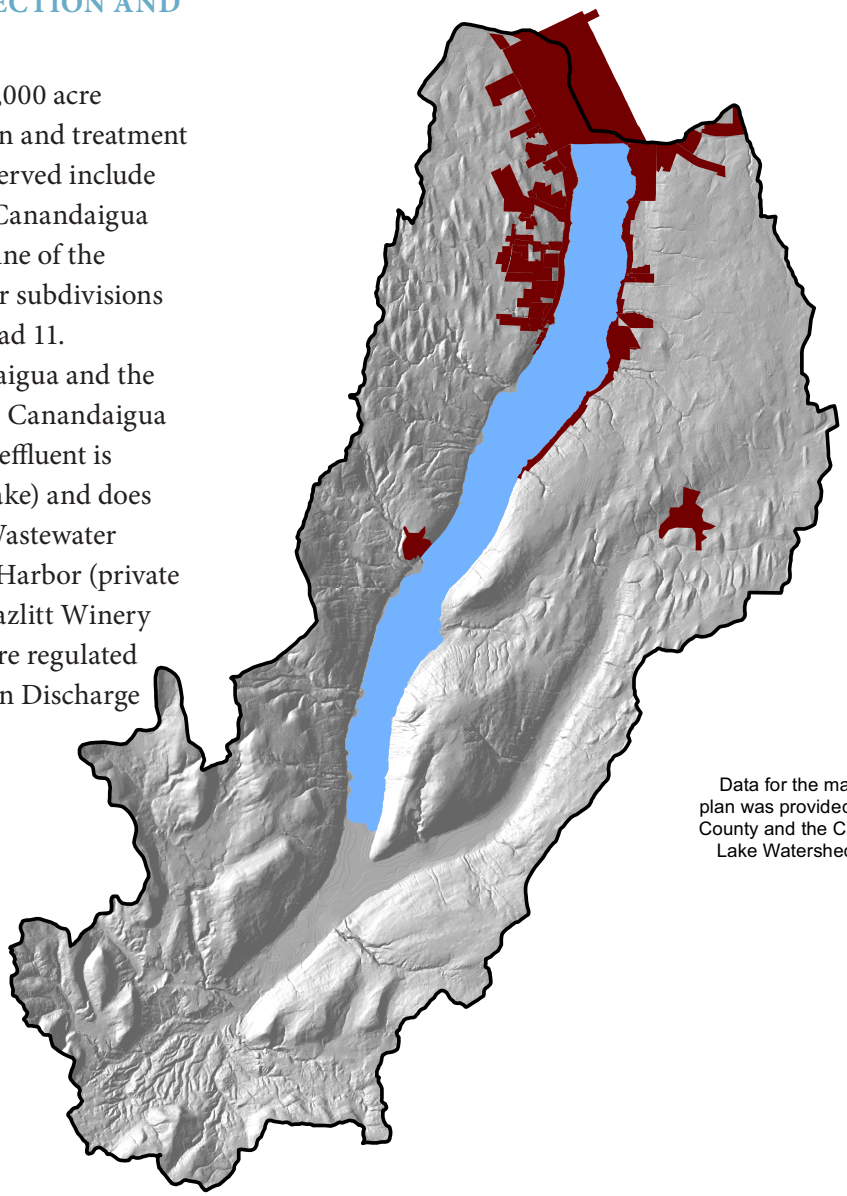
THE ISSUE

There are over 4,000 individual onsite wastewater systems serving residential and commercial properties and three centralized wastewater treatment facilities (Village of Rushville, Bristol Harbor and Hazlitt Winery) in the Canandaigua Lake watershed. When these systems and facilities are properly designed, installed and maintained, they are effective at treating regulated contaminants in human and industrial wastewater. However, if these individual systems or centralized facilities are not working properly, wastewater can contribute elevated levels of nutrients, pathogens and other contaminants to groundwater and surface water. Even when properly functioning, these systems are ineffective in the treatment of many pharmaceuticals and toxic chemicals.

CENTRALIZED WASTEWATER COLLECTION AND TREATMENT

Approximately 5%, or 5,000 acres, of the 109,000 acre watershed are served by centralized collection and treatment facilities (see map). The main areas that are served include the City of Canandaigua, Ontario County's Canandaigua Lake Sewer District (which covers the shoreline of the northern 1/3 of the lake) and a few new larger subdivisions along Middle Cheshire Road and County Road 11. Wastewater generated in the City of Canandaigua and the Canandaigua Lake Sewer District flow to the Canandaigua Wastewater Treatment Plant and the treated effluent is discharged into the Feeder Canal (outlet of lake) and does not enter the lake. The Village of Rushville Wastewater System discharges to the West River. Bristol Harbor (private system) discharges to Seneca Point Creek. Hazlitt Winery discharges to Naples Creek. These facilities are regulated by NYS-DEC under individual State Pollution Discharge Elimination System (SPDES) permits.

SANITARY SEWER SYSTEMS



Data for the maps in this plan was provided by Ontario County and the Canandaigua Lake Watershed Council.

ONSITE WASTEWATER SYSTEMS

Approximately 95% of the land area in the watershed is not served by centralized sewage collection and treatment. Thus, individuals living outside of these areas must provide their own onsite wastewater treatment system. The watershed has over 4,000 existing onsite wastewater systems, which includes conventional septic tank leach field systems, raised bed- sand filtration, aerobic treatment, holding tanks and several other technologies.

These existing on-site wastewater systems must meet the Canandaigua Lake Watershed Rules and Regulations (embedded in New York State Public Health Law) only after they fail or a point source "cheater pipe" is identified. However, the definition of failure is vague and typically defaults to a surface discharge of the onsite system or a sewage back-up into the residence. Most systems that are inadequately treating wastewater do not manifest to the worst case scenario of surface discharge. Therefore, many systems that are not working properly go undetected for years and contribute elevated levels of pathogens, nutrients and other contaminants to groundwater and ultimately the lake. The highest priority systems that are inadequately functioning are those along the shoreline, since there is no buffer or filtering before the groundwater flow from the wastewater system enters the lake. Typical four bedroom houses can generate 600 gallons of wastewater per day.

New onsite systems are governed by municipal code, the New York State Department of Health-Geneva Office, and the Canandaigua Lake Watershed Commission through the NYS Public Health Law, which includes Appendix 75-A. These systems are designed with the latest standards. However, there are no real requirements that mandate maintenance of these systems, which is essential to the proper functioning of the onsite system and ultimately to the protection of water quality.

Existing and new systems that are designed to have a capacity to treat more than 1,000 gallons per day are regulated by the NYSDEC. However, systems that are between 1,000 and 10,000 gallons per day have little oversight by the DEC, yet cumulatively can cause water quality problems.

Significant SPDES permits are for the centralized treatment systems identified above and have strict water quality monitoring requirements.

THE CANANDAIGUA LAKE WATERSHED COMMISSION AND THE WATERSHED INSPECTOR

The five municipal water purveyors in the watershed, the Town of Gorham, the Villages of Rushville, Newark and Palmyra and the City of Canandaigua, make up the Canandaigua Lake Watershed Commission and have had a set of rules and regulations for the watershed since 1953. The Canandaigua Lake Watershed Commission relies upon the work of the Watershed Inspector to help reduce the impacts of wastewater on water quality. The Watershed Inspector provides thorough and consistent oversight to onsite systems throughout the entire watershed, keeping impacts of onsite systems to a fraction of what they could potentially be.

In 2010 alone, the Watershed Inspector conducted 50 inspections of existing systems for deed/property transfer, reviewed dozens of plans for new systems, and conducted 16 onsite meetings with property owners and engineers. Additionally, he assisted with the tracking and maintenance of more than 250 non-traditional systems. The Watershed Inspector's work has identified potential sources of water quality impairments and helped fix them. For example, 55 violations of onsite systems were found from 2005 to 2012 and all were fixed. The Canandaigua Lake watershed is fortunate to have a full time Watershed Inspector that has created and implemented a program that is used as a model for other watersheds in New York State. The Watershed Inspector works with the NYS Department of Health Geneva Office, along with local code enforcement officers, in the enforcement of the Rules and Regulations.

The Watershed Rules and Regulations are dated and have gaps that do not provide for comprehensive protection of the watershed. For many years, the Commission worked with New York State to update the Rules and Regulations. However, the State did not move forward on making these changes to the law. Instead, the Department of Health encouraged the Watershed Commission to work with watershed municipalities to strengthen their own laws. Based on this new reality, the Watershed Commission adopted a more pro-active management approach; it restructured its bylaws to allow for implementation of actions not currently governed by the Rules and Regulations and more closely partnered with the Watershed Council to aid in watershed protection.

The goal of the following strategies is to move the inspection program to more management of onsite systems in the watershed. This is consistent with EPA onsite system management recommendations.

Dye testing is one of the many tools used to determine onsite wastewater system failures.

STRATEGIES

1. ENCOURAGE MUNICIPALITIES TO STRENGTHEN ONSITE WASTEWATER SYSTEM RULES AND REGULATIONS

A. Encourage all watershed municipalities to adopt a local law that calls for the inspection of onsite wastewater treatment systems during the time of property deed transfer. As of 2013, the Towns of Gorham and South Bristol have adopted this law. This law needs to be updated to reference the inspection protocol established by the Onsite Training Network. Numerous other counties and municipalities require this throughout New York State.

B. Encourage municipalities to improve design requirements for new onsite systems and for repairs/upgrades to existing systems through the following:

- Require a minimum design flow of 150 gpd/bedroom for shoreline properties and 130 gpd/bedroom for all other properties.
- Prohibit a reduction in total trench length of innovative systems, such as ATUs, for shoreline properties. Review total trench length for innovative systems for all upland properties.
- Require a minimum depth of the absorption system following ATU or microbial inoculator generator of 2 feet depth of usable soil.
- Partner with the Watershed Inspector to develop enforceable annual maintenance requirements for all enhanced treatment units.
- Ensure the required annual maintenance of all enhanced treatment units occurs, with records sent to the Watershed Inspector at the time of maintenance and application of enforcement mechanisms when maintenance does not occur.

C. Before granting building permits or going through the site plan review process, municipalities should verify the location and suitability of on-site septic systems through the Watershed Inspector.

D. Encourage municipalities to consider requiring an inspection every 5 years for onsite systems within 200 feet of the lake and require all inspectors to use the standardized Onsite Training Network (OTN) inspection protocol. The Cayuga County Health Department requires a greater frequency of inspections at the lake and also requires periodic inspections throughout the county.

E. Consider a local law that requires shoreline residences that are rented on a continual basis to verify that the maximum occupancy is also based on the hydraulic load to the onsite wastewater treatment system.

F. Formalize the relationship between the Watershed Inspector and the municipalities on implementation and enforcement of stricter onsite system codes.



Digging up a failed onsite wastewater system.

2. FINALIZE AND MAINTAIN A SPATIAL DATABASE ON ONSITE SYSTEMS IN THE WATERSHED

A. Finish converting all records of onsite system locations, types and inspection results into a spatial database in GIS. A spatial database of the onsite systems would assist the Watershed Inspector and Manager to target inspections and outreach and would aid in the tracking of onsite inspections, violations, and upkeep.

B. Work with property owners and authorized manufacturer representatives to track all enhanced treatment onsite systems. Work with local haulers and plumbers to improve tracking of maintenance for traditional septic systems.

3. EDUCATE LANDOWNERS ON PROPER ONSITE SYSTEM USE AND MAINTENANCE

A. Continue to provide the Department of State approved realtor workshops through the Soil and Water Conservation District and Watershed Commission. Specifically, encourage onsite system inspections prior to purchase and for alternative systems, encourage discussions of the annual maintenance agreement requirements.

B. Conduct educational workshops for onsite system owners. All workshops will follow the Onsite Training Network framework (OTN). The current Watershed Inspector is a certified instructor for the OTN and could conduct trainings.

C. Send educational mailings to onsite system owners, utilizing the GIS database. Information should include upcoming workshops, proper maintenance, and recommendations for inspections.

D. Conduct targeted outreach to enhanced treatment unit owners to ensure annual maintenance is performed. A list of these owners could be obtained from the new database.

E. Create a list of funding opportunities for economically-disadvantaged onsite owners and distribute. The Bishop Sheen Foundation and the Keuka Housing Foundation are two organizations that currently serve the watershed.

Peat moss alternative septic system.

4. IMPROVE AND EXTEND CENTRALIZED WASTEWATER COLLECTION AND TREATMENT WHERE APPROPRIATE

A. Provide technical assistance to the Village of Naples where appropriate. Currently, the Village does not have a sewer or wastewater treatment facility. However, they hope to install a collection system and retrofit Hazlitt's wastewater treatment facility to allow treatment of municipal waste. The Watershed Council, the Watershed Commission, and numerous other stakeholders will provide technical guidance throughout the research and implementation process.

B. Provide technical assistance to the Village of Rushville where appropriate. The Village of Rushville has a collection system and wastewater treatment plant. They hope to conduct an inflow and infiltration study to determine where non-wastewater flow is entering the system during storm events. Reducing I&I will help the system to function properly during storm events.

C. Work with municipalities on any future sewer collection system expansion and centralized wastewater treatment projects.

D. Encourage Ontario County to allow connection to existing residential properties that are adjacent to or nearby the existing sewer district boundaries.

5. CONTINUE AND ENHANCE COLLABORATION BETWEEN THE WATERSHED PROGRAM AND THE DEC FOR SPDES FACILITIES.

A. Ensure the Watershed Inspector has access to all SPDES facility sampling data, including those that are not required by law to be publicly available.

B. Coordinate enforcement and remediation of SPDES permit violations with DEC and DOH.

THE NYS TROOPERS OFFICE IN ONTARIO COUNTY (ON 332) NOW HAS A 24/7 SECURE PHARMACEUTICAL DROPBOX.

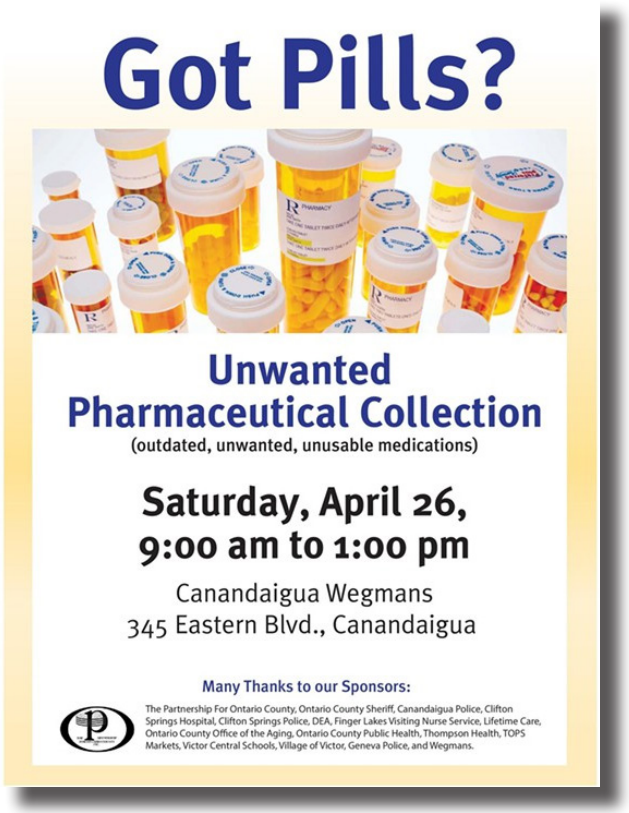
6. PREVENT WATER CONTAMINATION FROM DISPOSING PHARMACEUTICALS AND TOXIC SUBSTANCES IN TOILETS, SINKS AND STORMWATER DRAINS

A. Continue to review the science on pharmaceutical, cosmetics, cleaning products and toxic substances in home wastewater and incorporate information into educational programs.

B. Partner with the various community groups that host and advertise pharmaceutical drop offs within the watershed.

C. Encourage additional household hazardous waste drop offs at the Ontario County Landfill.

D. Encourage commercial sellers of pharmaceuticals, cleaning products, and toxic substances to post educational materials on proper disposal in their stores.



4.7 AGRICULTURE

THE ISSUE

Agriculture is an important part of the Canandaigua Lake watershed, supporting the economy, providing local food sources, preserving open space, providing a reduced cost of community services and maintaining the rural character that makes this region so special. Close to one-third of the watershed land is currently in some form of agricultural production and includes dairies, beef cattle, vegetable production, vineyards and large amounts of corn.

Agricultural operations can also be a significant contributor of sediment, nutrients, pathogens and pesticides to the lake if the proper measures are not put in place both at the barnyard and field level. The inherent and necessary nature of working the land to grow our food requires that large areas of land need to be disturbed to plant various crops. Agricultural fields can be particularly vulnerable to problems immediately after planting, as traditional tillage practices leave the soil completely bare until crop emergence. As important, some of today's higher value cash crops (corn, beans, and other vegetable crops) can also have little protection from erosion during the growing season- thus leaving these areas open to erosion for extended periods of time during the associated higher intensity storm events.

Combined with these realities is the existence of over 350 miles of streams and hundreds of miles of roadside ditches that cross or run alongside agricultural land before entering Canandaigua Lake. Both streams and roads can act as "pollution highways", efficiently transporting runoff and pollutants such as nutrients, sediments, pathogens and pesticides from a field or barnyard area directly to the lake. Implementing a wide array of agricultural best management practices at both the farmstead and field level can greatly reduce pollutant loads from agriculture.

Certain areas of the watershed are seeing an increase in both the number of farms and acreage devoted to agricultural production. Corn and soybean prices have allowed marginal lands to be profitable, thus encouraging additional production in the watershed. In addition, there continues to be an influx of Mennonites to the region. This population does not traditionally participate in government programs. New approaches that meet the cultural requirements of the growing Mennonite population need to be explored to try to reduce field level and barnyard area issues.

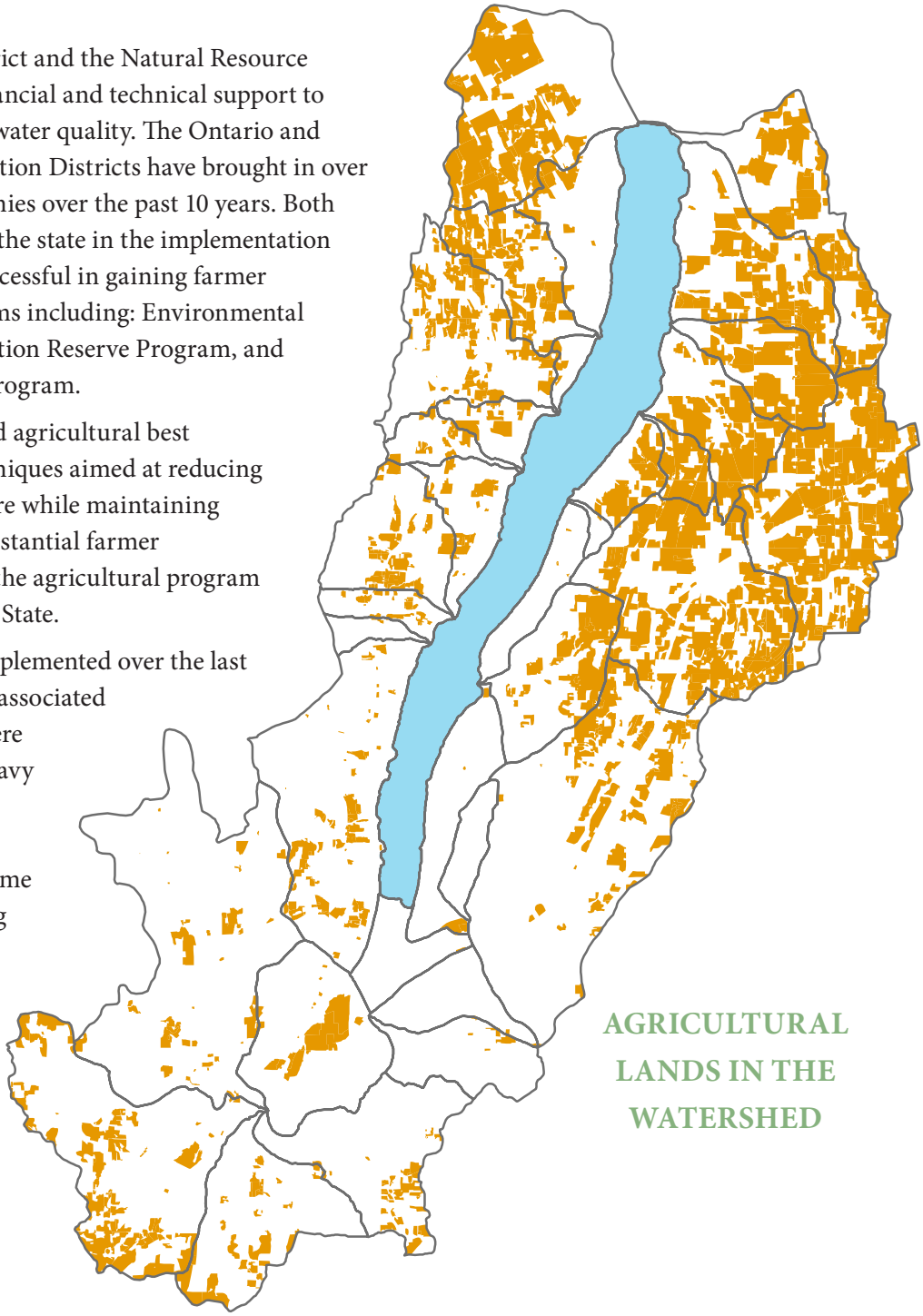
Farm field runoff during a storm event

EXISTING PROGRAMS

The Soil and Water Conservation District and the Natural Resource Conservation Service both provide financial and technical support to farmers to reduce erosion and protect water quality. The Ontario and Yates County Soil and Water Conservation Districts have brought in over $2 million in NY State AEM grant monies over the past 10 years. Both Districts are considered leaders across the state in the implementation of AEM programs. NRCS has been successful in gaining farmer participation in several federal programs including: Environmental Quality Incentives Program, Conservation Reserve Program, and Conservation Reserve Enhancement Program.

These two agencies utilize standardized agricultural best management practices, which are techniques aimed at reducing the environmental impact of agriculture while maintaining or increasing productivity. There is substantial farmer participation in the program, making the agricultural program in this watershed a leader in New York State.

Many of the projects that have been implemented over the last ten years focused on solving problems associated with barnyard areas or other areas where animals tend to concentrate such as heavy use laneways and fencing off streams. These have been high quality projects with tangible water quality benefits. Some of the projects have focused on creating and implementing Comprehensive Nutrient Management Plans to better manage the use of synthetic fertilizers and manure on farm fields. Several projects have made substantial changes to reducing field level erosion.



AGRICULTURAL LANDS IN THE WATERSHED

However, based on the water quality monitoring program, visual observations during storm events, and communication between watershed, NRCS and District personnel; there are still significant field level runoff/erosion issues that require enhanced management. The goal of the following strategies is to continue many of the existing programs and to find new and innovative ways through public private partnerships to work with our agricultural community to promote field production and protect water quality.

STRATEGIES

1. PROMOTE AND PARTNER ON THE PROGRAMS OFFERED BY SOIL AND WATER CONSERVATION DISTRICTS AND NATURAL RESOURCE CONSERVATION SERVICE

A. Encourage farms through the SWCD and NRCS to adopt healthy soil management practices. Soil health is achieved through a mixture of practices including reduced tillage, crop rotations and installation of a mixture of cover crops. A healthy soil will infiltrate more runoff water and have higher crop yields.

B. Explore avenues of communication and promote use of best management practices and projects that are compatible with the interests of the growing Mennonite population in the watershed.

C. Continue to support the Soil and Water Conservation Districts and farmers in applying for grant funding. Create additional financial incentives to enhance farmer participation and improve grant competitiveness such as:

- Work with private donors to help fund a portion of the farmer's share
- Where appropriate and public benefit can be easily identified, utilize Watershed Council funds to help pay for a portion of the farmer's share on grant awards

D. Encourage SWCD and NRCS to showcase the large number and geographic extent of best management practices implemented through maps and educational programs. In addition, reinvigorate the voluntary Agricultural Program Committee, consisting of watershed farmers and the lake friendly farm program.

E. Encourage farmers to come into compliance with Highly Erodible Lands and tolerable soil loss requirements for their fields through best management practices. NRCS will play a critical role in assisting farmers to meet these requirements.

F. Encourage CAFOs and other operations that spread liquid manure on fields to take substantial precautions before applying within the Canandaigua Lake Watershed. Discourage winter spreading of manure and spreading when weather forecasts call for potential thunderstorms. Encourage CAFO operators, DEC, SWCD and private farm planners to mandate liquid applications be incorporated the same day that it is spread.

G. Encourage farmers to stay 100 feet away from watercourses and roadside ditches when spreading manure even if there is a vegetative buffer or same day incorporation. Current regulations require a 35 foot setback if there is a vegetative buffer and 15 foot setback if it is incorporated within 24 hours.

H. When farmers are unwilling to work within the standardized AEM and NRCS programs or the project can't meet their 25 year storm event design requirements: utilize private, Watershed Council and municipal funding to complete worthy projects that can provide some level of water quality protection.

Grassed waterway on an agricultural field, a technique used to reduce erosion

2. PROMOTE BUFFERS BETWEEN AGRICULTURAL LANDS AND ADJACENT STREAMS AND ROADSIDE DITCHES

A. Encourage municipalities to use their open space funds to protect critical streamside and roadside buffers to separate active agriculture from these pollution highways. Consider partnering with conservation groups to maximize funding and project success.

B. Continue to promote various funding opportunities for vegetative buffers and distribute to local producers through NRCS, FSA and Soil and Water Conservation Districts.

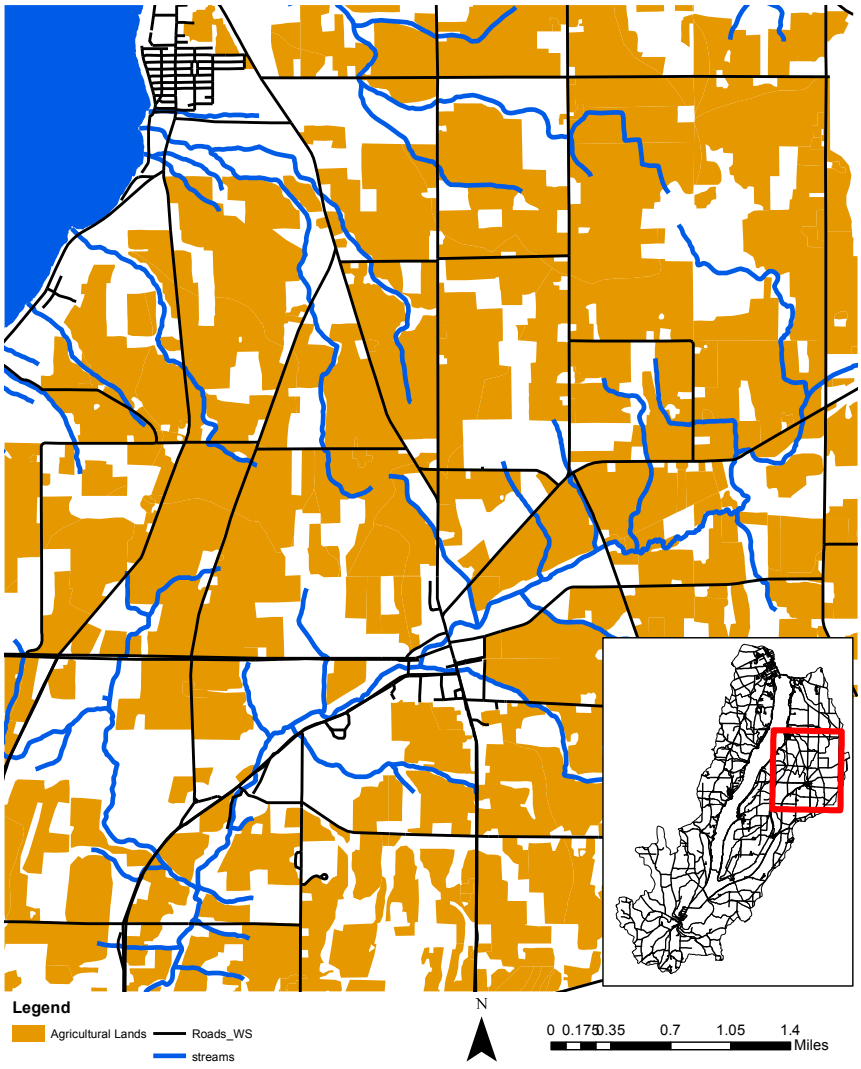
C. Work with farmers to reduce the ditching of streams through farm fields and wetland areas. Ditching reduces the hydrological connection to the surrounding landscape, which can increase downstream flooding and water quality impacts. If ditching is absolutely necessary for the farm operation, seed the banks immediately to reduce erosion.

D. Restore the hydrologic connection of streams to their wetlands that are downstream of farm field areas. Utilize weir systems and shallow berms to maintain the base flow condition, but allow runoff to be temporarily captured by the wetland area during storm events in order to improve water quality and reduce downstream flooding. Grant funds will be used in the Sucker Brook watershed to enhance wetland systems to meet these goals.

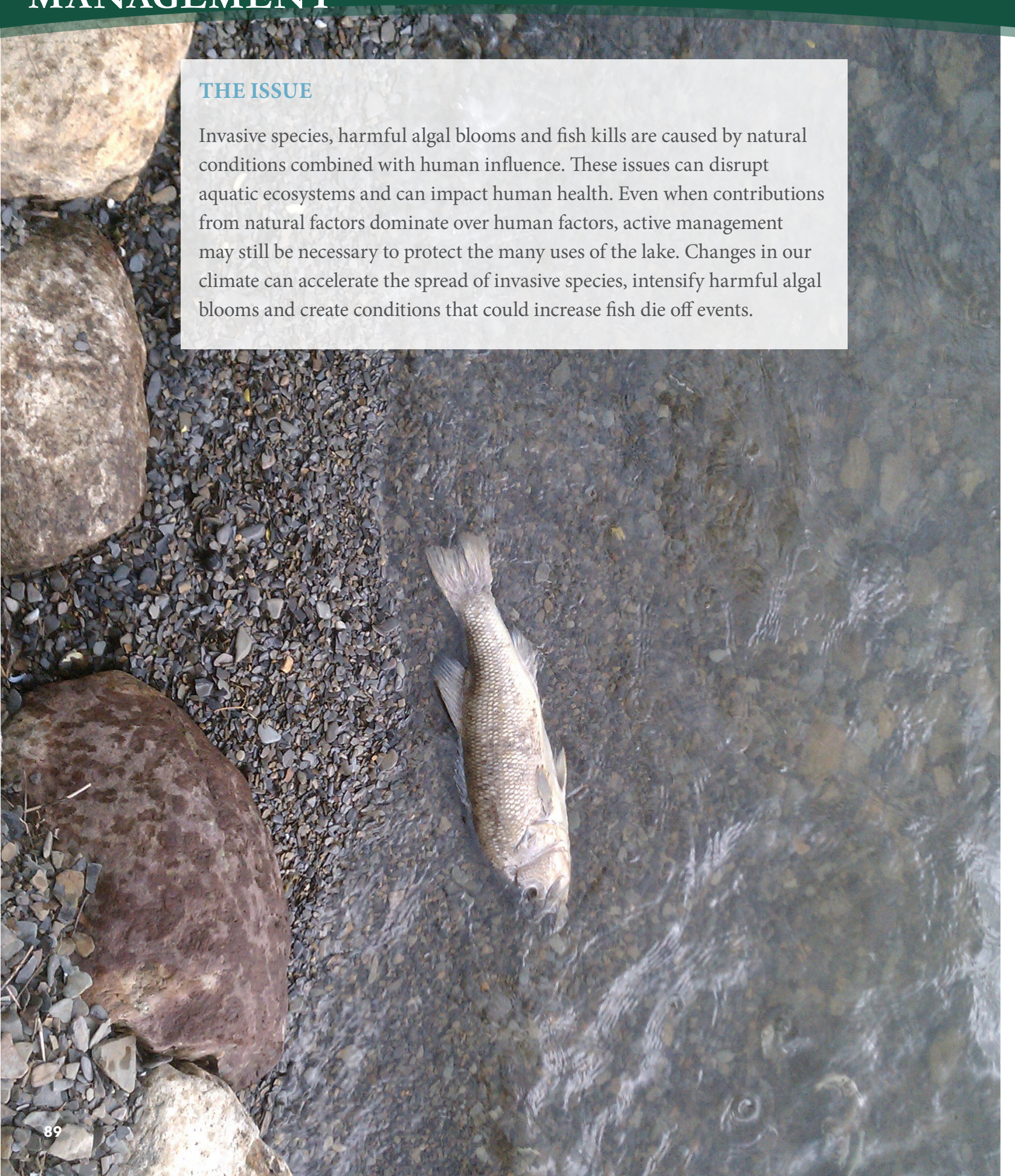
ROADS AND STREAMS CUTTING THROUGH AG LANDS CAN ACT AS RUNOFF POLLUTION HIGHWAYS IF NOT PROPERLY BUFFERED AND PROTECTED.

Lack of vegetated buffer between a field and a ditch.

Agricultural Lands with Potential Conveyance Channels



4.8 IN LAKE ISSUES: INVASIVE SPECIES, HARMFUL ALGAL BLOOM AND FISH KILL MANAGEMENT



THE ISSUE

Invasive species, harmful algal blooms and fish kills are caused by natural conditions combined with human influence. These issues can disrupt aquatic ecosystems and can impact human health. Even when contributions from natural factors dominate over human factors, active management may still be necessary to protect the many uses of the lake. Changes in our climate can accelerate the spread of invasive species, intensify harmful algal blooms and create conditions that could increase fish die off events.

INVASIVE SPECIES

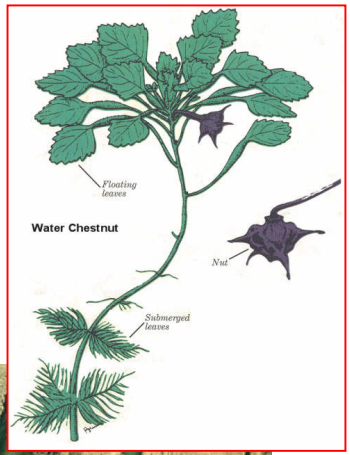
Invasive species can enter the Finger Lakes region through multiple pathways. The Great Lakes Watershed has 4.2 million small boats, and Canandaigua Lake alone has over 4000 power/sail boats that may be used on other waterbodies. Moving boats from waterbody to waterbody can move invasive species if they are not properly cleaned before each use. In addition, the canal system in the area and roadside ditches increase the connectedness of waterbodies, which facilitates movement of invasive species. The Canandaigua Lake Watershed already has some established aquatic invasive species, but is threatened by many others (see table below).

Terrestrial species of concern in the area include giant hogweed, Japanese knotweed, purple loosestrife, garlic mustard, swallow worts, emerald ash borer, and hemlock wooly adelgid. A much larger list of invasive species can be found at http://www.nyis.info/index.php?action=israt.

Once invasive species are established and widespread, they are nearly impossible to eradicate. Some management techniques can lessen the impacts of the established invasive species. However, preventing the establishment of new invaders is key. Additionally, early detection of new arrivals provides the opportunity to manage the species while eradication is still possible. Rapid response to a new arrival also helps minimize the spread of the invasive species.

INVASIVE SPECIES ARE PLANTS AND ANIMALS THAT OCCUR OUTSIDE THEIR NATURAL RANGE DUE TO HUMAN INFLUENCE AND CAUSE NET HARM TO THE ENVIRONMENT, THE ECONOMY AND HUMAN HEALTH.

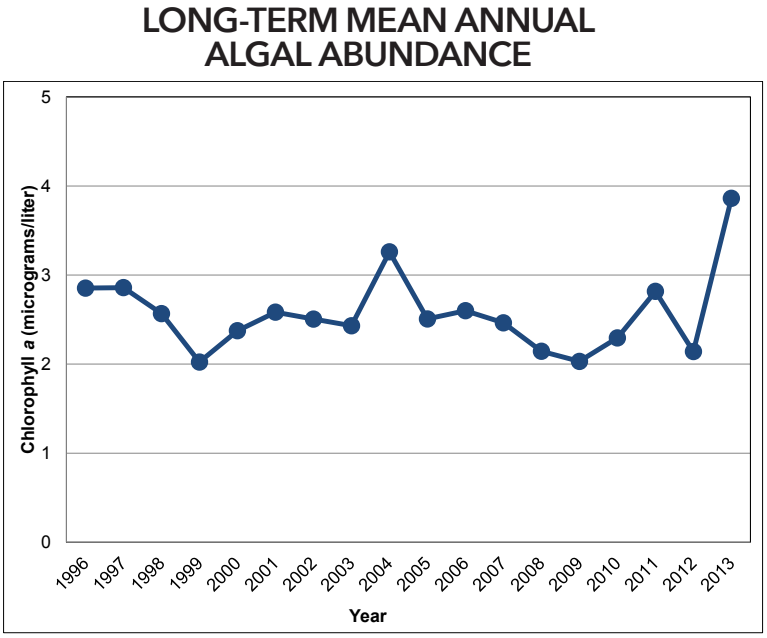
ESTABLISHED	POTENTIAL
Zebra mussels	Hydrilla
Quagga mussels	European frogbit
Asian clams	Brittle naiad
Eurasian watermilfoil	Bloody red shrimp
Water chestnut	Round goby
Curly-leaf pondweed	Asian carp (silver and bighead)
Fishhook waterflea	Spiny waterflea
Mosquito fern	Viral Hemorrhagic septicemia (VHS) disease
Common carp	
European rudd	
Furunculosis disease	
Starry stonewort	



Water chestnut locations in the West River.

HARMFUL ALGAL BLOOMS

Most algae do not impact human health. However, certain types of blue green algae (such as *Microcystis*) are capable of producing toxins. When the concentrations of these algae are high enough, they can pose a risk to human, pet, and wildlife health. The health threat depends on the type of toxin produced and level of exposure, but can range from skin rashes to liver and neurological problems.



It is well understood that increased nutrient loading from the surrounding watershed directly impacts algae levels. However, research around the country is trying to determine what conditions trigger the development and release of the toxins in these algae. Federal or NYS guidelines on safe concentrations of blue green algae have not yet been established, though they are underway. In 2013 and in previous years, Canandaigua Lake has experienced increased algal concentrations dominated by blue green algae. In late August of 2013, secchi disk readings dropped below 3 meters, raw water turbidity doubled (algae based) and samples analyzed by Dr. Bruce Gilman documented that *Microcystis* was the dominant algae in the water. The increasing dominance of Quagga mussels along with runoff events has created the conditions for blue green algae to continue to dominate the algal biomass. Minimizing phosphorus into the lake will be the only manageable way to curtail blue green algae levels.

FISH DIE OFF

Fish die offs are when large numbers of fish die in the lake over a limited amount of time. Both 2013 and 2014 experienced a higher than average fish die off that caused concern throughout the lake community. Die offs are typically natural, but can be exacerbated by human impacts. Based on the Cornell Fish Pathology Lab research and DEC analysis, 2013 was a perfect example of a combination of natural factors that can cause fish die offs in Canandaigua Lake including: spawning and post spawning stress along with quick weather/water temperature changes that can allow common fish bacteria (*Furunculosis* and *Columnaris*) to quickly move through the fish community.

When high concentrations of dead fish remain in the lake, they can pose a threat to the health of people swimming. Also, if the fish kill was caused by a disease, leaving the dead fish in the water can facilitate continued spread of the disease throughout the fish community.

An example of a fish kill on the lake.

STRATEGIES

1. ESTABLISH AN EARLY DETECTION AND RAPID RESPONSE PROTOCOL FOR INVASIVE SPECIES IN CANANDAIGUA LAKE

A. Partner with FLCC to be the liaison with the Finger Lakes Partnership for Regional Invasive Species Management (PRISM), the NY Invasive Species Research Institute and other local organizations to understand invasion risks.

B. Continue and enhance the level of research for early detection of invasive species, partnering with FLCC, DEC and other interested entities. Hotspots such as boat launches and marinas should be monitored throughout the summer season. Emphasis will continue to be placed on Hydrilla, which was recently found in Cayuga Lake. The Hydrilla Task Force on Cayuga Lake will serve as an example.

C. Create a group of trained volunteers to monitor for invasive species, collaborating with the Watershed Association, Soil and Water, Finger Lakes Community College, marinas, angler associations, and boating associations. The Hydrilla Hunter program on Cayuga Lake will serve as an example.

D. Continue and enhance the current efforts to monitor and eradicate water chestnut from the West River.

Hydrilla has not yet been found in Canandaigua Lake but is a great concern because it is found in the Finger Lakes.

2. PREVENT THE SPREAD OF INVASIVE SPECIES FROM RECREATION

A. Promote the local coordination and leadership of the Watercraft Steward Program, which places invasive species educators/inspectors at boat launches throughout the Finger Lakes. Funding has been eliminated at the federal level. Advocate to the state and federal government for permanent funding for the program. If funding is not reinstated, then work at the local level with the FLI, Watershed Association and FLCC to utilize local stewards at public launches.

B. Put signage on boat cleaning techniques at all boat launches and at points of interest on the forthcoming water trail. The DEC recommends checking for invasive species, cleaning visible mud, plants, and debris, draining all water from the boat and other equipment, drying the boat and equipment completely before use in another waterbody, and disinfecting the boat and equipment.

C. Evaluate the need and feasibility of installing washing stations and invasive species disposal containers at boat launches and marinas. Evaluate the Lake George Park Commission invasive species program and determine if it can be adapted to Canandaigua Lake.

D. Conduct outreach and education on invasive species to area residents. Focus on lakefront property owners, public access points, angler groups, bait shops, pet shops and renters. Utilize mailings, the Lake Reporter, websites, and annual meetings.

Cleaning boats of aquatic vegetation is one way to stop the spread of invasive species. Photo from NYS DEC

3. DEVELOP PROTOCOL FOR MONITORING AND MANAGING HARMFUL ALGAL BLOOMS

A. Work with DEC, DOH, local municipalities, and SUNY-ESF to maintain and enhance an algal bloom monitoring protocol for toxins. This should include standardizing water sample collection methods, setting water quality thresholds for harmful algal blooms, and communicating with the public.

B. Utilizing the growing body of scientific research, ensure watershed management is addressing factors that increase algal blooms, including nutrient inputs. Multiple chapters in this management plan address these factors.

4. DEVELOP A FISH KILL ACTION PLAN

A. Host a meeting with all relevant parties to review the 2013 and 2014 fish kills and determine if there is an appropriate level of government responsibility for fish kill response. Include all municipalities, watershed program staff, NYS DEC, NYS Department of Health, Ontario and Yates County Emergency Management, Ontario and Yates County Public Health, and Ontario County Landfill.

B. Determine thresholds for governmental involvement in fish kill management. Before thresholds are exceeded, develop a plan for fish collection and disposal. Locate centralized sites for collecting fish from the public, trucks for hauling the fish from collection sites, and final disposal or composting sites for the fish. Establish agreements with the necessary parties prior to fish kills.

C. Develop educational materials for the public on safe fish collection and disposal, thresholds for reporting fish kills to DEC, and angling practices that reduce the spread of fish diseases.

Dead fish in 2013 washing up along the north shore of Canandaigua Lake.

4.9 RECREATION

THE ISSUE

Thousands of area residents and tourists are attracted to Canandaigua Lake for sightseeing, swimming, fishing, and boating as well as enjoying its natural beauty. Tourism and recreation associated with the lake bring in millions of dollars to the local economy each year. The natural capital provided by the lake is one of the main economic engines that drives the overall local economy.

While recreation is a positive use of the lake for the community overall, overuse can have negative impacts, including degradation of water quality, habitat impacts, increased conflicts of various uses of the lake, decreased boating safety, and noise and aesthetic impacts. Specific concerns for Canandaigua Lake include congestion from boating, discharge of pollutants from marinas and boats, competing uses that decrease the overall quality of the recreational experience for more passive uses and limited public access points.

BOATING

Boating on Canandaigua Lake is extremely popular and includes the various activities of tubing/waterskiing, fishing, sailing, sightseeing, along with personal watercrafts/jetskis. The 2010 Canandaigua Lake Peak Boat Use Inventory and Carrying Capacity Report (Olvany et. al.) documented that over 4000 power/sail boats have access to the lake with approximately 659 to 974 operating on peak use days (summer weekends). Access points include two state boat launches, five commercial marinas, various lakeside town house/condo communities and over 1,500 parcels. The report, endorsed by the Watershed Council, recommends that the carrying capacity for boats on the lake, defined as the number of boats that can be operated on the lake without compromising the lake's multiple uses, aesthetic enjoyment, natural beauty and environmental quality, should be in the range of 15 to 20 acres/boat. In the northern 1/3 of the lake, the estimated boat density is approximately 5.7 to 7.9 acres/boat during peak use times. In the southern 2/3 of the lake, the boat density is approximately 19 – 27 acres/boat. The report does not recommend trying to actively reduce the current number of boats that can access the lake, but does recommend not increasing access for the more intensive uses of the lake, such as power boating, especially at the north end of the lake.

The growing population in the region will undoubtedly increase boat densities and increase congestion problems, including pollution, noise, waves, crowding, and infringement on privacy. Cumulatively, these impacts degrade the overall quality of recreational experiences and reduce compatibility among the many different types of use of the lake. Reducing the impact of users on one another will improve recreational opportunities on the lake.

WATER QUALITY

Boating can contribute to water quality concerns in the lake. Motorized boats, along with marinas and fueling stations, can contribute hydrocarbons and other motor fluids to the lake. A study in partnership with a SUNY-ESF doctoral student was conducted on the lake in 2010, comparing hydrocarbon levels prior to peak boating hours (morning) near Kershaw Beach with water quality on the same day during peak boating hours (late afternoon). Hydrocarbon levels were very low in the morning. However, water quality at peak boating times actually approached state pollution standards for some hydrocarbons.

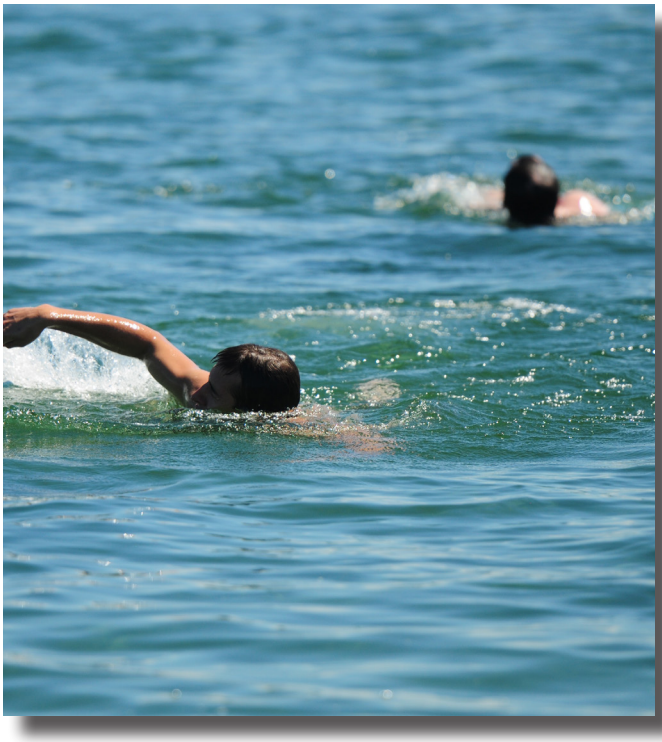
Additional pollution issues associated with boating include:

- Boat induced waves eroding shorelines and stirring up bottom sediment.
- A lack of public bathroom facilities leads to the use of the lake as a bathroom.
- Boats can move invasive species into and out of Canandaigua Lake. Once established, invasive species can be very costly and difficult to eradicate.

MARINAS

Marinas are a key access point for the public that do not own shoreline properties. They also provide a valuable service to the boating community through their sales, fuel stations, boat cleaning and repair business. There are 5 commercial marinas on the lake (2013) that provide service to the public. The main potential impacts from marinas include: fuel spills during filling operations, boat washing activities, fuel storage, and stormwater runoff from the impervious areas of the marina. It is critical that we work with our marinas to reduce their potential impact.

Safely tubing or water skiing on Canandaigua Lake takes many acres of space per boat.



IMPROVING PUBLIC ACCESS

Over 97% of the Canandaigua Lake shoreline is privately owned. Ensuring the public has access to the lake and the associated recreational opportunities is therefore a priority. The Watershed Council received a grant to partner with multiple organizations to build the Canandaigua Lake Water Trail, which will increase use of the lake by canoe and kayakers. The Water Trail will include mapped canoe and kayak routes and launching sites, along with the location of historic, cultural and ecological destinations near these routes. To initiate the water trail, two new non-motorized public access points will be built, canoe and kayak routes will be mapped, and educational kiosks will be installed.

SWIMMING BEACHES

Five public swimming areas are located around the lake including Kershaw Swim Beach at the north end, Deep Run and Vine Valley on the east side, and Onanda and Butler Parks on the west side of Canandaigua Lake. The Town and City of Canandaigua Parks and Recreation Departments generate revenue from day use and seasonal pass fees for access to the swim beaches at Onanda Park and Kershaw, respectively.

The July-September 2012 Kershaw Swim Beach closure during the clean-up of buried material resulted in lost revenue for the City of Canandaigua and impacted the hundreds of residents and visitors who typically utilize the beach for swimming access on a daily basis. Swim beaches are important areas to continue to monitor for water quality, as they provide access to literally hundreds of people around the lake on any given summer day.

- Kershaw Swim Beach Remediation: The discovery of a tar-like substance at Kershaw Swim Beach at the north end of Canandaigua Lake during the summer of 2012 has brought the issue of toxic substances to the forefront of water quality protection within the Canandaigua Lake Watershed. Through a research partnership with Dr. John Hassett of SUNY ESF, the tar-like substance was identified as remnants of very old lubricating oil, possibly crank case oil, in the bottom of the drums that were buried in this area back in the 1920's. To remediate this problem, the existing sand beach was excavated down to the native clay layer and replaced with new, clean sand. Monitoring wells were put in place for continued assessment of water quality in the area.

STRATEGIES

1. ENSURE SAFE WATER QUALITY FOR PUBLIC SWIMMING BEACHES

A. Periodically assess water quality in the Kershaw Swim Beach area utilizing the monitoring wells installed at the northeast corner of the remediation area. The City, DEC, DOH and Watershed Council will partner on this assessment.

B. Each of the respective operators of the public swimming beaches will continue to monitor water quality at their areas, especially for elevated fecal coliform and blue-green algae levels. The Watershed Council can act as a local clearinghouse on this information and notify the DEC and DOH about elevated bacteria and/or algae in the lake.

C. Consider larger setbacks from public beaches for boaters, especially at Kershaw Beach where hundreds of boats congregate on busy weekends.

2. REDUCE THE IMPACT OF BOATING ON WATER QUALITY AND IMPORTANT ECOSYSTEMS

A. Advertise the existing boat pump stations and possibly construct more pump stations along the lake shore.

B. Consider constructing public docks for transient use access at the north end area to more easily access public restrooms and commercial facilities from the lake.

C. Encourage boat owners to keep engines in proper running order to prevent fuel and motor fluid leaks along with encouraging low impact uses in the West River and Hi-Tor Wetlands. Utilize public boat launches to distribute materials to boat owners.

D. Educate the public on how to prevent the spread of invasive species and fish diseases. See the Invasive Species, Harmful Algal Blooms and Fish Kill section for more details.

People out fishing on Canandaigua Lake

3. INCREASE COMPATIBILITY AMONG DIFFERENT RECREATIONAL USES AND IMPROVE SAFETY

A. Develop Water Trail Plan for Canoes and Kayaks and other non-motorized use of the lake. Organize the Water Trail Committee, which will include local municipalities, recreation groups, the Finger Lakes Visitor's Connection, local businesses, the Finger Lakes Land Trust, the National Parks Service, New York State Parks, and other interested entities. Work with the Committee to create and promote the use of the Water Trail, including locating the routes, identifying destination points, installing new public access points and educational kiosks, creating Water Trail maps, resolving infrastructure and legal issues, and distributing promotional materials.

B. Strictly enforce the number of boat slips allowed under the Uniform Docks and Moorings Law and have periodic meetings with the six shoreline Enforcement Officers to ensure the law is being uniformly enforced.

C. Encourage Ontario and Yates Sheriff's offices to increase enforcement of noise and speed violations. The speed limit is 20 mph at night, 45 mph during daylight and 5 mph within 200 feet of the shoreline or any structure.

D. Strictly scrutinize projects that would promote additional boat access, especially in the northern third of the lake, which would further exceed the Peak Boat Use Carrying Capacity of the lake.

4. ENSURE MARINAS ARE NOT CONTRIBUTING TO WATER QUALITY PROBLEMS

A. Verify that all marinas around the lake are meeting their Multi-Sector State Pollution Discharge Elimination Permit requirements.

B. Work with the DEC to conduct a workshop for marina operators and provide educational material on best management practices. Specifically, address the following:

- Fuel station maintenance and operation
- Facility cleaning and maintenance
- Boat washing, specifically power-washing
- Boat maintenance activities
- Lake-friendly winterizing
- Storm water management

C. Encourage marina owners to post educational material and/or host workshops for members on lake friendly boating practices.

5. PROTECT IMPORTANT FISH HABITAT IN CANANDAIGUA LAKE AND THE NAPLES CREEK COMPLEX

A. Support projects in the Naples Creek Complex to protect and enhance fish habitat that sustain naturally reproducing lake trout, rainbow trout and other associated fishing opportunities.

B. Complete a study of the near shore littoral zone to identify high quality habitat areas and promote their protection to the public and fishing groups.

Trout Derby in Naples Creek

4.10 LAKE LEVEL MANAGEMENT

Floods of 2011- DEC boat launch- South end of the lake.

THE ISSUE

With 10,553 acres of lake surface area and depths reaching 276 feet; Canandaigua Lake can hold up to 433 billion gallons of water. This may seem like an infinite resource, however relatively small changes in lake level can have impacts on the various users of the lake. Potential impacts include: wetland/wildlife impacts on Hi-Tor wetland complex, recreational impacts on ingress and egress for boaters from docking systems and launches, flooding and erosion impacts along the shoreline, and possible impacts to water supply withdrawal. Therefore, making sure the lake level is properly managed to meet these multiple uses is important.

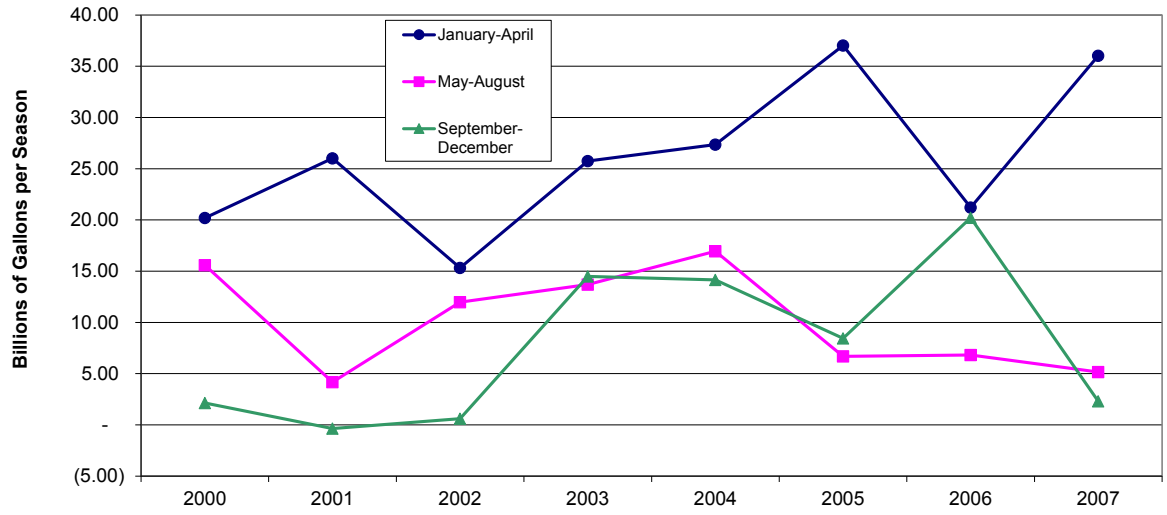
Lake water flooding a low lying home during the floods of 2011.

The City of Canandaigua was given authority to manage the lake levels by the State of New York in 1886 and does so by opening and closing the outlet gates. The City of Canandaigua utilizes the Guide Curve, which is a tool developed by multiple local, state and federal agencies in the 1980s to balance the multiple lake level dependent uses. The Guide Curve helps preserve high quality experiences for all users of the lake, balancing the needs of boating, fishing, swimming, habitat, and drinking water. The Guide Curve calls for a lake level to range from 686.90 to 688.5 feet above sea level or 1.6 feet throughout the year.

Although the City has some control over the lake level during certain times of year, mother-nature is ultimately in-charge. Substantial snowmelt or precipitation events may raise lake levels beyond the drawdown capacity of the outlets, creating a substantial flooding situation (1972, 2011). Conversely, droughts may reduce lake levels below the Guide Curve, even with minimum flow through the outlets. Therefore, the City manages the lake level based on the Guide Curve along with short and long term weather forecasts in mind.

The lake level on any given day is dependent on the balance of inflows to the lake and outflows from the lake. This balance changes throughout the seasons. The lake levels are highest in the spring due to rain and snowmelt events. The levels then decline through the summer and fall, reaching the lowest level in the winter to provide storage for the next year's flows.

ESTIMATED SEASONAL INFLOWS IN BILLIONS OF GALLONS TO CANANDAIGUA LAKE FROM 2000 TO 2007 FOR THREE TIME CATEGORIES.



The water purveyors each are allocated a daily maximum withdrawal. These allocations ensure that public water supply does not have a significant impact on lake levels.

WATER PURVEYOR	DAILY MAXIMUM WITHDRAWAL (MILLION GALLONS/DAY)
City of Canandaigua	6.0 (annual avg)
Town of Gorham	1.5
Village of Newark	4.0
Village of Palmyra	3.0
Village of Rushville	0.96
Bristol Harbor	0.255
Total	15.715

INFLOWS

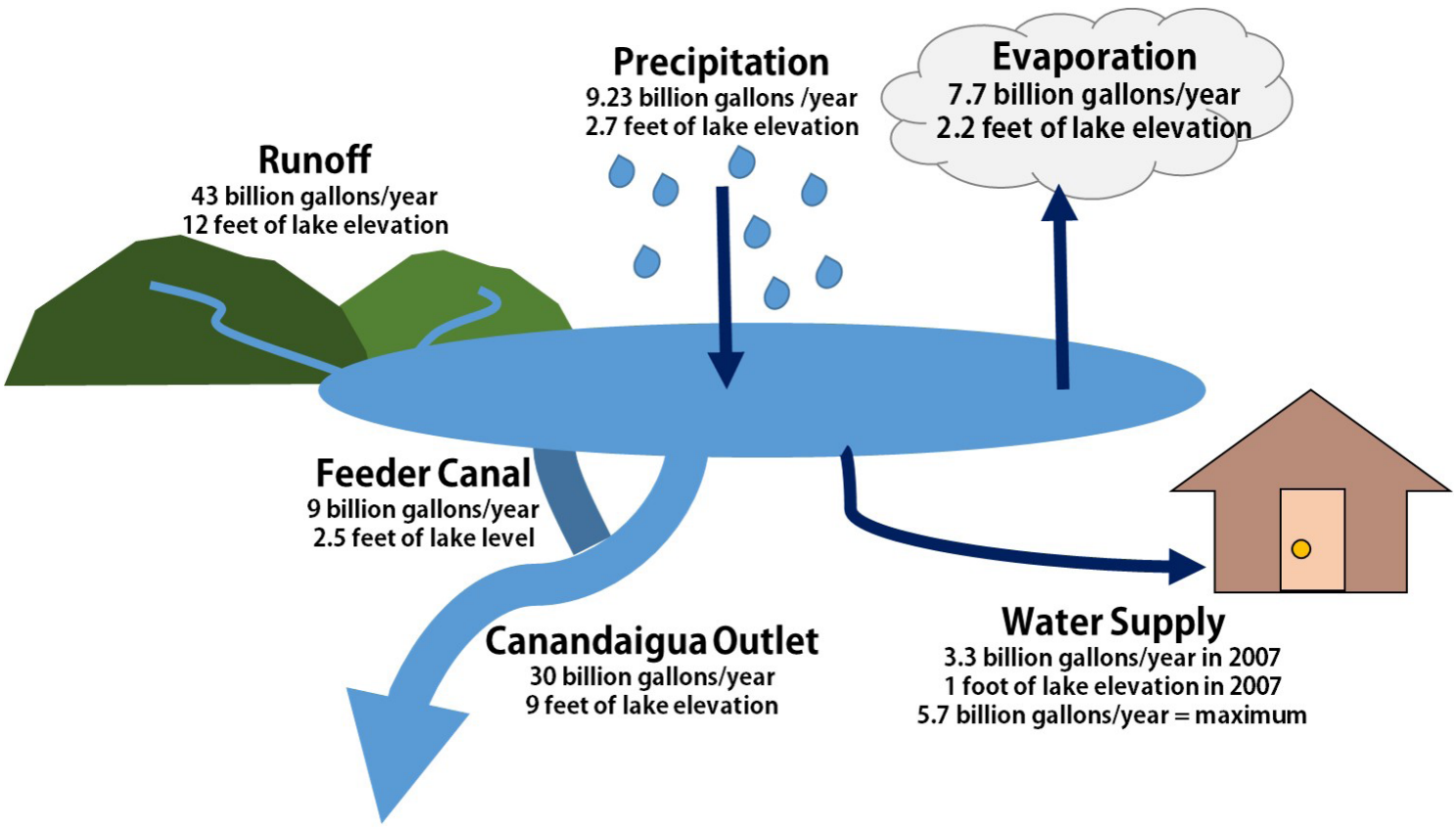
Water falls on the lake directly as precipitation (~2.7 feet). In addition, approximately 1/3 of the precipitation that falls in the watershed enters the lake through direct runoff and through the 100s of small and large streams and gullies that outlet to the lake.

OUTFLOWS

Canandaigua Lake has two outlets. The Canandaigua Outlet is the main outlet, which flows through Lagoon Park. There are two flow control gates that are located behind Wegmans, which are utilized as the main flood control gates. Over the last twenty years, the main gates are opened on average 110 days per year. The Feeder Canal is the second outlet and is a man-made channel (east of Kershaw Beach) that connects to the Canandaigua Outlet 1.5 miles downstream (north) from the lake. The DEC mandates that flows in the Feeder Canal are at least 35 cubic feet per second or 22.6 million gallons per day to dilute the treated outflow from the City of Canandaigua Wastewater Treatment Plant and other downstream wastewater treatment plants. Both the main outlet gates and feeder canal gates are controlled by the Canandaigua Wastewater Treatment Plant personnel.

In addition to the two outlets, water also leaves the lake through evaporation (2.2 feet of evaporation over a year). The majority of this evaporation occurs during the summer months. On hot summer days, the lake loses the equivalent of one inch of lake every 4-5 days (approximately 300 million gallons).

The other outflow from the lake is through the use of the lake as a water supply for approximately 70,000 people. On average, 3.3 billion gallons of water is withdrawn from the lake for water supply purposes each year. Five municipalities (City of Canandaigua, Town of Gorham, Villages of Newark, Palmyra and Rushville) along with Bristol Harbour withdraw water from the lake, treat it and sell it to their customers including other municipalities in the region.



Approximate average water balance for Canandaigua Lake.

MANAGEMENT

Lake levels affect boating, fishing, swimming, aesthetics, habitat value, water quality, and its ability to provide drinking water.

Opening and closing the outlet gates is the primary human mechanism to control lake levels. The Guide Curve indicates where lake levels are during a typical year and helps to promote high quality experiences for all users. For example, fall drawdown allows for storage of snowmelt in the spring and reduces the possibility of flooding, while levels are kept at a certain height during the summer for high quality boating conditions.

The City will keep the level slightly above or below the Guide Curve to account for the current and projected weather forecasts, antecedent moisture conditions and watershed stream flows. However, there are times that Mother Nature is in control of lake level, such as during the late summer timeframe through the fall months. The following graph shows the average lake level over the last 20 years. During average summer precipitation conditions, the lake level typically dips below the Guide Curve and the City has no control of the lake level at that point.

The City of Canandaigua first controls lake levels by opening the Feeder Canal gate. This gate can be opened to different levels to allow different amounts of water to flow through. When the lake levels needs to be lowered further to prevent flooding or increase storage, the gates to the main outlet are opened.

Changes to water withdrawn for public water supply can also have a small impact on lake levels when compared to the impact of flows through the outlet gates. The water withdrawn for public water supply for the entire year is equivalent to opening the main outlet gates for just 10 days or 10-12 inches of lake level. On an average year, these gates are opened for 111 days. Regulations for water supply withdrawal and implementing water conservation techniques can therefore have a small impact on lake levels.

When the lake falls below certain thresholds, the City is required to implement drought management strategies for their water service area as detailed in the State Environmental Quality Review Negative Declaration for the City of Canandaigua Water Supply Permit Modification. During drought periods, priority is given to water supply first, with additional consideration given to the protection of habitat in the Hi Tor Wetland Complex, the Canandaigua Outlet and shorelines areas, and recreational access to the lake.

Outlet gates in the closed position

The feeder canal allowing the minimum flow out.

Canandaigua Lake Outlets and Lake Level Control Gates

STRATEGIES

1. CONTINUE TO MANAGE LAKE LEVELS USING THE GUIDE CURVE

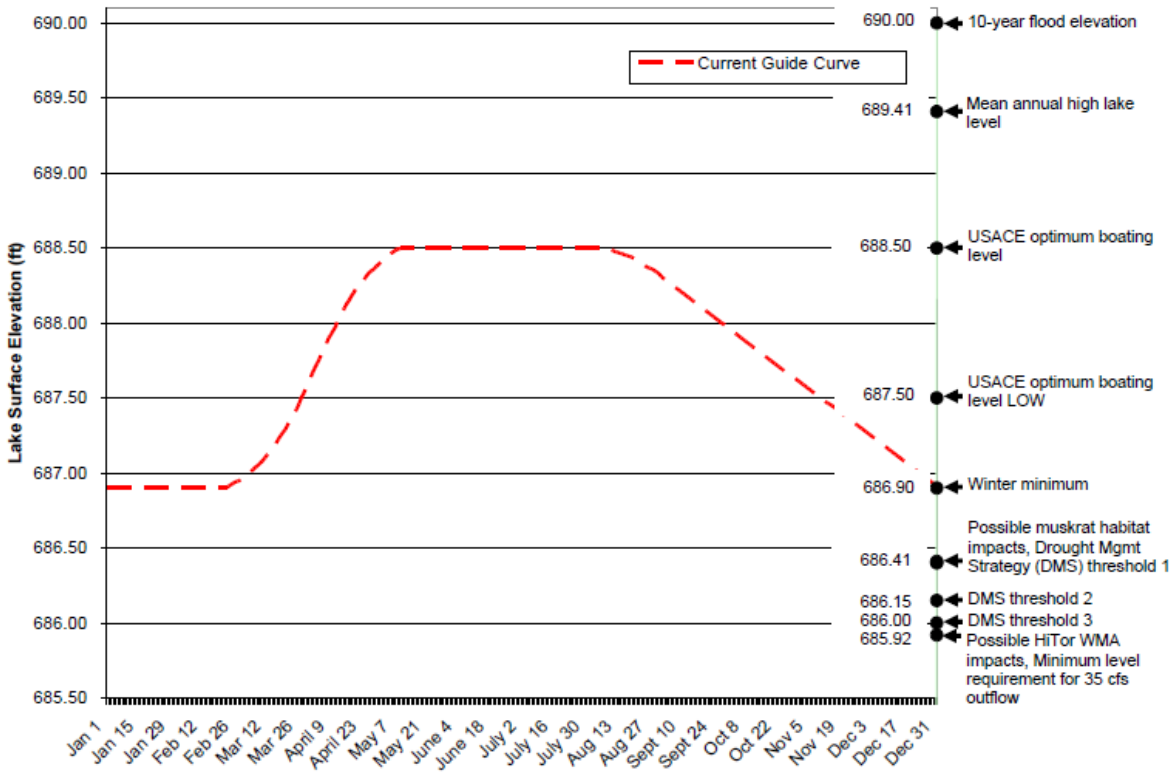
A. Continue to monitor lake levels daily. The City of Canandaigua Wastewater personnel are responsible for manually recording lake levels from the USGS-owned lake level gage, which is located at the City Pier inside the City owned building. This information is then sent to NOAA for uploading to their website during the work week. This is critical information for the multiple users of the lake.

B. Continue to research the partnership with the City, USGS and NOAA to establish a web link to gather continuous and instantaneous lake level readings and making these readings publicly-available on an easily accessible website. This system would allow the public much greater and easier access to this information.

C. Continue to use the Guide Curve, weather conditions and institutional knowledge to manage lake levels. This system has proven successful, as flooding has been a rare occurrence and the drought management thresholds have almost never been exceeded.

Flooding along the lakeshore

THE GUIDE CURVE



2. IMPLEMENT DROUGHT MANAGEMENT PROTOCOLS WHEN NECESSARY

A. Assist the City of Canandaigua, as necessary to implement their Drought Water Use and Lake Level Management Strategy, as detailed below.

B. Encourage the 5 other water purveyors to implement the Drought Water Use and Lake Level Management Strategy, as detailed below, when thresholds are exceeded. Currently, only the City of Canandaigua is legally obligated to implement these protocols.

C. Educate the public about the Drought Management Protocol, why it is necessary and what they can do to conserve water.

	THRESHOLD (MUST BE EXCEEDED FOR AT LEAST 3 CONSECUTIVE DAYS)	ACTION (LEVELS MUST REMAIN ABOVE THRESHOLD FOR 3 CONSECUTIVE DAYS TO COMPLETE)
MAY 1 — OCT 15	Lake level drops below Guide Curve by 1 ft or more	Water conservation measures
	Lake level drops below Guide Curve by 1.2 ft or more	Reduce Feeder Canal flow to 25 cfs (notify DEC and monitor dissolved oxygen level weekly in Outlet)
	Lake level drops below the Guide Curve 1.5 ft or more	• Reduce Feeder Canal flows to 20 cfs (notify DEC and monitor by dissolved oxygen level in outlet twice per week) • Initiate the alternate source supply protocol
OCT 16 — APR 31	Lake level of 686.40 ft or below	• Institute water conservation measures • Reduce Feeder Canal flow to 25 cfs (notify DEC and monitor dissolved oxygen levels weekly)
	Lake level of 686.15 ft or below	• Reduce Feeder Canal to 20 cfs (notify DEC and monitor dissolved oxygen twice per week) • Initiate the alternate source supply protocol

4.11 FORESTRY

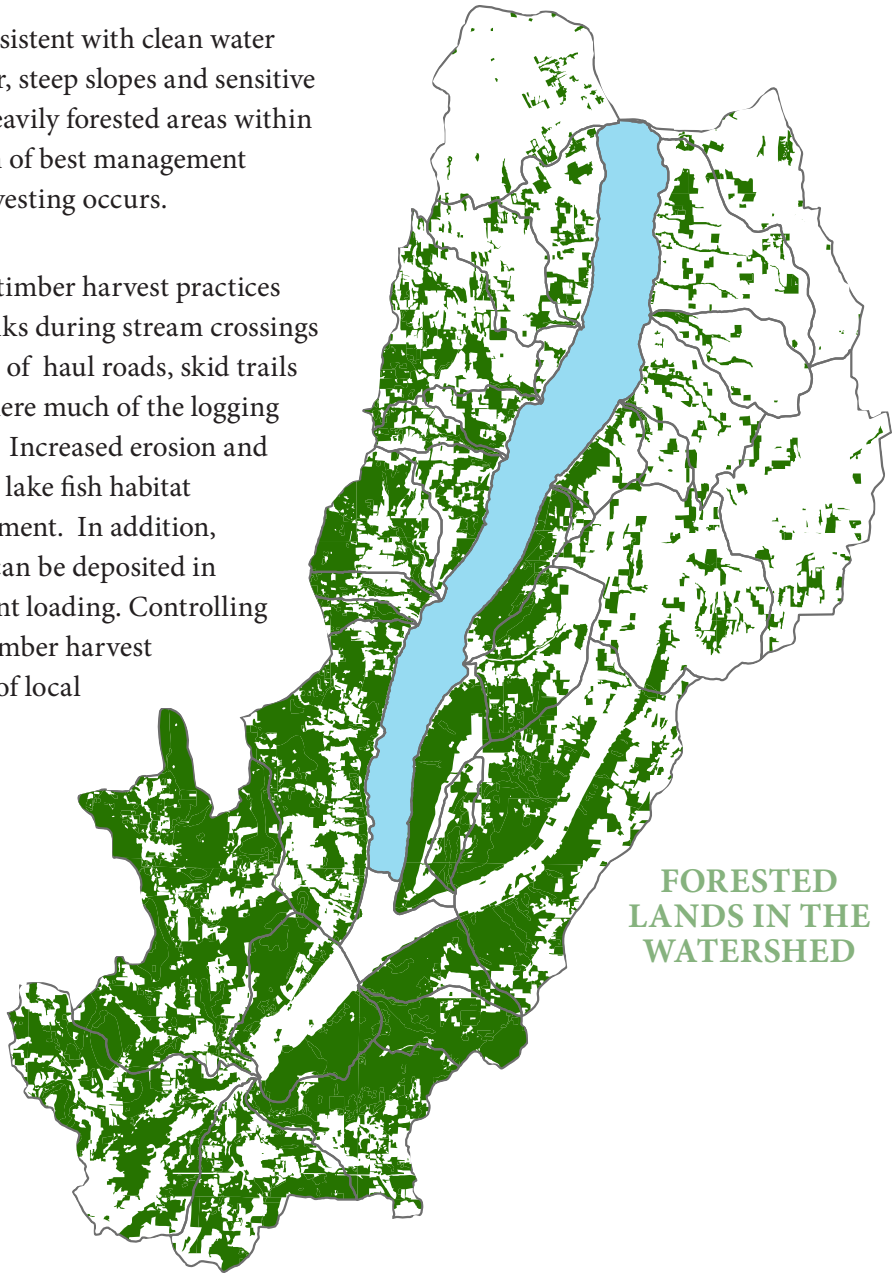
THE ISSUE

The Canandaigua Lake watershed is fortunate to have over 40 percent of the watershed in some stage or type of forest cover. This forested area predominately includes much of the southern watershed municipalities of Middlesex, Italy, Naples, and South Bristol, along with the Town of Canandaigua.

Quality timber harvesting operations can be consistent with clean water that naturally flows from wooded areas. However, steep slopes and sensitive stream environments characterize most of the heavily forested areas within the watershed. Therefore, proper implementation of best management practices needs to be a priority when timber harvesting occurs.

The biggest risk to water quality associated with timber harvest practices stems from degradation of streams and their banks during stream crossings by heavy equipment, as well as the establishment of haul roads, skid trails and staging/landing areas on the steep slopes where much of the logging occurs within the Canandaigua Lake watershed. Increased erosion and resulting sedimentation can smother stream and lake fish habitat and spawning areas with depositions of fine sediment. In addition, the naturally phosphorus rich soil of the region can be deposited in Canandaigua Lake, resulting in increased nutrient loading. Controlling soil erosion during and immediately following timber harvest operations is the key to protecting water quality of local streams and Canandaigua Lake.

Municipalities and the Watershed program are important partners in supporting sustainable timber harvesting and forest management in the Canandaigua Lake watershed. By promoting educational programs, offering stream arch culverts and considering reasonable regulations that protect water quality; municipalities can ensure the continued economic and environmental viability of timber harvesting as an important local industry.



FORESTED LANDS IN THE WATERSHED

STRATEGIES

1. MINIMIZE SOIL EROSION FROM TIMBER HARVEST OPERATIONS

A. Advertise the arch culvert loan program provided by the Canandaigua Lake Watershed Council to increase use by timber harvesters and foresters. These arch culverts create temporary stream crossings, protecting streams from heavy equipment. They are available on loan, at no cost, to timber harvesters and foresters working in the Canandaigua Lake watershed area. Advertise the arch culvert process through the timber harvest registry process.

B. Continue to assist municipalities who have already adopted or are considering adopting the Model Timber Harvest Law, which provides uniform water quality protection and regulation within the Canandaigua Lake watershed. The model law recommends no harvest zones within 15 feet of streams, along with utilizing BMPs on haul roads and skid trails that exceed 15% slope to reduce erosion.

Available at: http://www.dec.ny.gov/docs/lands_forests_pdf/dlfbmpguide.pdf

C. Further promote the use of forestry best management practices throughout the watershed area. NYS Forestry Best Management Practices (BMP): The NYS DEC has outlined a comprehensive set of practices in the NYS Forestry Best Management Practices BMP for Water Quality Field Guide (2011). These practices should be utilized by local foresters working within the Canandaigua Lake watershed area both during and immediately following logging operations. http://www.dec.ny.gov/docs/lands_forests_pdf/dlfbmpguide.pdf

Logs inappropriately placed in a gully to act as a landing area, creating a possible log jam during a runoff event.

2. FACILITATE TRAINING AND EDUCATION FOR LAND OWNERS AND FORESTRY PROFESSIONALS

A. Promote existing timber harvesting and forest management programs and organizations that provide education and workshops for Best Management Practices in forestry. These organizations include:

- New York Forest Owners Association (NYFOA) Western NY Chapter
- Cornell Cooperative Extension
- NYS DEC's Forestry Best Management Practices for Water Quality
- WNY Chapter of the Society of American Foresters
- American Forest Foundation (Tree Farm)

B. Partner with SUNY-ESF, Cornell Cooperative Extension and forestry organizations to continue to host training workshops for land owners and forestry professionals focused on timber harvest BMP and forest management innovations suitable for use in the Canandaigua Lake watershed.

SEDIMENT GENERATED FROM A LOGGING OPERATION TWO MILES UPSTREAM.

3. ENCOURAGE ACTIVE PARTNERSHIPS BETWEEN MUNICIPALITIES AND FORESTRY PROFESSIONALS

A. Encourage municipalities to consider using open space funds to collaborate with local land trusts, such as the Finger Lakes Land Trust, to utilize Conservation Easements on working forest lands.

B. For those municipalities that do not adopt the Model Law, utilize the registration law to educate the logging community on the use of BMPs for erosion control in forestry practices and the potential water quality fines from DEC.

C. Support NYS legislation to reduce disincentives associated with the NYS Forest Tax Law – 480a program to allow for increased enrollment. Disincentives include the minimum acreage requirement (50 acres), ten year rolling enrollment commitment penalties, tax assessment classification, and the 6 percent stumpage payment.

4.12 MINING AND NATURAL GAS EXTRACTION

THE ISSUE

The geologic setting of the Canandaigua Lake watershed, with its localized rich sand and gravel deposits and marginal deep shale-locked deposits of natural gas, provides important natural resources and commercial business opportunities for the local community. However, natural resource extraction in the form of sand/gravel mines and natural gas drilling can have significant impacts on surface and groundwater. Active, inactive, and non-permitted sand and gravel mine sites throughout the watershed can pollute nearby streams by increasing sediment loads. The potential for high volume hydraulic fracturing for natural gas could have major implications for water quality due to the millions of gallons of water and hydrofracking fluid used to activate each gas well. Trucking, spills, stormwater management concerns, additional roads, industrialization of rural areas, well casing leaks, water withdrawal from the lake, the lack of a comprehensive state inspection program and the shallow extent of the Marcellus Shale in relation to the bottom of the lake and groundwater—all pose real threats to watershed.

SAND AND GRAVEL MINES

According to the NYS DEC, seven permitted and an additional eight reclaimed sand and gravel mine sites are located within the Canandaigua Lake watershed. Numerous other mine sites exist that are inactive or operate below the one thousand ton removal per year threshold requiring permitting by the DEC. Unrestricted runoff and sedimentation from bare mine banks can have an impact on nearby surface waters, resulting in:

- impaired stream flows
- diminished water clarity
- damaged fish habitats

Once disturbed, mine banks are difficult to revegetate and continue to contribute to water quality problems over long periods of time.

NATURAL GAS EXTRACTION

Canandaigua Lake is the economic lifeblood of our region, providing high quality drinking water for over 65,000 people and supporting a thriving recreational and tourism industry. Environmentally, the intact forested lands within our watershed provide the following ecological services: reduce flooding, protect Canandaigua Lake as a drinking water source, limit the amount of filtration needed and increases biodiversity and habitat quality of the lake and surrounding watershed.

Based on these facts, the Watershed Council has requested that the NYS DEC provide equal protection as the NYC and Syracuse/Skaneateles watersheds along with primary aquifers by prohibiting high volume hydraulic fracturing in the Canandaigua Lake Watershed and supporting a 4,000 foot buffer from the watershed boundary. At this time, not enough information is known about the water quality impacts to surface and groundwater or the health impacts from air and water pollution. Trucking, spills, stormwater management concerns, industrialization of rural areas, well casing leaks, the lack of a comprehensive state inspection program and the shallow extent of the Marcellus Shale in relation to the bottom of the lake and groundwater- all pose real threats to the watershed.

STRATEGIES

1. REDUCE WATER QUALITY RISKS FROM MINED SITES WITHIN THE WATERSHED.

A. Work with DEC to continue to maintain an inventory of active and inactive mining sites within the Canandaigua Lake watershed and periodically check these sites during storm events to evaluate pollution potential.

B. Provide educational materials on water quality protection to mine operators and municipalities.

C. Encourage municipalities to include mining operations in stormwater regulations in local land use zoning.

2. PROTECT THE CANANDAIGUA LAKE WATERSHED FROM IMPACTS RELATED TO HIGH VOLUME HYDRAULIC FRACTURING

A. Continue to encourage New York State to provide equal protection to Canandaigua Lake as it is providing to Skaneateles Lake and the New York City Watershed.

B. Continue to support scientific study that looks at all of the cumulative impacts from high volume hydrofracking. Encourage the US EPA to look at the Pennsylvania area very closely and take on a comprehensive monitoring program of private water wells near hydrofracking locations. High quality, comprehensive scientific examination will be critical to evaluating the potential impacts from high volume hydrofracking.

C. Encourage watershed municipalities to prohibit high volume hydrofracking in the watershed portion of their municipality plus a 4,000 foot buffer to protect from potential groundwater contamination.

D. Provide technical support and actively work with municipalities as they review possible local land use regulations and road use agreements regarding high volume hydraulic fracturing.

E. Encourage public and private water purveyors that use the lake or watershed streams to not provide water to hydrofracking operations. In addition, encourage DEC to not allow the lake to be used as a withdrawal location for the hydrofracking industry. Water withdrawals will greatly increase truck traffic and will require millions of gallons of water per well.

F. Recommend that municipal and private wastewater treatment plants in the watershed not accept high volume hydraulic fracturing waste.

G. Recommend that municipalities, counties and State DOT do not use brine from high volume hydraulic fracturing for deicing agents on municipal or private roads in the watershed.

H. In the event that hydrofracking is allowed within the watershed boundaries, the Watershed Program would partner with DEC and municipalities to monitor hydrofracking sites and waste disposal.

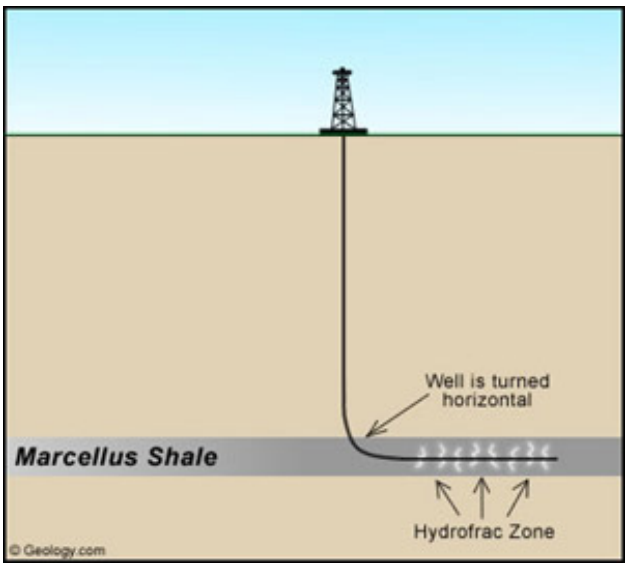


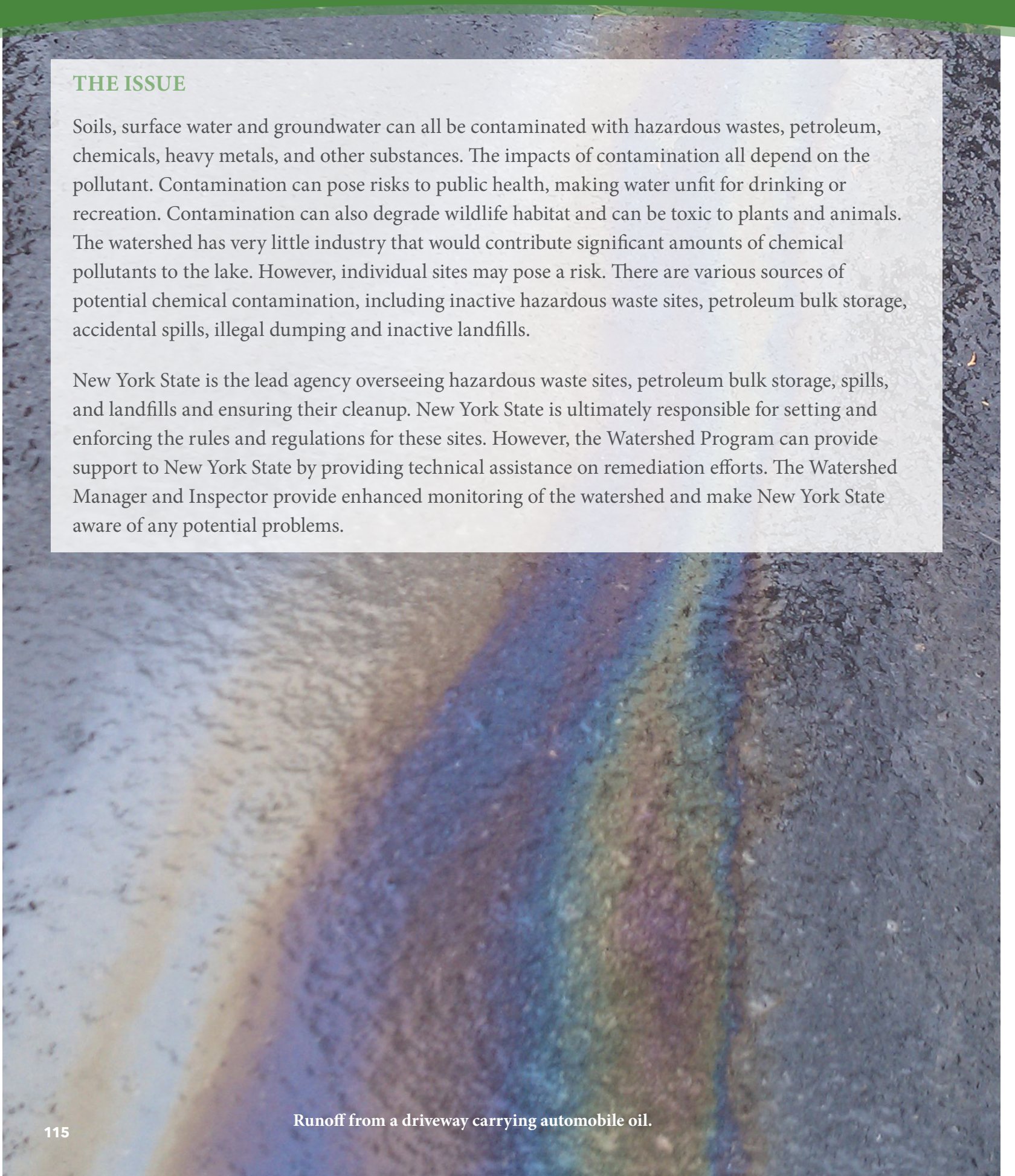
Image courtesy Brad Cole, Geology.com

4.13 CHEMICAL CONTAMINATION PREVENTION

THE ISSUE

Soils, surface water and groundwater can all be contaminated with hazardous wastes, petroleum, chemicals, heavy metals, and other substances. The impacts of contamination all depend on the pollutant. Contamination can pose risks to public health, making water unfit for drinking or recreation. Contamination can also degrade wildlife habitat and can be toxic to plants and animals. The watershed has very little industry that would contribute significant amounts of chemical pollutants to the lake. However, individual sites may pose a risk. There are various sources of potential chemical contamination, including inactive hazardous waste sites, petroleum bulk storage, accidental spills, illegal dumping and inactive landfills.

New York State is the lead agency overseeing hazardous waste sites, petroleum bulk storage, spills, and landfills and ensuring their cleanup. New York State is ultimately responsible for setting and enforcing the rules and regulations for these sites. However, the Watershed Program can provide support to New York State by providing technical assistance on remediation efforts. The Watershed Manager and Inspector provide enhanced monitoring of the watershed and make New York State aware of any potential problems.



Runoff from a driveway carrying automobile oil.

INACTIVE HAZARDOUS WASTE SITES

The watershed has a few inactive hazardous waste sites within its boundaries, each classified by its stage in the remediation process and the program through which it is being remediated (from the DEC Remedial Site Database, http://www.dec.ny.gov/cfmx/extapps/derexternal/index.cfm?pageid=3).

- Former Voplex Plant Canandaigua (C): This site has been used for various manufacturing projects in the past. Elevated levels of volatile organic compounds were found in the site, necessitating remediation efforts administered through the State Superfund Program. Substantial efforts have been made to clean up the site, but progress and monitoring has stopped since the owner's bankruptcy. The site is in a manufacturing corridor, with great redevelopment possibilities. This site has brownfield possibilities if a new owner is willing to provide final clean-up along the existing building foundation.
- Former Labelon Corporation Facility Canandaigua (C): This site has been used to manufacture many different things over the past 100 years. Testing of the site found low levels of petroleum and chlorinated solvents, with specific concern for trichloroethene. This site is overseen by the Brownfield Cleanup Program and is classified as a non-registry site.
- Canandaigua Multi-Brownfield Site Redevelopment Project Canandaigua (C): This 7 parcel plot of land was formerly used for restaurants, a mobile home park, a dry cleaner and a gas station. This site is administered under the Brownfield Cleanup Program and is a non-registry site. The environmental conditions of the site are currently under review by the DEC. This project site is at the north end of Canandaigua Lake; surface flow is not in the watershed, but ground water flow may still impact Canandaigua Lake. Redeveloping the site through the brownfield clean-up program will provide a net benefit to the overall water quality of the area.
- RGE—Canandaigua (C) - Clark St.: Coal tars were found on this site, with some evidence that these were affecting sediments in Sucker Brook. Through the Voluntary Cleanup Program, this site has been cleaned up.
- RGE—Canandaigua (C) - South Main St.: The former manufactured gas plant showed evidence of coal tar, with concerns about volatile organic compounds, polycyclic aromatic hydrocarbons, and cyanide. This program is administered through the Voluntary Cleanup Program and is a non-registry site. This site was cleaned up in 2012.
- Boyce Property Canandaigua (C): This site has been successfully remediated and has been removed from the NYS registry. Previous concerns were for contamination from petroleum and waste solvents.

Remediation of contaminants from the former Manufactured Gas Plant along Sucker Brook.

SPILLS

Spills can happen anywhere in the watershed and can vary from leaks when a resident changes their own car oil to a trucker overturning to underground spills that go unnoticed for years. Though most spills are accidental, proper precautions can prevent some spills. In others, it is difficult to predict and prevent the spill. When this occurs, the amount of time to containment is critical. The longer a spill is uncontained, the more the contaminant can spread. This makes cleanup more difficult and costly.

INACTIVE LANDFILLS

The Canandaigua Lake Watershed has 5 inactive landfills, located in the Town of Canandaigua, the City of Canandaigua, Town of South Bristol, the Village of Rushville and the Village of Naples. Though inactive landfills are not currently being utilized, they may still impact water quality through leachate. Many inactive landfills are not properly lined and the impacts to water quality are unknown. More active management of these sites is therefore recommended.

ILLEGAL DUMPING

Illegal dumping refers to the dropping of trash or liquids, including chemicals, in non-designated sites. Sites may include the side of the road, a vacant lot, or even a storm drain. Because there is no control of runoff at illegal dumping sites, these areas can contaminate nearby water resources (EPA). Previous efforts have cleaned up some illegal dump sites.

JUNK/SALVAGE YARDS

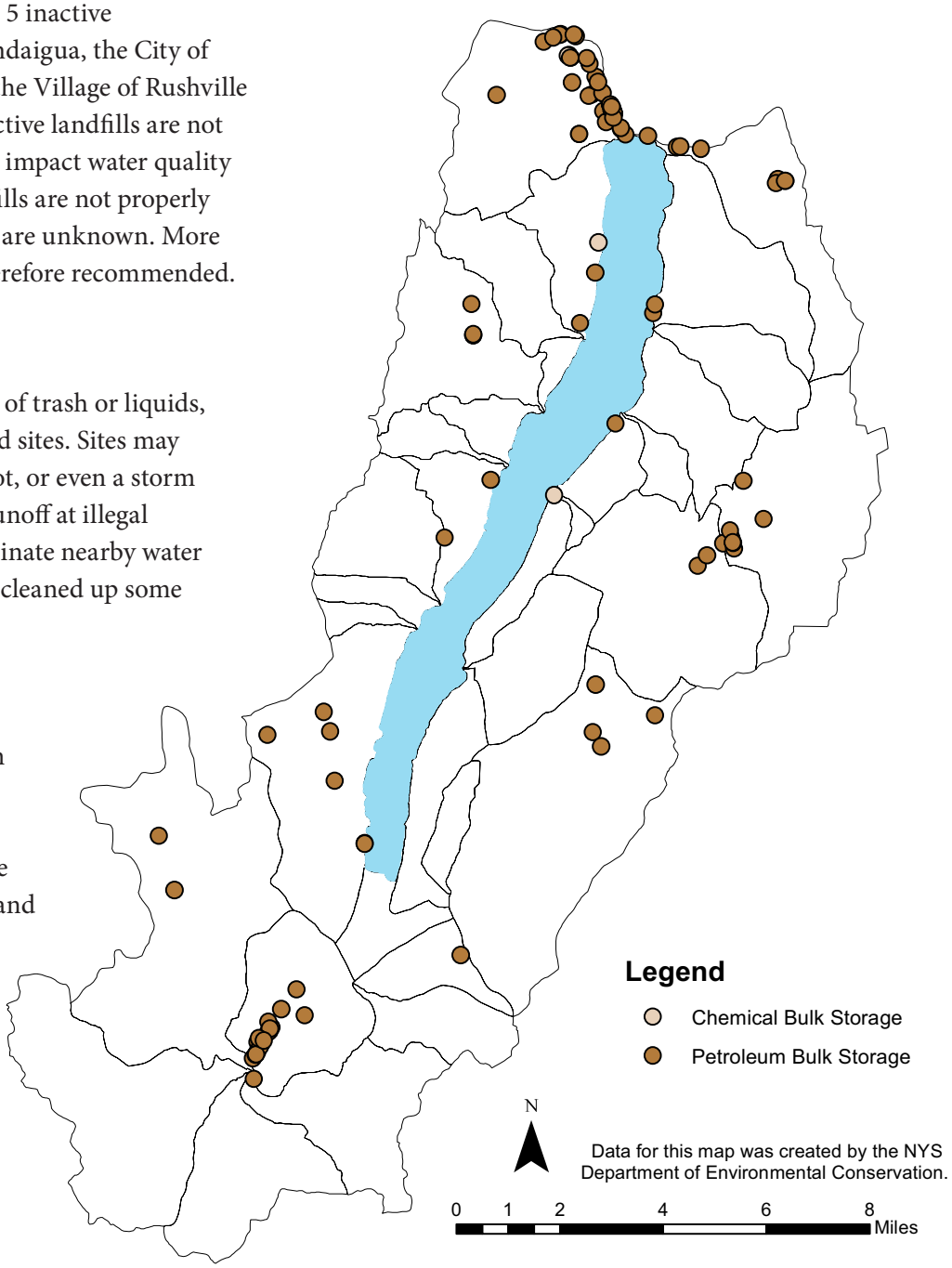
Junk and salvage yards can range from storing a few old cars on someone's residential property to the storage of dozens of cars for recycling automotive parts. Water quality concerns of junk and salvage yards depend on the number and types of activities, and can include oil and grease, heavy metals, mercury, petroleum hydrocarbons, organics and many more.

PETROLEUM AND CHEMICAL BULK STORAGE

There are over 181 known petroleum and chemical bulk storage facilities in the towns around the lake. Bulk storage of petroleum and chemical substances is highly regulated in New York. However, improper housecleaning, overfilling, loading and unloading problems, poor inspection and maintenance, and susceptibility to natural hazards can all result in contamination from bulk storage facilities.

DEC Bulk Storage Database (http://www.dec.ny.gov/cfmx/extapps/derexternal/index.cfm?pageid=4)

DEC BULK STORAGE SITES



STRATEGIES

1. CONTINUE AND ENHANCE STATE AND LOCAL COLLABORATION ON CHEMICAL REGULATION VIOLATIONS, SPILLS AND REMEDIATION

A. Continue to provide technical assistance from the Watershed Manager and Inspector to the DEC for investigation, containment, and remediation of contaminated sites and spills.

B. Enhance access to training to all relevant local officials dealing with hazardous waste spills.

C. Evaluate current spill containment materials with the relevant emergency management offices and determine if more is needed at the local level. Work to acquire any necessary materials.

D. Assist responsible parties to further remediation efforts and to help make these areas once again economically productive. Former Volplex plant is one example of a possible partnership location.

RELEVANT PARTIES INCLUDE THE DEC, THE YATES AND ONTARIO COUNTY'S EMERGENCY COORDINATOR'S OFFICES, THE WATERSHED COMMISSION AND THE WATERSHED COUNCIL.

2. REDUCE ACCIDENTAL SPILLS OF CHEMICALS FROM RESIDENTIAL USES

A. Conduct educational outreach on proper storage of petroleum and other chemical products, specifically addressing accidental spill notification procedures and proper inspection and maintenance. The Council could partner with commercial home oil heating providers to work with rural home owners.

B. Consider increasing hazardous waste drop-offs for residents in the watershed. Specifically, Ontario County should evaluate the feasibility of increasing their drop-offs to two times a year- once in the spring and in the fall. In addition, it would be advantageous to allow residents in Middlesex, Potter and Italy to participate in the program.

3. PREVENT AND ENFORCE REGULATIONS ON ILLEGAL DUMPS

A. Continue field checking sites by the Watershed Inspector and the Watershed Manager for illegal dumping.

B. Encourage municipalities and sheriff's offices to better enforce their illegal dumping and littering regulations. Post "no dumping" signs in known illegal dumping areas, listing fines and phone numbers for reporting dumping.

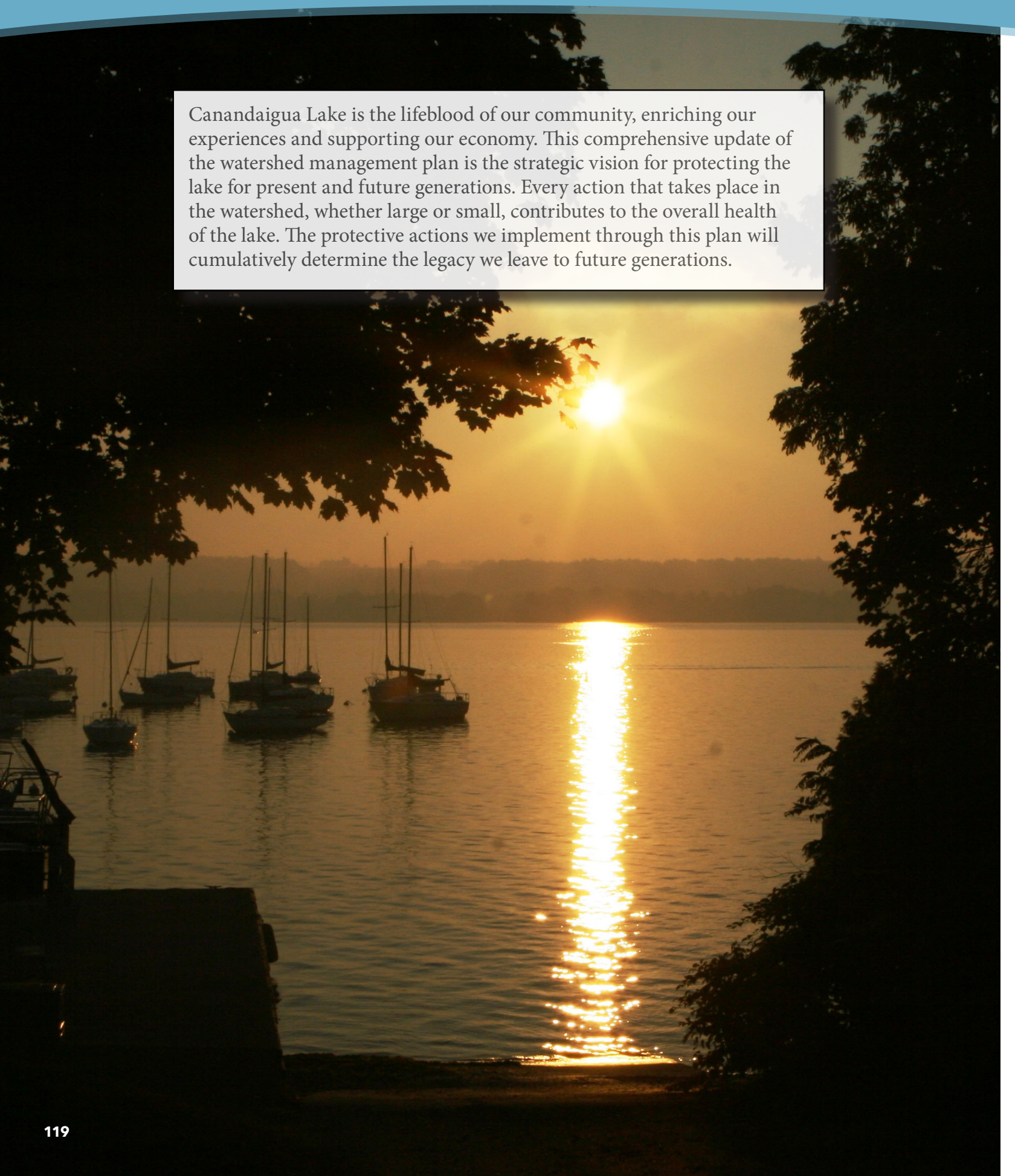
C. Work with sheriff's offices on establishing trail cameras at illegal dump sites where repeated dumping occurs. The Sunnyside Road area has an active illegal dumping site where this could be appropriate.

4. PREVENT WATER CONTAMINATION FROM JUNK/SALVAGE YARDS AND INACTIVE LANDFILLS

A. Evaluate municipal codes for any weaknesses in addressing junk/salvage yards and junk storage on residential property.

B. Assist municipal code officers enforce junk/salvage yard and residential property regulations through watershed field assessments by the Watershed Inspector and Manager.

5. CONCLUSION



Canandaigua Lake is the lifeblood of our community, enriching our experiences and supporting our economy. This comprehensive update of the watershed management plan is the strategic vision for protecting the lake for present and future generations. Every action that takes place in the watershed, whether large or small, contributes to the overall health of the lake. The protective actions we implement through this plan will cumulatively determine the legacy we leave to future generations.

CONCLUSION

Encompassing the principles of integrated watershed management, this plan has a purposefully broad scope and range of techniques. Threats come from deep in the headwaters to the lake shore, from residential to agricultural lands, from recreation to commercial businesses. No single land use or single economic sector is responsible for water quality risks, but instead all are. This plan is comprehensive, incorporating diverse land uses and economic sectors, governmental entities, and private citizens.

Through this updated plan, we have built on the knowledge gained and projects completed over the last fourteen years to develop a more comprehensive strategy to protect Canandaigua Lake and its surrounding watershed from existing and emerging threats. The specific actions identified in this plan have been developed to manage and reduce the impacts from the wide ranging potential sources of pollution that are identified through our water quality research and the 13 management categories. These thirteen categories are all interdependent and therefore have strategies and actions that can transcend a specific category. This watershed management plan is designed to tackle each problem through the five main protection approaches of research, education, restoration, open space protection and regulation. These actions will provide protection from the individual site level all the way to actions that can have watershed wide impacts.

The real strength of this watershed protection effort comes from the collaboration amongst the many organizations working to protect the lake. The Canandaigua Lake Watershed Council is the lead agency coordinating the implementation of this plan and the overall protection efforts of the watershed. The Council is a unique entity, established fifteen years ago through an intermunicipal agreement by the fourteen municipalities and the various partners. The Council provides a framework for decision making and consistency across municipal boundaries, creating synergies rather than conflict. The Council also provides annual funding and oversight for the position of Watershed Program Manager, water quality monitoring program, education programming and base level funding for restoration projects. The watershed directly benefits from the Council's leadership, collaborative nature, and program funding.

The successful implementation of this plan also relies on many partnerships. The Canandaigua Lake Watershed Association is a citizen's group working to protect the lake. The Council and Association work together closely, collaborating on projects and facilitating communication between the Council and the community. In addition, the Council and Finger Lakes Community College collaborate on research and water quality monitoring. The Watershed Commission, through the Watershed Inspector, implements watershed rules and regulations that deal mainly with onsite wastewater systems. The Watershed Inspector and Program Manager work closely on many activities including the inspection of construction sites. The Council also works with the Finger Lakes Land Trust, the local Soil and Water Conservation Districts, Planning Departments, Cornell Cooperative Extension, the Nature Conservancy, and many others.

Ultimately, protection of the lake relies on the support of watershed residents. This plan is intended to be used by the entire watershed community to protect the beauty of the lake and its watershed, preserve drinking water quality, enrich recreational opportunities, enhance aquatic habitat, and expand the local economy and well-being of the Canandaigua Lake watershed community. Many small actions can lead to significant improvements to the watershed. Through involvement of the entire watershed community, our legacy can be one of collaborative, inclusive management and a high quality lake that supports our community.

The following table breaks down each of the strategies and provides critical information for implementation, including approximate timeline, approximate cost, potential partners, benchmarks for success and which of the five protection approaches will be utilized.

APPENDIX 1. IMPLEMENTATION TABLE

Table Key

PARTNERS LIST WITH ABBREVIATION

Partner	Abbreviation	Partner	Abbreviation
Canandaigua Lake Watershed Council	WC	Finger Lakes Community College	FLCC
Canandaigua Lake Watershed Association	WA	Nature Conservancy	TNC
NYS- Dept. of Environmental Conservation	DEC	County Planning Department	P
Soil and Water Conservation District	SWCD	County Public Works	PW
Cornell Cooperative Extension	CCE	Genesee Finger Lakes Regional Planning Council	GFL
Finger Lakes Land Trust	FLLT	NY Dept of Transportation	DOT
Finger Lakes Institute	FLI	United State Geologic Survey	USGS
Municipalities	Munis	Watershed Commission (Inspector)	WI
Department of Health	DOH	Natural Resource Conservation Service	NRCS
Ontario/Yates County Emergency Management	EM	OC Information Services	IS

COST ESTIMATES:

$ = $1,000-$10,000 **$$= $10,000- $25,000** **$$$= $25,000-$100,000** **$$$$= >$100,000**

Category	ID	Strategies	Management Approach					Time-frame	Potential Partners	Cost	Evaluation Criteria
			Research	Education	Restoration	Open Space Protection	Regulation				
Existing and New Development	**1**	**Increase municipal management of stormwater**									
	1A	Assist municipalities meet MS4 regulations.	x	x	x	x	x	Ongoing	WC, Munis, WA, SWCD	$$	Yearly compliance
	1B	Encourage adoption of Enhanced Phosphorus Treatment Standards for new development.		x			x	2015-ongoing	Munis, WC	$	# of municipalities adopted
	1C	Continue and enhance the review of development plans and inspections of construction sites.		X			x	Ongoing	WC, Munis	$	# of plans reviewed and sites inspected
	1D	Inventory and evaluate stormwater ponds and promote enhancements.	x		x			2015-ongoing	WC, Munis	$$	# of ponds evaluated and enhanced
	1E	Host stormwater and erosion control trainings.		x			x	Ongoing	SWCD, WC, P, Munis	$	# of trainings and # of people trained
	1F	Conduct outreach on stormwater runoff and green infrastructure.		x		X		Ongoing	WC, WA,	$	# of mailings and presentations
	1G	Continue and enhance the storm drain marking program.		x				Ongoing	WC, WA, Munis	$	# of storm drain markers installed
	1H	Assist PBs and ZBAs on decisions that can impact water quality/quantity		x			x	Ongoing	WC, P, GFL, SWCD	$	workshops and attendance at PB and ZBA meetings
	2	**Encourage local-level comprehensive land use planning**									
	2A	Improve regulatory protection of environmentally sensitive areas.				X	x	2014-ongoing	P, WC, WA, Munis	$$	adoption of various laws and municipalities
	2B	Incorporate green infrastructure, low impact development, and urban forestry in development designs.				X	x	2014-ongoing	P, WC, WA, Munis	$	adoption of various laws and municipalities
	2C	Develop standards for the maximum allowable impervious surface coverage for the developable portion of the parcel.				X	x	2014-ongoing	P, WC, WA, Munis	$	model standards established
	3	**Expand green infrastructure and low impact development**									
	3A	Encourage prioritization of highly important lands for open space projects.	x		x	x		2013-ongoing	WC, FLLT, WA, P	$$	natural capital study complete
	3B	Continue and enhance green infrastructure/stormwater retrofit projects.	x	x	x	x		Ongoing	Munis, WC, WA, SWCD	$$$$	# of GI projects installed per year
	3C	Consider an incentives program for green infrastructure and LID projects.		x		X	x	2016-ongoing	Munis, WC, WA, SWCD, P	$$	Adoption of an incentives program
	3D	Develop funding mechanisms for green infrastructure.				x	x	2017-ongoing	Munis, WC, WA, SWCD, P	$$$$	TBD
Lawn and Landscaping Practices	**1**	**Improve educational programs on fertilizer and pesticide use.**									
	1A	Coordinate and enhance educational outreach on lawn and landscape practices.		x				Ongoing	WC, WA, CCE, SWCD, Munis	$$	# of new publications and mailings
	1B	Promote the NYS DEC fertilizer ban to the public.		x				Ongoing	WC, WA, DEC	$	# of presentations and mailings
	1C	Promote the City Turf and Landscape Management Policy		x			x	Ongoing	WC, WA, CCE, SWCD, Munis	$	# of presentations and mailings
	1D	Place Integrated Pest Management information on the website.		x				Ongoing	WC, WA, CCE, SWCD, Munis	$	# of new publications and mailings
	1E	Conduct outreach on Integrated Pest Management.		x				Ongoing	WC, WA, CCE, SWCD, Munis	$	# of new publications and mailings
	1F	WA development of a lake-friendly lawn care company standard.		x				2016-ongoing	WC, WA, CCE, SWCD, Munis	$	# of new publications and mailings
	1G	Encourage use of green infrastructure on residential/commercial properties.		x				Ongoing	WC, WA, CCE, SWCD, Munis	$	# of new publications and mailings
	2	**Monitor streams and lake for pesticides**									
	2A	Conduct baseline pesticide water quality study in lake.	x	x				2017-ongoing	WC, WA, USGS	$	Certified lab results for multiple lake and stream locations
	3	**Proper disposal of household chemicals**									
	3A	Hold more frequent household hazardous waste collection days.		x			x	2016 - ongoing	OC, WC	$$$	holding a second drop-off day

Category	ID	Strategies	Management Approach					Time-frame	Potential Partners	Cost	Evaluation Criteria
			Research	Education	Restoration	Open Space Protection	Regulation				
Municipal Roads and Highway Facilities	**1**	**Increase educational and technical support for local highway officials**									
	1A	Collaborate to ensure proper culvert sizing and environmental permits.		x			x	Ongoing	PW, WC, SWCD, Munis	$$$$	# of culverts sized through looking at the whole drainage area
	1B	Host Cornell Local Roads Program training.		x				2016-ongoing	PW, WC, SWCD, Munis	$	Training event and # of attendees
	1C	Apply for grant funding for road and roadside ditch management.		x	x			Ongoing	PW, WC, SWCD, Munis	$$$$	Successful grants, miles of roads stabilized
	1D	Encourage ditch design and management that reduces erosion.		x				Ongoing	PW, WC, SWCD, Munis	$$	# of trainings with local highway officials
	2	**Reduce roadside ditches as a source of sediment pollution**									
	2A	Identify erosion risks and prioritize management.	x		x			Ongoing	PW, WC, SWCD, Munis, WI	$	Communicate road bank issues with highway superintendents
	2B	Stabilize highly eroding roadside ditch banks.			x			Ongoing	PW, WC, SWCD, Munis, WI	$$$$	# of miles of road bank ditches stabilized
	3	**Break the hydrologic connection from the landscape to the roadside ditches to the streams.**									
	3A	Encourage on-site retention/infiltration of stormwater.		x	x		X	Ongoing	PW, WC, SWCD, Munis, WI	$$	Site plan review requirements, # of field outreach efforts
	3B	Encourage the use of cross culverts and levelers.		x	x			Ongoing	PW, WC, SWCD, Munis, WI	$$$	# of field outreach efforts
	3C	Educate landowners on roadside ditch hydrology.		x				Ongoing	PW, WC, SWCD, Munis, WI	$	# of mailings and field outreach efforts
	4	**Reduce the impact of de-icing salts on tributary water quality.**									
	4A	Continue monitoring salt concentrations in the lake and tributaries.	x	X				Ongoing	FLCC, WC	$	Annual monitoring
	4B	Ensure proper salt/sand mixing and loading, truck calibration and sensible salting education programs		x				Ongoing	Munis, WC, WA	$$$	# of trucks with calibration equipment, # of salt storage barns
	5	**Manage stormwater runoff and spills at highway department facilities**									
	5A	Ensure proper chemical management and building designs/maintenance at highway facilities.		x			x	Ongoing	Munis, WC, DEC	$$	Audits of each highway facility
	5B	Document spill and leak prevention and response practices and staff training. Verify compliance with DEC bulk fuel and chemical storage regulations.		x			x	Ongoing	Munis, WC, DEC	$$	Audits of each highway facility
	5C	Treat highway facility runoff with bio-retention and filter areas.		x	x			Ongoing	Munis, WC	$$	# of highway facilities with stormwater management solutions

Category	ID	Strategies	Management Approach					Time-frame	Potential Partners	Cost	Evaluation Criteria
			Research	Education	Restoration	Open Space Protection	Regulation				
Watercourse and Shoreline Management	**1**	**Monitor streambanks and shorelines for erosion and lack of buffers**									
	1A	Complete a comprehensive update to the GIS stream layer.	x					2016-ongoing	IS, P, WC, SWCD, Munis	$$	Comprehensive update of stream mapping
	1B	Continue to visually survey and evaluate streamside and shoreline areas.	x					Ongoing	WC, Munis	$	Field inspections during storm events
	2	**Protect, restore and stabilize streamside areas**									
	2A	Identify streamside and shoreline landowners and conduct educational outreach.	X	x				2016-ongoing	WC, WA, IS	$	# of mailings
	2B	Provide funding and/or technical assistance to private landowners on stream improvements where there will be public benefit.			x			Ongoing	WC, Munis, WA, SWCD	$$$$	# of projects completed
	2C	Encourage use of open space funds to protect critical streamside areas.			x	x		Ongoing	Munis, WC, WA, FLLT	$$$$	# of projects completed
	2D	Work with farmers to expand streamside protection measures on farms.			x	x		Ongoing	SWCD, Munis, WC	$$$$	# of projects completed
	2E	Encourage adoption of setback and overlay ordinances in streamside areas.					x	2016-ongoing	Munis, WC, WA	$	# of towns adopting setback laws from streams
	3	**Protect shoreline areas**									
	3A	Encourage softer vegetative/rock shoreline management strategies.		x			x	Ongoing	Munis, WC, DEC, WA	$	# of laws enacted
	3B	Encourage improvements to zoning ordinances within 100 feet of the lake.		X			x	Ongoing	Munis, WC, P, WA	$	# and quality of laws adopted
	3C	Encourage Zoning Board of Appeals to not grant variances to stream and shoreline setbacks.		X			x	Ongoing	Munis, WC, P, WA	$	# of variances granted
	3D	Encourage dock designs that protect water quality.		x			X	Ongoing	Munis, WC, WA, DEC	$	Strict enforcement of dock law
	3E	Ensure the Uniform Docks and Moorings Law is uniformly enforced and variances aren't granted.					x	Ongoing	Munis, WC, P	$	Strict enforcement of law
Wetlands and Floodplains	**1**	**Protect, restore and create wetlands and floodplains**									
	1A	Complete the Natural Capital Project and utilize for public education.	x	X				2016-ongoing	WA, WC, FLLT, FLCC	$$	Natural capital study complete
	1B	Utilize municipal funds and incentive programs to promote, restore, and create wetlands and floodplains.			x	x		Ongoing	Munis, WC, FLLT, WA	$$$$	Acres of wetlands restored/created
	1C	Encourage adoption of local laws and/or site plan review process for wetland and floodplain protection/restoration.					x	2016-ongoing	Munis, WC, WA, P	$	Enhanced wetland and floodplain regulations
	1D	Encourage wetland mitigation banking through partnerships to add wetlands in the watershed.			x		x	2016-ongoing	Munis, WC, FLLT, WA, DEC	$$$$	Net increase in wetlands through banking
	2	**Expand floodplain regulations**									
	2A	Work to get update to flood zone studies and mapping.	x				x	2017-ongoing	FEMA, Munis, WC	$$$	Selected areas get updated floodplain maps
	2B	Encourage adoption of local laws beyond National Flood Insurance Program minimums.					x	2017-ongoing	Munis, WC	$$	# of municipalities adopt laws above minimum standards
	2C	Host training events for local floodplain administrators.		x			x	2016-ongoing	Munis, WC, DEC	$	# of training events and attendees
	2D	Encourage participation in the Community Rating System.		x			x	2016-ongoing	Munis, WC, DEC	$$	Participation in CRS
	2E	Educate landowners both in and out of the flood zone on flood risks, insurance and protection measures		x				2016-ongoing	Munis, WC, WA, DEC	$	# of training events and attendees

Category	ID	Strategies	Management Approach					Time-frame	Potential Partners	Cost	Evaluation Criteria
			Research	Education	Restoration	Open Space Protection	Regulation				
Wastewater Management	**1**	**Encourage municipalities to strengthen onsite wastewater system rules and regulations**									
	1A	Encourage adoption of inspection of onsite system at deed transfer local law		x			x	2016-ongoing	WI, WC, Munis, DOH, SWCD	$	# of municipalities adopting law
	1B	Encourage improvements to requirements for onsite system design, repairs, and upgrades.		x				2016-ongoing	WI, WC, Munis, DOH, SWCD	$	# of municipalities adopting law
	1C	Encourage verification of onsite systems location and suitability prior to site plan reviews and building permits.		x			x	2016-ongoing	WI, WC, Munis, DOH, SWCD	$	# of municipalities adopting law
	1D	Encourage requirements for onsite system inspections every 5 years within 200 feet of the lake.		x			x	2016-ongoing	WI, WC, Munis, DOH, SWCD	$	# of municipalities adopting law
	1E	Consider a local law requiring verification that rental property occupancy matches onsite system capabilities.		x			x	2016-ongoing	WI, WC, Munis, DOH, SWCD	$	# of municipalities adopting law
	1F	Formalize relationship between Watershed Inspector and municipalities on stricter onsite system code.		x			x	2016-ongoing	WI, WC, Munis, DOH, SWCD	$	# of municipalities adopting law
	2	**Finalize and maintain spatial database of onsite systems**									
	2A	Convert all records of onsite systems into a GIS database.	x					2015-ongoing	WI, WC, SWCD	$$	All paper files in GIS database
	2B	Track all enhanced treatment onsite systems.	x				x	2015-ongoing	WI, WC, SWCD	$	Tracking systems for enhanced treatment systems
	3	**Educate landowners on proper onsite system use and maintenance**									
	3A	Continue to provide realtor workshops.		x				Ongoing	WC, WI, SWCD, DOH	$	# of workshops
	3B	Conduct educational workshops for onsite system owners.		x				Ongoing	WC, WI, SWCD, DOH	$	# of workshops
	3C	Send educational mailings to all onsite system owners.		x				2016-ongoing	WC, WI, SWCD, DOH	$	# of mailings
	3D	Conduct targeted outreach to enhanced treatment unit owners.		x				2016-ongoing	WC, WI, SWCD, DOH	$	# of mailings
	3E	Create and distribute a list of funding sources for economically-disadvantaged onsite owners.		X				Ongoing	WC, WI, SWCD, DOH	$	# of mailings
	4	**Improve and extend centralized wastewater collection and treatment where appropriate**									
	4A	Provide technical assistance to the Village of Naples on sewer and wastewater treatment facility implementation.	X		X			2017?	WC, WI, P, PW, DOH	$$$$	Insulation of sewer system
	4B	Provide technical assistance to the Village of Rushville on their inflow/infiltration study.	X	X	X			2015-ongoing	WC, WI, DOH	$$$	Completed study
	4C	Work on future sewer and centralized wastewater treatment projects.	X					Ongoing	PW, Munis, WI, WC, DOH	$$$$	TBD
	4D	Encourage permission from county for out-of-district users to connect to nearby existing sewer lines.		X				Ongoing	PW, Munis, WI, WC, DOH	$$	TBD
	5	**Continue and enhance collaboration on SPDES facilities**									
	5A	Ensure Watershed Inspector has access to all SPDES facility sampling data.					X	2015-ongoing	WI, DEC, WC, DOH	$	Transfer of information from DEC to WI
	5B	Coordinate enforcement and remediation of SPDES permit violations.					X	2015-ongoing	WI, DEC, WC, DOH	$	Successful remediation of permit violations
	6	**Prevent water contamination through use of toilets, sinks, and stormwater drains for disposal.**									
	6A	Review science on pharmaceuticals, cosmetics, cleaning products, and toxic substances in home wastewater.	X	X				2015-ongoing	WC, WI, DOH, DEC	$	Continued research
	6B	Assist with pharmaceutical drop off programs.		X				2015-ongoing	WC, WI, DOH, DEC, Sheriff	$$	Enhanced educational efforts, advertisements
	6C	Encourage additional household hazardous waste drop offs.			X			2015-ongoing	WC, WI, DOH, DEC, Sheriff	$$$	Additional drop off per year/ additional location
	6D	Encourage stores to post educational materials on proper disposal of pharmaceuticals, cleaning products and toxic substances.		X				2015-ongoing	WC, WI, DOH, DEC, Sheriff	$	Enhanced educational efforts, advertisements

Category	ID	Strategies	Management Approach					Time-frame	Potential Partners	Cost	Evaluation Criteria
			Research	Education	Restoration	Open Space Protection	Regulation				
Agriculture	**1**	**Promote and partner on the programs offered by Soil and Water and NRCS.**									
	1A	Encourage farms to adopt healthy soil practices.		X				2015-ongoing	SWCD, NRCS, WC, CCE	$	TBD
	1B	Promote best management practices that are compatible with Mennonite interests.	X		X			2015-ongoing	SWCD, NRCS, WC, CCE	$	Successful projects with Mennonite farmers
	1C	Support and enhance grant funding for farm applications where beneficial			x	x		2015-ongoing	SWCD, NRCS, WC, CCE	$$$	Continued cost share support
	1D	Encourage NRCS and SWCD to showcase existing best management practices and invigorate the Agricultural Program Committee.		X	X			2015-ongoing	SWCD, NRCS, WC, CCE	$$	More public display of successful projects
	1E	Encourage farmer compliance with Highly Erodible Lands and tolerable soil loss requirements.		X	X	X		2015-ongoing	SWCD, NRCS, WC, CCE	$$	NRCS enforcement of these requirements
	1F	Work with farms that spread liquid manure to take precautions, including weather considerations and manure incorporation.		X				2015-ongoing	SWCD, NRCS, WC, CCE	$$	Reduction in farm liquid manure runoff during storm events
	1G	Encourage 100 foot buffer from watercourses and road ditches when spreading manure even if there is a vegetative buffer and/or 24 hour incorporation		X	X	X		2015-ongoing	SWCD, NRCS, WC, CCE	$$	Reduction in farm liquid manure runoff during storm events
	1H	Utilize alternative sources to fund ag. water quality projects if farmer does not want to participate in federal/state program requirements		X	X	X		2015-ongoing	SWCD, NRCS, WC, CCE	$$$	WC and WA funding of projects
	2	**Promote buffers between agricultural lands and adjacent streams and roadside ditches.**									
	2A	Encourage the use of open space funds to protect critical streamside and roadside buffers.		X	X			2015-ongoing	Munis, FLLT, WC, WA, SWCD	$$$$	# of projects implemented
	2B	Promote and distribute information on funding sources for vegetative buffers.		X				2015-ongoing	Munis, FLLT, WC, WA, SWCD	$	# of projects implemented
	2C	Work with farmers to reduce the ditching of streams.		X	X			2015-ongoing	Munis, FLLT, WC, WA, SWCD	$	Increase communication with farmers to not ditch streams
	2D	Restore the hydrologic connection between streams and their downstream wetlands.			X			2015-ongoing	Munis, FLLT, WC, WA, SWCD	$$$	# of projects completed

Category	ID	Strategies	Management Approach					Time-frame	Potential Partners	Cost	Evaluation Criteria
			Research	Education	Restoration	Open Space Protection	Regulation				
Invasive Species, Harmful Algal Bloom and Fish Kill Management	**1**	**Establish an early detection and rapid response protocol for invasive species**									
	1A	Continue working with local invasive species and academic institutions to understand invasion risks.	X	X				2015-ongoing	FLI, WA, WC, SWCD, FLCC	$	Presentations by experts to watershed organizations
	1B	Continue and enhance monitoring for early detection of invasive species, with specific emphasis on Hydrilla.	X					2015-ongoing	FLI, WA, WC, SWCD, FLCC	$$	Annual investigation of invasive species at hot spots
	1C	Create a group of trained volunteers to monitor for invasive species.	X	X				2015-ongoing	FLI, WA, WC, SWCD, FLCC	$$	Maintain trained volunteers
	1D	Continue and enhance efforts to monitor and eradicate water chestnut from the West River.			x			2015-ongoing	FLI, WA, WC, SWCD, FLCC	$$$	Eradication of water chestnut
	2	**Prevent the spread of invasive species from recreation**									
	2A	Promote the local funding of the Watercraft Steward Program and advocate for continued state funding.	X	X				2015-ongoing	WA, WC	$$	Maintain and enhance watercraft steward program
	2B	Put signage on boat cleaning techniques at all boat launches and points of interest on the forthcoming water trail.		X				2015-ongoing	WA, WC, FLI	$$$	High quality signs at each launch
	2C	Evaluate the need and feasibility of installing boat wash stations and invasive species disposal containers.	X					2015-ongoing	WA, WC, FLI	$$$$	Installation of boat watch station at North End only if permanently and/or self funded
	2D	Conduct outreach and education on invasive species to area residents.		X				2015-ongoing	WA, WC, FLI	$$	# of workshops and mailings
	3	**Develop protocol for monitoring and managing harmful algal blooms**									
	3A	Work with partners to maintain and enhance an algal bloom monitoring protocol for toxins.	X					2015-ongoing	DEC, FLCC, WC, WA, DOH	$	Obtain protocol from DEC and DOH
	3B	Ensure watershed management is addressing factors that increase algal blooms.	X					2015-ongoing	DEC, FLCC, WC, WA, DOH	$$$$	Maintain phosphorus levels below 10 micrograms per liter
	4	**Develop a fish kill action plan**									
	4A	Host a meeting to review the 2013 and 2014 fish kill and to determine governmental role in response.	X	X				2015-ongoing	DEC, DOH, Munis, WC, EM	$	Meeting occurred and recommendations established for government involvement
	4B	Determine thresholds for governmental involvement in fish kill management and plans should thresholds be met.	X	X				2015-ongoing	DEC, DOH, Munis, WC, EM	$	Meeting occurred and recommendations established for government involvement
	4C	Develop educational materials on safe fish collection and disposal and when/how to report fish kills.		X				2015-ongoing	DEC, DOH, Munis, WC, EM, WA	$	Educational materials developed and mailed

Category	ID	Strategies	Management Approach					Time-frame	Potential Partners	Cost	Evaluation Criteria
			Research	Education	Restoration	Open Space Protection	Regulation				
Recreation	**1**	**Ensure safe water quality for public swimming beaches**									
	1A	Periodically assess water quality monitoring wells in the Kershaw Swim Beach.	X					2015-ongoing	DEC, DOH, City, WC	$	Wells are sampled and results provided
	1B	Act as a local clearinghouse for water quality monitoring data from public swimming beaches.	X					2016-ongoing	WC, Munis	$	Sample results for different beaches sent to WC
	1C	Consider larger setbacks from public beaches for boaters, especially at Kershaw Beach.	X				X	2016-ongoing	City, WC, DOH	$	TBD
	2	**Reduce the impact of boating on water quality and important ecosystems**									
	2A	Advertise existing boat pump stations and possibly construct more pump stations.		X				2017-ongoing	Munis, DEC, WC, WA	$$	Better advertisement of boat pump stations
	2B	Consider constructing transient use docks at the north end area to allow easier access to restroom facilities.			X			2017-ongoing	Munis, DEC, WC, WA	$$$$	Obtain grant to install dock for transient use only
	2C	Encourage boat owners to keep engines in good working order and to use low impact techniques in sensitive areas.		X				2017-ongoing	Munis, DEC, WC, WA	$	Educational information at launches
	2D	Educate the public on how to prevent the spread of invasive species and fish diseases.		X				2017-ongoing	Munis, DEC, WC, WA	$$	Educational information at launches and mailings
	3	**Increase compatibility among different recreational uses and improve safety**									
	3A	Create the Water Trail for Canoes and Kayaks and promote its use.		X	X			2016-ongoing	USPS, WC, WA, Munis, PW	$$$	Creation of the water trail plan and installation of numerous access and destination points
	3B	Strictly enforce boat slip restrictions under the Uniform Docks and Moorings Law.					X	2016-ongoing	USPS, WC, WA, Munis, PW	$$	No variances
	3C	Increase enforcement of noise, reckless boating and speed violations.					X	2016-ongoing	USPS, WC, WA, Munis, PW, Sheriff	$$	Increased boat hours for sheriff
	3D	Strictly scrutinize projects that would promote additional boat access in the northern third and further boat congestion.					X	2016-ongoing	USPS, WC, WA, Munis, PW	$	No additional tier 2 facilities in northern third of the lake
	4	**Ensure marinas are not contributing to water quality problems**									
	4A	Verify that all marinas are complying with SPDES requirements.					X	2016-ongoing	DEC, WC, WA, Munis	$	Periodic inspections of all marinas
	4B	Conduct a workshop for marina operators and provide educational materials on best management practices.		X				2016-ongoing	DEC, WC, WA, Munis	$	Workshop completed
	4C	Encourage marina owners to post educational materials and host workshops for members.		X				2016-ongoing	DEC, WC, WA, Munis	$	Provide and install educational materials at marinas
	5	**Protect important fish habitat in Canandaigua Lake and the Naples Creek Complex**									
	5A	Support projects in the Naples Creek Complex to protect and enhance fish habitat.			X	X		2015-ongoing	DEC, WC, WA	$$$$	Study complete
	5B	Complete study of near shore littoral zone to identify and prioritize areas for protection.	X		X			2016	DEC, WC, WA	$$	# of projects completed

Category	ID	Strategies	Management Approach					Time-frame	Potential Partners	Cost	Evaluation Criteria
			Research	Education	Restoration	Open Space Protection	Regulation				
Lake Level Management	**1**	**Continue to manage lake levels using the Guide Curve**									
	1A	Continue to monitor lake levels daily and post to NOAA website.	X	X				Ongoing			
	1B	Access the feasibility of gathering continuous and instantaneous lake level readings and making readings publicly-available.	X	X				2015-ongoing	City, WC, USGS	$$	Lake level readings available through internet
	1C	Continue to manage lake levels using the Guide Curve, weather, and institutional knowledge.			X		X	2015-ongoing	City, WC	$	reduced low and high level frequency through lake level management
	2	**Implement drought management protocols when necessary**									
	2A	Assist in the implementation of the Drought Water Use and Lake Level Management Strategy.					X	2015 - ongoing	City, WC	$	
	2B	Encourage the 5 other water purveyors to implement the Drought Water Use and Lake Level Management Strategy.		X			X	2017	WC, and City	$	Policy implemented by other purveyors
	2C	Educate the public on the Drought Management Protocol.		X			X	2016	Munis, WC	$	mailings, public service announcements
Forestry	**1**	**Minimize soil erosion from timber harvest operations**									
	1A	Advertise the arch culvert loan program to timber harvesters and foresters.		X	X			2016	WC, Munis	$	mailings, handouts located at southern watershed towns
	1B	Continue to assist municipalities adopt and implement the Model Timber Harvest Law.					X	2017	Munis, WC	$	# of municipalities that adopt law
	1C	Promote the use of forestry best management practices as described by the DEC field guide.		X				2015 - ongoing	WC, DEC, ESF and Munis	$	print and make field guide available at towns
	2	**Facilitate training and education for land owners and forestry professionals**									
	2A	Promote existing programs and organizations that provide education on forestry best management practices.		X				2015 - ongoing	WC, DEC, ESF and Munis	$	print and make field guide available at towns
	2B	Continue to host training workshops for land owners and forestry professionals.		X				2015 - ongoing	WC, DEC, ESF and Munis	$	print and make field guide available at towns
	3	**Encourage active partnerships between municipalities and forestry professionals**									
	3A	Encourage the use of open space funds for Conservation Easements on working forest lands.				X		2015 - ongoing	WC, DEC, ESF and Munis	$	model demonstation easement with Land Trust
	3B	Utilize the registration law to educate the logging community on erosion control and water quality fines.		X			X	2015 - ongoing	WC, DEC, ESF and Munis	$	print and make field guide avail at towns
	3C	Work to reduce disincentives associated with NYS Forest Tax Law - 480a.					X	2015 - ongoing	WC, DEC, ESF and Munis	$	write letter to state legislator

Category	ID	Strategies	Management Approach					Time-frame	Potential Partners	Cost	Evaluation Criteria
			Research	Education	Restoration	Open Space Protection	Regulation				
Mining and Natural Gas Extraction	**1**	**Reduce water quality risks from mined sites within the watershed**									
	1A	Maintain an inventory of active and inactive mining sites and periodically check for pollution during storm events.	X					2017	WC, WI, DEC, Munis	$	GIS map and field survey with DEC
	1B	Provide educational materials on water quality to mine operators and municipalities.		X				2018	WC, WI, DEC, Munis	$	DEC materials printed
	1C	Encourage inclusion of mining operations in local stormwater regulations.					X	2016	WC, WI, DEC, Munis	$	include in local regulations
	2	**Protect against impacts related to high volume hydraulic fracturing**									
	2A	Encourage NYS to provide protection equal to that for Skaneateles Lake and the NYC Watershed.		X			X	2016	DEC, Munis, WC, WA	$	state level equal protection
	2B	Support scientific research on the cumulative impacts from high volume hydrofracking.	X				X	2016	Munis, WC, WA	$$	DOH and other studies
	2C	Encourage municipalities to prohibit high volume hydrofracking in the watershed plus a buffer.		X			X	2016	Munis, WC, WA	$$	# of municipalities with local law adoption
	2D	Provide technical support on municipal review of land use regulations and road use agreements pertaining to hydrofracking.	X				X	2016	Munis, WC, WA	$	WC involvement and assistance
	2E	Encourage public and private water purveyors to not provide lake water to hydrofracking operators.		X			X	2016	Munis, WC, WA	$	TBD
	2F	Recommend that municipal and private wastewater treatment plants not accept hydrofracking waste.		X			X	2016	Munis, WC, WA	$	policies established at each WWTP
	2G	Recommend that hydrofracking brine not be used as a deicing agent on roads.		X			X	2016	DOT, Munis, WC, WA	$	policies established at each municipal and DOT facility
	2H	Monitor hydrofracking sites and waste disposal if hydrofracking is permitted.	X				X	2016	DEC, Munis, WC	$$	weekly inspections during active period
Chemical Contamination Prevention	**1**	**Continue and enhance state and local collaboration on chemical regulation violations, spills and remediation**									
	1A	Provide technical assistance to DEC for investigation, containment, and remediation of contaminated sites and spills.	X				X	Ongoing	DEC, WC	$	WI and Manager continue to work with DEC
	1B	Enhance access to training for all relevant local officials.		X				Ongoing	DEC, WC	$	training session
	1C	Evaluate current spill containment materials and acquire more materials if necessary.	x	x				2015	DEC, WC, OC	$$	complete inventory with Emergency Management
	1D	Assist on grant proposal writing to help further remediation efforts.			X			2016-ongoing		$	successful grants
	2	**Reduce accidental spills of chemical from residential uses**									
	2A	Conduct outreach on proper storage of petroleum and other chemical products.		X			X	2016 - ongoing	DEC, WC, WI, WA	$	information on website
	2B	Consider increasing frequency and geographic extent of hazardous waste drop-offs.		X			X	2016 - ongoing	OC, WC	$$$	holding a second drop-off day
	3	**Prevent and enforce regulations on illegal dumps**									
	3A	Continue field checking sites for illegal dumping.	X				X	2015 - ongoing	WC	$	WI and Manager identify sites
	3B	Encourage better enforcement of illegal dumping and littering regulations.					X	2015 - ongoing	DEC, Munis, WC	$	work with DEC
	3C	Establish trail cameras at illegal dump sites with repeated dumping.					X	2015 ongoing	DEC, WC	$$	purchase and install trail camera
	4	**Prevent water contamination from junk/salvage yards and inactive landfills**									
	4A	Evaluate municipal codes for weaknesses in addressing junk/salvage yards and junk storage in residential areas.	X				X	2016	WC, P, Munis	$	complete inventory municipal codes
	4B	Assist in junk/salvage yard enforcement through watershed field assessments.	X				X	2017	WC, P, Munis	$	WI and Manager assist CEOs

APPENDIX 2.
INTERMUNICIPAL AGREEMENT

REAUTHORIZATION

INTERMUNICIPAL AGREEMENT

REGARDING

CANANDAIGUA LAKE WATERSHED COUNCIL

THIS AGREEMENT, effective as of the 1st day of January 2015 by and between the Towns of Bristol, Canandaigua, Gorham, Hopewell, Italy, Middlesex, Naples, Potter, South Bristol; the Villages of Naples, Newark, Palmyra, Rushville; and the City of Canandaigua to continue the Canandaigua Lake Watershed Council, adopt the Update of the Canandaigua Lake Watershed Management Plan and continue to fund the Watershed Council to implement the Watershed Protection Program.

WITNESSETH THAT:

WHEREAS, pursuant to Article 5-G Section 119-o and 239-n of the General Municipal Law of the State of New York, Section 64 of Town Law, and Article 4 of Village Law, municipalities have the authority to enter into contracts and intermunicipal agreements necessary to carry out their respective functions for the benefit of the municipality; and

WHEREAS, the municipalities identified in this agreement desire to continue the cooperative agreement originally made on December 10th, 1999. This agreement created the Canandaigua Lake Watershed Council along with adopting and funding the original Canandaigua Lake Watershed Management Plan. This agreement was reauthorized in 2004 and 2010; and

WHEREAS, Canandaigua Lake and its surrounding 174 square mile watershed provides numerous benefits to the region including drinking water for approximately 70,000 people, varied recreational opportunities, scenic beauty, Natural Capital and ecological significance; and

WHEREAS, the goal of the Canandaigua Lake Watershed Council is to protect the lifeblood of this region-Canandaigua Lake and its surrounding watershed by maintaining and enhancing the high water quality of this watershed through the continued implementation of the comprehensive watershed protection program; and

WHEREAS, the parties to this agreement, desire to continue the Canandaigua Lake Watershed Council, hereinafter referred to as the Watershed Council, that will provide the necessary leadership, coordination and commitment to successfully administer and oversee the implementation of the Watershed Protection Program and the 2014 Update to the Canandaigua Lake Watershed Management Plan as approved by the Watershed Council; and

WHEREAS, The participating municipalities will work together cooperatively in the decision-making process and share the leadership and ownership in implementing the Watershed Program as outlined in the Watershed Council bylaws. The Watershed Council utilizes five protection themes of research, education, restoration, open space protection and regulation to provide comprehensive level protection.

NOW, THEREFORE, in consideration of the terms and conditions herein contained, the parties to this agreement do hereby agree as follows:

1. The Canandaigua Lake Watershed Council is hereby continued as the official Intermunicipal entity created by the fourteen municipalities in 1999 to implement the Watershed Protection Program.

2. This intermunicipal agreement is voluntary and will not be construed so as to interfere with or diminish any municipal powers, authority, or regulatory authority of any of the participating municipalities.

3. The Comprehensive Update of the Canandaigua Lake Watershed Management Plan is hereby adopted by each respective municipality. The Watershed Council provided the coordinated SEQR review of the Plan update and has issued a Negative Declaration documenting that no substantial negative impacts will occur as the result of the adoption of the Updated Plan.

4. The Watershed Council will approve a budget each year and the participating municipalities will provide the necessary funding by March 31st of each year based on the fair share funding formula adopted in 1999 and updated each year. The Watershed Council will approve the updates to the fair share funding formula for each year and will send a copy of the funding formula and calculations to each of the municipalities by January 15th of each year.

5. The participating municipalities shall appoint one publicly elected representative (i.e. Municipal supervisor, or municipal board member and an alternate representative (another publicly elected representative) to the Watershed Council. In the case of the two non-watershed water purveying municipalities (Newark and Palmyra), they can send their chief water treatment plant operator or water authority representative as an alternative to the publicly elected representative.

6. The term of this agreement shall commence January1st, 2015 and terminate December 31st, 2019. This Agreement shall be automatically renewed for four additional five-year terms, unless either party notifies the other party of its intent not to renew within 90 days of the expiration of any term or renewal term.

7. This agreement authorizes the Watershed Council to enter into contracts within the limits of, and subject to, the appropriations provided by the participating municipalities and other funding sources.

8. The Canandaigua Lake Watershed Council will act as the official Stormwater Coalition for any of the municipalities in the watershed that have to comply with the Federally and State mandated Municipal Separate Storm Sewer System regulations and will provide assistance to these municipalities to meet and exceed the Clean Water Act derived regulatory requirements.

9. The Watershed Council is required to carry insurance with a minimum aggregate of $2 million in general liability coverage, $1 million in Hired and Non-owned auto coverage, $1 million umbrella liability and $1 million in Public Officials coverage. All such insurance policies shall list each of the participating municipalities as additional insureds.

10. The Watershed Council shall indemnify and hold harmless the fourteen municipalities named in this agreement, its officers, employees and agents from and against any and all liability, damage, claims, demands, costs, judgments, fees, attorneys' fees or loss arising directly or indirectly out of the negligent acts or omissions hereunder by the Watershed Council, Watershed Program Manager or third parties under the direction or control of the Watershed Council or Watershed Program Manager and to provide defense for and defend, at its sole expense, any and all claims, demands or causes of action directly or indirectly arising out of the acts or omissions referred to in this paragraph and to bear all other costs and expenses related thereto.

11. The parties to this agreement desire to continue to provide for the day to day coordination of the Watershed Program through a Canandaigua Lake Watershed Program Manager, hereinafter referred to as the Watershed Program Manager.

12. The Watershed Council will provide direct oversight and control of the Watershed Program Manager. The Watershed Program Manager duties will include but not limited to: water quality research on the lake and streams, technical assistance to the municipalities on water quality and flood control projects, assist residents on water quality issues, investigate sources of pollution and develop management strategies to solve those sources of pollution in partnership with other relevant agencies, grant application assistance to the Watershed Council and member municipalities, technical reports, educational outreach, MS4 assistance, provide regulatory assistance to the municipalities including site inspections and plan reviews and act as the official spokesperson for the watershed program.

13. The Watershed Council will have ultimate authority over all municipal contributions made to the Watershed Council.

14. The City of Canandaigua will provide the necessary facilities, accounting, worker's compensation insurance and support for the Watershed Manager to carry out the implementation of the Plan as agreed to in the Agreement For Services between the Watershed Council and City of Canandaigua. The Watershed Council will abide by the NYS Human Rights Law with respect to hiring practices.

15. That any party to this agreement may terminate its participation within the Council at any time but must do so upon giving written notice to all other participating municipalities that such party will terminate its participation in the Council, the reasons for the termination and the effective date of such termination, such written notices to be given at least 30 days prior to the date such termination shall take effect. No refunds will be provided to any party that terminates its participation for that year. Withdrawal from the agreement by one party shall not operate to terminate the agreement, which shall continue in full force and effect with respect to the other parties.

16. If any term or provision of this agreement or the application thereof shall, to any extent, be invalidated or unenforceable, the remainder of this agreement or the application of such term or provision, other than those to which it is held invalid or unenforceable, shall be unaffected thereby, and each term and provision of the agreement shall be valid and enforceable to the fullest extent permitted by law.

17. If the Council should cease to exist in accordance with the bylaws, the funds still available will be returned to the parties to this agreement under the same formula as originally gained.

IN WITNESS WHEREOF, the following parties through their Chief Elected Officials have executed this agreement.

Municipal Signatories

Supervisor Robert Green
Town of Bristol

Supervisor Pamela Helming
Town of Canandaigua

Supervisor Fred Lightfoote
Town of Gorham

Supervisor Margaret Hilton
Town of Hopewell

Supervisor Margaret Dunn
Town of Italy

Supervisor Robert Multer
Town of Middlesex

Supervisor John Cowley
Town of Naples

Supervisor Leonard Lisenbee
Town of Potter

Supervisor Barbara Welch
Town of South Bristol

Mayor Brian Schenk
Village of Naples

Mayor Peter Blandino
Village of Newark

Mayor Chris Piccola
Village of Palmyra

Mayor Jon Bagley
Village of Rushville

Mayor Ellen Polimeni
City of Canandaigua

2015 Watershed Council Fair Share Formula

Breakdown of Criteria used in the Formula

Municipality	Gal. Use	Shore line	% of w'shed	Pop. Den.	Watershed Assess	Tourism $
Measurement	millions	miles	%	sq- mile	millions-$	Range
Cdga City	1,315	1.5	1.4	2449.7	368.4	7
V. Newark	1,047					
T. Canandaigua		11.5	16.0	134.6	709.4	4
Gorham	159	7	17.5	73.4	398.2	3
South Bristol	33	7.4	9.9	41.5	340.8	4
V. Palmyra	452					
Middlesex		7.5	18.4	44.2	157.0	
Naples			19.0	32.4	72.7	3
V. Naples	70		0.8	1128.8	51.3	3
Rushville	40		0.3	969.1	21.7	
Italy		0.4	9.5	27.4	37.4	
Hopewell			1.8	94.3	28.7	1
Potter			3.3	49.8	3.7	
Bristol			0.3	59.0	2.4	

Two of the criteria change each year: gallons used and Watershed assessed value.

Both City of Canandaigua and Newark used approx 100million gallons less in 2013

Approved Formula

Watershed Council

Municipality	Gal. Use	Shore line	% of w'shed	Pop Den	Watershed Assess	Tourism $	Total Score	% of Total	2015 Annual Municipal Cost	2014 Comparison	2000 Comparison
Cdga City	72.4	1.3	0.7	10.5	31.6	10.0	126.6	25.3%	$ 24,318	$ 23,853	$ 24,028
V. Newark	57.7	0.0	0.0	0.0	0.0	0.0	57.7	11.5%	$ 11,077	$ 10,978	$ 14,827
T. Canandaigua	0.0	10.0	8.4	0.6	60.9	5.7	85.6	17.1%	$ 16,448	$ 15,581	$ 11,582
Gorham	8.8	6.1	9.2	0.3	34.2	4.3	62.8	12.6%	$ 12,073	$ 11,318	$ 9,306
South Bristol	1.8	6.4	5.2	0.2	29.3	5.7	48.6	9.7%	$ 9,338	$ 8,881	$ 6,899
V. Palmyra	24.9	0.0	0.0	0.0	0.0	0.0	24.9	5.0%	$ 4,782	$ 4,529	$ 5,004
Middlesex	0.0	6.5	9.7	0.2	13.5	0.0	29.9	6.0%	$ 5,739	$ 5,383	$ 4,676
Naples	0.0	0.0	10.0	0.1	6.2	4.3	20.7	4.1%	$ 3,969	$ 3,740	$ 3,959
V. Naples	3.9	0.0	0.4	4.8	4.4	4.3	17.8	3.6%	$ 3,420	$ 3,213	$ 3,670
Rushville	2.2	0.0	0.2	4.2	1.9	0.0	8.4	1.7%	$ 1,609	$ 1,488	$ 1,689
Italy	0.0	0.3	5.0	0.1	3.2	0.0	8.7	1.7%	$ 1,666	$ 1,562	$ 1,391
Hopewell	0.0	0.0	0.9	0.4	2.5	1.4	5.2	1.0%	$ 1,007	$ 954	$ 915
Potter	0.0	0.0	1.7	0.2	0.3	0.0	2.3	0.5%	$ 436	$ 410	$ 440
Bristol	0.0	0.0	0.2	0.3	0.2	0.0	0.6	0.1%	$ 119	$ 110	$ 110
							499.8	100.0%	$ 96,000	$ 92,000	$ 88,500
Weights	7	1	1	1	3	1		96,000.00			