Owasco Lake Watershed Management and Waterfront Revitalization Plan

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PROJECT MANAGER

Cayuga County Department of Planning and Economic Development

Cayuga County Office Building
160 Genesee Street, 5th Floor
Auburn, New York 13021
(315) 253-1276
www.cayugacounty.us/Departments/Planning-and-Economic-Development

PROJECT CONSULTANT

EcoLogic, LLC

9 Albany Street, Suite 3J
Cazenovia, New York 13035
(315) 655-8305
http://www.ecologicllc.com

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Executive Summary

Purpose

The Owasco Lake Watershed Management and Waterfront Revitalization Plan (the Plan) examines the present state of Owasco Lake and its watershed, how water quality and habitat conditions are changing, and the challenges of meeting community goals for continued use and enjoyment of this valued resource. In light of this assessment, the Plan recommends specific actions needed to restore and protect Owasco Lake and its watershed for future generations.

State of the Owasco Lake Watershed

Environmental Setting

Owasco Lake is one of the New York Finger Lakes, a group of eleven elongated lakes of glacial origin located in the west-central region of the state. Owasco Lake is part of the Seneca-Oneida-Oswego River Basin. The lake's watershed (defined as the land area that drains into the lake) extends over approximately 205 square miles and encompasses all, or portions of, eleven towns and one village in Cayuga County (representing 81.5% of the watershed area), one town in Onondaga County (representing 2.3% of the watershed area), and three towns and one village in Tompkins County (representing 16.2% of the watershed area).

The watershed is drained by a network of tributary streams. Major streams include Owasco Inlet, Dutch Hollow Brook, Sucker Brook, and Veness Brook, while smaller unnamed streams channel surface runoff directly into Owasco Lake. The majority of water flowing into Owasco Lake enters at its southern end, which is characteristic of the Finger Lakes; approximately 62% of the annual inflow from the watershed flows into the lake through the Owasco Inlet.

The water quality and aquatic habitat of Owasco Lake reflect its natural setting: environmental conditions of the watershed such as topography, soils, land cover, and climate; and physical features of the lake itself such as depth, water residence time, and the extent of habitat in shallow waters near the shoreline. These natural features are affected by the multitude of ways in which humans use the lake and its watershed, through settlement patterns, resource extraction, cultivation of agricultural crops, animal husbandry and waste management, water withdrawals, water level controls, wastewater disposal, recreational uses, introduction of invasive species, and other factors.

Land Use/Land Cover

Overall, agriculture is a dominant land use within the Owasco Lake watershed; 23% of the land area is dedicated to cultivated crops, and an additional 28% of the land area is actively used for hay and pasture. The deep, well-drained, and calcareous soils found throughout the watershed are very well suited for crop production. The watershed lands include significant areas of USDA-designated prime farmland soils and farmland of statewide importance. In contrast, developed areas account for only 5% of the watershed land area. There are approximately 16,400 residents within the watershed with population centers in the Villages of Groton and Moravia, outskirts of

the City of Auburn in the Towns of Owasco and Fleming, and a small area of the Town of Locke. The remainder of watershed land cover is forest (31%), scrub and shrub vegetation (7%), and wetlands and open waters (6%).

Owasco Lake and Watershed Conditions

Owasco Lake is an oligo-mesotrophic lake, meaning that the lake exhibits low to moderate levels of nutrients and algal abundance. The lake waters are generally clear and dissolved oxygen concentrations remain adequate to support aquatic life throughout the entire depth of the water column. Phosphorus is the limiting nutrient for algal growth.

The lake is classified as a Class AA (T) waterbody. According to NYCRR Part 701.5, the best usages of Class AA waters are:

- A source of water supply for drinking, culinary or food processing purposes
- Primary and secondary contact recreation
- Fishing (the waters shall be suitable for fish, shellfish, and wildlife propagation and survival)

The (T) designation means that Owasco Lake water quality and habitat conditions are suitable for cold water fish such as salmon and trout. The AA classification indicates that the lake is considered to be a suitable and safe source of drinking water, if the water is subjected to approved disinfection treatment, with additional treatment if necessary to remove naturally present impurities.

Cyanobacterial blooms, also known as Harmful Algal Blooms (HAB), have been detected in Owasco Lake in recent years and are of great concern for recreational users and suppliers of potable water. Recent water quality monitoring data suggest that the lake's conditions are deteriorating, and that nutrient enrichment is a presumed cause.

Based on the decline in water quality conditions and the increasing frequency of HAB, in December 2014 the New York State Department of Environmental Conservation (NYSDEC) released an updated assessment of the extent to which Owasco Lake conditions support their designated uses. The lake was listed as impaired for both water supply and recreational uses. The NYSDEC also reported the types and sources of pollutants that are interfering with the recreational and water supply uses. Pollutant types are listed as pathogens and HAB; pollutant sources are listed as agriculture (as a source of phosphorus promoting HAB) and waterfowl (as a source of pathogens).

Status of Local Regulatory Environment

The *Owasco Lake Watershed: Institutional Framework and Assessment of Local Laws, Programs, and Practices Affecting Water Quality* identified opportunities to strengthen municipal controls in the Owasco Lake Watershed to enhance overall protection and preservation of water quality. There is significant variation across the watershed in the degree to which municipal laws address protection of watershed resources.

Development of the Plan

Partners

Preparation of this Plan was led by the Owasco Lake Watershed Advisory Committee (WAC) in collaboration with members of the Owasco Lake Watershed Management Council (OLWMC). The OLWMC, formed in 2011, is comprised of representatives of the watershed municipalities and the City of Auburn; these voting members are joined by representatives of resource management agencies including the Cayuga County Department of Planning and Economic Development (CCPED), the Cayuga County Health Department (CCHD), the Cayuga County Soil and Water Conservation District (SWCD), the Owasco Watershed Lake Association (OWLA), the Owasco Lake Watershed Inspection Program (WIP), and the Finger Lakes Institute (FLI) at Hobart and William Smith Colleges. The WAC, formed in 2014 to help guide development of this Plan, broadens the group to include representatives of other regional agencies, including Cornell Cooperative Extension (CCE), NYSDEC, Cayuga County Buildings and Grounds, Central New York Regional Planning and Development Board (CNYRPDB), Tompkins County Planning Department, Cayuga County Farm Bureau, and New York State Department of State (NYSDOS).

Public input was important to the development of this Plan, and thus the WAC sponsored a series of public meetings and focus groups to solicit input. Presentation materials and draft documents have been posted on the Cayuga County website.

Approach

The project team used the watershed planning approach jointly developed by the NYSDOS and NYSDEC and described in the 2009 guidebook *Watershed Plans: Protecting and Restoring Water Quality* to identify priority actions that will help meet watershed goals. Addressing these goals will contribute to the restoration and protection of the entire Owasco Lake Watershed, and may also provide valuable information for managing other New York Finger Lakes facing similar water quality challenges.

The watershed planning approach began with preparation of the ***Owasco Lake Watershed Management and Waterfront Revitalization Plan: Watershed and Waterbody Inventory Report*** *(Waterbody and Watershed Inventory Report*), which compiled and analyzed information regarding the natural and built environment, with a focus on changes in conditions since the completion of the 2000 *State of the Owasco Lake Watershed* and the 2001 *Owasco Lake Watershed Management Plan*. The findings of the *Waterbody and Watershed Inventory Repor*t provided the foundation for this Plan; the project team then integrated the data and information gathered over the past fifteen years by multiple agencies and researchers into an updated characterization of the land and water resources, and an analysis of how the lake and watershed are evolving in response to human activities and other agents of environmental change. The *Waterbody and Watershed Inventory Report* provided the project team with a sound foundation to identify current conditions and trends in water quality and habitat conditions, understand how land use practices affect water quality, and identify regions of the watershed most at risk of contributing pollutants.

In addition to the *Waterbody and Watershed Inventory Report*, the project team completed a detailed review of the federal, state, regional, and local institutional framework dedicated to water quality management. A significant component of the resulting report, ***Owasco Lake Watershed: Institutional Framework and Assessment of Local Laws, Programs, and Practices Affecting Water Quality****,* examines the land use and development controls in place and municipal practices for each watershed municipality, and identifies vulnerabilities and gaps. Local laws related to impervious surfaces, site plan reviews, setbacks from waterways, development in floodplains, and erosion and sedimentation controls can have a significant effect on water quality. Local laws governing land use and municipal

practices can differ significantly among municipalities, largely because New York municipalities are responsible for formulating their own land use regulations (the "home rule" provision of General Municipal Law). The findings of this detailed analysis led to recommendations to assist municipalities in strengthening their ability to address water quality issues. In addition to developing these reports as prescribed steps in the watershed planning process, the project team reviewed other relevant planning efforts underway in the watershed, such as the agenda of the Cayuga County Manure Management Working Group. These analyses are reflected in the Plan recommendations.

Vision and Goals

The WAC worked in a collaborative manner to develop a vision for the future in which:

"The Owasco Lake Watershed is a functioning, dynamic and healthy ecosystem providing natural, spiritual, economic, recreational, and community benefits to current and future generations."

Guided by this vision, the WAC established goals that reflect conditions in the Owasco Lake watershed:

- Identify and reduce the adverse water quality impacts from agricultural operations.
- Identify and reduce nonpoint sources of nutrients, sediment, microorganisms, salts, and other chemicals to Owasco Lake and its tributary streams.
- Reduce the risk of water-related illnesses associated with using Owasco Lake as a source of drinking water and recreation.
- Expand environmentally sound recreational access and tourism (notably at Emerson Park and Owasco Flats).
- Identify model ordinances that can improve watershed health and sustainability, including smart growth land use practices, and support municipal efforts to adopt and implement these measures in their local codes and practices.
- Position and sustain the Owasco Lake Watershed Management Council as the central hub for effective collaboration among water resources management professionals, Soil and Water Conservation Districts, elected officials, water purveyors, the Owasco Watershed Lake Association, county Planning and Economic Development and Public Health agencies, and local research institutions.
- Continue water quality sampling and monitoring programs to track the lake and streams' response to management actions.
- Identify and respond to emerging issues including invasive species.
- Continue to partner with regional and state water resources agencies to address common challenges to the Finger Lakes, such as lake level management, invasive species response, climate change adaptation, and funding for projects that contribute to the vision.
- Build community awareness of how human activities affect the future of the Owasco Lake Watershed.

Recommendations

Categories of Actions

The Plan presents a series of specific recommendations designed to bring about improved lake and watershed conditions. The recommendations reflect a site-specific analysis of the watershed's natural and built environment, current water quality conditions and trends, key sources of pollution, and the institutional framework in place for lake and watershed management. Some recommendations are oriented toward restoration—improving degraded land and water resources—while others are oriented toward protection.

The recommendations are grouped into eight broad categories. Select examples of recommendation in each of the eight categories are included below.

Category	***Examples***
A. Planning	Continue the Nine Key Elements Planning initiative, with detailed subwatershed modeling
B. Measures to Reduce Nonpoint Source Pollution	Implement agricultural best management practices tailored to the Owasco Lake watershed; stabilize eroding streambanks; improve municipal road and ditch maintenance practices; improve homeowner and property manager practices
C. Lake Level Management	Plan for lake level adjustments to respond to extreme conditions, shoreline erosion, and invasive species
D. Monitoring and Assessment	Integrate monitoring efforts, develop a unified database, and communicate results to the public
E. Recreation and Waterfront Revitalization	Inspect watercraft for invasive species, support implementation of the Emerson Park Master Plan, monitor for Harmful Algal Blooms
F. Water and Wastewater Infrastructure	Evaluate benefits and risks of extending public sewers; support water purveyors dealing with cyanobacteria
G. Institutional Structure for Lake and Watershed Management	Maintain OLWMC as hub for collaboration on Owasco Lake issues; actively pursue additional funding to implement Plan recommendations
H. Outreach and Education	Develop a coordinated strategy for watershed education; conduct outreach via educational institutions

Setting Priorities

The WAC assigned a priority to each of the Plan's recommendations. The priorities reflect the urgency of each recommendation with respect to meeting the goals for watershed protection and restoration, as well as institutional capacity, funding availability, and regulatory requirements.

The Importance of Agricultural Best Management Practices

Since agriculture is a predominant land use, it is an important contributor of phosphorus and sediment to Owasco Lake. As such, it is vitally important to identify and implement best management practices (BMPs) that will help keep nutrients and sediments on the landscape. At the same time, it is essential to recognize the central role of farming in meeting local food needs and supporting the broader regional economy. The recommended actions

include both regulatory and programmatic measures to provide technical support and cost-sharing to producers, as well as specific restoration and protection measures designed to minimize the potential for nonpoint source pollution from agriculture. Overall, these recommendations are considered to represent the most urgent and important actions within this Plan.

In January 2016, the Cayuga County Manure Management Working Group published a 14-point county-wide agenda designed to improve manure handling practices and reduce the risk of adverse water quality impacts. The recommendations of this Plan are consistent with the agenda of the Working Group.

To help identify where the need for BMPs is most critical, each of Owasco Lake's subwatersheds was assigned an interim priority of High, Medium, or Low, based on factors related to environmental conditions and land use in the subwatersheds. The interim assignment of priorities will be refined through a coordinated effort to advance watershed analysis and modeling as part of an ongoing effort to fulfill requirements of a Nine Key Elements Plan (supported by NYS funding awarded in late 2015). The planned watershed modeling effort will help pinpoint areas at greatest risk of nonpoint source pollution and incorporate site-specific knowledge of existing agricultural practices.

Monitoring, Assessment, and Reporting

The OLWMC and the WAC are committed to tracking the implementation of the Plan's recommended actions designed to restore and protect the lake and watershed. A coordinated monitoring program is underway to optimize the resources of the many agencies and researchers tracking indicators of lake and stream health. Each year, a Lake and Watershed Report Card will be prepared to keep the entire community apprised of progress toward implementing the Plan's recommendations, the effectiveness of the measures as indicated by the condition of Owasco Lake and its tributary streams, and next steps.

Looking Ahead

This watershed management plan is a living document, and will be updated as new projects are undertaken, as the effectiveness of actions is documented, and as new challenges arise. Cayuga County has received a New York State Department of State Local Waterfront Revitalization Grant award to expand this plan to incorporate the United States Environmental Protection Agency (USEPA) Nine Key Elements.

The OLWMC will coordinate implementation of projects with the many state, federal, academic, and nonprofit organizations that joined forces to focus on the Owasco Lake Watershed. Ultimately, realizing the vision for a healthy and economically vibrant future will depend on this collaborative approach.

Abbreviations

AEM	Agricultural Environmental Management
BMP	Best Management Practice
CAFO	Concentrated Animal Feeding Operation
CCE	Cornell University Cooperative Extension
CCHD	Cayuga County Health Department
CCPED	Cayuga County Department of Planning and Economic Development
CCPT	Cayuga County Parks and Trails
CDBG	NYS Community Development Block Grant
CIG	Conservation innovation Grant
CLRP	Cornell Local Roads Program
CNYRPDB	Central New York Regional Planning and Development Board
CSWL	Cornell University Soil and Water Lab
EFC	NYS Environmental Facilities Corporation
EPF	Environmental Protection Fund
EQIP	Environmental Quality Incentives Program
FLI	Finger Lakes Institute
FLLOWPA	Finger Lakes - Lake Ontario Watershed Protection Alliance
FLLT	Finger Lakes Land Trust
FL-PRISM	Finger Lakes Partnership for Regional Invasive Species Management
FPC	Farm Practices Council
GIGP	Green Innovation Grants Program
GIS	Geographic Information System
GLRI	Great Lakes Research Initiative
GWLF	Generalized Watershed Loading Function
HAB	Harmful Algal Bloom
MS4	Municipal Separate Storm Sewer System
NRCS	Natural Resources Conservation Service
NYCRR	New York Codes, Rules and Regulations
NYSDAM	New York State Department of Agriculture and Markets
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOS	New York State Department of State
NYSDOT	New York State Department of Transportation
NYSERDA	New York State Energy Research and Development Authority
NYSOPRHP	New York State Parks, Recreation, and Historic Preservation
OCHD	Onondaga County Health Department
OFNR	Owasco Flats Nature Reserve
OLWMC	Owasco Lake Watershed Management Council
OWLA	Owasco Watershed Lake Association
P, TP	Phosphorus, Total phosphorus
PWL	Priority Waterbodies List
QAPP	Quality Assurance Project Plan
SARE	Sustainable Agriculture Research and Education Program
SWAT	Soil and Water Assessment Tool
SWCD	Soil and Water Conservation District
TCHD	Tompkins County Health Department
TMDL	Total Maximum Daily Load
USACOE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
WAC	Owasco Lake Watershed Advisory Committee
WHIP	Wildlife Habitat Incentive Program
WIP	Owasco Lake Watershed Inspection Program
WQIP	NYSDEC Water Quality Improvement Project Grant Program
WQMA	Water Quality Management Agency
WRI	Water Resources Institute

Links to Selected Key Resources

Reports Prepared in Conjunction with This Plan

Owasco Lake Watershed Management and Waterfront Revitalization Plan: Watershed and Waterbody Inventory Report, May 2015 — www.cayugacounty.us/Departments/Water-Quality-Management-Agency/Information-on-County-Waterbodies/Owasco-Lake/Management-Plan

Owasco Lake Watershed: Institutional Framework and Assessment of Local Laws, Programs, and Practices Affecting Water Quality, Sept. 2015 — www.cayugacounty.us/Departments/Water-Quality-Management-Agency/Information-on-County-Waterbodies/Owasco-Lake/Management-Plan

Other Plans and Reports Related to the Owasco Lake Watershed

Cayuga County Agriculture and Farmland Protection Plan, 2014 — www.cayugacounty.us/Departments/Planning-and-Economic-Development/Agricultural-Farmland-Protection/Ag-Plan-Update

Emerson Park Master Plan, Mar. 2015 — www.cayugacounty.us/Portals/0/planning/Documents/EmersonParkMasterPlan/Emerson%20Park%20Master%20Plan%20Adopted%2004-28-15.pdf

Improving Manure Management: A Fourteen-Point Countywide Agenda for Action, Jan. 2016— www.cayugacounty.us/Portals/0/planning/WQMA/Documents/Agenda%20for%20Action_Jan_26_2016.pdf

***Owasco Flats Wildlife Management Area: A Conceptual Management Plan*, 2008** — www.owla.org/owascoflatswildlifemanagementareaconceptualplan.pdf

***Owasco Flats: Conservation Planning and Stakeholder Survey Project*, 2007** — www.cnyrpdb.org/fingerlakes/docs/2007-07-05_OwascoFlatsReport.pdf

Model Ordinances and Information for Municipalities

NYS Department of State Division of Local Government Services —www.dos.ny.gov/lg
The NYS Department of State's Division of Local Government Services is a principal resource for New York's local governments, providing training and assistance to local governments and helping local officials address planning, land use, and regulatory controls. Sample resource:

Planning Land Use Regulation –www.dos.ny.gov/lg/publications.html#Planning

NYS Department of Environmental Conservation Stormwater – www.dec.ny.gov/chemical/8468.html
The NYSDEC requires permits for stormwater discharges from Municipal Separate Storm Sewer Systems (MS4s), and provides resources that can be useful to any municipality seeking to improve stormwater controls. Sample resources:

MS4 Toolbox – www.dec.ny.gov/chemical/8695.html
NYS Stormwater Management Design Manual – www.dec.ny.gov/chemical/29072.html
Sample Local Law for Stormwater Management and Erosion & Sediment Control – www.dec.ny.gov/docs/water_pdf/localaw06.pdf

Regional Agencies

Genesee/Finger Lakes Regional Planning Council – www.gflrpc.org

Central New York Regional Planning and Development Board — www.cnyrpdb.org

Finger Lakes-Lake Ontario Watershed Protection Alliance — http://www.fllowpa.org/

Chapter 1. Introduction

1.1 Purpose of this Document

The Owasco Lake Watershed Management and Waterfront Revitalization Plan (the Plan) is designed to serve as a roadmap for protecting the vital natural resources the watershed provides, while balancing the need for economic development among the watershed's communities. The Plan is not a mandate; rather, it will serve as a guide to effective actions to protect and restore the quality of the watershed, and enhance quality of life for its residents while maintaining the integrity of the natural ecosystem. Implementation of these recommended actions will require commitment at many levels: federal, state, and local government; natural resource and agricultural management agencies; shoreline residents and others within the watershed. The water quality and habitat issues affecting Owasco Lake are the cumulative results of many activities and conditions, and the responsibility for improvements rests with the entire community.

A watershed provides various "services" which benefit the people living within it, as well as supports the mosaic of aquatic, terrestrial, and wetland ecosystems of which people are but one component. A well-managed watershed provides flood protection, habitat for fish and wildlife, and recreational and aesthetic benefits. Surface and groundwater resources within the watershed are a source of potable water for residents. With some of the best farmland soils in New York, the Owasco Lake watershed is dominated by agricultural land uses, which contribute to open space and scenic vistas. Agriculture is also a major economic engine for the central Finger Lakes. The lake and its tributary streams are important destinations for recreation and tourism. With all these benefits, the watershed can also experience pollution and degradation from land uses, thus the Plan sets forth a series of aggressive measures designed to target the pollutants and sources posing the greatest threat to the long-term quality of Owasco Lake.

Preparation of this Plan was funded in part through a New York State Department of State (NYSDOS) Title 11 Environmental Protection Fund Local Waterfront Revitalization Program grant to the Cayuga County Department of Planning and Economic Development (CCPED).

1.2 Vision and Goals for the Owasco Lake Watershed

An early step in developing the Plan was to solicit community input on a vision and goals for the future of the lake and watershed, including the waterfront. The project team facilitated an interactive discussion in response to the prompt "Imagine you have been away for a decade and return to the Owasco Lake Watershed following implementation of the recommendations of the management plan. Describe what you discover upon your return." The responses were compiled into the following vision statement:

> **"The Owasco Lake Watershed is a functioning, dynamic and healthy ecosystem providing natural, spiritual, economic, recreational, and community benefits to current and future generations."**

In subsequent discussions, community representatives and members of the Owasco Lake Watershed Management Council developed a series of goals designed to make the vision a reality. The numbering of these goals does not necessarily correspond to priorities.

1. Identify and reduce the adverse water quality impacts from agricultural operations.
2. Identify and reduce nonpoint sources of nutrients, sediment, microorganisms, salts, and other chemicals to Owasco Lake and its tributary streams.
    a. Identify model practices that will reduce adverse water quality impacts from roadway maintenance practices such as ditching and application of salt and sand, and support municipal efforts to adopt and implement such practices.
    b. Research ways that new technologies such as innovative septic systems or stormwater treatment systems would improve water quality, and promote their adoption.
    c. Minimize the impact of contamination from fuel and other chemicals associated with transportation and storage accidents.
3. Reduce the risk of water-related illnesses associated with using Owasco Lake as a source of drinking water and recreation.
4. Expand environmentally-sound recreational access and tourism (notably at Emerson Park and Owasco Flats).
5. Identify model ordinances that can improve watershed health and sustainability, including smart growth land use practices, and support municipal efforts to adopt and implement these measures in their local codes and practices.
6. Position and sustain the Owasco Lake Watershed Management Council as the central hub for effective collaboration among water resources management professionals, Soil and Water Conservation Districts, elected officials, water purveyors, the Owasco Watershed Lake Association, county Planning and Economic Development and Public Health agencies, and local research institutions.
7. Continue water quality sampling and monitoring programs to track the lake and streams' response to management actions.
8. Identify and respond to emerging issues including invasive species.
9. Continue to partner with regional and state water resources agencies to address common challenges to the Finger Lakes, such as lake level management, invasive species response, climate change adaptation, and funding for projects that contribute to the vision.
10. Build community awareness of how human activities affect the future of the Owasco Lake Watershed.

1.3 Environmental Setting

Owasco Lake is one of the New York Finger Lakes, a group of eleven elongated lakes of glacial origin located in the west-central region of the state (**Map 1-1**). Owasco Lake is part of the Seneca-Oneida-Oswego River Basin. The lake's watershed (defined as the land area that drains into the lake) extends over approximately 205 square miles (**Map 1-2**) and encompasses all, or portions of, eleven towns and one village in Cayuga County (representing 81.5% of the watershed area), one town in Onondaga County (2.3%), and three towns and one village in Tompkins County (16.2%). The distribution of municipal lands within the watershed is displayed in **Figure 1-1**.

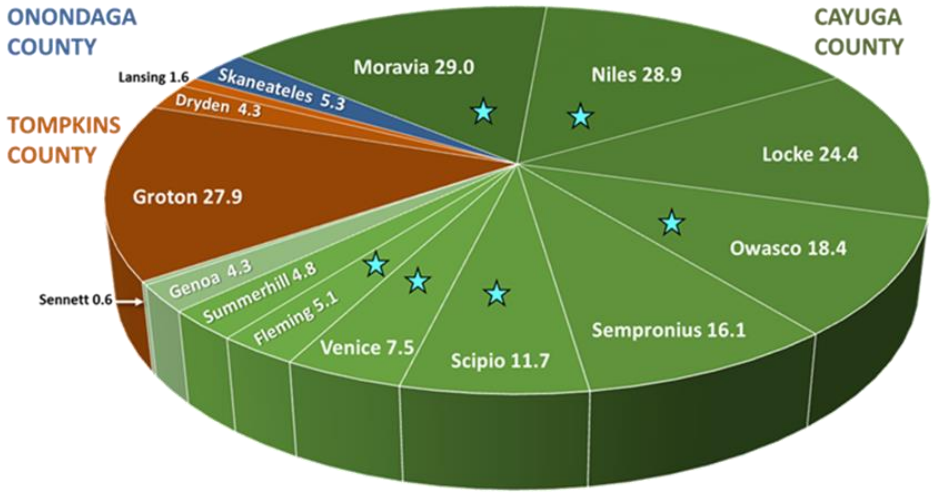


Figure 1-1. Municipalities within the Owasco Lake watershed (units are square miles)
Note that starred municipalities include shoreline properties

The water quality and aquatic habitat of Owasco Lake reflect its natural setting: environmental conditions of the watershed such as topography, soils, land cover, and climate; and physical features of the lake itself: depth, water residence time, and the extent of littoral zone habitat. These natural features are affected by the multitude of ways in which humans utilize the lake and its watershed, through settlement patterns, resource extraction, cultivation of agricultural crops, animal husbandry and waste management, water withdrawals, water level controls, wastewater disposal, recreational uses, introduction of invasive species, and other factors. To index current conditions and analyze the factors affecting Owasco Lake, the project team completed a detailed Watershed and Waterbody Inventory Report in May, 2015; this report updates the *State of the Owasco Lake Watershed Report* completed by Cayuga County in 2000. The 205 square mile watershed is drained by a network of tributary streams (**Map 1-3**). Due to the watershed topography, some of the streams are small and intermittent, while others flow year-round. The majority of water flowing into the lake enters at its southern end, which is characteristic of the Finger Lakes (**Figure 1-2**); approximately 62% of the annual inflow from the watershed flows

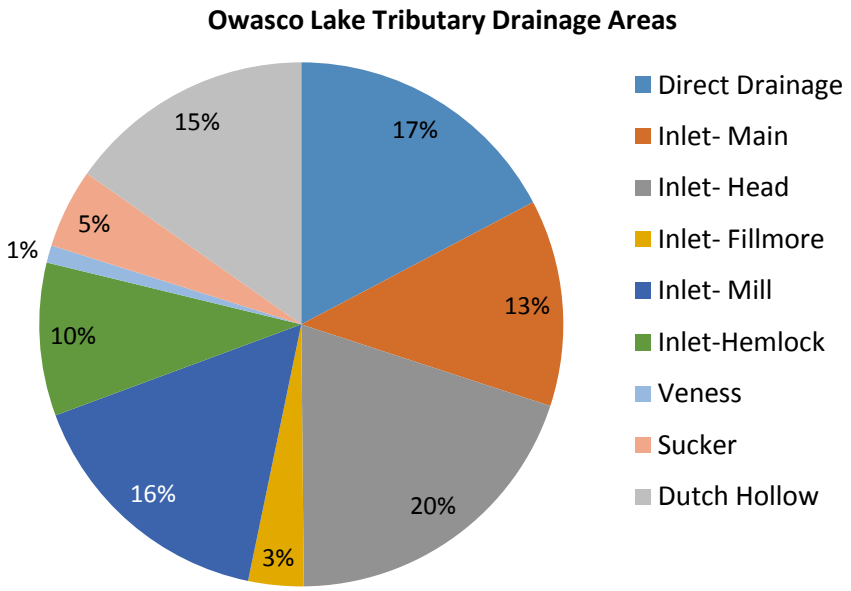


Figure 1-2. Percent Contribution of Subwatersheds to Owasco Lake Drainage Basin

into Owasco Lake through the Owasco Inlet. The land use/vegetative cover within the individual subwatersheds vary, as summarized in **Table 1-1**. Overall, agriculture is a dominant land use within the Owasco Lake watershed. The deep, well-drained, and calcareous soils found throughout the watershed are very well suited for crop production. As displayed in **Map 1-4**, significant areas of USDA-designated prime farmland soils and farmland of statewide importance are found in the Owasco Lake watershed.

Table 1-1. Land Use and Vegetative Cover within the Owasco Lake Watershed

Land Cover Classification	Watershed Area (mi^2)	Watershed Area (ha)*	Percent of Total
Open Water**	0.24	62.7	0.1%
Developed, Open Space	7.41	1919.3	3.6%
Developed, Low Intensity	1.23	317.9	0.6%
Developed, Medium Intensity	0.25	65.1	0.1%
Developed, High Intensity	0.08	20.3	0.0%
Barren Land	0.01	2.2	0.0%
Deciduous Forest	48.11	12457.6	23.7%
Evergreen Forest	5.29	1369.3	2.6%
Mixed Forest	4.60	1189.9	2.3%
Shrub/Scrub	12.61	3265.8	6.2%
Herbaceous	0.80	207.9	0.4%
Hay/Pasture	53.76	13920.5	26.4%
Cultivated Crops	43.84	11352.3	21.6%
Woody Wetlands	10.44	2701.9	5.1%
Emergent Herbaceous Wetlands	1.26	326.8	0.6%

Source: National Land Cover Database, 2011 ** A hectare (ha) is 2.47 acres.* *** Does not include lake surface.*

1.4 Description of the Watershed and Waterfront Revitalization Planning Process

Protecting and restoring Owasco Lake and its watershed for generations to come requires careful cooperative planning and management. Owasco Lake's watershed crosses political boundaries, rather than being contained within them. Effective management of the watershed, therefore, requires partnerships and cooperation among the municipalities within the watershed, and the inclusion and buy-in of a diverse group of stakeholders beyond the elected and appointed officials of those municipalities. The many stakeholders collaborating on development of the Plan attest to the importance of this perspective.

Led by the WAC in collaboration with the OLWMC, staff from resource management agencies, lake association members, elected officials, the public, and other stakeholders within the Owasco Lake watershed and the neighboring City of Auburn contributed to development of this document. Preparation of the Owasco Lake Watershed Management and Waterfront Revitalization Plan follows the approach jointly developed by the NYSDOS and NYSDEC and described in the guidebook *Watershed Plans: Protecting and Restoring Water Quality*. This Plan is an update and expansion of the 2001 *Owasco Lake Watershed Management Plan* that was developed by the CCPED.

The project team has been committed to keeping the community engaged and informed over the approximately 20 months of Plan development through an active web site, multiple public meetings, notices in local media, and promotion of an online public opinion survey. As evident from the recommendations put forth in Chapter 3, a

robust program of public engagement will be essential to implement the many detailed recommendations of the Plan.

A watershed management plan addresses a series of questions:

1. **Where are we now?** That is, what is the current status of the natural, cultural, and political environment within the watershed? What are the assets, existing problems, and emerging threats and opportunities?
2. **Where are we going?** What processes and programs are in place that will affect the future of the watershed?
3. **Where do we want to be?** What is the community's vision for the future of the watershed? What desirable conditions or attributes of the watershed should be enhanced, and what undesirable conditions should be minimized or eliminated?
4. **How do we get there?** What strategic actions will enable the community to achieve the goals and vision? What specific practices and projects will help restore and protect the watershed and how can funds be leveraged?
5. **When will we get there?** When will the recommended projects be advanced, and how will the priority actions be decided?
6. **How do we measure progress?** What is the plan for tracking improvement and deciding what else needs to be done?

The USEPA has also promoted a framework for watershed management plans that are developed and implemented for threatened or impaired waters using funding from Clean Water Act Section 319. The NYSDEC is strongly encouraging watershed management plans to fully incorporate the USEPA framework, which is known as the Nine Key Elements Watershed Management Plan. The nine key elements are as follows:

1. Identify the causes and sources of pollution
2. Estimate pollutant loading into the watershed and the expected load reductions to be realized with implementation of the recommendations
3. Describe management measures that will achieve load reductions and target critical areas
4. Estimate the amounts of technical and financial assistance and the relevant authorities needed to implement the plan
5. Develop an information/education component
6. Develop a project schedule
7. Describe the interim, measurable milestones
8. Identify indicators to measure progress
9. Develop a monitoring component

It is the intent of Cayuga County to fully integrate the USEPA nine key elements into the Owasco Lake Watershed Management and Waterfront Revitalization Plan. Efforts to identify and quantify specific sources of pollutants are underway and will continue beyond the publication date of this document; these efforts include monitoring specific locations in the watershed before and after selected best management practices are implemented, compilation and analysis of multiple years of monitoring data, and development of a watershed model. Funding has been received from a NYSDOS Local Waterfront Revitalization to expand this plan into a Nine Key Elements Plan.

Expanding this Plan to fully comply with the USEPA's nine minimum elements is also a collaborative effort of multiple stakeholders. The Cornell University Department of Biological and Environmental Engineering's Soil and Water Lab is currently partnering with Cayuga County SWCD and the CCPED to enhance the quantitative framework.

1.5 Themes for Implementation

While the recommendations outlined in the following sections provide critical guidance on how to achieve the goals of this plan, it is also useful to empower the vision statement and goals of the plan with overarching, unifying themes. These themes will provide a common and consistent frame of reference to all groups and individuals charged with implementation responsibilities and help to bring about synergistic convergence of action toward desired outcomes. Three themes have emerged during the development of this Owasco Lake Watershed and Waterfront Revitalization Plan.

Theme 1: A Systems Approach

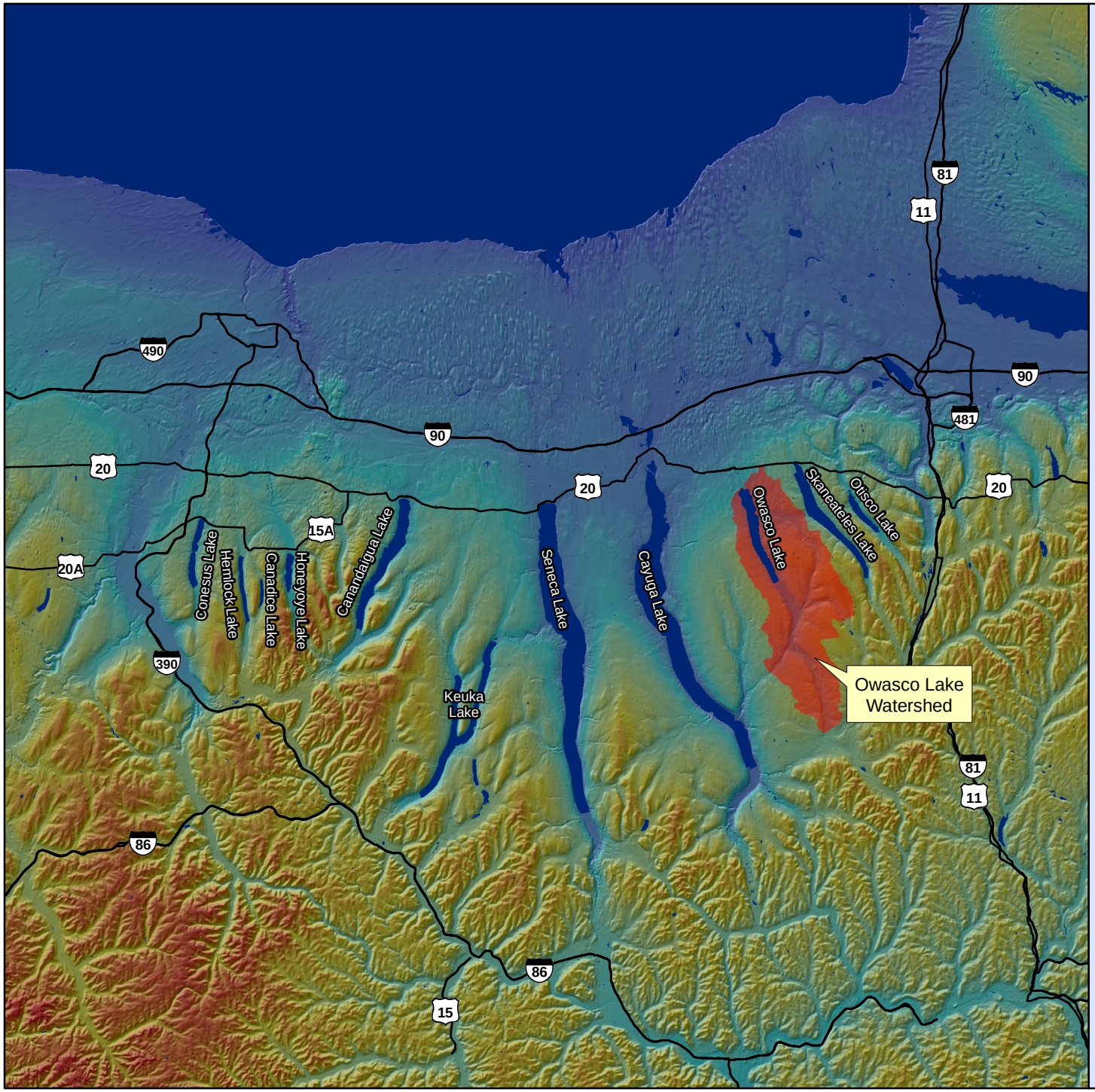
The Watershed is much more than a geographic management unit. It is a complex network of systems, the health of which is dependent on elements and processes that affect biodiversity, productivity, nutrient and chemical cycles, and evolutionary processes. The values of the economic services as well as the intangible non-economic services and functions that these systems provide must be considered when making any decisions about the management of the Watershed.

Theme 2: Watershed Planning as a Continuous Process

No plan describes all of the details about all of the steps that will need to be taken for its implementation. Watershed planning is a process of continuously formulating what stakeholders are able to do and intend to do to affect positive change. The recommendations in this plan are heavily influenced by the conditions of the watershed currently understood, as described in the Plan's supporting documentation including the *Owasco Lake Watershed Management and Waterfront Revitalization Plan: Watershed and Waterbody Inventory Report.* As new information becomes available and new ideas emerge, priorities shift and the ability to implement recommendations changes. The implementation process must allow for clarification of goals and objectives over time and the development of more specific measures to achieve those goals and objectives. A key component of the planning process is continued, broad-based public involvement in all phases.

Theme 3: Intermunicipal Collaboration

The Counties, Towns, and Villages that share the Watershed all have crucial roles to play in implementing this plan, with local circumstances dictating which elements of the planning process are emphasized in any particular area. Cayuga County will continue to provide leadership and coordination, and the current intermunicipal organization of the OLWMC will continue to promote cooperative decision making. Everyone involved with the implementation of this plan must remain vigilant to identify opportunities to create new intermunicipal arrangements as well as new ways for individual municipalities to act independently in furtherance of commonly-held goals.



Map 1-1

Regional Setting

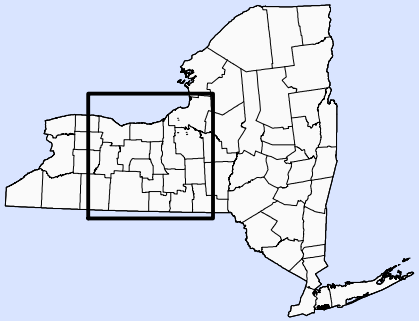
Owasco Lake Watershed

Sources:

U.S. Geological Survey. 2012. The National Elevation Dataset (NED).

U.S. Geological Survey. 2014. The National Hydrographic Dataset (NHD); The National Transportation Dataset (NTD).

Cayuga County Department of Planning and Economic Development. 2014. County Geographic Information System (GIS) database.



NEW YORK STATE OF OPPORTUNITY. Department of State

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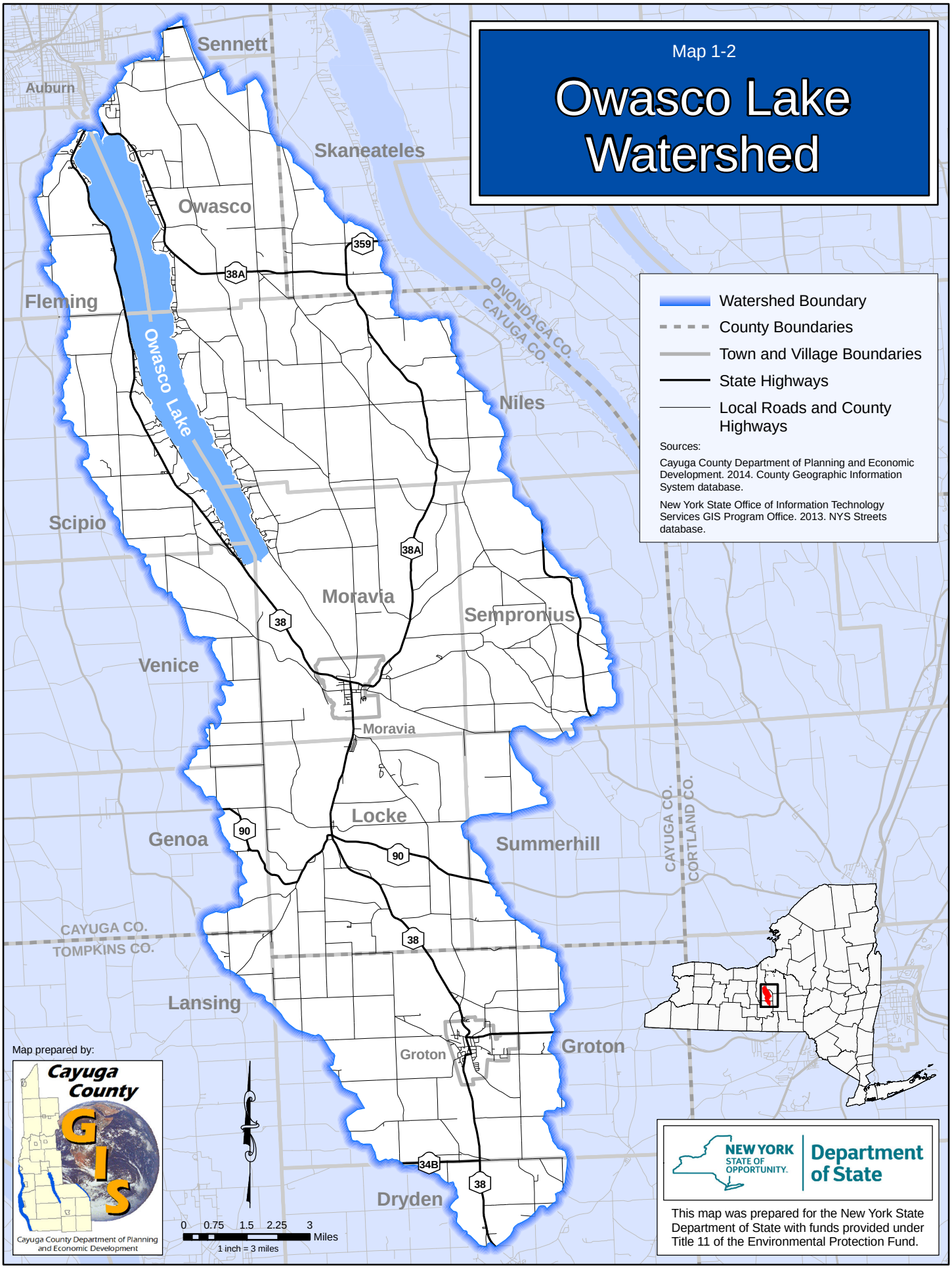
Map prepared by:

Cayuga County GIS

Cayuga County Department of Planning and Economic Development


Map 1-2
Owasco Lake Watershed
Watershed Boundary
County Boundaries
Town and Village Boundaries
State Highways
Local Roads and County Highways
Sources:
Cayuga County Department of Planning and Economic Development. 2014. County Geographic Information System database.
New York State Office of Information Technology Services GIS Program Office. 2013. NYS Streets database.
Sennett
Auburn
Skaneateles
Owasco
Fleming
Owasco Lake
ONONDAGA CO.
CAYUGA CO.
Niles
Scipio
Moravia
Sempronius
Venice
Moravia
Locke
Genoa
Summerhill
CAYUGA CO.
CORTLAND CO.
CAYUGA CO.
TOMPKINS CO.
Lansing
Groton
Groton
Dryden
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Map prepared by:
Cayuga County GIS
Cayuga County Department of Planning and Economic Development
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Department of State
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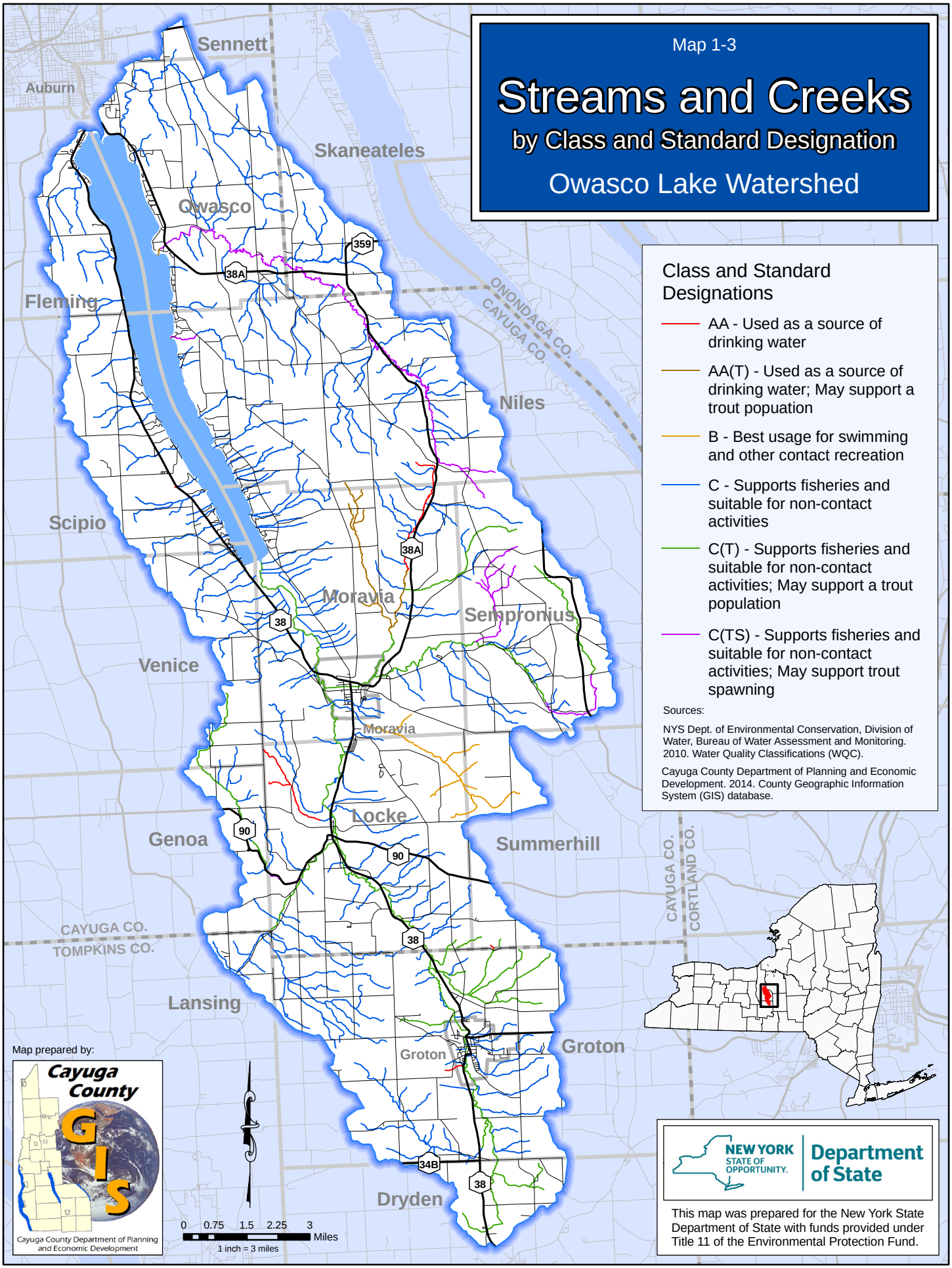
Map 1-3
Streams and Creeks
by Class and Standard Designation
Owasco Lake Watershed
Class and Standard Designations
AA - Used as a source of drinking water
AA(T) - Used as a source of drinking water; May support a trout popuation
B - Best usage for swimming and other contact recreation
C - Supports fisheries and suitable for non-contact activities
C(T) - Supports fisheries and suitable for non-contact activities; May support a trout population
C(TS) - Supports fisheries and suitable for non-contact activities; May support trout spawning
Sources:
NYS Dept. of Environmental Conservation, Division of Water, Bureau of Water Assessment and Monitoring. 2010. Water Quality Classifications (WQC).
Cayuga County Department of Planning and Economic Development. 2014. County Geographic Information System (GIS) database.
Sennett
Auburn
Skaneateles
Owasco
Fleming
Scipio
Niles
Moravia
Sempronius
Venice
Locke
Genoa
Summerhill
Lansing
Groton
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ONONDAGA CO.
CAYUGA CO.
CORTLAND CO.
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Map prepared by:
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1 inch = 3 miles
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Department of State
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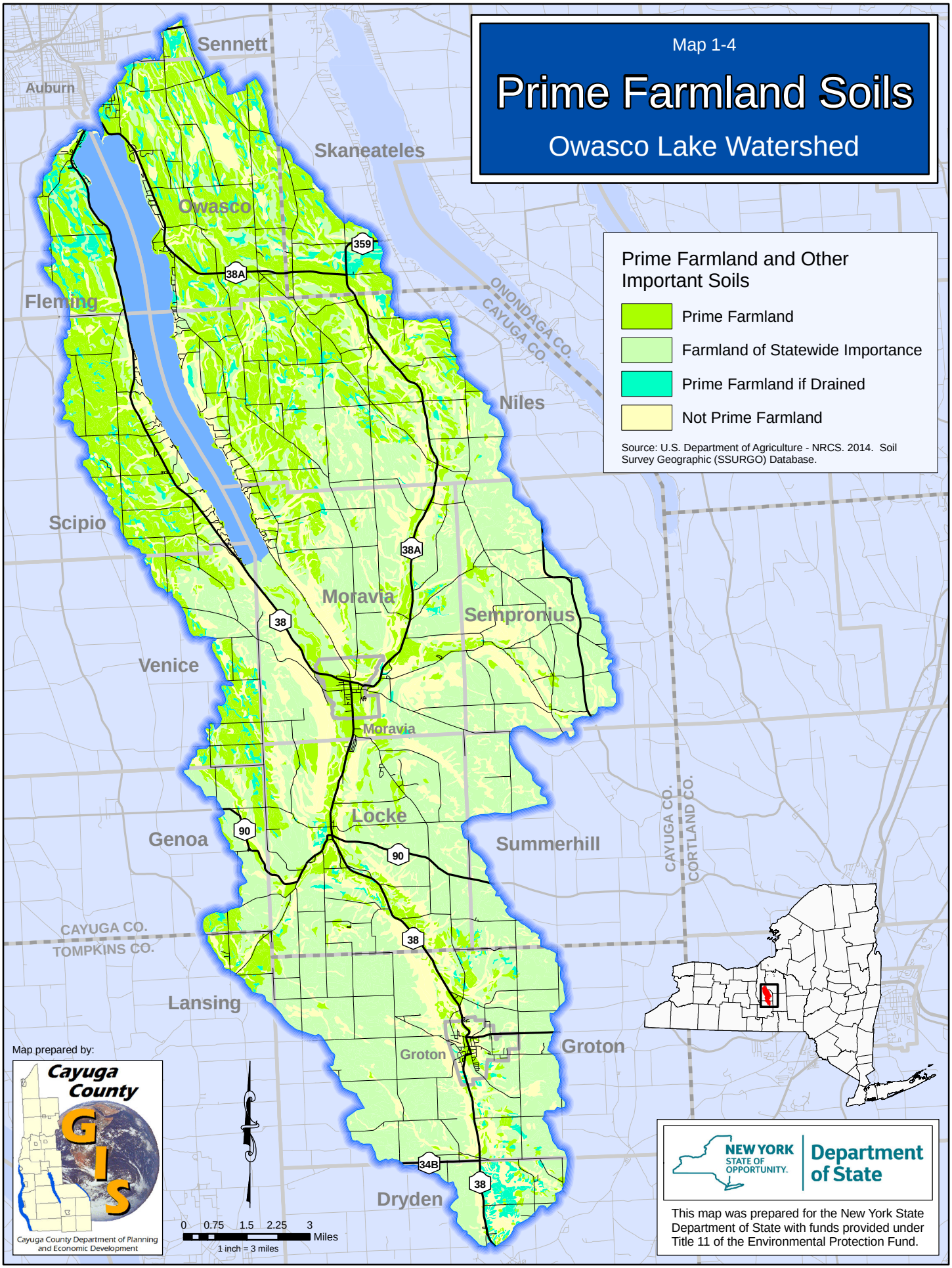
Map 1-4
Prime Farmland Soils
Owasco Lake Watershed
Prime Farmland and Other Important Soils
Prime Farmland
Farmland of Statewide Importance
Prime Farmland if Drained
Not Prime Farmland
Source: U.S. Department of Agriculture - NRCS. 2014. Soil Survey Geographic (SSURGO) Database.
Sennett
Auburn
Skaneateles
Owasco
Fleming
Scipio
Niles
Moravia
Sempronius
Venice
Locke
Genoa
Summerhill
Lansing
Groton
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Map prepared by:
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1 inch = 3 miles
NEW YORK STATE OF OPPORTUNITY.
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Chapter 2. State of Owasco Lake and Watershed

2.1 Introduction

This section of the Owasco Lake Watershed Management and Waterfront Revitalization Plan (the Plan) summarizes the major findings of two detailed reports completed during the planning process: the *Owasco Lake Watershed Management and Waterfront Revitalization Plan: Waterbody and Watershed Inventory Report* (*Waterbody and Watershed Inventory Report*) and the *Owasco Lake Watershed: Institutional Framework and Assessment of Local Laws, Programs, and Practices Affecting Water Quality*. Taken together, these reports describe the status of the Owasco Lake ecosystem; by definition, the ecosystem encompasses not only the lands and waters but also the human community reliant on these natural resources. The information and knowledge incorporated within the two reports form the basis for the Plan's recommendations. By understanding the nature, types, and sources of pollutants affecting Owasco Lake and its streams, resource managers can identify effective actions for restoration and protection. By reviewing the current institutional framework for lake and watershed management, planners are able to identify gaps and opportunities for improvement. The recommendations set forth in Chapter 3 are informed by this analysis of challenges and opportunities, and define a path toward realization of the community vision for a healthy lake and watershed.

2.2 Subwatershed Inventory and Analysis

The *Waterbody and Watershed Inventory Report* compiled data and information provided by multiple agencies and researchers into an updated characterization of the land and water resources, including descriptions and maps of several attributes that can affect transport of sediment, phosphorus, and other potential contaminants from the landscape to the waters. In addition, the *Waterbody and Watershed Inventory Report* summarized findings regarding current water quality and aquatic habitat conditions. In 2010, The CCPED completed a detailed analysis of watershed soil characteristics and topography and ranked watershed tributary subbasins according to how prone they are to become saturated during precipitation events and generate runoff. As displayed in **Map 2-1**, there is substantial variability across the watershed in the potential to generate runoff and therefore transport sediment and associated nutrients to waterways. Note that this map of natural susceptibility does not take into account land use/land cover, site-specific land management practices, precipitation, or any other factors that might influence surface water runoff.

To integrate land use/land cover with nutrient and sediment loss to the waterways, it is useful to focus on the tributary subwatershed as a unit of analysis. There are nine delineated tributary subwatersheds to Owasco Lake (**Map 2-2**), ranging in size from Veness Brook (2.19 mi^2) to the headwaters of Owasco Inlet (40.28 mi^2). Land use and vegetative cover vary among the subwatersheds (**Table 2-1**), with active agricultural use (row crops and hay/pasture) accounting for 51% of the land area on a watershed-wide basis, and ranging from 34% to 80% by subwatershed. The American Farmland Trust reports approximately 200 farms within the Owasco Lake watershed, varying in size from 8 to over 800 hectares (19.2 to 1,984 acres) (Wright and Haight 2011). Forested lands account for 34% of the watershed overall, and range from a low of 6% to a high of 64% in the subwatersheds. The percentage of land classified as developed is low; the watershed-wide estimate is 5%, and the range is 2 to 6%.

Table 2-1. Land Cover Statistics for the Nine Major Subwatersheds to Owasco Lake (*Source: NRCS 2011)*

Land Use/Cover	Forested		Developed		Cultivated Crop		Hay/Pasture		Wetlands/Water		Scrub/Shrub		Total	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
INLET-Main Stem	984	40%	93	4%	361	15%	482	20%	257	11%	272	11%	2,448	100%
INLET-Headwaters	1,397	36%	227	6%	531	14%	1,237	32%	223	6%	304	8%	3,918	100%
DIRECT DRAINAGE	603	18%	199	6%	1,149	33%	1,088	32%	162	5%	242	7%	3,442	100%
MILL	1,384	43%	148	5%	514	16%	792	25%	110	3%	242	8%	3,189	100%
VENESS	14	6%	6	3%	79	36%	98	44%	17	8%	7	3%	222	100%
SUCKER	82	8%	48	5%	352	35%	348	34%	165	16%	24	2%	1,019	100%
FILLMORE	438	64%	13	2%	28	4%	142	21%	17	2%	45	7%	683	100%
DUTCH HOLLOW	680	22%	142	5%	1,085	35%	891	29%	117	4%	167	5%	3,082	100%
HEMLOCK	499	26%	64	3%	497	26%	557	29%	184	10%	106	6%	1,907	100%
WATERSHED-WIDE	6,080	31%	940	5%	4,596	23%	5,636	28%	1,252	6%	1,406	7%	19,910	100%

Several tributary stream segments within the Owasco Lake watershed have been placed on the NYSDEC Priority Waterbodies List (PWL), last updated in December 2014. NYSDEC periodically evaluates water quality and habitat conditions throughout NY and compiles a listing of streams, lakes, estuaries, rivers and harbors where conditions may not support their designated uses (e.g., aquatic life protection, water contact recreation, water supply, fishing, etc.). The listings **(Table 2-2)** reveal that the major Owasco Lake tributary streams, particularly in their lower reaches, are adversely affected by sedimentation and nutrients. Mill/Dresserville Creek and its tributaries, as well as Decker Creek and its tributaries, are waterbodies that do meet all their designated use.

Every two years, NYSDEC is required to report to USEPA a list of waters where designated uses are not met, and a Total Maximum Daily Load (TMDL) approach or other restoration strategy is required (the 303(d) list). The final 2014 list includes the Owasco Inlet (upper and tributaries), a Class C(T) river segment that is listed as impaired by excessive nutrients from municipal and agricultural sources. This river segment has appeared in Part 1 of the 303(d) list since 2008. The 2014 listing of Owasco Inlet is marked with an asterisk (*), which denotes a High Priority Water, scheduled for TMDL/restoration strategy development and submission for approval to USEPA within the next two years.

The 2014 NYSDEC PWL revision considered data gathered by Professor John Halfman and his students at FLI in an annual monitoring program underway since 2006. This program includes automated sampling at the mouths of major tributary streams to provide data for calculating loads, as well as stream segment analysis to identify spatial variability in water quality and habitat conditions. (The annual reports for John Halfman's Research of Owasco Lake are available on the Cayuga County Water Quality Management Agency (WQMA) website.)

Other investigators and volunteers are also actively monitoring stream quality within the Owasco Lake watershed. Resource managers and planners working on the Plan recognized that compilation and analysis of the many observations and measurements of conditions within the watershed will enhance data usability and support a more quantitative analysis of subwatershed loading and prioritization. Moreover, an enhanced quantitative evaluation will help bring the Plan into alignment with USEPA requirements, described as a Nine Key Elements Plan. CCPED used a portion of their annual Finger Lakes Lake Ontario Watershed Alliance (FLLOWPA) funding to compile historical and current water quality monitoring data for Owasco Lake and watershed. Results of monitoring programs conducted by Cayuga County, OWLA, FLI, NYS Water Resources Institute, and CCE were imported into a relational database using the open source program R. Cornell University's Soil and Water Lab (CSWL) has agreed to maintain and update the database on behalf of Cayuga County and make it available to all researchers.

Table 2-2. NYSDEC 2014 Assessment of Use Attainment, Tributaries to Owasco Lake

Water segment (size)	Use(s) Impacted	Type of pollutant (CAPS indicate major)	Source of pollutant (CAPS indicate major)
Tributaries to Owasco Lake: includes lower reaches of Sucker, Veness, and unnamed (89.4 miles)	Aquatic life (stressed) Recreation (stressed) Habitat/Hydrology stressed)	NUTRIENTS Silt/sediment	STREAMBANK EROSION agriculture, stormwater, road banks
Dutch Hollow Brook and tributaries (68.5 miles)	Habitat/Hydrology (stressed)	SILT/SEDIMENT Thermal changes	HABITAT MODIFICATION, STREAMBANK EROSION Hydrologic modification, agriculture
Owasco Inlet and tributaries (59.1 miles)	AQUATIC LIFE (impaired) Recreation (stressed)	NUTRIENTS (PHOSPHORUS) Silt/sediment	AGRICULTURE, MUNICIPAL, streambank erosion

In 2008, Professor Barry Evans of Penn State University completed a watershed model of Owasco Lake using an ARC-GIS model known as AVGWLF; this mathematical model is used to estimate the amount of runoff, sediment, and nutrients (nitrogen and phosphorus) from a watershed based on a suite of input parameters including land use/land cover, soils, and topography. The model can also account for wastewater inputs, both from onsite (septic) systems and wastewater treatment plants. The major findings of this effort indicated that agriculture accounts for at least 70% of the total phosphorus load to Owasco Lake, and that interannual variability is a function of different hydrologic conditions (wet years vs. dry years). This finding supports the recommendations outlined in Chapter 3 of the Plan, which place a high priority on efforts to reduce losses of phosphorus and sediment from agricultural operations.

The next step toward meeting the requirements of a Nine Key Elements Watershed Plan is to develop and test a watershed model that can help identify specific areas of subwatersheds that contribute disproportionate amounts of sediment and phosphorus to Owasco Lake. When funding becomes available, the plan is to apply a modified version of the publically available SWAT (Soil & Water Assessment Tool) model to estimate the sources of phosphorus reaching Owasco Lake using the compiled database completed in 2015. CSWL has previously developed, calibrated and verified a hydrologic model of the Owasco Lake watershed; this is a major component of SWAT and will enable this task to be completed in an efficient and cost-effective manner.

The CSWL researchers are completing a modified version of the SWAT model for the neighboring Cayuga Lake watershed. This significant effort has provided a deeper understanding of the sources and fate of various phosphorus fractions, including an assessment of biological availability. This knowledge will enhance the ability of resource managers to identify specific practices and regions of the watershed where remedial measures will provide the greatest ecological benefit.

2.3 Owasco Lake Conditions

Owasco Lake is considered to be an oligo-mesotrophic lake, meaning that the lake exhibits low to moderate levels of nutrients and algal abundance (Halfman et al. 2014). The lake waters are generally clear and dissolved oxygen concentrations remain adequate to support aquatic life throughout the entire depth of the water column (**Table 2-3).** Phosphorus is the limiting nutrient for algal growth.

Table 2-3. Owasco Lake Trophic Status

Metric	Oligotrophic	Mesotrophic	Eutrophic	Owasco Lake (2006–2015)
Summer average total phosphorus, upper waters (µg/L)	<10	10-25	>25	11.1
Summer average chlorophyll-a, upper waters (µg/L)	<4	4 - 8	>8	2.7
Average Secchi disk transparency, m	>4	2-4	<2	4.0
Dissolved oxygen in lower waters (% saturation)	80 – 100	10-80	Less than 10	50-80

The lake is classified as a Class AA (T) waterbody. According to NYCRR Part 701.5, the best usages of Class AA waters are:

- a source of water supply for drinking, culinary or food processing purposes;
- primary and secondary contact recreation; and
- fishing (the waters shall be suitable for fish, shellfish, and wildlife propagation and survival).

The (T) designation means that Owasco Lake water quality and habitat conditions are suitable for cold water fish, such as trout and salmon. The AA classification indicates that the lake is considered to be a suitable and safe source of potable water, if the water is subjected to approved disinfection treatment, with additional treatment if necessary to remove naturally present impurities. In December, 2014 NYSDEC released an updated assessment of the extent to which Owasco Lake conditions support their designated uses (**Table 2-4**); the lake was listed as impaired for its water supply and recreational uses.

Table 2-4. NYSDEC 2014 Assessment of Use Attainment, Owasco Lake

Lake Ecosystem and Human Use Metrics	Attainment Status and Severity	Documentation
Uses Evaluated		
Water supply	Impaired	Suspected
Public bathing	Impaired	Suspected
Recreation	Impaired	Suspected
Aquatic Life	Fully supported	Known
Fish consumption	Fully supported	Unconfirmed
Conditions Evaluated		
Habitat/Hydrology	Fair	
Aesthetics	Fair	

NYSDEC also reported on the types and sources of pollutants affecting the uses and conditions (note that capital letters indicate their conclusions regarding the major sources).

<u>Type of Pollutant(s)</u>

Known: PATHOGENS, HARMFUL ALGAL BLOOMS, Algal/Plant growth (native)

Suspected: NUTRIENTS (phosphorus), Silt/Sediment

<u>Source(s) of Pollutant(s)</u>

Known: AGRICULTURE, OTHER SOURCE (waterfowl), Habitat alteration

Suspected: Hydrologic alteration, municipal discharges, onsite/septic systems

In the current 303(d) list, Owasco Lake is listed in Part 1 as impaired by pathogens and requiring a TMDL. However, the NYSDEC December 2014 update to the Priority Waterbodies List notes that "the suspected impacts to water quality and uses may not be sufficient to warrant continued listing" and recommended a re-evaluation of listings for the lake during the 2016 listing cycle. During the comment period on the draft 2014 listings, the Cayuga County Water Quality Management Agency submitted comments to NYSDEC stating that Owasco Lake should be added to the 303(d) list of impaired waters requiring a TMDL due to excessive phosphorus/nutrients, citing the presence of numerous and widespread cyanobacterial blooms in recent years. Excessive aquatic vegetation growth was also noted. NYSDEC responded that current data for phosphorus concentrations in Owasco Lake demonstrate that concentrations remain well below the agency's assessment criteria and do not support a listing. However, the cyanobacterial blooms are of concern. Similar to their comments related to pathogens, NYSDEC recommended re-evaluating the lake's regulatory listing during the 2016 cycle.

Summer average total phosphorus (TP) is used as an index of the lake's trophic state and suitability for use in water supply and recreation. Elevated TP concentrations cause an increase in algal abundance and decrease water clarity. NYSDEC has adopted a guidance value for TP in lakes of 20 µg/L summer average (defined as the four month period from June 1 to September 30) to protect recreational uses. NYSDEC is considering adopting numerical nutrient criteria for lakes to protect water supply uses as well; these criteria may be lower or may extend over a longer averaging period. The summer average TP concentrations in Owasco Lake's upper waters are consistently below the current regulatory guidance value of 20 µg/L for recreational uses (**Figure 2-1**); however, the data are trending higher.

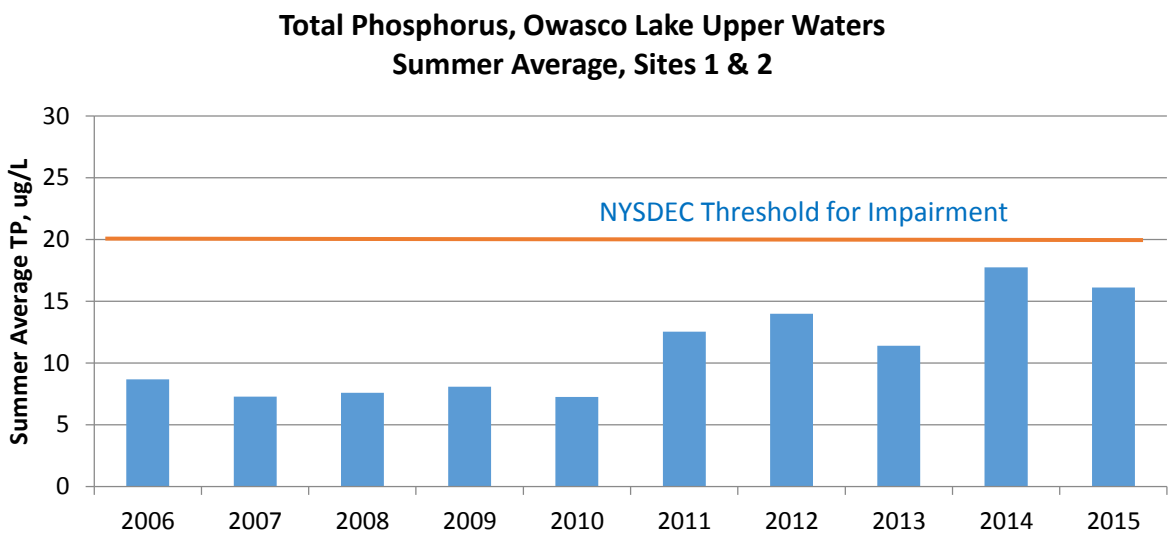


Figure 2-1. Total Phosphorus Concentration, Owasco Lake Upper Waters, 2006-2015 Compared to the Regulatory Threshold for Use Impairment for Recreation

There is also a narrative standard in place for phosphorus and nutrients in waters "None in amounts that will result in growths of algae, weeds, and slimes that will impair the waters for their best usages". Beach closures due to harmful algal blooms in 2014 and 2015 indicate that the narrative nutrient standard may not be consistently met in Owasco Lake.

There is no regulatory limit for chlorophyll-*a* concentration in the state's lakes and reservoirs as of the date of this document (March 2016). However, NYSDEC is developing nutrient criteria to protect surface waters used for potable water supply. While the proposed nutrient criteria are not yet released for public review and comment,

the draft revisions to NYSDEC Consolidated Assessment and Listing Methodology (CALM) cites a threshold of 4 µg/L chlorophyll-*a* for Class AA waters. Eventually, statistical modeling will be used to relate this level of algal abundance to ambient phosphorus concentrations. The objective of managing lakes to keep chlorophyll-*a* levels low is to reduce the risk of formation of disinfection byproducts in drinking water. The chlorophyll-*a* concentrations measured in Owasco Lake are consistently below this threshold, indicating that algal levels are low and the lake's use as a public water supply is not at risk (**Figure 2-2**). However, conditions in some years (2005, 2009, 2014, 2015) approach the proposed threshold of 4 µg/L chlorophyll-*a* for Class AA waters. There is substantial natural variability in algal abundance and species composition over the annual cycle; some phytoplankton species are adapted to cool water and low light conditions, while other species thrive under warm, sunny conditions. Because of this seasonal effect, the timing of sample collection can influence the annual average chlorophyll-*a* concentrations, which are used as a standard indicator of phytoplankton abundance. In general, wet springs, which deliver nutrients needed for phytoplankton growth, and warm summers are associated with higher annual average chlorophyll-*a* concentrations in Owasco Lake.

Cyanobacterial blooms, also known as Harmful Algal Blooms (HAB), have been detected in Owasco Lake in recent years and are of great concern for recreational users and suppliers of potable water. HAB reports are archived on the NYSDEC web site; reports from 2012-2015 are summarized in **Table 2-5**. CCHD organized a systematic surveillance and testing program in 2015 using resources of the Watershed Inspection Program. The suggested trend toward earlier development of bloom conditions is of concern.

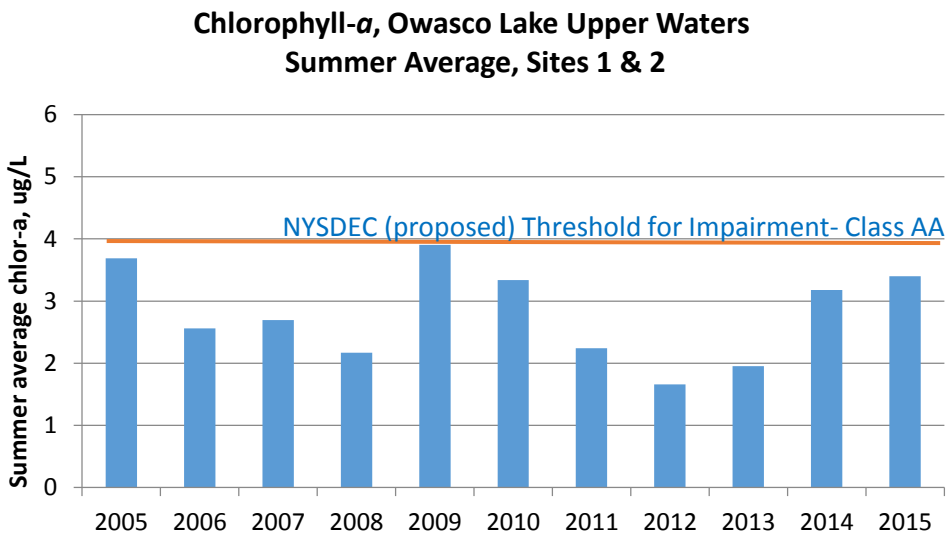


Figure 2-2. Chlorophyll-*a* Concentration, Owasco Lake, 2006-2015 Compared to the Proposed Threshold for Use Impairment for Public Water Supply

Taken together, the recent water quality monitoring of Owasco Lake indicate that water quality conditions are deteriorating, and that nutrient enrichment is a presumed cause. The 2014 regulatory designation of the lake as impaired for its uses for public water supply and recreation is a significant development. The need to take effective actions on multiple fronts to reduce nutrient inflows to the lake is reflected in the recommendations (Chapter 3) and their prioritization.

Table 2-5. Summary of Reported Harmful Algal Blooms, 2012-2015

Year	Bloom Period (Date Reported, Date Removed)	Duration of Confirmed HAB (weeks)
2012	9/07/12— 9/27/12	1
2013	8/25/13—10/03/13	7
2014	8/22/14—10/12/14	12
2015	7/10/15—10/16/15	9

2.4 Institutional Framework for Watershed Management and Nonpoint Source Pollution Prevention

The 2015 *Owasco Lake Watershed: Institutional Framework and Assessment of Local Laws, Programs, and Practices Affecting Water Quality* provides information regarding the institutional capacity of the resource management agencies and local government as they strive to reduce nonpoint source pollution. Included in the document are:

- Description and analysis of the institutional framework that guides decision making and activities in the watershed, including the roles and responsibilities of federal, state, and county governments, as well as initiatives and collaborations involving regional entities, nonprofit organizations, and academic institutions;
- Overview and analysis of the roles and responsibilities of local governments;
- Inventory of local laws, and a gap analysis regarding local laws for each watershed municipality; and
- Preliminary recommendations for municipal governments focusing primarily on laws, as well as an overview of specific conditions in local towns and villages that present opportunities for best management practices.

Within the Owasco Lake watershed, there is significant variation in the degree to which municipal laws and municipal practices address protection of watershed resources, ranging from towns with overlay zoning to safeguard vulnerable areas (e.g., Fleming, Owasco, Skaneateles) to towns with few local laws to manage stormwater or control erosion and sediment loss. The findings of the inventory identify regions of the watershed where local laws and municipal practices can be modified to address nonpoint source pollution in a more effective manner. A summary of the current status indicates that there is room for substantial improvement.

- *Comprehensive plans* have been adopted by 82% (14/17) of municipalities In the Owasco Lake watershed, representing 73% of the watershed area.
- *Zoning laws* exist in 64% (11/17) of Owasco Lake watershed municipalities, representing 55% of the watershed area. In addition, 18% (3/17) of municipalities have zoning overlay districts (one Environmental Protection Overlay District and two watershed-related districts), representing 15% of the watershed area.
- *Subdivision regulations* exist in some form in 70% (12/17) of Owasco Lake watershed municipalities, representing 77% of the watershed area.
- *Site plan review* is required by 59% (10/17) of municipalities in the watershed, representing 51% of the watershed area.
- *Stormwater and Erosion Control Regulations (MS4)* have been formally adopted by 12% (2/17) of municipalities in the Owasco Lake watershed, which are designated as MS4 (meaning they have municipal separate storm

sewer systems). The Tompkins County MS4 includes Lansing and Dryden and represents less than 3% of the watershed area. However, any municipality can work toward voluntary compliance with MS4 guidelines and adoption of some stormwater management measures.

New York is a "home rule" state, with land use laws generally adopted and enforced at the municipal level. Consequently, the recommendations in Chapter 3 related to local laws focus on training, professional planning support, and circulation of model ordinances. There are a few regions of the watershed where strengthening local laws is a priority; regions with steep slopes, erodible soils, and development pressure are at higher risk of environmental degradation.

Although municipalities in New York State have broad powers to enact laws governing land use, state laws impose certain restrictions on local government authority. The Agriculture and Markets Law (Article 25-AA, Section 305-a) states that: "Local governments…shall not unreasonably restrict or regulate farm operations within agricultural districts in contravention of the purposes of this article unless it can be shown that the public health or safety is threatened" (NYSDOS and NYS Department of Agriculture and Markets 2013).

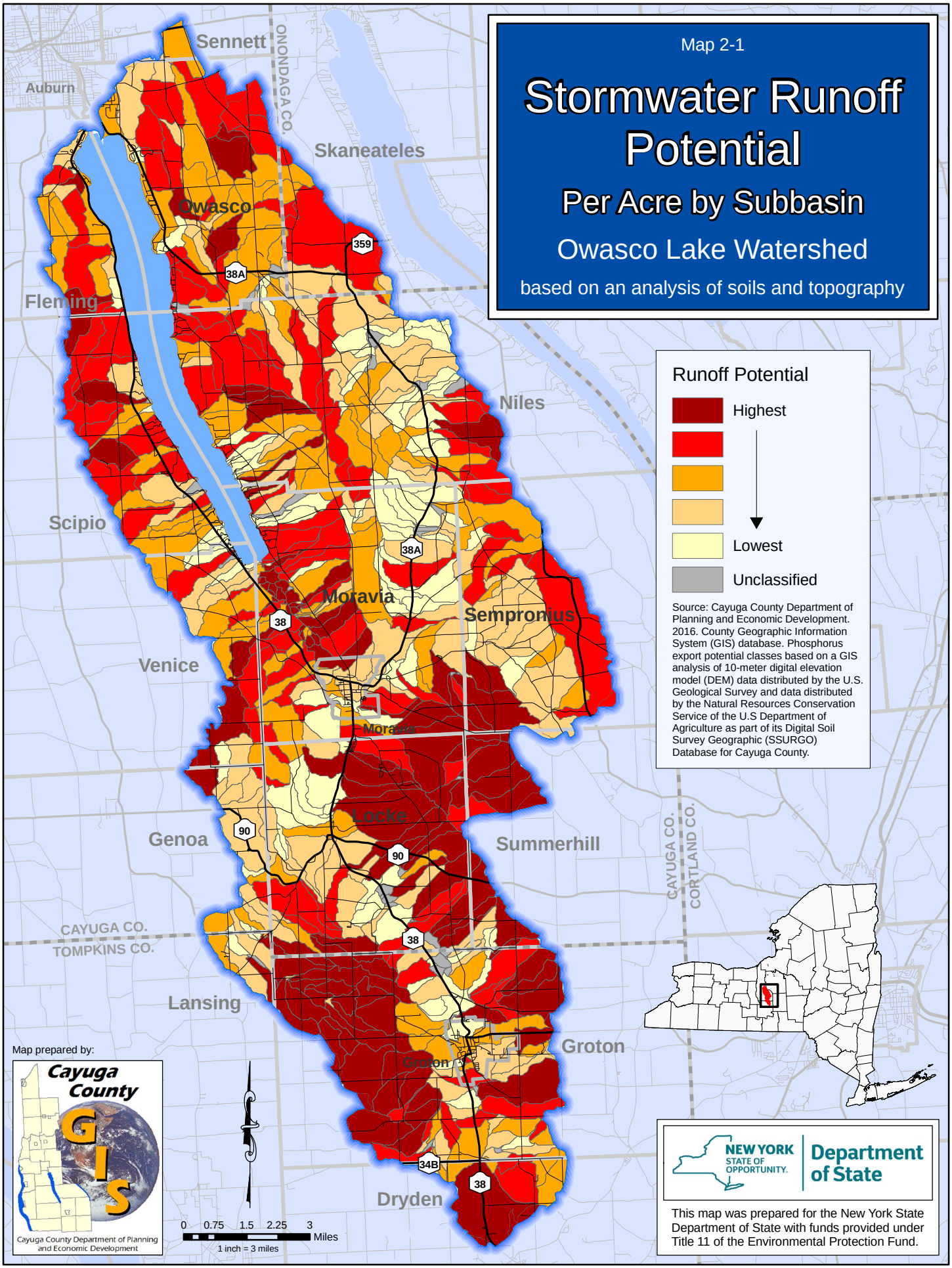
One way municipalities can address watershed-related agricultural issues is by encouraging farmers to participate in Agricultural Environmental Management (AEM) programs, which are overseen by the NYS Department of Agriculture and Markets and implemented through county-based Soil and Water Conservation Districts.

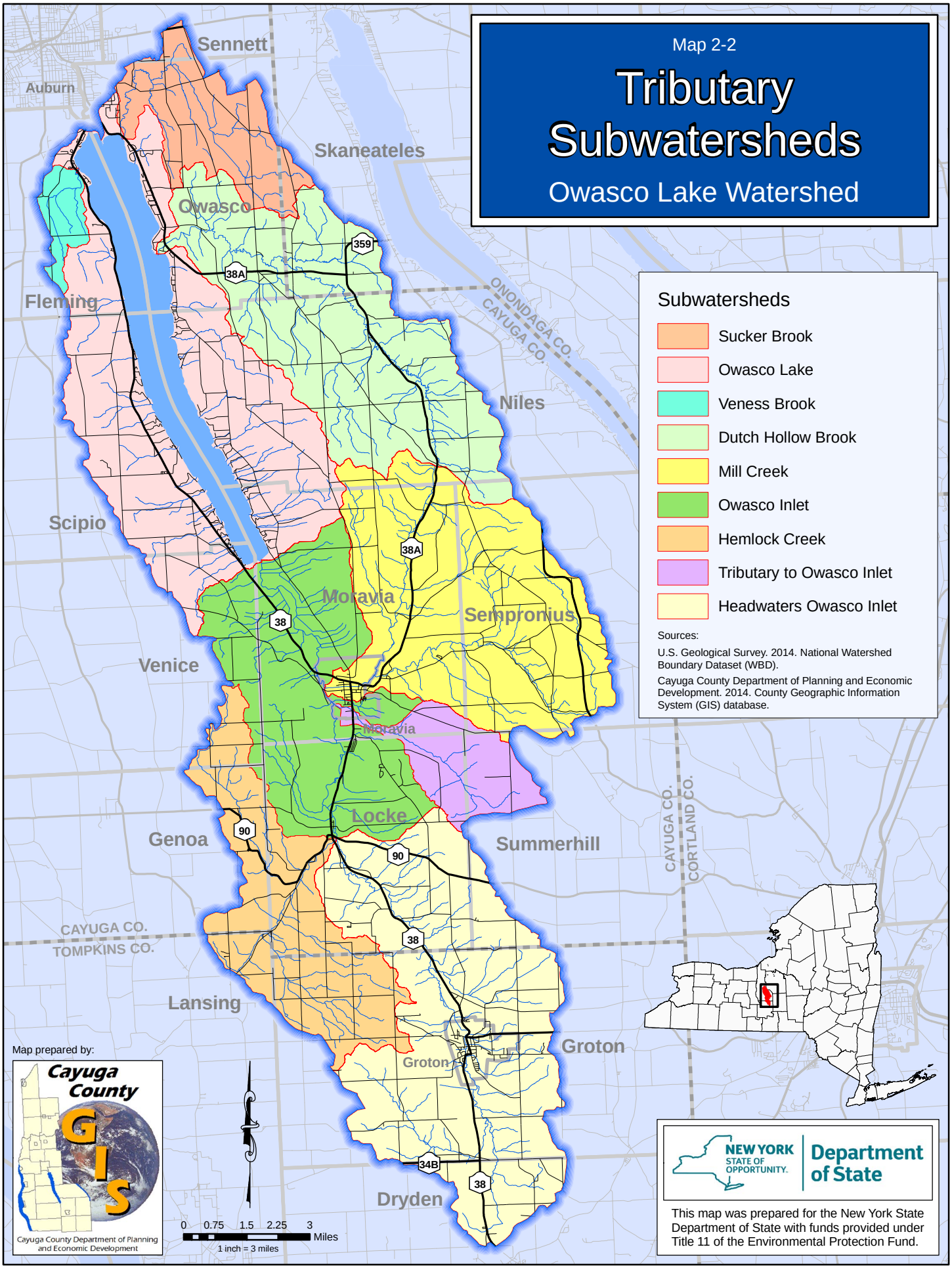
Because agriculture is such a significant land use in the Owasco Lake watershed and is so important to the region's economy, numerous governmental and nongovernmental organizations have developed documents and active collaborations/committees that focus on ways in which agriculture, the lake, and the watershed are woven together. These partnerships are essential for ensuring that the multiple uses of Owasco Lake and watershed can be sustained.

2.5 Emerging Issues

An impressive amount of data was reviewed during this effort to characterize the state of Owasco Lake and its watershed. While some indicators of progress are positive, particularly the institutional capacity dedicated to water resources management, there are other signs that Owasco Lake is trending toward a less stable condition. Changes in agricultural practices have led to more animals and more cultivated lands in the watershed. Episodes of intense rainfall carry phosphorus, both dissolved and particulate, and other pollutants from the landscape to the lake. Invasive species pose a threat to aquatic habitat, nutrient cycling, and the lake's capacity to fully support its designated uses for recreation and water supply. Terrestrial invasives could decimate ash and hemlock trees over the next five to twenty years, which are critical to stabilizing our wooded slopes and ravines. The potential erosion, sediment and clarity impacts could be enormous. Cyanobacterial blooms have become increasingly problematic for many lakes in New York, and Owasco Lake has not escaped this potentially serious threat to public health. Influencing the severity of all of these issues to various degrees is climate change. Warmer weather and more variable precipitation complicate efforts to manage lakes and watersheds.

The four emerging issues: agronomic practices, invasive species, cyanobacteria, and climate change adaptation are the focus of research and public education efforts across the Finger Lakes. Knowledge developed through these collaborative efforts has guided the recommended actions in Chapter 3. Clearly, actions well beyond the watershed boundaries will be required to address these challenges. The themes introduced in Chapter 1: the importance of an ecosystem approach, watershed management planning as a continual process, and the importance of intermunicipal collaboration permeate the recommendations and implementation strategy.


Map 2-1
Stormwater Runoff Potential
Per Acre by Subbasin
Owasco Lake Watershed
based on an analysis of soils and topography
Runoff Potential
Highest
Lowest
Unclassified
Source: Cayuga County Department of Planning and Economic Development. 2016. County Geographic Information System (GIS) database. Phosphorus export potential classes based on a GIS analysis of 10-meter digital elevation model (DEM) data distributed by the U.S. Geological Survey and data distributed by the Natural Resources Conservation Service of the U.S Department of Agriculture as part of its Digital Soil Survey Geographic (SSURGO) Database for Cayuga County.
Sennett
Auburn
ONONDAGA CO.
Skaneateles
Owasco
Fleming
Niles
Scipio
Moravia
Sempronius
Venice
Locke
Genoa
Summerhill
CAYUGA CO.
CORTLAND CO.
CAYUGA CO.
TOMPKINS CO.
Lansing
Groton
Dryden
359
38A
38
90
34B
Map prepared by:
Cayuga County
GIS
Cayuga County Department of Planning and Economic Development
0 0.75 1.5 2.25 3 Miles
1 inch = 3 miles
NEW YORK STATE OF OPPORTUNITY.
Department of State
This map was prepared for the New York State Department of State with funds provided under Title 11 of the Environmental Protection Fund.


Map 2-2
Tributary Subwatersheds
Owasco Lake Watershed
Subwatersheds
Sucker Brook
Owasco Lake
Veness Brook
Dutch Hollow Brook
Mill Creek
Owasco Inlet
Hemlock Creek
Tributary to Owasco Inlet
Headwaters Owasco Inlet
Sources:
U.S. Geological Survey. 2014. National Watershed Boundary Dataset (WBD).
Cayuga County Department of Planning and Economic Development. 2014. County Geographic Information System (GIS) database.
Sennett
Auburn
Skaneateles
Owasco
Fleming
Niles
Scipio
Moravia
Sempronius
Venice
Locke
Genoa
Summerhill
Lansing
Groton
Dryden
ONONDAGA CO.
CAYUGA CO.
CORTLAND CO.
TOMPKINS CO.
359
38A
38
90
34B
Map prepared by:
Cayuga County GIS
Cayuga County Department of Planning and Economic Development
0 0.75 1.5 2.25 3 Miles
1 inch = 3 miles
NEW YORK STATE OF OPPORTUNITY.
Department of State
This map was prepared for the New York State Department of State with funds provided under Title 11 of the Environmental Protection Fund.

Chapter 3. Recommendations for Watershed Management and Waterfront Revitalization

3.1 Introduction

This chapter presents a series of specific recommendations designed to bring about improved lake and watershed conditions. The recommendations reflect a site-specific analysis of the watershed's natural and built environment, current water quality conditions and trends, key sources of pollution, and the institutional framework in place for lake and watershed management. Some recommendations are oriented toward restoration—improving degraded land and water resources—while others are oriented toward protection. Members of the WAC and OLWMC and resource management agencies developed and screened several iterations of these recommendations from the perspective of feasibility, importance, applicability to the problems, community support, and capacity of the resource management agencies. The recommendations were presented and discussed at a well-attended public meeting. Additional feedback on the recommendations and their relative priority was solicited through an online public opinion survey (Appendix 1).

The recommendations are grouped into eight broad categories:

A. Planning
B. Measures to Reduce Nonpoint Source Pollution (from agriculture, streambanks, developed areas, municipal activities, and residential/community landscapes)
C. Lake Level Management
D. Monitoring and Assessment
E. Recreation and Waterfront Revitalization
F. Water and Wastewater Infrastructure
G. Institutional Structure for Lake and Watershed Management
H. Outreach and Education

For each of the specific recommendations within these categories, this chapter presents an overview of the need for action, benefits, and implementation priority and leadership. Chapter 4 presents a strategy and schedule for implementing these priorities.

3.2 Prioritization

A. Prioritization of Recommendations

The recommendations in this Plan have been assigned a priority of High, Medium, or Low by the WAC and OLWMC. These priorities reflect the importance and urgency of each recommendation with respect to meeting the goals for watershed protection and restoration, as well as institutional capacity, funding availability, and regulatory requirements. The priorities are assigned to each recommendation presented in Chapter 3, and are reflected in Chapter 4's more detailed list of actions that can be implemented to fulfill the goals of this Plan. The priorities set forth in this Plan may be refined once the subwatershed modeling effort, which is part of the USEPA's Nine Key Elements of Watershed Planning, has been completed.

B. Prioritization of Subwatersheds for Agricultural BMPs

Because agriculture is the dominant land use in the Owasco Lake watershed and represents a major source of phosphorus to the lake, implementation of agricultural best management practices is the highest and most urgent priority in this Plan. To help identify where the need for BMPs is most critical, each of Owasco Lake's subwatersheds has been assigned a

priority of High, Medium, or Low, based on three factors related to environmental conditions and land use in the subwatershed, discussed below. It is important to note that the assignment of priorities is based on information compiled on a subwatershed scale, and that individual areas vary in their susceptibility to loss of materials such as manure, fertilizers, and pesticides from the landscape. The planned watershed modeling effort will help pinpoint areas at greatest risk of nonpoint source pollution and incorporate site-specific knowledge of existing agricultural practices. In the interim, priorities for implementation of agricultural BMPs are based on consideration of the following three factors.

1. *Natural susceptibility to transport nonpoint source pollutants* was assessed based on the detailed analysis of watershed soil characteristics and topography discussed in Chapter 2, which ranked tributary subbasins according to how prone they are to become saturated during precipitation events and generate runoff. Results of this analysis (refer to Map 2-1) reveal a substantial variability across the watershed in the potential to generate runoff and therefore transport sediment and associated nutrients to waterways. To translate this potential for sediment/nutrient transport to the subwatershed level, these results were averaged for each subwatershed, which was then assigned to one of five levels of natural susceptibility to nonpoint source pollution **(Figure 3-1)**. Results of this analysis at the subwatershed level show that susceptibility was highest in the Fillmore tributary (Dry Creek) to Owasco Inlet, and second-highest in the Veness Brook, Sucker Brook, and Hemlock Creek subwatersheds.

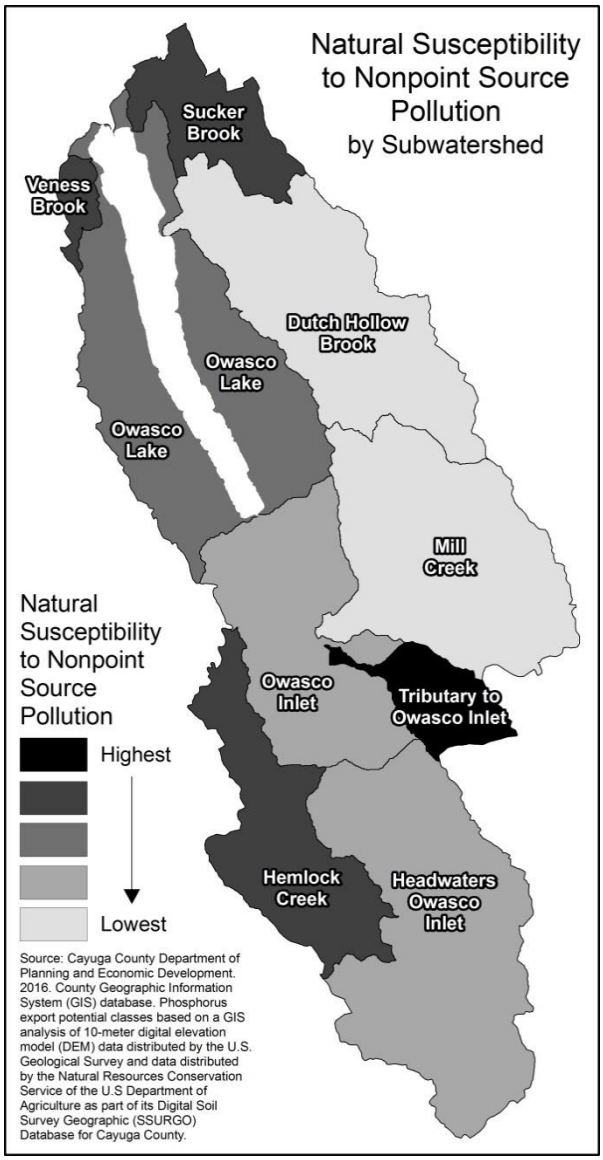


Figure 3-1. Natural Susceptibility to Nonpoint Source Pollution by Subwatershed

2. The importance of agriculture within each subwatershed was calculated as the total percentage of land cover devoted to crops and pasture (**Figure 3-2**). The subwatersheds where agriculture represents more than half of land cover are Veness Brook (80%), Sucker Brook (69%), Owasco Lake direct drainage (65%), Dutch Hollow Brook (64%), and Hemlock Creek (55%). The Fillmore tributary (Dry Creek) to Owasco Inlet subwatershed has the lowest percentage of agricultural land cover in the watershed.

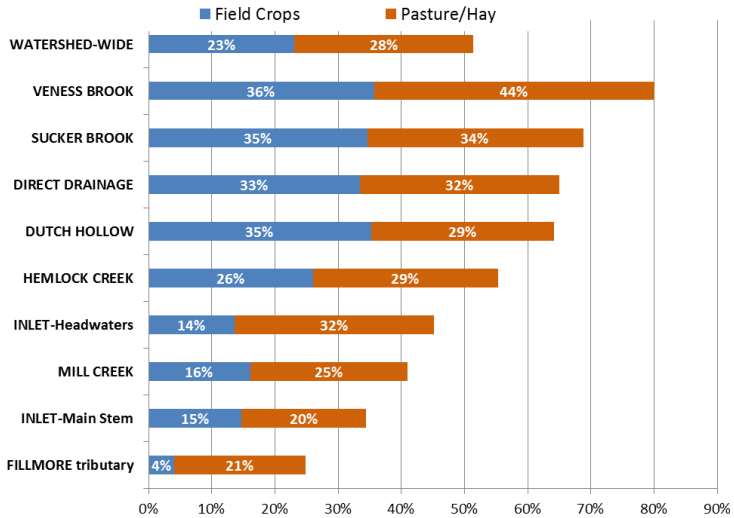


Figure 3-2. Importance of Agriculture in Subwatersheds

3. The number of miles of impaired stream segments, as designated on the NYSDEC PWL (2014), is the third factor indicating a need to implement BMP recommendations in each subwatershed. In calculating stream segment impairment, NYSDEC divides the Owasco Lake watershed into three major sub-areas that include the nine subwatersheds identified in this Plan (see Table 2-2).

Assignment of Priorities. Based on these three factors, the nine Owasco Lake subwatersheds were assigned a priority of

High, Medium, and Low with respect to the need for agricultural BMPs. Results of this subwatershed prioritization are summarized in **Table 3-1**, which provides the rationale for this preliminary assignment of priorities. The overall priority ranking for each of the subwatersheds is presented in **Map 3-1**. Priorities assigned to Owasco Lake subwatersheds for implementing agricultural best management practices are:

HIGH: Veness Brook, Sucker Brook, Owasco Lake direct drainage
MEDIUM: Dutch Hollow Brook, Hemlock Creek, Fillmore tributary (Dry Creek) to Owasco Inlet
LOW: Inlet headwaters, Inlet main stem, Mill Creek

Table 3-1. Subwatershed Prioritization Related to Agricultural BMPs

Subwatershed	Natural Susceptibility (5=high)	Land Use in Agriculture (%)	Impaired streambank (mi)	Prioritization and Overview/Rationale
VENESS BROOK	**4**	**80**	**89.4**	**HIGH.** The Veness Brook subwatershed has the *highest* proportion of land in active agriculture (80%) in the Owasco Lake watersheds, and is classified in the second-highest category (4) of natural susceptibility to nonpoint source pollution. It is grouped with subwatersheds that had the greatest number of miles of impaired streambanks in 2014.
SUCKER BROOK	**4**	**69**		**HIGH.** The Sucker Brook subwatershed has the second-highest proportion of agriculture in the Owasco Lake watershed (68%), and is classified in the second-highest category (4) of natural susceptibility to nonpoint source pollution. It is grouped with subwatersheds that had the greatest number of miles of impaired streambanks in 2014.
OWASCO LAKE Direct Drainage	**3**	**65**		**HIGH.** The subwatershed draining directly to Owasco Lake has the third-highest proportion of agriculture in the Owasco Lake watershed (65%), and is classified in the middle category (3) of natural susceptibility to nonpoint source pollution. It is grouped with subwatersheds that had the greatest number of miles of impaired streambanks in 2014.
DUTCH HOLLOW BROOK	1	**64**	68.5	**MEDIUM.** Although a substantial proportion (64%) of the Dutch Hollow Brook subwatershed is devoted to agriculture, it is one of the two subwatersheds *least* susceptible to nonpoint source pollution. Grouped with Mill Creek subwatershed, it had a moderate number of miles of impaired streambanks in 2014.
MILL CREEK	1	41		**LOW.** Less than half of the Mill Creek subwatershed (41%) is devoted to agriculture, and it is one of the two subwatersheds *least* susceptible to nonpoint source pollution. Grouped with the Dutch Hollow Brook subwatershed, it had a moderate extent of impaired streambanks in 2014.
HEMLOCK CREEK (drains to Inlet)	**4**	**55**	59.1	**MEDIUM.** Although the Hemlock Creek subwatershed has a moderate proportion of land use in agriculture (55%), it is one of three subwatersheds in the second-highest category (4) of natural susceptibility to nonpoint source pollution. It is grouped with subwatersheds that had the fewest miles of impaired streambank in 2014.
INLET FILLMORE TRIBUTARY (Dry Creek)	**5**	25		**MEDIUM.** Although the Fillmore tributary (Dry Creek) to the Owasco Inlet is highly *susceptible* (5) to nonpoint source pollution, this tributary is well buffered by forest and has the lowest proportion (25%) of agricultural land use in the watershed. It is grouped with subwatersheds that had the fewest miles of impaired streambank in 2014. Because of this area's high susceptibility to nonpoint source pollution, any expansion of agriculture in this subwatershed would be require careful design of BMPs.
INLET headwaters	2	45		**LOW.** Less than half of the Owasco Inlet headwaters subwatershed (45%) is devoted to agriculture, and it is it is in the second-lowest category of susceptibility to nonpoint source pollution. It is grouped with subwatersheds that had the fewest miles of impaired streambank in 2014.
INLET main stem	2	34		**LOW.** Only one-third of the Owasco Inlet main stem subwatershed (34%) is devoted to agriculture, and it is in the second-lowest category of susceptibility to nonpoint source pollution. It is grouped with subwatersheds that had the fewest miles of impaired streambank in 2014.

3.3 Recommendations

A. PLANNING

Recommendation A-1: Continue to Incorporate the EPA's Nine Key Elements of Watershed Planning into the *Owasco Lake Watershed Management and Waterfront Revitalization Plan*

Overview

The federal Environmental Protection Agency has issued guidance regarding watershed planning and has identified the following nine key elements as critical for achieving improvements in water quality:

1. Identify the causes and sources of pollution.
2. Estimate pollutant loading into the watershed and the expected load reductions to be realized with implementation of the recommended actions.
3. Describe management measures that will achieve load reductions and target critical areas.
4. Estimate the amounts of technical and financial assistance and the relevant authorities needed to implement the plan.
5. Develop an information/education component.
6. Develop a project schedule.
7. Describe the interim, measurable milestones.
8. Identify indicators to measure progress.
9. Develop a monitoring component.

Watershed management plans that meet these nine key elements are eligible to apply for federal funds to implement the recommended actions. In New York, the NYSDEC is encouraging development of watershed management plans that fully comply with the nine key elements. The *Owasco Lake Watershed Management and Waterfront Revitalization Plan* addresses most of these nine key elements. Additional work is necessary, however, to develop and incorporate a more quantitative evaluation of pollutant sources and loading rates. This modeling work will support a detailed analysis at the subwatershed scale to identify which best management practices (BMPs) are best suited for this watershed, where in the watershed the BMPs will be most effective (prioritization), and how effective the recommended practices will be in reducing pollutant loads to Owasco Lake.

A coordinated effort to advance the watershed analysis and modeling required to produce a nine elements plan is underway and will continue with additional NYS Environmental Protection Fund Local Waterfront Revitalization funding awarded in late 2015. This first recommendation of the Plan is central to providing information to guide implementation of the recommended actions that follow in an efficient and cost-effective manner. By targeting resources to specific locations and practices with the greatest potential for pollutant loss, the community investment in the long-term health of Owasco Lake and its watershed will be maximized.

Regulatory and Programmatic Action

a. Integrate the planning, coordination, monitoring, and modeling necessary to expand the *Owasco Lake Watershed Management and Waterfront Revitalization Plan* so that it fully addresses the nine key elements identified by the USEPA as critical for achieving improvements in water quality.

Benefits to Owasco Lake and Watershed

Expanding this Plan to address each of these nine elements, apply quantitative nutrient loading models, and specify most appropriate best management practices in targeted areas will help direct resources for restoration and protection measures. In addition, this information can inform further design of monitoring and assessment programs. The community investment in restoration and protection measures can be optimized.

Priority: High

Leadership: Cayuga County Department of Planning and Economic Development

B. MEASURES TO REDUCE NONPOINT SOURCE POLLUTION

Recommendation B-1: Control Agricultural Nonpoint Sources

Overview

Since agriculture is a predominant land use, it is an important contributor of phosphorus and sediment to Owasco Lake. As such, it is vitally important to identify and implement best management practices that will help keep nutrients and sediments on the landscape. At the same time, it is essential to recognize the central role of farming in meeting local food needs and supporting the broader regional economy. The recommended actions include both regulatory and programmatic measures to provide technical support and cost-sharing to producers, as well as specific restoration and protection measures designed to minimize the potential for nonpoint source pollution from agriculture. Overall, these recommendations are considered to represent the most urgent and important actions within this Plan.

Regulatory and Programmatic Actions

a. Identify existing regulatory and programmatic measures that could impede implementation of improved agricultural practices, and work to remove these barriers. (For example, cost tradeoffs that could make it more profitable for farmers to reduce buffers than to improve practices.)

b. Seek additional sources of support for agriculture programs and services provided by county Soil and Water Conservation Districts (SWCDs) and Cornell Cooperative Extension (CCE) that are aimed at reducing nutrient and sediment loss. Support for these efforts is critical to fulfilling goals for the watershed, given the significance of agriculture as a land use and as a source of phosphorus to Owasco Lake.

c. Enforce the existing water supply regulations prohibiting direct, unrestricted access to streams by livestock and manure runoff from agricultural fields.

d. Coordinate and improve communications between the agricultural community and other watershed stakeholders in topics including but not limited to:

- The need for investment of public and private funds to help advance installation of BMPs within the Owasco Lake watershed.
- Water quality impacts of certain agricultural practices.
- The progress being made in mitigating the water quality impacts of agriculture though the implementation of BMPs.
- The contribution of nutrients to the watershed via agricultural drain tiles and measures to minimize this contribution.

Restoration and Protection Actions

e. Implement agricultural BMPs tailored to the Owasco Lake watershed to reduce the loss of soil, nutrients, fertilizers, animal wastes, crop residues, and pesticides from the landscape.

- Identify priority areas for BMP implementation.
- Identify site-specific BMPs tailored to the Owasco Lake watershed such as: cover crops, riparian (streamside) buffers, grassed waterways, hedgerow establishment/maintenance, vegetative buffers/filter strips, and livestock exclusion/access controls, and conduct baseline monitoring to determine current loading to receiving waters.
- Pursue funding to design and implement site-specific BMPs in priority areas; explicitly considering the impacts of climate change on the risk of nonpoint source pollution from agricultural lands when designing BMPs.
- Integrate these site-specific BMPs into the programs and initiatives of the Agricultural Environmental Management (AEM) activities.
- Document progress in reducing sediment and nutrient losses after implementation of BMPs, document effectiveness of BMPs, refine priority areas, and identify the need for additional measures.

f. Assist in implementing the recommendations of the Cayuga County Manure Management Working Group's Advisory Committee, including those addressing:

- Adoption of the most recent updates of the NRCS Conservation Practice Standard 590 (NY) – Nutrient Management, which provides standards on how manure is applied to soils.
- Manure application practices on frozen, snow-covered or saturated soils to prevent runoff; building storage as needed.
- Incorporation of surface-applied manure into the soil as soon as possible after application; incorporation of surface applied liquid manure within 48 hours of application unless it is applied to growing crops or on soil with more than 30% plant residue ground cover.
- Encouraging NYSDEC enforcement actions to focus compliance efforts on farms with repeated violations and set fines at a level that would deter willful violations.
- Using fines collected as a result of enforcement actions against farms or other entities to help finance the implementation of agricultural practices that will reduce nutrient and sediment export in the same region or watershed.

g. Support the development and use of technologies including but not limited to:

- Mobile device applications designed to couple maps of hydrologically sensitive areas of the landscape with weather predictions to help farmers reduce risk of runoff of surface-applied manures.
- The nutrient boom, a new technology that delivers manure to the surface of the ground in *growing* crops through flexible hoses attached to a boom applicator.

h. Provide technical assistance to farms of all sizes for the purpose of ensuring that emergency response procedures and resources are in place to address manure, fertilizer, and milk releases from transportation, storage, and application accidents.

i. Utilize experts and professionals with information tailored to Central New York/Finger Lakes conditions, such as Cornell University, CCE, SWCDs, CNY Regional Planning and Development Board (CNYRPDB), northeast dairy producer groups, milk cooperatives, local research farms, etc., as well as regional and national experts, to identify and promote measures that will reduce the use of pesticides and the loss of nutrients and sediment from the landscape. Examples include:

- Phosphorus index for fertilization rates.
- Feed management as a tool to optimize feed efficiency and ultimately reduce nutrient content of animal waste.
- Integrated pest management.
- Planning for design storms.

Benefits to Owasco Lake and Watershed

These agricultural nonpoint source recommendations are of critical importance for the future of Owasco Lake, in terms of water quality conditions and support of its designated use as a recreational asset and water supply. In addition, continued investment in BMPs will support the viability of the agricultural economy with all its associated benefits to the fabric of the community and the regional rural character and open space.

Priority: High. *Because of the overall significance of agriculture as a land use and as a source of phosphorus to Owasco Lake, implementation of the agricultural best management practices is the highest and most urgent priority.*

Leadership: Owasco Lake Watershed Management Council and the Cayuga County Water Quality Management Agency, in conjunction with Cayuga County SWCD, the Owasco Lake Watershed Inspection Program, and other agricultural support agencies.

Recommendation B-2: Stabilize Streambanks in Priority Areas

Overview

While sediment transport by streams is a natural process, acceleration of this natural process by changes in land use and vegetative cover can lead to substantial downstream transport of sediments with adverse impacts on the watershed and the lake. Annual monitoring efforts of the Finger Lakes Institute/Hobart and William Smith Colleges, in addition to visual observations by watershed residents, document that vast amounts of sediment reach Owasco Lake during high runoff conditions. Often this sediment is associated with eroding streambanks and beds in the tributary subwatersheds. The contribution of intermittent streams and rivulets is not well understood.

Major tributaries to Owasco Lake (including Dutch Hollow Brook, Veness Brook, Sucker Brook, and Owasco Inlet) have been surveyed to identify regions where bank repairs or stabilization will reduce the erosion and transport of streambank and bed material. Several segments have been restored and stabilized, but additional areas remain. Continued action on this initiative is needed.

Regulatory and Programmatic Actions

a. Pursue funding to complete additional projects as defined by the subwatershed streambank assessment programs.

Restoration and Protection Actions

b. Design and implement stream restoration to restore (or mimic) natural hydrologic and biological processes using soft or vegetative engineering, and take into account the most recent projections of effects of climate change on frequency and intensity of rainfall and associated changes in stream velocity.

c. Coordinate annual monitoring efforts to refine priority areas and document the effectiveness of restoration measures.

Benefits to Owasco Lake and Watershed

Reducing streambank erosion will benefit the lake and watershed. On the landscape, streambank erosion can result in stream channel instability, loss of productive lands, and loss of habitat for stream and riparian biota. In the lake, excessive sediment inflows degrade water clarity and can interfere with water treatment processes. Sediment deposition within the lake affects benthic habitat and may expand the littoral area supporting macrophyte growth. Finally, sediment particles may transport plant nutrients, pesticides, and other potential contaminants downstream. Streambank stabilization and protection of riparian areas will help to prevent or reduce these negative impacts of sediment transport.

Priority: High (long-term project)

Leadership: Cayuga County SWCD, Owasco Lake Watershed Management Council, Cayuga County Department of Planning and Economic Development

Recommendation B-3: Adopt or Amend Local Regulations Designed to Reduce Nonpoint Source Pollution from Developed Areas

Overview

While the Owasco Lake watershed is rural with large expanses of open space, runoff from developed areas potentially contributes sediment, fertilizers, pesticides, and other pollutants to Owasco Lake and its tributary streams. Sediment loss during construction is of particular concern. This recommendation encompasses changes to local municipal regulations to manage runoff from developed areas including commercial development, residences, schools, golf courses, parks, etc.

Regulatory and Programmatic Actions

a. Assist watershed municipalities in efforts to amend their local laws to institute/implement/adopt best practices to control nonpoint source pollution.

- Review the completed inventory and municipal nonpoint source assessment from the "Owasco Lake Watershed Institutional Framework and Assessment of Local Laws, Programs, and Practices Affecting Water Quality" with representatives from each municipality (local town/village board, planning board, zoning board of appeals, and codes enforcement) and identify areas for improvement.
- Review local land use regulations and amend them to improve consistency among watershed municipalities and address specific water quality concerns. Specific topics may include but are not limited to the following:
    - Compliance with New York's SPDES Stormwater Construction Permit requirements
    - Lakeshore/riparian overlay district
    - Sediment and erosion control
    - Limitation of impervious cover
    - Restriction of development on steep slopes
    - Riparian setbacks or buffer strips for non-agricultural parcels
    - Prevention of development pressure due to sewer line extensions
    - Stream setback standards developed as part of the Community Risk and Resiliency Act
- Circulate model ordinances to watershed communities and advocate for their adoption.

b. Continue to offer training to municipalities on issues such as building on steep slopes; riparian protection and restoration; floodplain protection; stormwater design, permitting, and inspection; and erosion and sediment controls.

c. Seek funds to assist municipalities with updates to local regulations.

d. Advocate that municipalities incorporate projections of climate change in calculations of design storms and runoff events used for mitigation measures and sizing of infrastructure within their regulations.

Benefits to Owasco Lake and Watershed

There are significant differences among the watershed municipalities with respect to their requirements for setbacks, site plan review, erosion and sediment controls during construction, subdivision ordinances, and impervious surface requirements. While not all tools are appropriate for all municipalities, opportunities exist to reduce nonpoint source pollution from development. This will ultimately serve to reduce the input of sediment and other potential contaminants to Owasco Lake and tributaries.

Priority: High

Leadership: Cayuga County Department of Planning and Economic Development

Recommendation B-4: Reduce Nonpoint Source Pollution from Municipal Activities

Overview

Municipal activities can have an effect on water quality both through formal and informal programs and through the choices municipalities make as they manage their own facilities. In addition, road installation and maintenance activities can affect local hydrology and increase the risk that stormwater runoff will increase pollutant transport to waterways. The rural Owasco Lake watershed is no exception. There are approximately 480 miles of maintained roads within the watershed; of these, approximately one quarter (120 miles) are state or county highways; the rest are local roads maintained by towns and villages. Maintenance practices are designed to optimize driver safety, especially during winter conditions, and to keep the roads in good condition. Consequently, deicing materials are applied, and roadway ditches are installed to move water off the roadbed. These actions affect the movement of water and materials, and can have negative effects on downstream waterways. This recommendation seeks to minimize, to the extent possible, potentially adverse water quality impacts of the watershed's transportation network.

Regulatory and Programmatic Actions

a. Target training specifically to watershed-related issues for municipal land-use decision makers and personnel.

b. Provide training to watershed municipalities of all sizes to adopt best practices related to stormwater management, and strive for compliance with the most recent MS4 requirements.

c. Incorporate New York State Department of Transportation (NYSDOT) design and guidance documents, standard specifications, and procedural manuals into local laws and highway department operating procedures.

d. Encourage municipalities to take advantage of training programs such as Cornell Local Roads.

e. Investigate and implement innovative approaches to stormwater management including requirements for enhanced phosphorus removal.

f. Encourage watershed municipalities to participate in programs on environmental impacts of road maintenance practices, including the application of deicing materials and model roadside ditch efforts.

g. Assist watershed municipalities in sharing resources (including equipment, training, personnel, standard operating procedures, etc.).

Restoration and Protection Actions

h. Implement best management practices at municipal facilities to reduce nonpoint source pollution, including but not limited to:

    - Complete facilities inventory of operational and onsite materials handling and storage practices and procedures
    - Disconnection of rooftops, driveways and floor drains from the stormwater system
    - Secondary containment of fuel storage
    - Cover sand and salt stockpiles
    - Identify hydrologically sensitive areas that may be unsuitable for snow disposal
    - Oil/water separators in garages
    - Hazardous material storage and disposal

i. Stabilize ditches as soon as possible following maintenance, with priority in regions proximate to Owasco Lake and tributaries; work with the SWCD to specify optimal seed mixes.

j. Remediate eroding ditches and make improvements including plantings that will reduce the risk of future erosion; work with the SWCD to specify optimal seed mixes.

k. Incorporate projections of changes in the frequency, intensity, and magnitude of precipitation events due to climate change on the design of infrastructure (culverts, ditches, bridges, etc.).

l. Stop applying herbicides to rights-of-way and streambanks at road crossings.

m. Investigate the feasibility of using alternative deicing materials that may be less harmful to the watershed and of installing computer-controlled spreaders of deicing materials on plow trucks to reduce the quantity of deicers used; if feasible, install on trucks assigned to watershed roadways.

n. Ensure that emergency response procedures and resources are in place to address fuel and chemical releases from transportation and storage accidents.

Benefits to Owasco Lake and Watershed

Municipal practices can have an effect on water quality, and the implementation of best management practices can help reduce the impact to Owasco Lake. Road ditches are both a source of potential contamination to the waterways and a conduit for contaminants from other upland sources. Improved practices will help reduce the transport of sediment, nutrients, and other materials from the landscape.

Priority: Medium

Leadership: Municipalities (Town Supervisors, Highway Superintendents), Cayuga County Department of Planning and Economic Development, Soil and Water Conservation Districts, Owasco Lake Watershed Inspection Program, Owasco Lake Watershed Management Council

Recommendation B-5: Reduce Nonpoint Source Pollution from Residential Property and Community Landscapes

Overview

Homeowners and property managers in the Owasco Lake watershed can reduce their potential to cause or contribute to nutrient, bacteria and sediment inputs to Owasco Lake and its tributary streams through programs and practices on their own property and in community settings such as schools, parks, businesses and golf courses.

Restoration and Protection Actions

a. Plant new vegetation (using native species) and maintain existing vegetation to protect streambanks and lakeshore areas.

b. Plant trees, construct rain gardens and install other "green infrastructure" on private property.

c. Identify and stabilize areas of streambank/lakeshore erosion on private property; enlist SWCD and other experts to define practical solutions and assign priorities for streambank restoration.

d. Conduct stream, lakeshore, and roadside cleanup events.

e. Educate homeowners and property managers on landscaping that is protective of water quality, and recognize those who install landscaping that is protective of water quality.

f. Provide proper maintenance to septic systems.

Benefits to Owasco Lake and Watershed

Homeowners and property managers can improve the quality of the water entering Owasco Lake and its tributaries from their property and the properties they manage.

Priority: High

Leadership: Owasco Lake Watershed Inspection Program, Cayuga County Health Department

C. LAKE LEVEL MANAGEMENT

Recommendation C-1: Plan for Lake Level Adjustments

Overview

The outflow of water from Owasco Lake, and thus the lake level, is controlled by the operation of the State Dam on Pulsifer Drive, downstream of the lake outlet. The City of Auburn is responsible for operation of the dam and maintaining the lake level, under a set of operating conditions known as the Owasco Lake rule curve. Lake level management throughout the Seneca-Oswego-Oneida basin is coordinated by a series of rule curves intended to provide protection from flooding while maintaining adequate water levels and flows for the multitude of users and interests; these interests include water supply, navigation, fish and wildlife habitat, recreational use, power generation, and assimilation of treated wastewater.

The current Owasco Lake rule curve was formalized in 1984 by the United States Army Corps of Engineers (USACOE) following an analysis of the effect of seasonal water levels on the lake's capacity to support and balance these multiple uses. Currently, lake levels are managed seasonally; levels are higher in the summer to support recreation and lower in the winter to provide storage capacity for spring rains and snow melt. The rule curve was developed based on an understanding of the environmental and cultural conditions at that time, but without lake water quality as a criterion. Three decades later a number of these conditions have changed. The weather is more variable, exotic species have invaded, and concerns about septic field performance and shoreline erosion have grown. The interplay of lake level with water quality issues needs to be added to the evaluation. The extreme winter of 2014/2015 led to ice scour conditions that threatened and damaged private property and public infrastructure. This recommendation calls for a multi-agency collaborative reexamination of lake level management decision criteria.

Regulatory and Programmatic Actions

a. Establish a formal working group of interested parties to develop decision criteria and lines of communication regarding short-term adjustments to lake level and the rule curve, with members representing the City of Auburn, Village of Port Byron, Towns of Owasco, Niles, Moravia, Venice, Scipio and Fleming, USACOE, Region 7 NYSDEC, Cayuga County Department of Health, Cayuga County Department of Planning and Economic Development, Cayuga County SWCD, Cayuga County Flood Hazard Mitigation Engineer, Cayuga County Hazard Mitigation Coordinator, OLWMC, and OWLA.

b. If short-term lake level adjustments do not provide adequate lake level management due to erosion and water quality concerns, climate change, increased demand for water, recreational uses, or invasive species management, initiate a formal review of the rule curve.
    - Commit local funds needed to prepare a formal request to the USACOE.
    - Investigate the availability of grant funds, such as funding through the Great Lakes Restoration Initiative (GLRI) program, to help offset costs associated with ACOE review of the formal request.

Benefits to Owasco Lake and Watershed

Preliminary discussions among an ad-hoc group of stakeholders and regulators have been positive. The benefit of formalizing a working partnership is ensuring that local input is brought forward in a timely manner, thus helping the Owasco Lake watershed community respond to changing conditions.

Priority: Medium

Leadership: Owasco Lake Watershed Management Council, City of Auburn

D. MONITORING AND ASSESSMENT

Recommendation D-1: Integrate Monitoring Programs, Consolidate Data, and Report Progress

Overview

Multiple agencies and organizations monitor the quality of Owasco Lake and its tributary streams for a variety of objectives. The public water suppliers test raw water and finished water for compliance with regulatory limits on chemicals, turbidity, and microorganisms. The NYSDEC conducts occasional monitoring to evaluate whether water quality and aquatic habitat conditions are adequate to support the designated uses of the waterways. The Finger Lakes Institute's Dr. John Halfman monitors the trophic state of Owasco Lake and samples various tributary streams to estimate their contribution of sediment and nutrients to the lake. Other researchers from USGS and local academic institutions test the quality of groundwater to, among other objectives, evaluate the effectiveness of existing controls on pesticides. Cayuga County SWCD has a number of collaborative projects with academic institutions to evaluate the effectiveness of agricultural best management practices. The Cayuga County Health Department tests the water at public bathing beaches for microbiological quality. The Owasco Lake Watershed Inspection Program staff and volunteers from the Owasco Watershed Lake Association collect samples from various locations in the lake and streams. Recently, lake monitoring has expanded to include cyanobacteria and toxin levels.

To date, these various monitoring efforts have remained distinct and uncoordinated. This recommendation is directed at bringing parties together to develop an integrated and collaborative approach to monitoring. Moreover, the recommendation addresses data compilation, data accessibility, and communication of key findings to stakeholders. CCPED directed a portion of its 2015 FLLOWPA allocation toward developing an integrated database. This project, initiated as part of the USEPA nine key elements planning, provides a platform to archive and analyze data from multiple sources. The final component of this recommendation is to communicate results and findings to the watershed community each year.

Restoration and Protection Actions

a. Identify and convene interested parties to develop, update, and implement annual monitoring/sampling plans that include:

    - Description of priorities and objectives
    - Identification of opportunities to share resources
    - Quality control standards, including development of a Quality Assurance Project Plan
    - Approaches to data analysis and interpretation
    - Requirement of samplers to geo-reference sample locations (i.e., include latitude and longitude coordinates), use consistent site names or codes, and document metadata
    - Assignment of specific personnel who will enter the monitoring data into a database each year and perform quality control checks
    - Provisions for continued operation and maintenance of the United States Geological Survey (USGS) gage stations.

b. Identify current funding sources and seek out additional sources that could be utilized in implementing the plans.

c. Designate a responsible party to review and upload data annually to the integrated database; make the database available to all.

d. Develop and implement standard communication protocols for all organizations involved in monitoring. These protocols should help these organizations to:

    - Communicate the monitoring goals.

- Explain how the results might vary in significance based on variations in sampling location, conditions and analytical techniques.
- Distribute results.
- Help the public interpret the results with respect to relative risk to human health and the environment.

e. Prepare and distribute an annual Report Card for a general audience summarizing conditions in the lake and watershed, progress toward implementing the *Owasco Lake Watershed Management and Waterfront Revitalization Plan*, and the status of funding requests.

Benefits to Owasco Lake and Watershed

Monitoring is expensive. By bringing the various investigators together, it is anticipated that a more efficient program design will emerge, focused on the particular issues and spatial locations of greatest concern. A consolidated database that is available to all parties will increase transparency and demonstrate the value of data collection. It will synthesize information in a way that could, over time, provide new insights into changing conditions across the watershed as a whole. This institutional arrangement also positions the watershed research ad monitoring community to respond to emerging issues such as pharmaceuticals. Annual reporting provides an opportunity to track progress and identify emerging concerns.

Priority: High

Leadership: Owasco Lake Watershed Management Council, Cayuga County Department of Planning and Economic Development

E. RECREATION AND WATERFRONT REVITALIZATION

Recommendation E-1: Address Invasive Species Issues

Overview

Many invasive species of plants and animals have become firmly established in the Finger Lakes region in recent decades, and other species are poised to follow. Current invasives in the watershed include Asian clam, hemlock woolly adelgid, and Chinese mystery snail, while hydrilla and water chestnut are in neighboring waterbodies. Invasive species have the potential to affect Owasco Lake and watershed in many ways, altering the fundamental cycling of nutrients and energy in the ecosystem as well as threatening the human-centered uses. Recognizing the regional nature of this threat, various resource management agencies have collaborated on information development and dissemination, surveillance and monitoring, and response. The recommendations of this Plan build on these regional alliances, with a focus on prevention, early detection and rapid response.

Prevention is a key element. Educating boaters and others who may transfer species between lakes is essential, as is an effective watercraft inspection program. It is also important to educate landowners about insects that can kill their trees, which could in turn lead to erosion. Early detection and rapid response is the next level of protection, as invasive species are far easier to control in the early stages of establishment in the water or on the landscape. Once species are established, local control and management may be necessary to keep populations at manageable levels.

Regulatory and Programmatic Actions

a. Continue active engagement with regional partners to share information and knowledge.

Restoration and Protection Actions

b. Employ watercraft stewards during peak recreational periods.

c. Provide signage and information at marinas and boat launches and public rights-of-way.

d. Continue annual monitoring and control measures to reduce the population of the Asian clam (*Corbicula fluminea).*

e. Develop a template rapid response plan that could be used for *Hydrilla verticillata,* water chestnut, and other invasive aquatic species including phytoplankton and zooplankton.

f. In coordination with other NYS agencies and researchers, develop a plan to respond to the invasion of hemlock wooly adelgid, emerald ash borer, and emerging terrestrial threats in the watershed.

g. Explore the feasibility of boat washing stations, and if feasible, look for funding to implement.

Benefits to Owasco Lake and Watershed:

The benefits of this recommendation may be framed as avoiding serious adverse impacts. The threats to Owasco Lake and watershed are serious, and local actions are necessary but probably will not be sufficient. Efforts to control invasive species are far easier under conditions of early detection and rapid response.

Priority: Medium

Leadership: Cayuga County Department of Planning and Economic Development, Finger Lakes Institute and Finger Lakes Partnership for Invasive Species Management (FL-PRISM), Cornell University Cooperative Extension, Owasco Lake Watershed Inspection Program, Cayuga County Parks and Trails, Marinas on Owasco Outlet and Lake

Recommendation E-2: Manage Aquatic Vegetation in Owasco Lake

Overview

Owasco Lake has a relatively small amount of littoral habitat, defined as the region where sunlight can penetrate to the sediment surface. The shallow southern basin, northern basin, and limited areas of the eastern and western shorelines have suitable littoral habitat and support aquatic plants (macrophytes). Macrophytes are an essential component of the lake ecosystem and provide multiple benefits including stabilizing sediments and providing habitat and shelter for the aquatic biota. However, an abundance of aquatic vegetation can reach nuisance levels in some areas of Owasco Lake, interfering with recreational use and navigation (e.g., by impeding swimming and boat propellers).

The Cayuga County SWCD manages a mechanical harvesting program in several lakes, including Owasco. The amount of plant material removed from the lake varies each year, depending on the number of days of harvesting, plant density, and conditions during the operation. There are other potentially effective techniques to manage aquatic vegetation such as installing bottom barriers (benthic mats) and lowering the lake level in the winter. This recommendation addresses measures to help manage aquatic vegetation in Owasco Lake and focuses on sharing knowledge with other resource managers as they seek to mitigate this common impediment.

Regulatory and Programmatic Actions

a. Continue to partner with regional agencies such as FLLOWPA and the Finger Lakes PRISM to review macrophyte management techniques that would prevent or address overabundance.

Restoration and Protection Actions

b. Continue to support weed harvesting by Cayuga County SWCD in problem areas.

c. Review and update “Aquatic Weeds: Nuisance and Necessity: Managing Waterweeds in Cayuga, Owasco and Seneca Lake,” republish and advertise its availability.

d. Seek additional confirmation that lowering winter lake level reduces aquatic vegetation survival or density; implement program if it is successful.

Benefits to Owasco Lake and Watershed:

Managing macrophyte growth can enhance the usability of the lake for recreation and navigation and improve the taste and odor of drinking water obtained from the lake. In addition, removal of harvested plant biomass can reduce the standing crop of nutrients and organic material in the lake.

Priority: Medium

Leadership: Cayuga County Department of Planning and Economic Development, Cayuga County SWCD

Recommendation E-3: Monitor Harmful Algal Blooms and Keep the Public Informed

Overview

Harmful algal blooms (HABs) have become a common occurrence on Owasco Lake since 2010. Recent monitoring of Owasco Lake phytoplankton has confirmed that cyanobacteria, also known as blue-green algae, are present and tend to increase in relative abundance as the summer progresses. Certain species of cyanobacteria exude harmful toxins that can affect the liver, neurological system, or skin. When present in large quantities as "blooms," some cyanobacteria can pose a significant potential threat to human and ecological health. Dogs are also vulnerable to adverse health impacts from entering waters with cyanobacterial bloom conditions. While there is no simple answer to why these blooms develop, they are associated with elevated concentrations of phosphorus, warm water, and calm conditions. It is important to recognize areas where blooms are occurring so that lake users can be informed of appropriate action. This recommendation builds local capacity for monitoring and providing notification of bloom conditions, and assists NYSDEC in their statewide notification and tracking system for harmful algal blooms.

Regulatory and Programmatic Actions

a. Continue the program of surveillance monitoring for HABs and provide timely notification to stakeholders.

b. Train a network of observers in key areas around the lake shoreline to enhance surveillance monitoring.

c. Investigate the possibility of developing local analytical capability and, if feasible, initiate local analysis program.

Benefits to Owasco Lake and Watershed

Early detection and warning are essential when HABs develop so that watershed residents and the water purveyors can take appropriate precautions.

Priority: Medium

Leadership: NYS Department of Environmental Conservation, Owasco Lake Watershed Inspection Program, Cayuga County Health Department

Recommendation E-4: Improve Recreational Opportunities

Overview

There are opportunities to improve recreational opportunities around Owasco Lake, the Owasco Inlet, and other tributaries in the watershed in an environmentally sustainable manner. Emerson Park at the northern end of Owasco Lake is owned by Cayuga County and contains the only public beach on the lake. It also provides a place for people to picnic, boat, fish, play disc golf, attend theatre, and enjoy the natural beauty of the lake. Emerson Park has a Master Plan that cites specific design elements that would enhance access to the lakeshore for people while also reducing stormwater runoff and habitat loss. The Emerson Park Master Plan's implementation theme is to design all additions or alterations to minimize environmental impact and demonstrate practical conservation measures that can be implemented in other areas throughout the County. Cayuga County, the City of Auburn, NYSDEC, and the Owasco Flats Nature Reserve own land at the south end of the Lake known as the Owasco Flats, which provides public access to hunt, boat, fish, hike, and enjoy nature. Work is needed in the Owasco Flats area, as well as throughout the watershed, to improve ecological integrity and recreational opportunities, such as acquiring public fishing rights along the Inlet and developing additional access areas, while considering people with disabilities.

Restoration and Protection Actions

a. Assist in the implementation of the recommendations of the Emerson Park Master Plan. Particularly relevant recommendations of the plan include:

- Explore opportunities to replace the current "rip-rap" installed along and adjacent to the swimming areas with natural shoreline materials that would facilitate lakeshore seating and access for bathers and boaters.
- Prepare a wildlife management plan to control the bird populations (including but not limited to gulls and geese) and their waste around the swimming areas.
- Create a canoe and kayak launch area at the Deauville Island Channel on east side of the Fleming Lakeshore.
- Install porous pavement at the Ward W. O'Hara Agricultural Museum, align the southernmost entrance to this lot with the main entrance of park across the street, and upgrade the crosswalk to the main park.
- Establish erosion-controls along with lake access improvements at the Fleming Lakeshore.
- Design and install improved lakeshore access between the west side of the seawall and the beach area at Deauville Island which currently consists of rubble and rip-rap.
- Create a system to catch and filter stormwater surface drainage in the main parking areas before discharging into the lake, the channel, and the Owasco River.
- Construct bio-swales, native plant communities, pervious pavement, and bio-filter systems to catch and filter storm water throughout the park.
- Install streambank stabilization and natural planting buffers along streams within the park.
- Position Deauville Island as the primary active recreation area within the park, taking advantage of beach and swimming access, existing and new boater access, upgraded restroom facilities and enhanced picnic facilities. Likewise, relocating the playground from the Pavilion Area allows the reprogramming of this space for passive recreational uses and shifts this section of the park from active recreation toward picnicking, strolling, arts and cultural, and related passive uses.
- Establish a park-wide multiuse pathway system suitable for walking, biking, running, etc. The pathway should be an all-weather surface wide enough to accommodate multiple users / uses at one time and it should have various amenities along the pathway throughout the park such as benches, lightning, landscaping, public art, etc.
- Widen lanes, replace crosswalks, and add / replace the curbing along the median strip for the main entrance road at Route 38A.
- Relocate the main Playground Facilities adjacent to the Pavilion to the Deauville Island Playground Area.
- Design and install shade / weather shelters, with seating, for the consolidated playground at Deauville Island; and include amenities for seating, shelter areas, and picnicking.

- Install porous pavement at the Ward W. O'Hara Agricultural Museum, align the southernmost entrance to this lot with the main entrance of park across the street, and upgrade the crosswalk to the main park.
- When developing a long-term plan for the Deauville Island playground expansion, consider including spray-park features either now or in the future.

b. Acquire public fishing rights and develop access, considering people with disabilities.

c. At Owasco Flats, improve the kayak/canoe launch; improve parking areas, trails and the County access road utilizing green infrastructure planning. Treat invasive plants at the Owasco Flats to maintain ecological integrity.

Benefits to Owasco Lake and Watershed

There are water quality and habitat benefits associated with implementing the recommendations of the Emerson Park Plan as well as improvements to recreational opportunities. In addition, major benefits will accrue to watershed residents and visitors who will have access to the resource and opportunities to learn more about their environment.

Priority: Medium

Leadership: Cayuga County Department of Planning and Economic Development, Owasco Flats Nature Reserve

Recommendation E-5: Protect and Enhance the Owasco Flats Area

Overview

Two important initiatives are underway to protect and restore this unique wetland area of the Owasco Inlet subwatershed and provide significant habitat enhancements along with water quality improvements. First, the 2007 *Owasco Flats Conservation Planning and Stakeholder Survey Project* (Whitmore and Finger Lakes Land Trust) examined the ecology of the Flats and studied stakeholder and landowner perspectives concerning the area. The *Owasco Flats Wildlife Area Management Plan* (NYSDEC 2008) identified critical parcels for acquisition and specific restoration projects to enhance the hydrological and ecological functioning of this area. Second, the Owasco Flats Wetland Restoration and Riparian Buffers Initiative Project funded by the NYS Environmental Facilities Corporation (EFC) is designed to reconnect Owasco Inlet with its floodplain; during high flow events water will flow into created and existing wetlands that will help retain nutrients and sediment. The project will reduce phosphorus and sediment inputs to Owasco Lake while improving habitat for fish and wildlife, including invertebrates, reptiles, amphibians, birds, and mammals. This recommendation supports full implementation of the two projects.

Restoration and Protection Actions

a. Continue to work with NYSDEC and others to acquire parcels to be managed to protect water quality and wildlife resources in perpetuity.

b. Continue work to improve the hydrologic functioning of this area, which may serve to reduce sediment and nutrient export to Owasco Lake.

c. Seek opportunities to enhance recreational use of the area while protecting fish and wildlife, including migratory bird habitat and resident birds such as bald eagles.

d. Assess currently closed publicly-owned areas to determine whether they can be reopened.

Benefits to Owasco Lake and Watershed

The Owasco Inlet is documented to be a major source of sediment and phosphorus to the lake. These projects will ultimately benefit the water quality of Owasco Inlet and the lake, as well as enhance upland, wetland, and aquatic habitat.

Priority: Medium

Leadership: Finger Lakes Land Trust, Cayuga County Department of Planning and Economic Development

F. WATER AND WASTEWATER INFRASTRUCTURE

Recommendation F-1: Encourage All Watershed Counties to Adopt a Sanitary Code Consistent with the Provisions of the Cayuga County Sanitary Code

Overview

While the shoreline of Owasco Lake is completely within Cayuga County, more remote regions of the watershed are in Tompkins County (17.8% of the watershed) and Onondaga County (2.8% of the watershed). Areas outside Cayuga County are not subject to the County's requirements for periodic inspections of on-site wastewater disposal systems. A uniform sanitary code would address this gap.

Regulatory and Programmatic Action

a. Encourage the Counties of Tompkins and Onondaga to adopt a sanitary code that requires the periodic inspections of on-site wastewater disposal systems within the Owasco watershed.

Benefits to Owasco Lake and Watershed

Implementation of this recommendation will reduce the risk to public health and the environment of inadequately treated wastewater reaching downgradient receiving waters.

Priority: Medium

Leadership: Owasco Lake Watershed Inspection Program

Recommendation F-2: Consider the Suitability of Extending Public Sewers in Certain Areas

Overview

There are areas within the Owasco Lake watershed where individual on-site wastewater disposal systems are at a higher risk of failure and the ability to upgrade these systems is limited due environmental conditions such as limited lot size, poor soil, or inadequate depth to groundwater. Some of these areas have been identified; the Owasco Town Board is in the process of extending their sewer system to include properties to the Owasco-Niles town line, including Koenig's Point. Another area where public sewers may be advisable is the Hamlet of Locke.

Regulatory and Programmatic Action

a. Support the efforts of municipalities to extend public sewers in areas where public health and environmental quality may be compromised by current on-site wastewater disposal systems, after careful consideration of the full range of potential environmental impacts including secondary impacts on farmland protection, open space, and rural character.

- Identify areas of concern.
- Secure funding necessary to develop the map plan and report needed for district formation.
- Prepare preliminary engineering estimates of capacity, potential service area, and cost estimates.
- Meet with affected homeowners to gauge level of support.
- Follow NYS law on district formation/extension.
- Evaluate potential impacts of development pressure due to sewer line extensions and work with that community to reduce those impacts.
- Assist communities in completing Clean Water State Revolving Fund (CWSRF) listing and application processes.

Benefits to Owasco Lake and Watershed

Implementation of this recommendation will reduce the risk to public health and the environment of inadequately treated wastewater reaching downgradient receiving waters.

Priority: High

Leadership: Cayuga County Water and Sewer Authority

Recommendation F-3: Help Ensure Compliance with Drinking Water Standards

Overview

While the City of Auburn and Town of Owasco public water supplies are currently in compliance with all regulatory standards, some of the municipal systems that purchase treated Owasco Lake water have had elevated disinfection byproducts (DBP) levels. In addition, the presence of cyanobacteria in Owasco Lake is of increasing concern due to the potential impacts on the treated water. Many watershed residents rely on groundwater as their source of potable water, and measures must be in place to ensure that the aquifers are protected from contamination.

Regulatory and Programmatic Actions

a. Work with the municipalities of Groton, Locke and Moravia to create wellhead protection programs to preserve and protect their groundwater resources.

- Delineate the land area which provides water to public supply wells.
- Identify existing and potential sources of contamination.
- Manage potential sources of contamination to minimize their threat to drinking water sources.

Restoration and Protection Actions

b. Strictly enforce the Rules and Regulations of the Owasco Lake Watershed as well as existing NYSDEC Regulations to protect the surface and ground waters of the watershed from contamination.

c. Continue financial support to the Watershed Inspection Program.

d. Assist the City of Auburn and the Town of Owasco with identifying and evaluating treatment options to improve the quality of their treated drinking water.

e. Assist the City of Auburn and Town of Owasco with monitoring untreated water and finished water quality when cyanobacteria are in the vicinity of their intakes.

Benefits to Owasco Lake and Watershed

Safe drinking water is essential for life. Continued investment in infrastructure and programs to prevent pollution, cleanse the water of impurities, and monitor for quality will benefit all who rely on the waters of the Owasco Lake watershed.

Priority: High

Leadership: Cayuga County Health Department, Owasco Lake Watershed Inspection Program

G. INSTITUTIONAL STRUCTURE FOR LAKE AND WATERSHED MANAGEMENT

Recommendation G-1: Provide for Ongoing Collaboration led by the Owasco Lake Watershed Management Council

Overview

The Owasco Lake Watershed Management Council was created in 2011 to serve as the hub for collaboration on water resources issues throughout the entire watershed. Representatives from watershed municipalities, the City of Auburn, and agencies responsible for land and water management are active participants. The resource management agencies currently represented include: Cayuga County SWCD, the Owasco Watershed Lake Association, Cayuga County Department of Planning and Economic Development, the Cayuga County Health Department , Cornell Cooperative Extension, and educational and research institutes. This recommendation directs the Council to consider its membership and organizational structure in order to position itself to oversee implementation of the recommendations of this *Owasco Lake Watershed Management and Waterfront Revitalization Plan*. The Council also oversees the Owasco Lake Watershed Management Inspection Program and directs program staff.

Regulatory and Programmatic Actions

a. Develop an annual work plan based on the recommendations of this Plan.

b. Consider measures to improve the long-term effectiveness of the Council to guide lake restoration and protection; review other organizational structures and consider adding standing committees. Topics to be considered include, but are not limited, to the following:

- Membership (i.e., group size, diversity, participant recruitment)
- Leadership and staffing
- Action planning and decision making
- Financial resources and stakeholder engagement
- Committee structure (possible options include agricultural, technical, education and outreach)
- Watershed inspection leadership, staffing, and goals
- 501(c)(3) status

Benefits to Owasco Lake and Watershed

A coordinated effort will be required for the recommendations of the Plan to be implemented, tracked, and evaluated.

Priority: High

Leadership: Owasco Lake Watershed Management Council, Cayuga County Department of Planning and Economic Development

Recommendation G-2: Develop and Coordinate Funding and Other Resources to Address Owasco Lake Watershed Protection Priorities

Overview

The success of this plan will depend on an ongoing commitment of funding and other resources to support Owasco Lake watershed protection recommendations and initiatives. Potential new sources of support may exist within watershed communities, among local and regional partners, and through broader public or private funding entities. Developing these resources will require a coordinated effort by leaders who can collaborate with stakeholders to channel existing resources toward watershed priorities and create the capacity to bring new initiatives to fruition. This recommendation focuses on establishing a committee responsible for leading these efforts, and identifies some specific mechanisms that this group might pursue.

Regulatory and Programmatic Actions

a. Establish a subcommittee of OLWMC members to tap existing resources and pursue new sources of funding.
    - Solicit input from collaborators who represent a range of affiliations to provide insights about potential funding sources:
        - in each geographic area of the watershed,
        - among all entities that have an interest in watershed protection (e.g., nonprofit, business, educational, government), and
        - from institutions and agency programs that exist at a regional, state, or national level.

b. Examine the feasibility of creating a funding mechanism for watershed protection based on voluntary donations by water users (e.g., municipal residents for whom Owasco Lake is a source of drinking water), and if feasible:
    - Encourage municipalities using Owasco Lake as a source of drinking water to solicit voluntary donations to a stewardship fund via an optional payment category on municipal water bills (working with a range of collaborators, including elected officials and boards of public water purveyors).
    - Designate an entity to administer the funds on behalf of stakeholders.
    - Direct funds to support the implementation of high-priority, recommended best management practices to protect and restore the quality of Owasco Lake.

c. Creatively explore new sources of assistance to carry out specific watershed protection activities. For example, establish internship opportunities in cooperation with higher education institutions (e.g., Cornell, Hobart and William Smith, SUNY-ESF, Cayuga Community College), offering students a chance to apply their knowledge and skills to real-world tasks as public outreach and education.

d. Seek grants, possibly in collaboration with other organizations and institutions that share an interest in protecting watershed resources.

Benefits to Owasco Lake and Watershed

Additional funding sources would help speed the accomplishment of these recommended actions, and could support implementation of high-priority, recommended best management practices. In addition, soliciting voluntary contributions and support from stakeholders raises awareness of water quality-related issues and highlights the linkages between watershed practices and lake quality.

Priority: High

Leadership: Owasco Lake Watershed Management Council, Owasco Lake Watershed Inspection Program

H. OUTREACH AND EDUCATION

Recommendation H-1: Foster an Appreciation for the Intrinsic Ecological Value of the Owasco Lake Watershed

Overview

The community's vision for the future of the Owasco Lake watershed includes references to its capacity to provide "natural, spiritual, economic, recreational, and community benefits to current and future generations." This recommendation addresses the need to instill in watershed residents of all ages an appreciation for the intrinsic ecological value of the lake and watershed.

Regulatory and Programmatic Actions

a. Provide local public and private school educators with suggestions on how to expand the opportunities of students, primary grades and beyond, to learn about watershed processes, the many benefits of healthy watershed ecosystems, and the use of ethical principals in moral reasoning about watershed environments.

b. When communicating with elected and appointed officials, water resource managers, and the community at large, convey the perspective that humans are an integral part of the Owasco Lake ecosystem, and that the ecosystem has an intrinsic value separate from its ability to support human uses for recreation and water supply.

Benefits to Owasco Lake and Watershed

Public decisions can be enhanced through a deeper awareness of the interconnected systems that influence and are affected by watershed processes. A multigenerational commitment is needed to restore and protect the Owasco Lake watershed.

Priority: Medium

Leadership: Cornell University Cooperative Extension

Recommendation H-2: Develop a Coordinated Strategy for Watershed Outreach and Implement Educational Campaigns

Overview

There are many municipalities, agencies, and organizations involved with Owasco Lake watershed issues. This creates a challenge to the public on two fronts: finding data and information in an efficient manner, and appreciating the ongoing efforts to collaborate on protection and restoration actions. This recommendation calls for an integrated program to build an identity and keep the public engaged. One essential tool is the selection and maintenance of a single web site or portal that can serve as a single point of contact for up-to-date descriptions of projects, progress, and partnerships. Other related actions address the need to disseminate essential information on how individual actions can affect the health of the lake and watershed.

Regulatory and Programmatic Actions

a. Establish a robust on-line resource for Owasco Lake and watershed information, develop an effective strategy for long-term maintenance.

b. Review case studies to identify successful components of existing outreach plans that can be used in the Owasco Lake watershed.

c. Establish branding and messaging to enhance public awareness and understanding of watershed issues.

d. Leverage partnerships (e.g., municipalities, businesses/cooperatives, tourism organizations) to extend the message to multiple audiences.

e. Provide partners with outreach tools that can be easily adopted, and suggestions for adapting these tools as part of microcampaigns targeted at specific audiences.

Restoration and Protection Actions

f. Adopt and circulate a relevant guidebook for residents on ways to protect the lake.

g. Continue to collaborate with OWLA, Cayuga County Departments of Health and Planning and Economic Development, Cornell Cooperative Extension, Cayuga Community College and other agencies to develop, seek funding for, and promote education and workshops tailored to watershed residents. Topics may include but are not limited to:

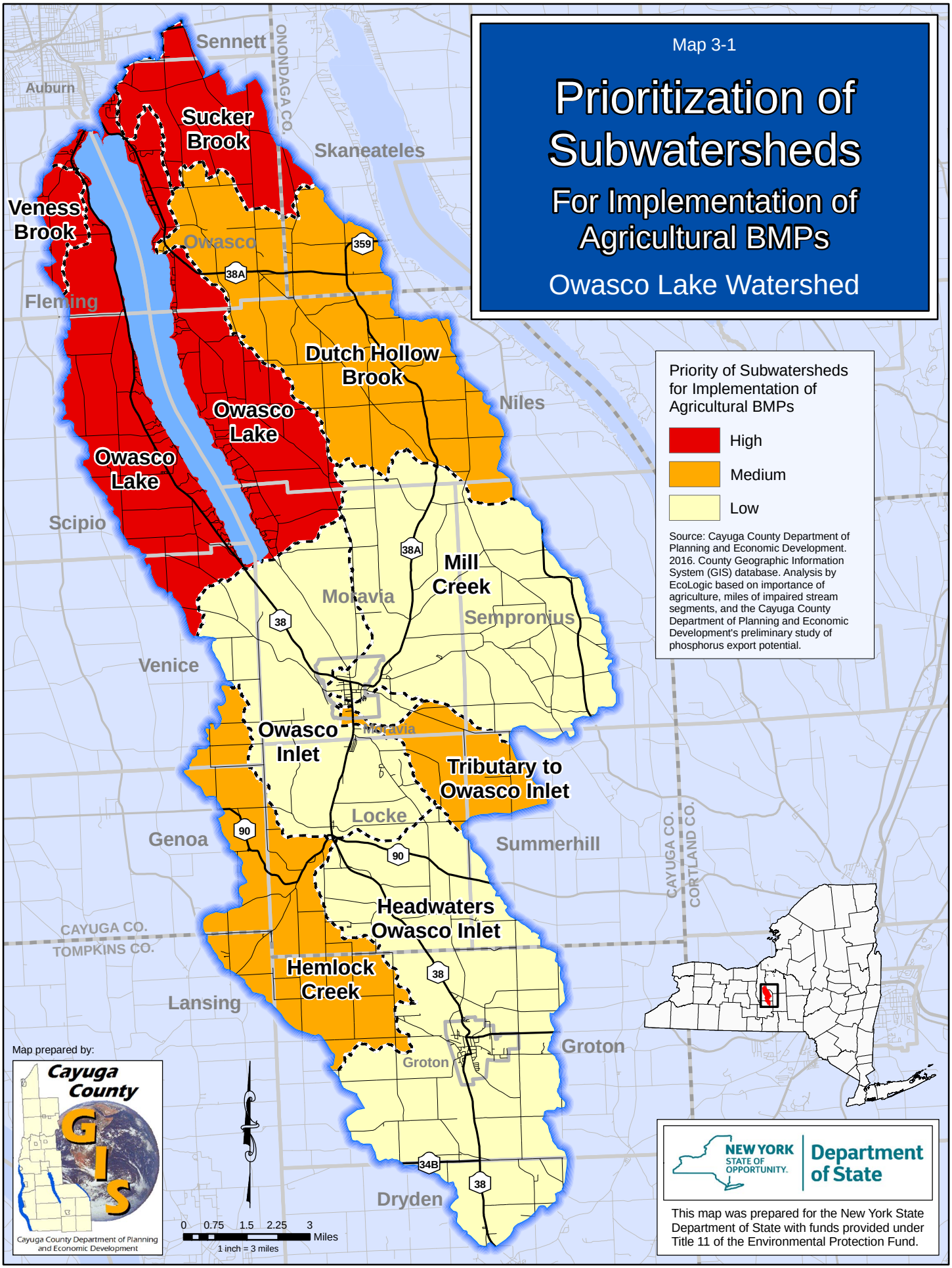
- Pharmaceutical take-back programs
- Proper handling of yard waste, pet waste, and campfire ash
- Septic system maintenance and record keeping
- Proper disposal of hazardous wastes and electronics
- Impact of stormwater runoff on water quality
- Impact of human activities on water quality
- Importance of road maintenance and safety (e.g., sensible winter driving; why and when ditches are cleaned)
- Erosion reduction and lake-friendly landscaping (e.g., planting and protecting streamside/lakeside vegetation)
- Impact of fertilizer and pesticides on water quality
- Value of agriculture

Benefits to Owasco Lake and Watershed

Providing watershed residents and visitors with an easily-accessible and reliable source of updated information will foster their active participation in watershed management actions. Moreover, unifying under a single brand will promote appreciation of the lake and watershed to residents and visitors of all ages.

Priority: Medium

Leadership: Cayuga County Water Quality Management Agency, Cayuga County Department of Planning and Economic Development, Owasco Lake Watershed Management Council, Owasco Lake Watershed Inspection Program


Map 3-1
Prioritization of Subwatersheds
For Implementation of Agricultural BMPs
Owasco Lake Watershed
Priority of Subwatersheds for Implementation of Agricultural BMPs
High
Medium
Low
Source: Cayuga County Department of Planning and Economic Development. 2016. County Geographic Information System (GIS) database. Analysis by EcoLogic based on importance of agriculture, miles of impaired stream segments, and the Cayuga County Department of Planning and Economic Development's preliminary study of phosphorus export potential.
Sennett
Auburn
ONONDAGA CO.
Skaneateles
Sucker Brook
Veness Brook
Owasco
Fleming
Dutch Hollow Brook
Niles
Owasco Lake
Owasco Lake
Scipio
Mill Creek
Moravia
Sempronius
Venice
Owasco Inlet
Moravia
Tributary to Owasco Inlet
Locke
Genoa
Summerhill
CAYUGA CO.
CORTLAND CO.
Headwaters Owasco Inlet
CAYUGA CO.
TOMPKINS CO.
Hemlock Creek
Lansing
Groton
Groton
Dryden
359
38A
38A
38
90
90
38
34B
38
Map prepared by:
Cayuga County GIS
Cayuga County Department of Planning and Economic Development
0 0.75 1.5 2.25 3 Miles
1 inch = 3 miles
NEW YORK STATE OF OPPORTUNITY.
Department of State
This map was prepared for the New York State Department of State with funds provided under Title 11 of the Environmental Protection Fund.

Chapter 4. Implementation of Watershed Recommendations

4.1 Introduction

This chapter presents a strategy and schedule for implementing recommendations to improve conditions in Owasco Lake and its watershed. Successful implementation of this watershed management and waterfront revitalization plan will require collaboration among a diverse range of agencies, institutions, and stakeholders working together as partners, pursuing funding, and contributing resources to support initiatives that will protect and restore the quality of the watershed. Their coordinated activities will support the overarching watershed goals and priorities established as part of this Plan.

4.2 Implementation Strategy and Schedule for Owasco Lake Watershed Recommendations

To guide strategic implementation of the recommendations in Chapter 3, the Owasco Lake Watershed Management Council worked with community representatives and drew on public input to develop a matrix (**Table 4-1**) that identifies the factors needed to carry out these recommended actions. The matrix breaks down each watershed recommendation, providing critical information including task leaders and partners, potential funding sources, approximate cost, and proposed timeframe. Implementation timing estimates suggest when efforts will be initiated; these estimates may be revised as plans are refined and updated.

Because the implementation matrix synthesizes a great deal of information, it presents each recommendation in a succinct, abbreviated form. Therefore, readers using the matrix should continue to reference Chapter 3, which provides background information and broader context for each of the watershed recommendations.

4.3 Plan Updates

Cayuga County has received a NYSDOS Environmental Protection Fund Local Waterfront Revitalization Grant award to expand this Plan to incorporate the EPA Nine Key Elements. This work will begin as soon as the grant contract is executed.

Table 4-1. IMPLEMENTATION STRATEGY AND SCHEDULE FOR OWASCO LAKE WATERSHED RECOMMENDATIONS

KEY:

LEADERS/PARTNERS/FUNDING SOURCES LIST, ABBREVIATIONS

CCHD	Cayuga County Health Department
CCPT	Cayuga County Parks and Trails
CCPED	Cayuga County Department of Planning and Economic Development
Cayuga Water/Sewer	Cayuga County Water and Sewer Authority
CCE	Cornell University Cooperative Extension
CLRP	Cornell Local Roads Program
CNYEAB	Central New York Emerald Ash Borer Task Force
CNYRPDB	CNY Regional Planning and Development Board
CSWL	Cornell University Soil and Water Lab
EPF	Environmental Protection Fund (administered by several NYS agencies)
FLI	Finger Lakes Institute
FLLOWPA	Finger Lakes - Lake Ontario Watershed Protection Alliance
FLLT	Finger Lakes Land Trust
FL-PRISM	Finger Lakes Partnership for Regional Invasive Species Management
FPC	Farm Practices Council
GIGP	Green Innovation Grants Program (NYSEFC)
GLRI	Great Lakes Research Initiative
Hwy Depts.	Highway Departments
NRCS	Natural Resources Conservation Service
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOS	New York State Department of State
NYSDOT	New York State Department of Transportation
NYSEFC	New York State Environmental Facilities Corporation
NYSERDA	New York State Energy Research and Development Authority
OCHD	Onondaga County Health Department
OFNR	Owasco Flats Nature Reserve
OLWMC	Owasco Lake Watershed Management Council
OWLA	Owasco Watershed Lake Association ("OWLA Grant 2015" refers to NYS funds granted to OWLA in 2015)
SWCD	Soil and Water Conservation District
TCHD	Tompkins County Health Department
USACOE	U.S. Army Corps of Engineers
USDA	U. S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WIP	Owasco Lake Watershed Inspection Program
WQMA	Cayuga County Water Quality Management Agency

CATEGORIES OF COST

$	=	$1–$1,000
$$	=	$1001–$10,000
$$$	=	$10,001–$100,000
$$$$	=	$100,001–$500,000
$$$$$	=	> $500,000

GOALS FOR THE WATERSHED

1. Identify and reduce the adverse water quality impacts from agricultural operations.
2. Identify and reduce nonpoint sources of nutrients, sediment, microorganisms, salts, and other chemicals to Owasco Lake and its tributary streams.
   a. Identify model practices that will reduce adverse water quality impacts from roadway maintenance practices such as ditching and application of salt and sand, and support municipal efforts to adopt and implement such practices.
   b. Research ways that new technologies such as innovative septic systems or stormwater treatment systems would improve water quality, and promote their adoption.
   c. Minimize the impact of contamination from fuel and other chemicals associated with transportation and storage accidents.
3. Reduce the risk of water-related illnesses associated with using Owasco Lake as a source of drinking water and recreation.
4. Expand environmentally sound recreational access and tourism (notably at Emerson Park and Owasco Flats).
5. Identify model ordinances that can improve watershed health and sustainability, including smart growth land use practices, and support municipal efforts to adopt and implement these measures in their local codes and practices.
6. Position and sustain the Owasco Lake Watershed Management Council as the central hub for effective collaboration among water resources management professionals, Soil and Water Conservation Districts, elected officials, water purveyors, the Owasco Watershed Lake Association, county Planning and Economic Development and Public Health agencies, and local research institutions.
7. Continue water quality sampling and monitoring programs to track the lake and streams' response to management actions.
8. Identify and respond to emerging issues including invasive species.
9. Continue to partner with regional and state water resources agencies to address common challenges to the Finger Lakes, such as lake level management, invasive species response, climate change adaptation, and funding for projects that contribute to the vision.
10. Build community awareness of how human activities affect the future of the Owasco Lake Watershed.

NOTE: Some activities described in this matrix may require NYSDEC, USACOE, or other permits (e.g., work along lake shore and streams on private property; maintenance and stabilization of certain roadside ditches).

Table 4-1. IMPLEMENTATION STRATEGY AND SCHEDULE FOR OWASCO LAKE WATERSHED RECOMMENDATIONS

A. PLANNING

Recommendation A-1: Continue to Incorporate the EPA's Nine Key Elements of Watershed Planning into the Owasco Lake Watershed Management and Waterfront Revitalization Plan

Specific Recommendations	Goal	Target Sub-Watershed or Critical Area	Project Leader* & Potential Partners	Potential & Existing Funding Sources	Potential Cost +	Priority	Implementation Timing		
							1 Yr	2-5 Yrs	5+ Yrs
A-1. **Expand to nine element plan**.	ALL	Entire watershed	*CCPED, SWCD, CCHD	NYSDOS (grant received to expand plan, staff time), NYSDEC, FLLOWPA	$$$	HIGH	X		

B. MEASURES TO REDUCE NONPOINT SOURCE POLLUTION

Recommendation B-1: Control Agricultural Nonpoint Sources

Specific Recommendations	Goal	Target Sub-Watershed or Critical Area	Project Leader* & Potential Partners	Potential & Existing Funding Sources	Potential Cost +	Priority	Implementation Timing		
							1 Yr	2-5 Yrs	5+ Yrs
Regulatory and Programmatic Actions									
B-1-a. **Identify and remove barriers** to implementing improved practices.	1	Priority subwatersheds	*WQMA, SWCD, CCPED, CCE	Department and agency budgets	$$	HIGH		X	
B-1-b. **Seek additional sources of support** for programs/services aimed at reducing nutrient and sediment loss.	1, 9	N/A	*SWCD, CCE, OLWMC, WQMA	Department and agency budgets	$	MED		X	
B-1-c. **Enforce existing regulations and laws** that prohibit livestock access to streams and manure runoff.	1	All watershed areas	*WIP, CCHD, SWCD, NYSDEC	Department and agency budgets	$	HIGH	X		
B-1-d. **Coordinate/improve communication** between agricultural community and other stakeholders.	1	N/A	*WQMA, CCPED, SWCD, CCE, OWLA, FPC	Department and agency budgets	$	HIGH	X		
Restoration and Protection Actions									
B-1-e. **Implement agricultural BMPs in a strategic manner** to reduce the loss of soil, nutrients, fertilizers, animal wastes, crop residues, and pesticides from the landscape.	1	Areas that are prone to saturation; are proximate to watercourses and natural conveyances; have steep slopes; have highly erodible soils	*SWCD, CCE, NRCS, farmers	NRCS Ag Lands Easements, Wetland Reserve Easements, EQIP, WHIP, SARE, Ag Conservation Easement Program, CIG; Ag Nonpoint Source Abatement and Control Program, WQIP, GLRI, Conservation Stewardship Program, Climate Resilient Farming Program, Farmland Protection Implementation Grants, Farm Bill Initiative for Conservation Practices	$$$$	HIGH (a top priority in Plan)	X		

Recommendation B-1, continued

B-1-f. **Assist in implementing recommendations** of the Cayuga Co. Manure Mgmt. Working Group Advisory Committee.	1	All watershed areas	*OLWMC, WQMA, CCPED, SWCD, WIP, CCHD, CCE. See list MMWG 14-Pt Plan.	NYSDEC, NYSDOS, NYSEFC, FLLOWPA, department and agency budgets	$$$	HIGH (a top priority in Plan)	X		
B-1-g. **Support development/use of technologies** such as mobile apps, nutrient boom.	1	As/where needed	*SWCD, CCE	New Farmers Grant Fund, CIG, SARE, Small Business Innovation Research Program	$$$	MED		X	
B-1-h. **Provide technical assistance on emergency response** procedures/ resources for farms of all sizes.	1	All watershed areas	*SWCD, NYSDEC	Department and agency budgets	$$	MED	X		
B-1-i. Identify and promote measures to **reduce the use of pesticides and loss of nutrients and sediment.**	1	All watershed areas	*WQMA, SWCD, OLWMC, CCE	Department and agency budgets, NYS Integrated Pest Management Program	$$	HIGH	X		

Recommendation B-2: Stabilize Streambanks in Priority Areas

Specific Recommendations	Goal	Target Sub-Watershed or Critical Area	Project Leader* & Potential Partners	Potential & Existing Funding Sources	Potential Cost +	Priority	Implementation Timing		
							1 Yr	2-5 Yrs	5+ Yrs
Regulatory and Programmatic Actions									
B-2-a. **Pursue funding** to complete projects as defined by subwatershed streambank assessment programs.	2, 9	Priority subwatersheds	*SWCD, OLWMC, CCPED, WIP	Non-Ag Nonpoint Source Abatement Program, FLLOWPA	Confer w/ SWCD to define $$$-$$$$	HIGH		X	
Restoration and Protection Actions									
B-2-b. **Design and implement stream restoration** to restore natural hydrologic and biological processes, taking climate change into account.	2	According to Subwatershed Streambank Assessments	*SWCD, CCPED, SUNY-ESF, FLI, Cornell Univ.	Non-Ag Nonpoint Source Abatement Program, FLLOWPA	$$$-$$$$	HIGH		X	
B-2-c. **Coordinate annual monitoring efforts** to refine priority areas and document effectiveness of restoration measures.	2, 7	Watershed-wide, focusing on areas with BMPs	*OLWMC and CCPED, WIP, OWLA, FLI, CCHD, SWCD	Department and agency budgets	$	HIGH	X		

Recommendation B-3: Adopt or Amend Local Regulations Designed to Reduce Nonpoint Source Pollution from Developed Areas

Specific Recommendations	Goal	Target Sub-Watershed or Critical Area	Project Leader* & Potential Partners	Potential & Existing Funding Sources	Potential Cost +	Priority	Implementation Timing		
							1 Yr	2-5 Yrs	5+ Yrs
Regulatory and Programmatic Actions									
B-3-a. **Assist watershed municipalities in amending local laws** to control nonpoint source pollution.	2,5	Municipalities with lake shoreline and/or major tributaries	*CCPED, WIP, OLWMC	Department and agency budgets	$$$	HIGH		X	
B-3-b. **Continue to offer training** to municipalities on issues that can be addressed through local codes.	2, 5	Municipalities with lake shoreline and/or major tributaries	*CCPED, WIP	Department and agency budgets	$$$	HIGH	X		
B-3-c. **Seek funds** to assist municipalities with updates to local regulations.	5	Municipalities with lake shoreline and/or major tributaries	*CCPED, WIP	NYSDOS, CNYRPDB	$$$	HIGH		X	
B-3-d. Advocate that municipalities **incorporate projections of climate change.**	5, 9	Municipalities with lake shoreline and/or major tributaries	*CCPED, CNYRPDB, WIP, CCE, OLWMC	Department and agency budgets; CNYRPDB resources	$-$$	MED		X	

Recommendation B-4: Reduce Nonpoint Source Pollution from Municipal Activities

Specific Recommendations	Goal	Target Sub-Watershed or Critical Area	Project Leader* & Potential Partners	Potential & Existing Funding Sources	Potential Cost +	Priority	Implementation Timing		
							1 Yr	2-5 Yrs	5+ Yrs
Regulatory and Programmatic Actions									
B-4-a. **Target training specifically to watershed-related issues** for municipal decision makers and personnel.	2	All municipalities in watershed	*CCPED, SWCD, WIP, CNYRPB, OLWMC	NYSDOS Local Water-front Revitalization Program; department, agency, and municipal budgets	$$	HIGH	X		
B-4-b. **Provide training on stormwater management BMPs** to watershed municipalities of all sizes, striving for compliance with MS4 requirements.	2	All municipalities in watershed	*SWCD, CCPED, WIP, CNYRPDB, OLWMC	Department, agency, and municipal budgets, CNYRPDB resources	$$	HIGH	X		
B-4-c. Incorporate **NYSDOT design and guidance documents, standard specifications, and procedural manuals** into local laws and highway department operating procedures.	2, 5, 9	Start w/ County Hwy Dept. plus Hwy Depts. in priority subwatersheds	*CCPED and WIP, with municipalities and through CLRP resources, CNYRPDB	Department, agency, and municipal budgets	$$	LOW		X	
B-4-d. Encourage municipalities to **take advantage of training programs such as Cornell Local Roads.**	2	Start w/ County Hwy Dept. plus Hwy Depts. in priority subwatersheds	*CCPED and WIP, with municipalities and through CLRP resources, CNYRPB, SWCD, OLWMC, CCE	Department, agency, and municipal budgets	$	LOW		X	
B-4-e. Investigate and implement **innovative approaches to stormwater management.**	2	Emerson Park, all municipalities in watershed	*SWCD, CCPED, CNYRPDB, WIP, OLWMC, CCPT	Department, agency, and municipal budgets; EPF	$$$	MED		X	
B-4-f. Encourage municipalities to participate in programs on **environmental impacts of road maintenance practices.**	2	All municipalities in watershed	*SWCD, CCPED, WIP, CNYRPDB, OLWMC, municipalities	Department, agency, and municipal budgets	$	MED		X	
B-4-g. Assist watershed municipalities in **sharing resources.**	9	All municipalities in watershed	*OLWMC, WIP, SWCD, CCPED	Department, agency, and municipal budgets; Local Gov. Efficiency Grants	$$	MED	X		

Recommendation B-4, continued

Restoration and Protection Actions									
B-4-h. **Implement BMPs** at municipal facilities.	2	Municipal facilities	*Municipalities through OLWMC, SWCD, CCPED, WIP	Municipal, agency, and department budgets; GIGP; EPF	$$$	MED		X	
B-4-i. **Stabilize ditches** as soon as possible following maintenance.	2	All watershed areas	*Municipalities through SWCD, WIP, OLWMC	Municipal, agency, and department budgets; GIGP, EPF	$$$	HIGH	X		
B-4-j**. Remediate eroding ditches and make improvements**, including plantings to reduce erosion risk.	2	All watershed areas	*Municipalities through SWCD, WIP, OLWMC	Municipal, agency, and department budgets; GIGP, SWCD, WQIP, EPF	$$$	HIGH	X		
B-4-k. **Incorporate projections of changes in precipitation events** due to climate change on the design of infrastructure.	2	All watershed areas	*Municipalities through SWCD, WIP, CNYRPB, CCPED in zoning changes	Municipal budgets, GIGP, CCPED, department and agency budgets	$$$	MED	X		
B-4-l. **Stop applying herbicides** to rights-of-way and stream banks at road crossings.	2	Right of ways and streambanks at road crossings	*WIP, NYSDOT, County Hwy Dept.	NYSDOT	$	MED	X		
B-4-m. Investigate the feasibility of using **alternative deicing materials and installing computer-controlled spreaders** on plow trucks.	2	Municipalities with lake shoreline and/or major tributaries	*CCPED, NYSDOT, County and municipal Hwy Depts.	Department, agency, State, and municipal budgets	$$	MED		X	
B-4-n. **Ensure that emergency response procedures and resources** are in place to address fuel and chemical releases from transportation and storage accidents.	2	Municipalities with lake shoreline and/or major tributaries	*WIP, Emergency Mgmt. Offices, County and municipal Hwy Depts.	Department, agency, and municipal budgets	$$	MED		X	

Recommendation B-5: Reduce Nonpoint Source Pollution from Residential Property and Community Landscapes

Specific Recommendations	Goal	Target Sub-Watershed or Critical Area	Project Leader* & Potential Partners	Potential & Existing Funding Sources	Potential Cost +	Priority	Implementation Timing		
							1 Yr	2-5 Yrs	5+ Yrs
Restoration and Protection Actions									
B-5-a. **Plant new vegetation and maintain existing vegetation** to protect streambanks and lakeshore areas.	2	Shoreline and streamside areas	*WIP, SWCD, OWLA, residences, institutions, businesses, and municipalities	OWLA Grant 2015, individual contributions by property owners	$$$	HIGH	X		
B-5-b. Plant trees, construct rain gardens and **install other "green infrastructure"** on private property.	2	Shoreline and streamside properties	*WIP, SWCD, OWLA, residences, institutions, businesses, and municipalities	OWLA Grant 2015, individual contributions by property owners, GIGP	$$$$	HIGH		X	
Restoration and Protection Actions									
B-5-c. **Identify and stabilize areas of streambank/lakeshore erosion** on private property.	2	Shoreline and streamside properties	*WIP, SWCD, OWLA	OWLA Grant 2015, contributions by property owners, department and agency budgets	$$$	HIGH		X	
B-5-d. **Conduct stream, lakeshore, and roadside cleanup events.**	2	In priority subwatersheds	*WIP, SWCD, OWLA, CCPED	OWLA	$	MED	X		
B-5-e. **Educate** homeowners and property managers; **recognize** those who install landscaping that is protective of water quality.	10	Shoreline and streamside properties	*WIP, OWLA, CCE	Department and agency budgets	$$	HIGH		X	
B-5-f. **Maintain septic systems properly.**	2, 3	All watershed areas	*CCHD, WIP, CCE, TCHD, OCHD, property owners	Cayuga County Homsite Devel. Corp.	$$$	HIGH	X		

C. LAKE LEVEL MANAGEMENT

Recommendation C-1: Plan for Lake Level Adjustments

Specific Recommendations	Goal	Target Sub-Watershed or Critical Area	Project Leader* & Potential Partners	Potential & Existing Funding Sources	Potential Cost +	Priority	Implementation Timing		
							1 Yr	2-5 Yrs	5+ Yrs
Regulatory and Programmatic Actions									
C-1-a. **Establish a formal working group** to develop decision criteria and lines of communication regarding **short-term adjustments to lake level and the rule curve.**	9	N/A	*OWLMC and City of Auburn; OWLA; Village of Port Byron; Towns of Owasco, Niles, Moravia, Venice, Scipio, and Fleming; USACOE; NYSDEC; CCHD; CCPED; SWCD; Cayuga County Flood Hazard Mitigation Engineer; Cayuga County Hazard Mitigation Coordinator	Department, agency, State, Federal, and municipal budgets	$$	MED	X		
C-1-b. If short-term lake level adjustments do not provide adequate management, initiate **formal review of the rule curve.**	9	N/A	*City of Auburn and OWLMC, OWLA, USACOE, NYSDEC	Department, agency, and municipal budgets, USACOE, NYSDEC, GLRI	$$$$	MED		X	

D. MONITORING AND ASSESSMENT

Recommendation D-1: Integrate Monitoring Programs, Consolidate Data, and Report Progress

Specific Recommendations	Goal	Target Sub-Watershed or Critical Area	Project Leader* & Potential Partners	Potential & Existing Funding Sources	Potential Cost +	Priority	Implementation Timing		
							1 Yr	2-5 Yrs	5+ Yrs
Restoration and Protection Actions									
D-1-a. Identify and convene interested parties to **develop, update, and implement annual monitoring/ sampling plans**.	7, 6	Where monitoring is applicable	*OLWMC, CCHD, CCPED, OWLA, WIP, FLI	Department and agency budgets	$	HIGH	X		
D-1-b**. Identify current funding sources** and **seek additional sources** that could be utilized in implementing plans.	7, 6, 9	N/A	*CCPED and SWCD, CCE, CNYRPDB, OLWMC, CCHD, OWLA, WIP	Department and agency budgets	$	MED	X		
D-1-c. Designate a responsible party to **review and upload data annually to the integrated database.**	7, 6	N/A	*OLWMC, CCHD, CCPED, OWLA, WIP, CSWL	Department and agency budgets, CSWL (in-kind time)	$	HIGH	X		
D-1-d. **Develop and implement standard communication protocols** for organizations involved in monitoring.	7, 6, 9	N/A	*OLWMC, CCHD, CCPED, OWLA, WIP	Department or agency budgets	$	HIGH	X		
D-1-e. **Prepare and distribute an annual Report Card** for a general audience.	7	N/A	*OLWMC, CCHD, CCPED, OWLA, WIP	Department or agency budgets	$$	HIGH		X	

E. RECREATION AND WATERFRONT REVITALIZATION

Recommendation E-1: Address Invasive Species Issues

Specific Recommendations	Goal	Target Sub-Watershed or Critical Area	Project Leader* & Potential Partners	Potential & Existing Funding Sources	Potential Cost +	Priority	Implementation Timing		
							1 Yr	2-5 Yrs	5+ Yrs
Regulatory and Programmatic Actions									
E-1-a. **Continue active engagement with regional partners** to share information and knowledge.	8, 9	All watershed areas	*CCE and CCPED, FL-PRISM, FLI, FLLOWPA, WQMA Invasive Species Working Group, NYSDEC	Department and agency budgets	$-$$	HIGH	X		
Restoration and Protection Actions									
E-1-b. **Employ watercraft stewards** during peak recreational periods.	8	Boat launch areas in watershed; Emerson Park	*FLI and FL-PRISM, WIP, CCPT	EPF, GLRI	$$-$$$	HIGH	X		
E-1-c. **Provide signage and information** at marinas and boat launches and public rights-of-way.	8, 10	Boat launch areas in watershed, lakefront towns and offices	*WIP, OLWMC, FL-PRISM, WQMA Invasive Species Working Group, CCPT	Department and agency budgets, NYSDEC, Sea Grant, FLLOWPA, NYSDOS	$$-$$$	MED	X		
E-1-d. **Continue annual monitoring** and control measures to reduce Asian clam population.	7, 8	Owasco Lake shoreline target areas	*CCPED and OLWMC, SWCD assistance, WQMA Invasive Species Working Group	FLLOWPA	$$	MED	X		
E-1-e. **Develop a template rapid response plan** for terrestrial and aquatic invasive species.	8, 9	All watershed areas	*CCPED, FL-PRISM, FLLOWPA, WQMA Invasive Species Working Group, CCE	Department and agency budgets, FLLOWPA	$-$$	LOW		X	
E-1-f. Coordinate to develop a plan to **respond to the invasion of hemlock wooly adelgid, emerald ash borer, and emerging terrestrial threats**.	8	All watershed areas	*CCPED, FL-PRISM, FLLOWPA, WQMA Invasive Species Working Group, CNY Emerald Ash Borer Task Force, CCE	Department and agency budgets, NYSDEC	$–$$	MED		X	
E-1-g. **Explore the feasibility of boat washing stations**, and if feasible, look for funding to implement.	8	Emerson Park, boat launches on Owasco Outlet and Lake	*CCPT, *Marinas on Owasco Outlet and Lake, FLI, FL-PRISM	Department and agency budgets; EPF; NYSDOS	$$$	MED		X	

Recommendation E-2: Manage Aquatic Vegetation in Owasco Lake

Specific Recommendations	Goal	Target Sub-Watershed or Critical Area	Project Leader* & Potential Partners	Potential & Existing Funding Sources	Potential Cost +	Priority	Implementation Timing		
							1 Yr	2-5 Yrs	5+ Yrs
Regulatory and Programmatic Actions									
E-2-a. Continue to partner with regional agencies to **review macrophyte management techniques.**	8, 9	Owasco Lake	*CCPED, WQMA, PRISM, CCE	Department and agency budgets; NYSDOS, TIGER, NYSDOT	$	MED	X		
Restoration and Protection Actions									
E-2-b. **Continue to support weed harvesting** by Cayuga County SWCD in problem areas.	8	Owasco Lake	*SWCD, OLWMC, Legislature	FLLOWPA, department and agency budgets	$$$$	MED	X		
E-2-c. **Review and update** "Aquatic Weeds: Nuisance and Necessity: Managing Waterweeds in Cayuga, Owasco and Seneca Lake," republish and advertise its availability.	8, 10	Shoreline property owners	*CCPED, CCE	FLLOWPA, department and agency budgets	$$	MED		X	
E-2-d. Seek additional confirmation **that lowering winter lake level reduces aquatic vegetation survival or density**; implement program if successful.	7, 8	Owasco Lake	*CCPED	Department budget	$	LOW			X

Recommendation E-3: Monitor Harmful Algal Blooms and Keep the Public Informed

Specific Recommendations	Goal	Target Sub-Watershed or Critical Area	Project Leader* & Potential Partners	Potential & Existing Funding Sources	Potential Cost +	Priority	Implementation Timing		
							1 Yr	2-5 Yrs	5+ Yrs
Regulatory and Programmatic Actions									
E-3-a. **Continue surveillance monitoring** for HABs and **provide timely notification to stakeholders.**	3, 7	Owasco Lake	*NYSDEC, CCHD, WIP, OWLA	OWLA, NYSDEC, department and agency budgets, FLLOWPA	$$	HIGH	X		
E-3-b. **Train a network of observers in key areas** around the lake shoreline.	3, 7	Shoreline properties	*WIP, OWLA	FLLOWPA, department and agency budgets	$	MED	X		
E-3-c. Investigate the possibility of **developing local analytical capability**; if feasible, initiate analysis program.	3, 7	Owasco Lake	*CCHD, WIP	Department and agency budget	$$	MED		X	

Recommendation E-4: Improve Recreational Opportunities

Specific Recommendations	Goal	Target Sub-Watershed or Critical Area	Project Leader* & Potential Partners	Potential & Existing Funding Sources	Potential Cost +	Priority	Implementation Timing		
							1 Yr	2-5 Yrs	5+ Yrs
Restoration and Protection Actions									
E-4-a. **Assist in implementing Emerson Park Master Plan** recommendations.	4	N/A	*CCPED, County Legislature, CCPT, OLWMC	EPF; County, department and agency budgets; local foundations	$$$$$	MED		X	
E-4-b. **Acquire public fishing rights and develop access**, considering people with disabilities.	4	Tributaries to Owasco Lake	*CCPED, OLWMC, NYSDEC	NYSDEC	$$	MED		X	
E-4-c. At Owasco Flats, **improve the kayak/canoe launch; improve parking areas, trails and the County access road** utilizing green infrastructure planning; **treat invasive plants**.	4	Owasco Flats	*OFNR, CCPED, City of Auburn (large landowner in Flats) CCPT, OLWMC	NYSDEC, NYSDOS Local Waterfront Revitalization Program, department and agency budgets, BOCES School Projects	$$$	MED		X	

Recommendation E-5: Protect and Enhance the Owasco Flats Area

Specific Recommendations	Goal	Target Sub-Watershed or Critical Area	Project Leader* & Potential Partners	Potential & Existing Funding Sources	Potential Cost +	Priority	Implementation Timing		
							1 Yr	2-5 Yrs	5+ Yrs
Restoration and Protection Actions									
E-5-a. **Acquire parcels to be managed to protect water quality and wildlife resources** in perpetuity.	2, 4, 9	Owasco Flats	*FLLT, NYSDEC, OWLA, CCPED, CCPT, OLWMC	NYSDEC funds, private donations to Land Trust	$$$$	HIGH		X	
E-5-b. **Continue work to improve hydrologic functioning** of this area.	2, 4	Owasco Flats	*CCPED, USACOE, NYSDEC, City of Auburn, Cayuga County, CCPT, OLWMC municipalities,	GIGP, NYSDEC	$$$$$	HIGH		X	
E-5-c. Seek opportunities to **enhance recreational use while protecting fish and wildlife.**	4	Owasco Flats	*CCPED, CCPT, OLWMC	NYSDEC, department and agency budgets	$$	MED		X	
E-5-d. **Assess currently closed publicly owned areas** and recommend whether they can be opened.	4	Owasco Flats	*CCPED, CCPT, City of Auburn	Department and agency budgets	$	MED		X	

F. WATER AND WASTEWATER INFRASTRUCTURE

Recommendation F-1: Encourage All Watershed Counties to Adopt a Sanitary Code Consistent with the Provisions of the Cayuga County Sanitary Code

Specific Recommendations	Goal	Target Sub-Watershed or Critical Area	Project Leader* & Potential Partners	Potential & Existing Funding Sources	Potential Cost +	Priority	Implementation Timing		
							1 Yr	2-5 Yrs	5+ Yrs
Regulatory and Programmatic Action									
F-1-a. Encourage the Counties of Tompkins and Onondaga to **adopt a sanitary code**.	2, 3, 5	Tompkins County, Onondaga County	*WIP, CCHD	County, agency and department budgets	$$	MED		X	

Recommendation F-2: Consider the Suitability of Extending Public Sewers in Certain Areas

Specific Recommendations	Goal	Target Sub-Watershed or Critical Area	Project Leader* & Potential Partners	Potential & Existing Funding Sources	Potential Cost +	Priority	Implementation Timing		
							1 Yr	2-5 Yrs	5+ Yrs
Regulatory and Programmatic Action									
F-2-a. **Support efforts to extend public sewers in areas** where current on-site wastewater disposal systems may compromise public health and environmental quality, after carefully considering potential impacts.	2, 3	Critical areas as determined by Cayuga County Water/Sewer Assessment Study	*Cayuga County Water/Sewer, municipalities, OLWMC, CCHD, WIP	Municipal District Formation Process; USDA Rural Utilities Service; NYSEFC; NYS CDBG; NYSDOS (e.g., Local Government Efficiency, EPF); WQIP; NYS Municipal Facilities Program; Empire State Development	$$$$$	HIGH			X

Recommendation F-3: Help Ensure Compliance with Drinking Water Standards

Specific Recommendations	Goal	Target Sub-Watershed or Critical Area	Project Leader* & Potential Partners	Potential & Existing Funding Sources	Potential Cost +	Priority	Implementation Timing		
							1 Yr	2-5 Yrs	5+ Yrs
Regulatory and Programmatic Actions									
F-3-a. Work with Groton, Locke and Moravia to **create wellhead protection programs.**	3, 5	Groton, Locke, Moravia	*CCHD and TCHD, OLWMC, CCPED, WIP	NYSEFC funds	$$$	MED		X	
Restoration and Protection Actions									
F-3-b. **Strictly enforce** the Rules and Regulations of the Owasco Lake Watershed and existing NYSDEC regulations to protect surface and ground water.	3	Owasco Lake Watershed	*WIP, CCHD, NYSDEC, TCHD	Water users, department and agency budgets	$$$	HIGH	X		
F-3-c. **Continue financial support** to the Watershed Inspection Program.	3	Owasco Lake Watershed	*OLWMC, WIP, City of Auburn, Town of Owasco, Cayuga Co.	Water users via fees on Water Billing, other grant sources	$$$	HIGH	X		
F-3-d. Assist City of Auburn and Town of Owasco with **identifying/evaluating treatment options to improve treated drinking water quality.**	3	N/A	*CCHD, City of Auburn, Town of Owasco	City of Auburn, Town of Owasco, department budget	$$	MED		X	
F-3-e. Assist City of Auburn and Town of Owasco with **monitoring raw water and finished water quality when cyanobacteria are in the vicinity of their intakes**.	3	N/A	*CCHD, City of Auburn, Town of Owasco	City of Auburn, Town of Owasco, department budget	$$	HIGH	X		

G. INSTITUTIONAL STRUCTURE FOR LAKE AND WATERSHED MANAGEMENT

Recommendation G-1: Provide for Ongoing Collaboration led by the Owasco Lake Watershed Management Council

Specific Recommendations	Goal	Target Sub-Watershed	Project Leader* & Potential Partners	Potential & Existing Funding Sources	Potential Cost +	Priority	Implementation Timing		
							1 Yr	2-5 Yrs	5+ Yrs
Regulatory and Programmatic Action									
G-1-a. **Develop an annual work plan** based this Plan's recommendations.	6, 7	N/A	*CCPED and OLWMC	Department and agency budgets	$$	HIGH	X		
G-1-b. **Consider measures to improve the long-term effectiveness** of the Council to guide lake restoration and protection; review other organizational structures and consider adding standing committees.	6	N/A	*OLWMC	Department and agency budgets	$$	HIGH		X	

Recommendation G-2: Develop and Coordinate Funding and Other Resources to Address Owasco Lake Watershed Protection Priorities

Specific Recommendations	Goal	Target Sub-Watershed or Critical Area	Project Leader* & Potential Partners	Potential & Existing Funding Sources	Potential Cost +	Priority	Implementation Timing		
							1 Yr	2-5 Yrs	5+ Yrs
Regulatory and Programmatic Action									
G-2-a. **Establish a subcommittee** of OLWMC members to **tap existing resources and pursue new sources of funding.**	6, 9	N/A	*OLWMC	Department and agency budgets	$	HIGH	X		
G-2-b. Examine the feasibility and, if feasible, **create a funding mechanism for watershed protection** based on voluntary donations by water users.	6, 9	All watershed areas	*OLWMC, OWLA, municipal purveyors	Voluntary donations; department and agency budgets	$	HIGH		X	
G-2-c. **Creatively explore new sources of assistance** to carry out specific watershed protection activities.	6, 9	All watershed areas	*OLWMC	Department and agency budgets	$	HIGH		X	
G-2-d. **Seek grants**, possibly in collaboration with others.	6, 9	All watershed areas	*WIP, CCPED, CCSWCD, OLWMC	Department and agency budgets	$	HIGH		X	

H. OUTREACH AND EDUCATION

Recommendation H-1: Foster an Appreciation for the Intrinsic Ecological Value of the Owasco Lake Watershed

Specific Recommendations	Goal	Target Sub-Watershed or Critical Area	Project Leader* & Potential Partners	Potential & Existing Funding Sources	Potential Cost +	Priority	Implementation Timing		
							1 Yr	2-5 Yrs	5+ Yrs
Regulatory and Programmatic Action									
H-1-a. **Provide educators with suggestions** on expanding students' opportunities to learn about watershed processes, benefits of healthy watershed ecosystems, and use of ethical principals in moral reasoning about watershed environments.	10	Watershed schools	*CCE, WIP, schools	Department, agency, and school budgets	$	MED	X		
H-1-b. **When communicating, convey that humans are an integral part of the Owasco Lake ecosystem, and that the ecosystem has an intrinsic value** separate from its ability to support human uses.	10	All watershed areas	*CCE, WIP	Department and agency budgets	$	MED	X		

Recommendation H-2: Develop a Coordinated Strategy for Watershed Outreach and Implement Educational Campaigns

Specific Recommendations	Goal	Target Sub-Watershed or Critical Area	Project Leader* & Potential Partners	Potential & Existing Funding Sources	Potential Cost +	Priority	Implementation Timing		
							1 Yr	2-5 Yrs	5+ Yrs
Regulatory and Programmatic Action									
H-2-a. Establish a **robust on-line resource for Owasco Lake and watershed information.**	10	N/A	*WQMA, WIP, OLWMC, CCPED, CCHD, OWLA	Department and agency budgets; NYSDOS	$$	HIGH		X	
H-2-b. Review case studies **to identify successful components of existing outreach plans** that can be used in the Owasco Lake watershed.	6, 9, 10	N/A	*CCPED, OLWMC, OWLA	Department and agency budgets	$	MED	X		
H-2-c. **Establish branding and messaging** to enhance public awareness and understanding of watershed issues.	10	N/A	*WQMA, WIP, OLWMC, CCPED, OWLA	Department and agency budgets; NYSDOS	$$	HIGH		X	
H-2-d. **Leverage partnerships to extend the message to multiple audiences.**	9, 10	N/A	*OLWMC, OWLA, WIP, CCE, WQMA	Department and agency budgets	$	HIGH		X	
H-2-e. **Provide partners with outreach tools** that can be easily adopted, and suggestions for adapting these tools as part of microcampaigns targeted at specific audiences.	9, 10	N/A	*OLWMC, OWLA WIP, CCE, WQMA	Department and agency budgets	$	MED	X		
Restoration and Protection Actions									
H-2-f. Adopt and circulate a **relevant guidebook for residents on ways to protect the lake.**	10	Lakeshore residents	*CCPED, WIP, CCE	Department and agency budgets	$$	MED		X	
H-2-g. Continue to collaborate to develop, seek funding for, and promote **education and workshops tailored to watershed residents.**	9, 10	Watershed residents	*WIP, CCE	Department and agency budgets	$	MED		X	

Chapter 5. Adaptive Management: Monitoring, Assessment, and Reporting

5.1 Introduction

Chapters 3 and 4 summarize the recommended actions needed to bring Owasco Lake and its watershed toward the desired future state, as expressed in the vision statement. The recommendations are sorted into two categories: (1) regulatory and programmatic, which addresses measures such as changes to local laws and interagency coordination; and (2) restoration and protection, which encompasses both structural and nonstructural measures intended to reduce the flow of pollutants into waterways. These recommendations are based on the community's understanding of the state of the water and land resources as of 2015 to early 2016.

Chapter 5 focuses on the implementation of recommendation D-1 (integrate monitoring programs, consolidate data, and report progress), which is directed at bringing parties together to develop a cohesive approach to monitoring, compiling data and making it accessible, and communicating key findings to stakeholders.

Once the EPA Nine Key Elements of Watershed Planning are completed (recommendation A-1), local resource management professionals will have more quantitative estimates of the reduction in pollutant loading that may be achieved by implementing the highest priority recommendation (B-1): controlling agricultural sources of nonpoint source pollution, especially through the use of BMPs. For example, resource managers will be able to estimate the anticipated percent reduction in phosphorus loading from specific subwatersheds associated with planting winter cover crops or installing grassed swales. The actual reductions in loading are likely to vary from these estimates due to specific weather conditions affecting runoff as well as site-specific field conditions such as soil type and condition, topography, antecedent wetness, and manure disposal practices.

A well-designed monitoring program can be used to refine the estimated loading reduction associated with specific practices, and to document interannual variability. Perhaps more importantly, a well-designed monitoring program can provide information to apprise the community of progress: what's been done; how the lake and streams are responding; and how these findings affect the next priority actions.

This approach, termed **adaptive management** in the context of the Clean Water Act, is particularly well-suited for managing natural resources under conditions of uncertainty. While there is broad scientific consensus on the importance of land use practices to nutrient loading and the central role of phosphorus in algal productivity, the recent cyanobacterial blooms in Owasco Lake and other regional lakes with relatively low ambient phosphorus concentrations underscore the complexity of lake ecosystems. What role, if any, invasive species and climate change play in the cyanobacterial blooms is a significant area of uncertainty.

As summarized in the May 2015 *Owasco Lake Watershed Management and Waterfront Revitalization Plan: Watershed and Waterbody Inventory Report (Watershed and Waterbody Inventory Report)*, there are multiple researchers and resource management agencies actively collecting samples from Owasco Lake and its tributary streams. This Plan provides an opportunity to bring the parties together in a coordinated monitoring program and to reach consensus on benchmarks and metrics that relate to restoration and protection of the designated uses. This collaboration could result in a more complete spatial and temporal data set to analyze changes in the watershed, as well as a more efficient use of resources. Once key spatial and temporal indicators (metrics to document progress) are developed, the watershed partners will have a collective tool for documenting variability. The ultimate goal of a coordinated monitoring program is to support decision-making regarding optimal investment of specific measures to improve the health of the ecosystem. Moreover,

the suite of metrics selected should be meaningful to the public, easy to communicate, and relate to the community's vision for an improved lake and watershed.

5.2 Guiding Principles

The Owasco Lake monitoring program was designed with four important principles in mind.

A. Turn data into information, then into strategic information.

This evolution is a central attribute of any effective monitoring program. Data are results of individual measurements of the physical, chemical, and biological parameters of the system. For example, results of biweekly monitoring of water temperature, dissolved oxygen, total phosphorus, and chlorophyll-*a* are data.

Data become information when they are compiled and used to test a conceptual framework of the nature of the aquatic system. Temperature and oxygen data can help define stratification and rates of hypolimnetic oxygen depletion; chlorophyll-*a* data indicate the abundance of phytoplankton. Phosphorus accumulation in the lower waters over the stratified period helps managers assess trophic state. Measured results can be compared to a desired state of the ecosystem. For those parameters with criteria or standards, comparison between measured results (data) and the criteria or standards becomes information.

Information becomes strategic information when it provides a basis for informed decision making. The relative magnitude of loading of phosphorus and sediment from certain tributaries can help define priority areas for remedial action. Another example is trend analysis; a well-designed monitoring program can be used to assess whether conditions are changing over time.

B. Develop a Quality Assurance Project Plan for the integrated monitoring effort to document data quality and estimate sampling and analytical sources of variability.

A Quality Assurance Project Plan (QAPP) is a systematic effort to define objectives, document the integrity of the procedures used to collect and analyze samples, and provide a framework for data analysis and interpretation. The QAPP also defines how data will be archived and made available. With multiple agencies involved in monitoring, the QAPP allows managers to assess comparability of data sets and determine the extent to which system-wide comparisons can be drawn. A well-defined QAPP is particularly important for citizen monitoring to ensure that the data can be used without reservation.

The QAPP outlines details such as the use of replicate samples, split samples, and audit samples to identify sources of variability in data, and to provide feedback regarding the need to revise procedures. For trend analysis to be performed, it is essential to be able to identify and quantify sources of variability. Participating laboratories should use standard methods for analysis, meet all required holding times, and document their procedures.

C. Include "capstone indicators," defined as organisms that, by their presence or absence, provide information regarding the ecological status of the community.

The community of plants and animals present in Owasco Lake and its tributaries are adapted to ambient conditions of light, nutrients, temperature, sediment quality, etc. The presence and abundance of certain species can provide important information regarding overall water quality conditions. Key indicator species such as game fish and salmonids may be of high value as an economic/recreational resource. Other indicator species, such as native macrophytes, may be selected because of their importance in providing critical habitat. In the Finger Lakes, certain invasive species, both aquatic and terrestrial, are tracked due to their regional impacts. Macroinvertebrates in tributaries are studied because they are indicators of long-term water quality conditions.

D. Strive to be cost effective.

Monitoring is expensive. A well-designed monitoring program will eliminate redundancies and increase the value of the overall investment in monitoring. It will be important to retain the current monitoring partners, including Owasco Watershed Lake Association and the Finger Lakes Institute, and to recruit additional resources. The emerging program to be supported by OWLA's 2015 grant offers an excellent opportunity to collaborate on a focused monitoring program.

5.3 Lake Monitoring Program – Measures and Targets

As summarized in **Table 5-1**, a focused set of indicator parameters can track the quality of Owasco Lake with respect to attainment of its designated uses for water supply, recreation, and aquatic life protection. This relatively short list is not intended to address all research questions. Rather, this core monitoring program was designed to provide a basis for communicating status and trends to a broad audience by focusing on key indicators and regulatory compliance.

Table 5-1. Summary of Recommended Lake Monitoring Program

Owasco Lake				
			Metrics for Reporting	
Desired Use	**Goal**	**Key Measurements or Indicators ***	**Compliance**	**Trends**
Public water supply	Finished water is safe for consumers of all ages and health conditions	Sub-part 5 of NYS Sanitary Code list for public water supply	Meets requirements of Sub-part 5 of NYS Sanitary Code	• Total organic carbon • Na and Cl • Disinfection by-products • HAB toxin levels
	Lake waters meet the NYSDEC ambient water quality standards and criteria in place for Class AA waters	• Chlorophyll-*a* • Total phosphorus (P) • Total dissolved phosphorus (TDP) • Soluble reactive phosphorus (SRP) • Total nitrogen (N)	Meets NYSDEC ambient water quality standards and guidance values	• Summer average concentrations • Percent of samples over bloom threshold for chlorophyll-*a* • N:P ratio
Recreation	Water quality conditions are safe for full contact recreation	• Indicator bacteria at bathing beaches • Visual evidence of cyanobacterial blooms • HAB toxin levels • Days of beach closures • Secchi disk transparency • Macrophyte harvest	• Meets requirements of Sub-part 6-2 of the NYS Sanitary Code and NYSDEC • Absence of harmful algal bloom • Secchi disk transparency > 2m	• Percent of measurements in compliance at standard monitoring locations • Mass of plant material and phosphorus removed by harvesting • Extent of harmful algal blooms • Number of beach closures
Aquatic Life protection	Water quality and habitat conditions support a diverse assemblage of native species, including sensitive life stages	• Dissolved oxygen (DO) profiles during late summer at deepest station	Dissolved oxygen > 6 mg/L	• Water column depth at which dissolved oxygen is less than 6 mg/L
Ecosystem functioning	Phytoplankton community is composed of a mix of species typical of an oligo-mesotrophic lake	Plankton counts, identified to major taxa (monthly May–Sept.); every 3 years	Not applicable—no regulatory standards for compliance	• Community composition (percent of major taxa)
	Zooplankton community is composed of a mix of species typical of an oligo-mesotrophic lake	Plankton counts, length measurements, and identify to major taxa (monthly May–Sept.); every 3 years	Not applicable–no regulatory standards for compliance	• Average size of zooplankton • Community composition (percent of major taxa)
	Lake supports a diverse assemblage of native species typical of an oligo-mesotrophic lake	Benthic surveys; macrophyte surveys: density and area colonized (one survey, late summer); every 3 years	Not applicable—no regulatory standards for compliance	• Presence/composition of dreissenid mussels, Asian clams, and other invasive species

*Measures taken annually, unless otherwise noted.

5.4 Tributary Monitoring Program — Measures and Targets

There has been substantial data collection in the lake tributaries over the last decade (as documented in the May 2015 *Watershed and Waterbody Inventory Report*), but far less effort has been devoted to turning the data into information. During 2015, a project to compile the tributary monitoring data began, with funding support from Cayuga County's annual allocation of NYSDEC Environmental Protection Funds managed by FLLOWPA. Graduate students and faculty from the Cornell University Soil and Water Lab (CSWL), housed in the Department of Biological and Environmental Engineering, compiled stream monitoring data from four primary sources into a relational database. This data compilation project was envisioned as a necessary step toward developing a more quantitative framework to support the EPA's Nine Key Elements Plan for the Owasco Lake watershed.

Four sources of water quality monitoring data included: an investigation of Dutch Hollow Brook and Owasco Inlet by the Water Resources Institute (WRI) from 1986 to 2002; ongoing annual monitoring of various subwatersheds since 2006 by Professor John Halfman (FLI); tributary data from the "Phosphorus Project" in 2004; and various initiatives of OWLA since 1999. The database compiled from these sources includes 53 unique monitoring locations. The minimum number of sampling events at the 53 locations is one (several sites), and the maximum number is 1,718 (Dutch Hollow Brook, for the WRI project). The distribution of the sites and the number of samples in the database for each site is displayed in **Figure 5-1**; note that the size of the red dots corresponds to the number of samples. This visualization tool helped the Owasco Lake watershed project team identify gaps in spatial coverage and areas of the watershed of interest for future sampling.

The project scientists from CSWL completed various queries of the data as well, to look for temporal and spatial patterns. This analysis demonstrated the relationship between streamflow and concentration of total P and sediment, as well as the seasonality of loading; with highest loads in the winter and spring. The importance of sampling during high flow events on the precision of the estimate of annual loading cannot be overstated. Information regarding spatial and temporal patterns in the quality of the streams will provide a site-specific dataset to support the quantitative analysis needed to complete the Nine Key Elements watershed plan.

The following recommendations for tributary monitoring have emerged from this analysis, and are reflected in **Table 5-2**.

- **Routine water quality monitoring (annual)**: Select sentinel water quality monitoring locations at the mouths of major tributaries (Owasco Inlet, Dutch Hollow Brook) for annual monitoring of discharge and concentration (loading) of phosphorus and sediment. Make a concerted effort to capture high flow conditions in the annual monitoring program and begin monitoring early in the spring to capture runoff events.
    - Calculate and report annual loads using a standard methodology such as the program FLUX.
    - Calculate and report flow-weighted average concentrations of parameters of concern (total phosphorus (P), suspended sediment, soluble reactive phosphorus (SRP), total nitrogen (TN), total dissolved phosphorus (TDP)).
- **Routine biological monitoring (periodic)**: Establish sentinel biological monitoring sites in smaller tributaries and monitor the benthic macroinvertebrate community every three to five years, using standard NYSDEC techniques and metrics for reporting.
- **Special purpose monitoring**: In response to changes in practices, data gaps, new areas of concern.
    - For areas where BMPs (such as streambank stabilization or changes in agricultural practices) are planned, develop a baseline stream water quality dataset before the improvements whenever possible. Data collection upstream and downstream of the affected segment is recommended. Sampling during spring runoff conditions is critical.

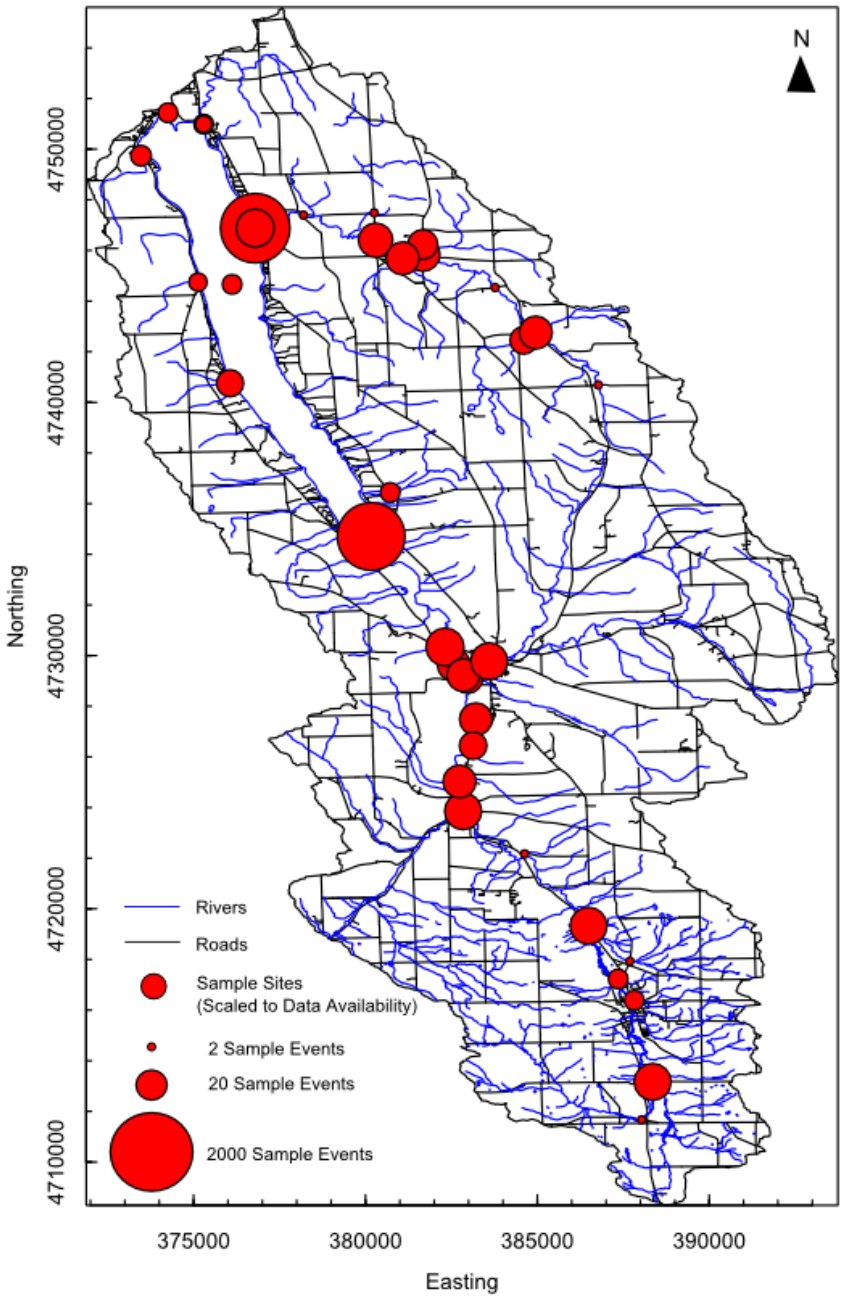


Figure 5-1. Visualization of the Location and Count of Prior Sampling Points in the Owasco Lake Watershed

Table 5-2. Summary of Recommended Tributary Monitoring Program

Objective	Locations	Parameters	Frequency	Metrics
Assess annual external loads from major streams	Owasco Inlet Dutch Hollow Brook	Total phosphorus Soluble reactive phosphorus Total dissolved phosphorus Total nitrogen Suspended sediment Discharge	Annual: March-November, strive to sample during high flow conditions	Annual load (calculated using FLUX) Annual flow-weighted average concentration
Provide data to calibrate and verify loading model for completing Nine Elements Plan	Multiple locations representing data gaps and under-represented land use patterns	Total phosphorus Soluble reactive phosphorus Total dissolved phosphorus Total nitrogen Suspended sediment Discharge	2016: April-November, strive to sample during high flow conditions	Per model requirements
Evaluate quality of stream habitat using benthic macroinvertebrates	Downstream sites in mapped streams that meet habitat requirements (sites can be monitored on a rotating basis)	Macroinvertebrate community (counts and species ID)	One event every 3 to 5 years for each stream, during low flow conditions, target late July through early Sept.	Family biotic index (FBI), Percent model affinity (PMA), Percent of dominant family, Taxa richness, and Ephemeroptera-Plecoptera-Trichoptera (EPT) index.
Monitor response to agricultural impacts and BMP implementation	Upstream and downstream during spring runoff	Total phosphorus Soluble reactive phosphorus Total dissolved phosphorus Total nitrogen Suspended sediment Discharge	Before and after improvements	Flow-weighted average concentration
Use a statistical analysis to determine whether stream conditions vary from baseline	At an established sentinel station, establish a baseline relationship between streamflow and loading, and calculate statistical variability (e.g. 95% confidence interval). This provides a defensible tool to determine whether conditions are changing.	Pollutants of concern: for example: Total phosphorus Soluble reactive phosphorus Suspended sediment	Baseline, then in response to specific hypotheses regarding effectiveness of control actions	Load of pollutants of concern over critical period (March-June)

5.5 Other Measures of the Plan's Success

The recommendations included in Chapter 3 are designed to restore and protect Owasco Lake and its watershed for future generations. The lake and tributary monitoring programs outlined above will track the environmental quality in response to the recommended actions. However, other socioeconomic measures are needed to evaluate progress with other elements of this Plan, such as a deeper community understanding and appreciation of water resources, more robust local laws for pollution prevention, success in attracting outside funding, enhanced recreational usage, and a resilient local economy. To that end, the project team and members of the Owasco Lake Watershed Management Council developed a list of indicators of the Plan's success that would encompass these additional factors (**Table 5-3**).

Table 5-3. Factors to Measure Progress toward Plan Recommendations

Objective	Measured By
Improve the capacity of local government to reduce nonpoint sources of pollution	Number of municipalities with sediment and erosion control local laws
	Number of highway personnel attending environmentally-related training
	Number of municipal Departments of Public Works or Highways using sediment and erosion control best practices
Improve outreach and education on Owasco Lake watershed issues	Number of press releases regarding the Owasco Lake watershed
	Number of contacts with educational institutions
	Attendance at annual Lake Day events
	Visits to related web pages
Expand recreational access and use	Number of canoe and kayak rentals
	Attendance at local parks
	Number of beach closures
	Number of boat launches
Prevent introductions of invasive species	Labor hours of boat launch stewards
	Number of vessel inspections completed
Develop enduring partnerships and collaborations	Number of municipalities participating in the Owasco Lake Watershed Council
	Land area under conservation easement or other protection
Acquire funds from multiple sources to support remedial measures	Number of grant applications submitted
	Total amount of non-municipal/non-County funds received
	Number of voluntary contributions received
Identify and reduce adverse water quality impacts from agricultural operations	Percent acres on which agricultural BMPs are implemented, number of farms adopting BMPs, or number of BMPs.
	Reduction in CAFO violations cited by NYSDEC and WIP
	Reduction in NYSDEC citations for runoff from farms
Rules and Regulations of the Owasco Lake Watershed and the Cayuga County Sanitary Code are being enforced.	Number of inspections, number of violations, number of violation notices and number of corrections through the Cayuga County Sanitary Code Program.
	Number of violations, number of violation notices and number of corrections through the WIP.
Improve public perception of lake conditions	Periodic surveys of public opinion
	Number of people attending meetings that are open to the public

5.6 Annual Report Card

Recommendation D-1-e states: "Prepare and distribute an annual report card for a general audience summarizing conditions in the lake and watershed, progress toward implementing the *Owasco Lake Watershed Management and Waterfront Revitalization Plan*, and the status of funding requests." This recommendation was inspired by a successful report card initiative underway since 2003 by the Livingston County Planning Department on behalf of the Conesus Lake Watershed Management Council. For example, the 2014 Conesus Lake and Watershed Report Card can be viewed online at http://www.co.livingston.state.ny.us/DocumentCenter/View/2869 .

Included in each annual report card is a list of the specific recommendations of the 2003 Conesus Lake Watershed Management Plan and what initiatives are underway to complete the recommended actions. Similar to other effective watershed management plans, the actions and priorities are reviewed and adjusted annually as needed to reflect new information and emerging issues.

For Owasco Lake, the annual report card could serve as a unified reporting mechanism on behalf of the multitude of County resource management agencies and departments, academic researchers, and OWLA. Many of the organizations already prepare an annual report; information relevant to Owasco Lake and its watershed can be compiled in a single document and made widely available. The metrics summarized in Tables 5-1, 5-2, and 5-3 provide a mechanism to track the efficacy of the recommended actions. This recommendation addresses one of the concerns expressed during the public outreach effort (notably, the June 2015 focus groups) regarding the lack of a single source of information regarding Owasco Lake's quality and safety.

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(See also "Links to Selected Key Resources" on page viii of this Plan.)

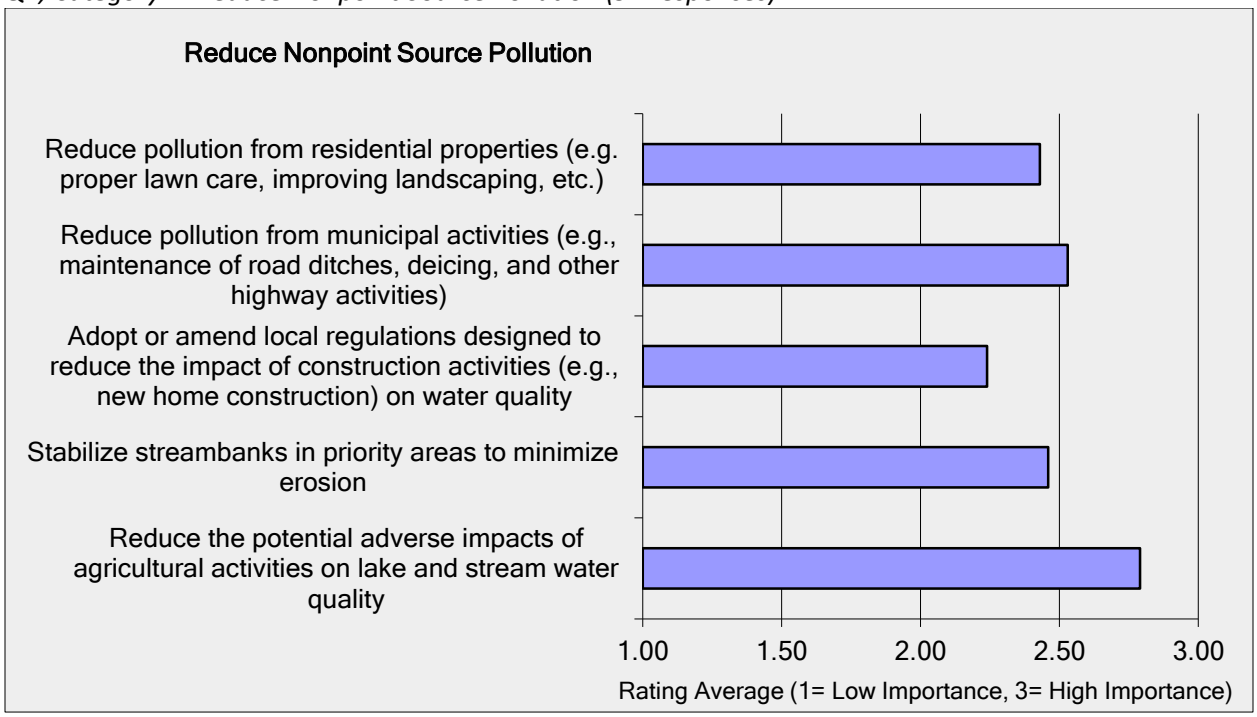
Appendix 1. Results of Public Opinion Survey

Owasco Lake Watershed Management and Waterfront Revitalization Plan Survey
December 2015

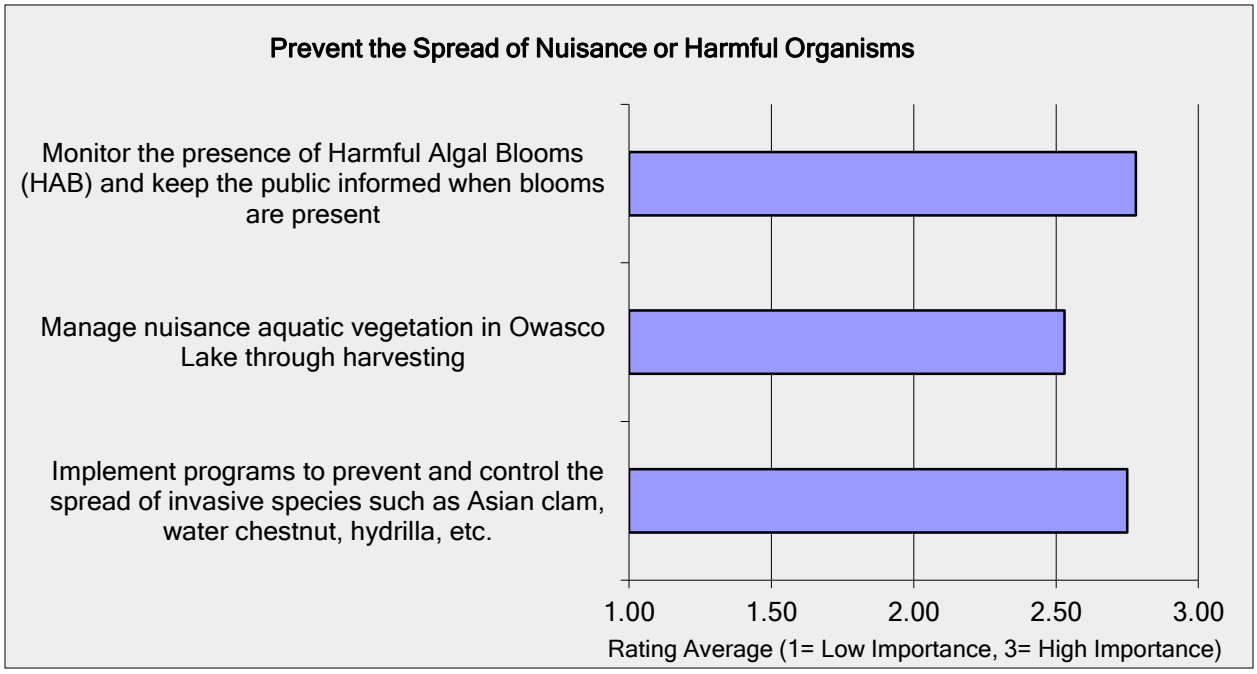
The Owasco Lake Watershed Management and Waterfront Revitalization Plan Survey was administered November 30 to December 21, 2015, as part of the public outreach effort associated with the *Owasco Lake Watershed Management and Waterfront Revitalization Plan*. Responses were received from 92 individuals. The survey was administered via Survey Monkey and linked from Cayuga County's Owasco Lake Watershed website in conjunction with a link to the Plan's draft Recommendations. The survey's availability was announced at a Nov. 30 public meeting (paper copies were also made available) and publicized via local media outlets. Respondents were asked to (1) review and rank the recommendations for the draft Watershed Management and Waterfront Revitalization Plan, (2) identify areas that need special attention, (3) specify stakeholder groups to which they belong, and (4) share any additional questions or comments.

Question 1. Respondents were asked to review key recommendations of the Plan, grouped within 5 categories, and rank the recommendations on a scale of importance from 1 (low importance) to 3 (high importance).

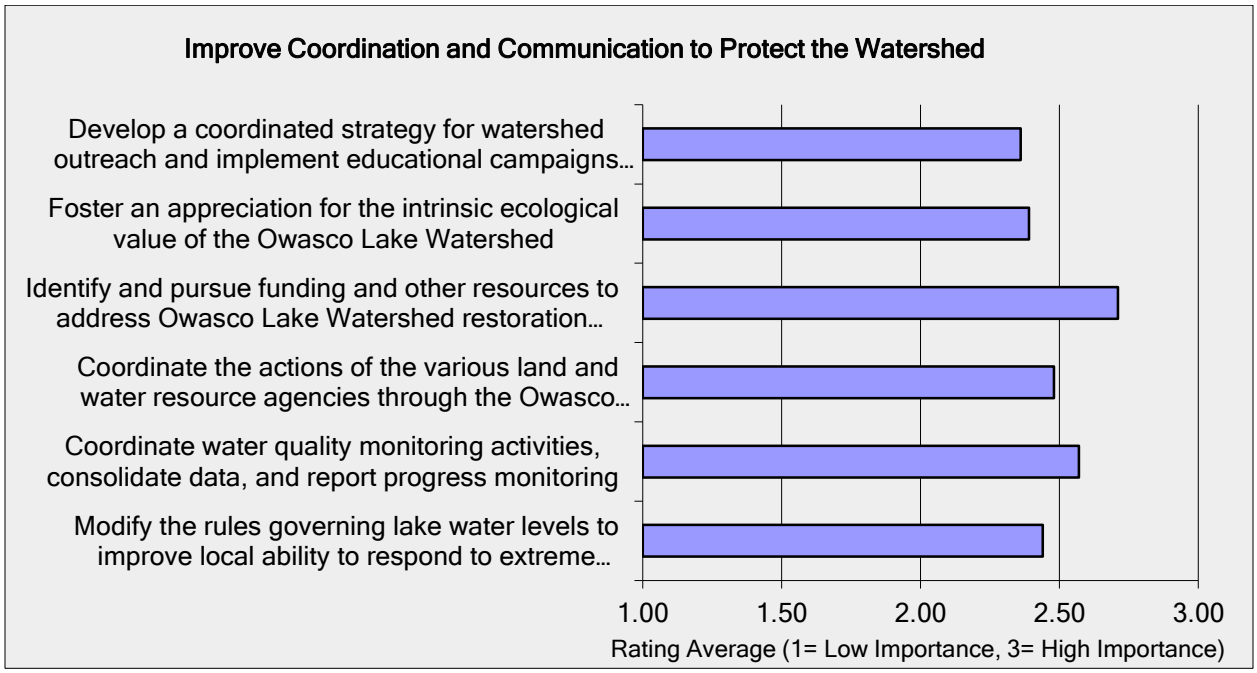
Q1, Category 1: Reduce Nonpoint Source Pollution (92 responses)



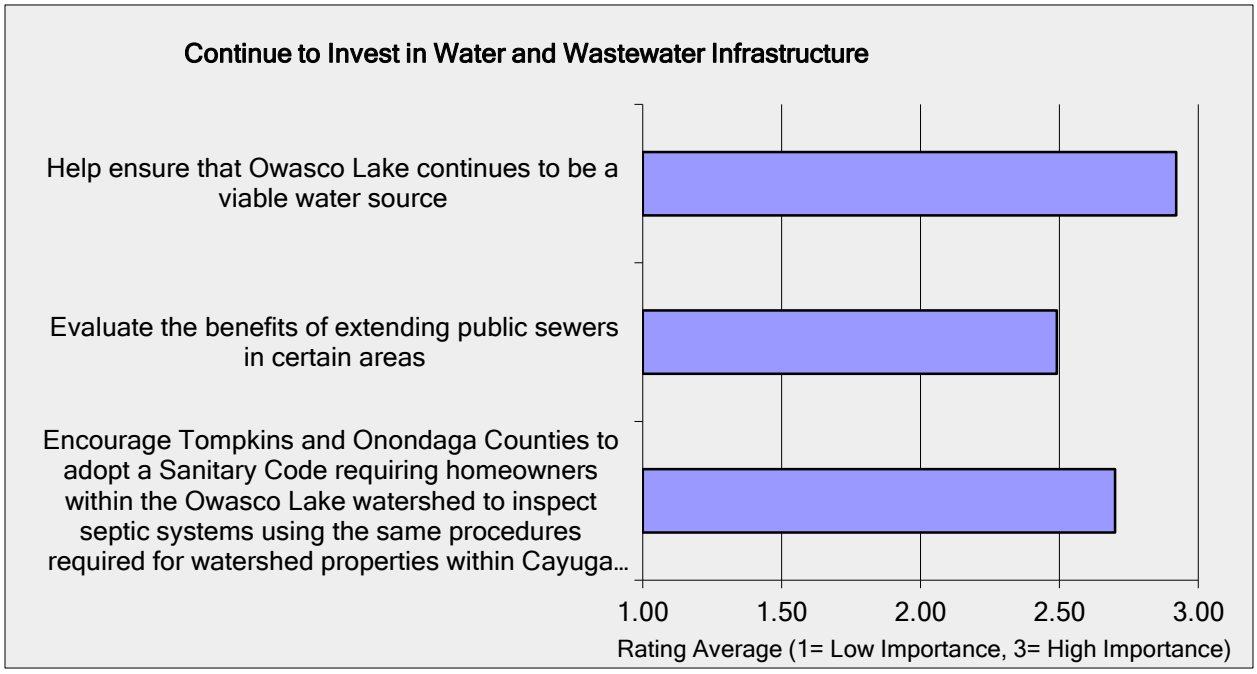
Q1, Category 2: Prevent the Spread of Nuisance or Harmful Organisms (91 responses)



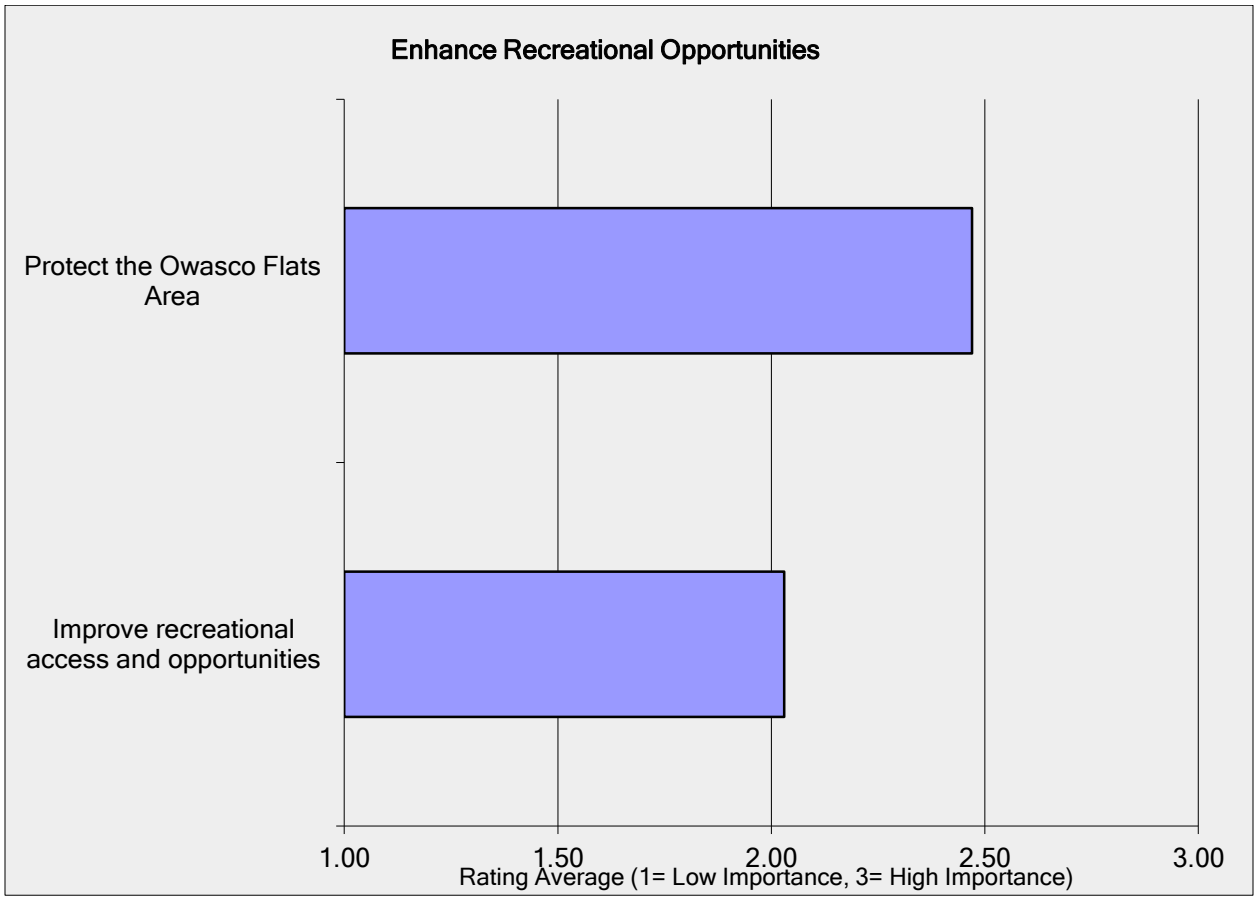
Q1, Category 3: Improve Coordination and Communication to Protect Watershed (92 responses)



Q1, Category 4: Continue to Invest in Water and Wastewater Infrastructure (92 responses)



Question 1, Category 5: Enhance Recreational Opportunities (92 responses)



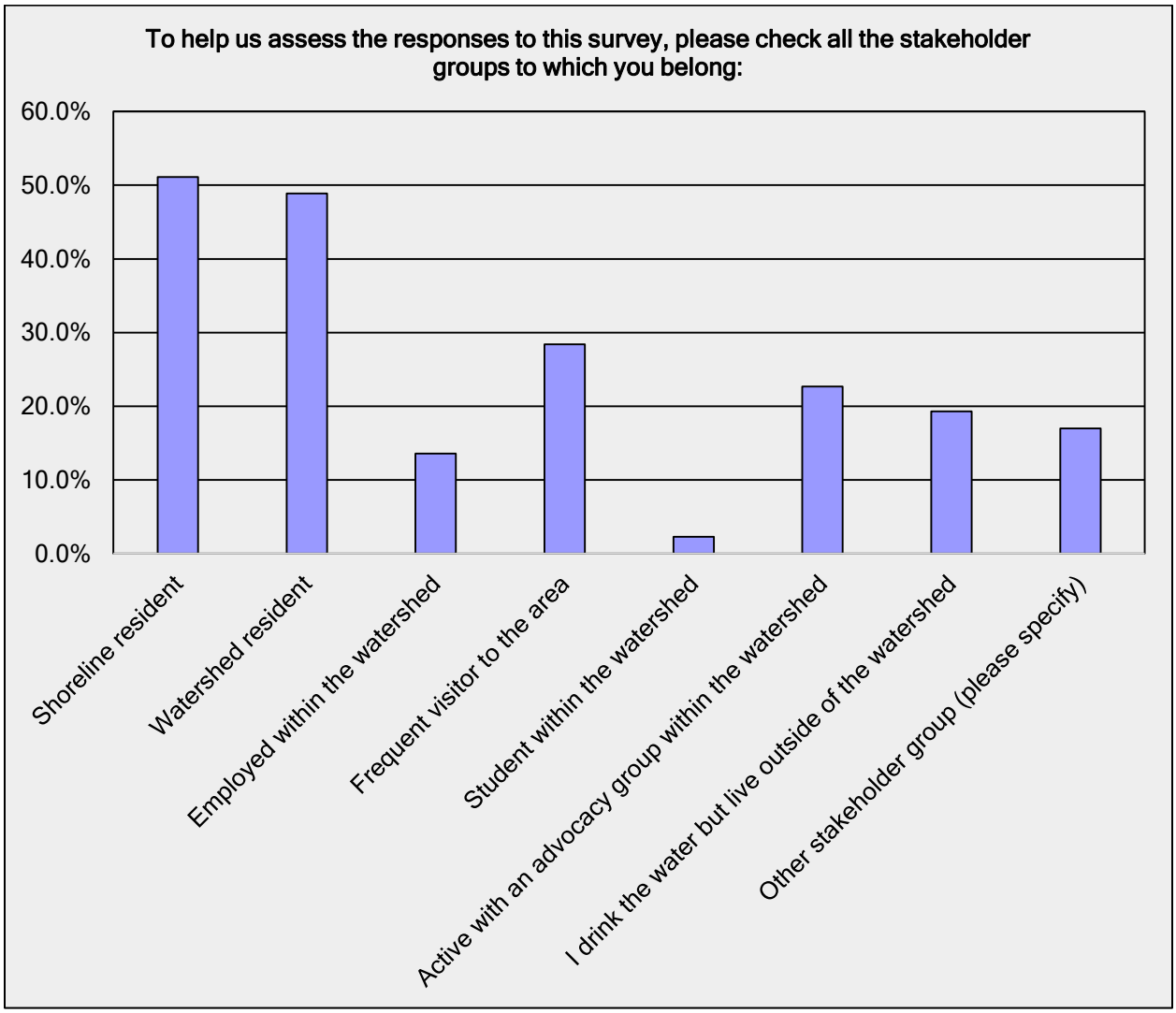
Question 2: ***What areas of the Owasco Lake Watershed do you feel need special attention?*** **(61 responses)**

Resp. #	Response Text
1	The inlet and the outlet
2	Areas testing high levels of HABs
3	The South End Of Owasco Lake
4	the very south end and the extreme north end
5	Our biggest concern is the number of geese that are on the water - this needs to be reduced substantially 70 to 100 at a time passing in front of our dock is NOT a pretty sight!!!!!
6	Inlet and areas of pollution feeding this area. Increase in the growth of plants in the 4' to 15' depth.
7	Camps and homes on the lake and their septic system monitoring
8	starting in the flats to preserve "foundation" of the lake, then steps to reverse damage already done to this great natural resource.
9	Farm fields. Farmers need to do the right things to reduce pollution
10	Owasco flats area
11	South End Area
12	inlet and southern part of Owasco Lake as well as Northern and Fleming
13	All contributaries should have a significant grass buffer, all farmers should be fairly compensated to help provide natural grass buffers to those contributaries .....EVERYONE SHOULD CARE!
14	ALL it has gone too far too long - Farm run off
15	Better lake LEVEL management
16	south end inlet water !
17	Phosphorus load in the lake, particularly from farmers (residences and golf courses as well) putting massive amounts of manure on the land and it then washing into the lake. This needs to be monitored and substantial fines need to occur as necessary. More watershed inspectors!
18	the whole watershed
19	The quality and cleanliness of the water in Owasco Lake is my greatest concern
20	Inlets that bring nutrients into the Lake that cause the Blue-Green Algae Blooms
21	south end
22	Farmland
23	Emerson Park beaches
24	South end
25	Farms surrounding the lake.
26	All areas in use by Ag. Nutrient and manure management. Also steep slope and highly erodible soils.
27	Non point pollution, manure runoff and farming activities. Cap the present number of cows in the watershed until it can be determined how to process the manure.
28	Emerson Park; public access points along the lake that are lacking.
29	the inlet
30	All lands that use high potent soluble phosphates and nitrates
31	Farms
32	Tributaries that flows into the Owasco lake
33	Agricultural runoff and fines for disregarding them or putting them out of business.

Continued Q2: *What areas of the Owasco Lake Watershed do you feel need special attention?* (61 responses)

Resp. #	Response Text
34	Pollution flowing into Owasco Lake from large farms without any checks from local agencies or any controls by farm owners and managers
35	All of it
36	Foot of lake, Water intake area
37	The lake level, it should be brought back to its natural level. Then the Owasco Flats can filter like it should naturally. The sand beach in front of my house can filter like it's supposed to.
38	Farmers keep eliminating hedge rows that hold water and help filter runoff. They also are installing grid tile that drastically reduces the ability for the ground to filter the water slowly naturally. Farmers need to develop more natural buffers to slow down runoff.
39	agricultural areas to control the run off fertilizers and manure into the lake and streams that feed into the lake.
40	Agricultural pesticide run off and private residence solid waste pollution.
41	Runoff
42	North and South ends of Owasco Lake
43	The whole lake.
44	The lakeshore residential people need to take responsibility in part for the quality of the lake. Many are on septic systems, fertilize their lawns, dump yard waste in tributaries and along the lake shore, and take part in other water quality degrading activities and are either unaware of their impact or are too snooty to admit they're part of the problem and place blame on the farmers. That being said, the southern third/half of the watershed needs lots of attention also. Lots of ag in the area and dramatic topography make for a bad combo - sediment and nutrients can make their way to the lake faster. Lots of education needs to be done in that area as well - folks in this area don't draw water from the lake so they tend to not care. Also the flats, because why not? It's the first line of defense for most of the water that comes into the lake plus we need all the freshwater wetlands we can get nowadays. And it's good fishing, can't lose that.
45	Lakefront property runoff
46	agricultural runoff
47	All
48	Owasco Inlet
49	The south end. But also the Ensinore public access site.
50	older cottages along the lake front. Waste water treatment plants need to be monitored better.
51	Areas along the shoreline where run off from fields occurs and also where sewage is discharged at the south end.
52	Anywhere there are blue-green algal blooms.
53	Farm lands and associated run off.
54	buffer areas along all streams on all agriculture land cleaning out and rebuilding Owasco flats for catch sediment before it gets into the lake
55	Algae blooms. Reduction of phosphorus entering the lake.
56	Main tributaries, Inlet, Dutch Hollow, Veness, Sucker, Fire lane 26
57	Dutch Hollow & Owasco Flats
58	All of the streams and all of the lake
59	The areas where there is a high volume of pollution run off into the lake and major streams.
60	Brook hollow
61	North West end popular place for boat/swimming

Question 3: ***To help us assess the responses to this survey, please check all the stakeholder groups to which you belong*** **(89 responses)**



Question 4: ***If you have any questions or comments about the Owasco Lake Watershed Management and Waterfront Revitalization Plan, the planning process, or specific recommendations for plan implementation, please note them in the text box below*** **(21 responses)**

Respondent Number	Response Text
1	Please keep up the good work bringing attention to a problem which took decades to get to and now will take collective effort to renew
2	Be more aggressive toward weed control and geese population,
3	Can we have on the water -Seasonal buoy mounted signs added which clarifying What a ZERO Discharge boating/ bathing area means
4	The lake level is generally too high during spring and most of summer compared to what it was in the 70's 80's, and some of 90's. It has not been controlled well since the NYS Thruway took over. It is too high for southern part of lake.
5	As a homeowner who lives on Owasco lake, I think it would benefit everyone to be provided simple solutions for minimizing our impact on this body of water, why is there no coordinated effort to provide guidance to lake landowners on how to responsibly live on Owasco lake? Thank you for your efforts!
6	I realize extending sewers are an expensive venture but I feel extending sewers would be a huge plus.
7	I don't understand how all who pollute the lake aren't held accountable? Farmers, residences, etc... Whoever is responsible needs to be held accountable! The lake belongs to all of us.
8	There needs to be a concerted effort of coordination between municipalities, industry, state and federal agencies to protect Owasco Lake.
9	It is criminal how the quality of the water has declined over the past 10 years
10	I personally do not feel that the state or federal government are taking the conditions of Owasco lake seriously enough. They won't react until it gets much worse and gets more publicity.
11	Need for real strong enforceable standards of all fertilizer use is the number one step to saving Owasco Lake
12	Keep up good work.
13	I see a lot of money being spent on studying the lake nothing being spent on protection of the lake.
14	How come no question on farmer runoff. I personally think that is the biggest problem with the lake. The liquid manure is the problem in my opinion.
15	That watershed inspector they got seems to be doing okay...
16	Keep lake levels low. High water and wind conditions cause bank erosion and property damage. The erosion causes more silt in the lake along with other problems
17	I don’t believe that there is enough public access on the lake and feel like people shouldn’t have to pay to launch a boat or be kept out of the Owasco flats.
18	What special plans and coordination are in the works to prevent down - stream flooding in Seneca River and Cross Lake and towns and cities along the River to Lake Ontario ?
19	We need better enforcement on bad actors or repeat negligent offender
20	There needs strong alignment between organization strategies, plans and timelines as they work on and for the lake
21	Manure is the single biggest problem. Focus on this first and once this is corrected you can chase the insignificant other offenders