

Chautauqua Lake Watershed Management Plan

Executive Summary

*Final
September 2010*



This watershed management plan was prepared for the New York State Department of State Division of Coastal Resources with funds provided under Title 11 of the Environmental Protection Fund, Local Waterfront Revitalization program.



Chautauqua Lake Watershed Management Plan



THE CHAUTAUQUA LAKE MANAGEMENT COMMISSION

Over the past decade, impairments to Chautauqua Lake and its watershed have highlighted the pressing need for a management structure to assist with the oversight and implementation of in-lake and watershed actions. The Chautauqua County Legislature took action and formed the Chautauqua Lake Management Commission (CLMC) in June 2005. The CLMC is composed of ten members serving one-year terms.

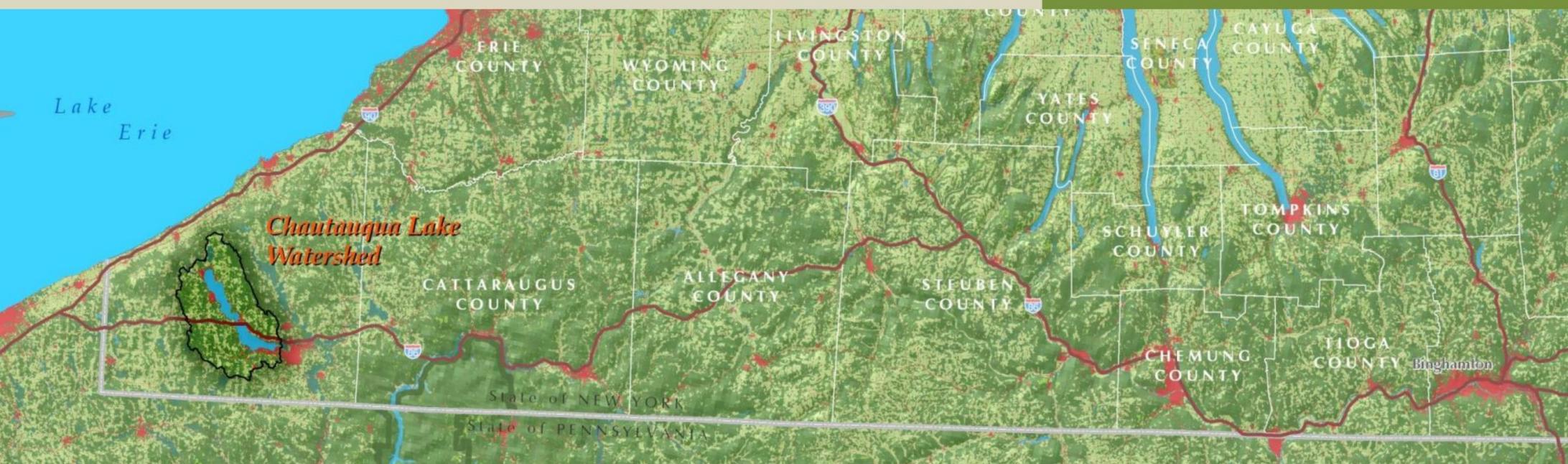
The mission of the CLMC is to “create, implement, and monitor a Comprehensive Lake and Watershed Management Plan which shall protect and enhance the health, ecology, and uses of Chautauqua Lake and its watershed.” Soon after its creation, while awaiting a grant from the Environmental Protection Fund Local Waterfront Revitalization Program, the CLMC began a comprehensive management plan for the lake based upon previously completed efforts. Once the grant was awarded, the CLMC selected Bergmann Associates, in association with the Academy of Natural Sciences and Glenn Harbeck and Associates, as the project consultant team. The project officially kicked off on February 13, 2009. Project oversight was provided by the Chautauqua County Department of Planning and Economic Development, with assistance from the CLMC, and the NYSDOS Division of Coastal Resources.

WHY PREPARE A WATERSHED MANAGEMENT PLAN?

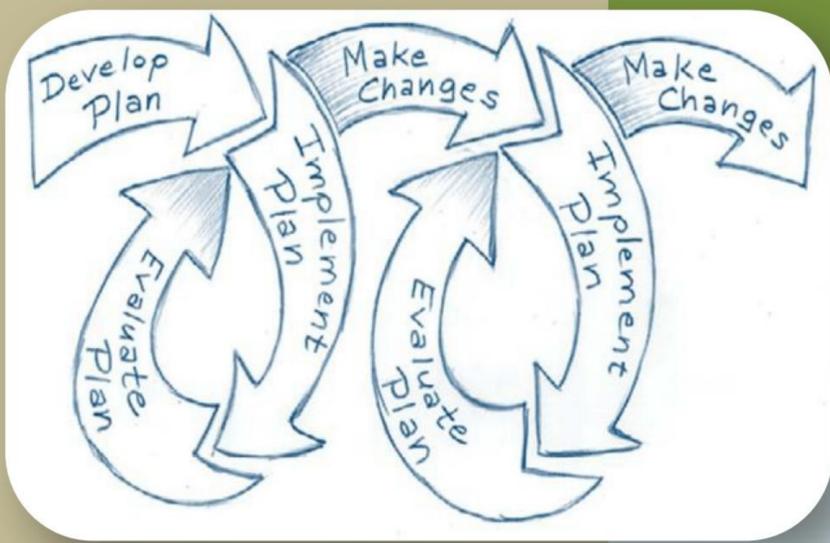
Chautauqua Lake, with its beautiful shoreline and scenic landscapes, is the heart of Chautauqua County. For those that live here, the lake is a prominent feature politically, economically, and socially. The lake is a major destination for its scenery, fishing, and water-based recreation, all of which are significant contributors to the regional economies. Chautauqua Lake is not without its problems, however. Excessive nutrient runoff and sedimentation have resulted in extensive and, in some locations, problematic growth of submerged aquatic vegetation, algal blooms, the loss of navigable water routes, and endangered drinking water supplies. All of these threaten the lake’s quality, recreation value, and sustainability. To ensure the continued sustainability of the lake and region, it was determined that the most appropriate course of action was the development of the *Chautauqua Lake Watershed Management Plan*.

The overall goals of the *Chautauqua Lake Watershed Management Plan* include:

- Goal 1:** Improve water quality in the lake, streams, ponds, and wetlands of the watershed by reducing the inflow of nutrients and sedimentation that causes the problematic growth of aquatic vegetation, the outbreak of algal blooms, and the loss of navigable water routes.
- Goal 2:** Protect and restore the natural function of the watershed’s drainage system that impacts stream conveyance, riparian health, floodplains, wetlands, and flow variability.
- Goal 3:** Conserve critical natural resources in the watershed that support healthy ecological communities of native plants, fish, wildlife, and other organisms.
- Goal 4:** Maintain and improve recreational opportunities in the lake and watershed.
- Goal 5:** Inspire and educate watershed stakeholders to implement the watershed management plan through public education and collaboration.
- Goal 6:** Implement sound land use practices and policies for private landowners, farmers, and municipalities that benefit the watershed.



Implementing the Watershed Management Plan



This figure illustrates the iterative nature of watershed planning and implementation

4 STEPS OF IMPLEMENTATION

- Identify the implementation team
- Prepare a work plan
- Develop a monitoring program and evaluation framework
- Communicate achievements and results

In addition to identifying strategies and recommendations to protect and improve water quality in the Chautauqua Lake watershed, it is also necessary to develop an organizational framework to ensure that these recommendations are implemented. Developing an organizational framework involves identifying the implementation team, preparing a work plan, developing a monitoring program and evaluation framework, and communicating achievements and results.

Identify the implementation team

These organizations and others will play a key role during implementation:

- The Chautauqua County Dept of Planning and Economic Development
- The Chautauqua Lake Management Commission and its member organizations
- The Chautauqua County Soil & Water Conservation District
- Cornell Cooperative Extension
- Watershed municipalities

Prepare a work plan

The purpose of a work plan is to outline the implementation activities described in the watershed management plan into short-term (0 to 3 years) time frames. While the watershed management plan (and Five-Year Action Plan) provides recommendations and strategies at all time frames, work plans act as specific to-do lists over much shorter periods of time.

Develop a monitoring program and evaluation framework

A necessary component of any implementation program is developing a set of criteria that can be monitored and evaluated to determine whether progress is being made towards meeting the identified goals. Developing a monitoring program and evaluation framework allows for an adaptive management approach in which implementation activities are continually reevaluated and revised to ensure the overall goals are met.

Communicate achievements and results

Providing regular updates to watershed stakeholders and decision-makers is an effective way to build awareness of watershed issues and the progress of watershed plan implementation, while also ensuring a more consistent approach at the subwatershed and municipal levels. As people see that progress is being made, the number of stakeholders will increase as more individuals become involved in the effort and work toward making the plan a success.

INDICATORS	WHAT'S THE SCOPE?	GRADE	HOW WE CAN BE PART OF THE SOLUTION
FLOODING AND EROSION			
Streams Erosion	Stream erosion is a key indicator of the effects of land use changes and human activities that are occurring within the watershed. To better understand the effects of flooding and erosion, broader data are needed. The current data available is for selected subwatersheds throughout the watershed.	I	Protect stream riparian. Plant riparian buffers along streams and subwatersheds. Do not increase the size of surface water runoff.
Flooding Advisories	The Niagara Peninsula Conservation Authority issued four Flood Advisories in 2005. No storm events exceeded the 100 year regulatory floodplain limits. Currently there is no data collection process to determine the number of properties or people affected by flooding events.	I	Do not build in floodplains or alter any streams, ponds or drainage ditches on your property without consulting your Municipality or the Niagara Peninsula Conservation Authority.
RECREATION			
Beach Postings	The Niagara watershed has over 50 public beaches. The overall loss of public beach time in the watershed was 11% in 2004 and 19% in 2005.	D	Revisit beach postings. Report your municipality in the development of policies to reduce the level of CSO discharge and polluted runoff.
Use of Protected Natural Areas	Links to natural areas increased by 7% from 2004 to 2005. Data is based on the visitors to Conservation Areas protected and maintained by the Niagara Peninsula Conservation Authority.	B	Take part in local community activities and enjoy your natural areas. Support municipal efforts to reduce water use.
COMMERCIAL WATER USE			
Water Restrictions	A formal process for addressing Regional water restrictions is being developed by the watershed partners.	C	Request water restriction notices.
Number of Water Efficiency Plans	Water Efficiency Plans are designed to reduce water demand for residential, commercial and institutional water users. Water Efficiency Plans are a fully award initiative and will continue to be implemented across the Niagara watershed.	I	Learn how you can develop and apply a Water Efficiency Plan for your home or business.
AGRICULTURE			
Environmental Farm Plans	Approximately 200 Environmental Farm Plans projects were implemented in the Niagara watershed in 2005. The Environmental Farm Plans projects are promoted by the Details Soil and Crop Improvement Association.	B	Participate in an Environmental Farm Plan workshop.
Nutrient Management Plans/Strategies	To enhance environmental protection, the Nutrient Management Act sets out the proper management of nutrient containing materials. The Region's Biosolids Water Plan provides an environmentally effective strategy for the disposal of biosolids including proper nutrient management. This is a recent initiative and data will be collected to measure the number of plans being implemented in the Niagara watershed.	I	Find out how your farm can contribute to the Nutrient Management Strategy.

Example report card for the Niagara River watershed for 2005

Five-Year Action Plan



The purpose of the Five-Year Action Plan is to guide implementation of the overall Chautauqua Lake Watershed Management Plan over the next five years. The actions identified include those recommended strategies determined to be of highest priority in the Chautauqua Lake watershed in the near-term. These strategies were identified based on an analysis of all recommended strategies provided within the management plan, as well as input provided by watershed stakeholders, the CLMC, and Chautauqua County Planning and Economic Development staff. The high priority recommended strategies identified in the Five-Year Action Plan are broken down into three categories:

- Watershed-wide recommended strategies;
- Recommended regulatory actions; and
- Capital project recommendations.

See Section 2.2 of the *Chautauqua Lake Watershed Management Plan* for more details.

Watershed-wide recommended strategies (see Section 2.2 and Section 4)

Watershed-wide recommendations generally are more programmatic and applicable to all areas within the Chautauqua Lake watershed. These recommendations range from actions that individuals can take on a daily basis to changes in existing institutional structures and practices to the adoption of additional regulatory programs.

Recommended regulatory actions (see Section 2.2 and Section 6)

Existing land use controls and other regulatory tools can have important implications for water quality as they form the framework under which development occurs. The purpose of this section is to identify land use controls that are of highest priority to each of the 14 municipalities within the Chautauqua Lake watershed with respect to protecting and improving water quality.

Capital project recommendations (see Section 2.2 and Section 5)

The high priority capital project recommendations are based on the specific issues facing each subwatershed (e.g., agricultural BMPs, streambank restoration). Given that no single municipal body is responsible for any given subwatershed, these recommendations were grouped by municipality for ease of implementation.



*A few of the key stakeholders
in plan implementation*

Characteristics of the Chautauqua Lake Watershed

SUBWATERSHEDS

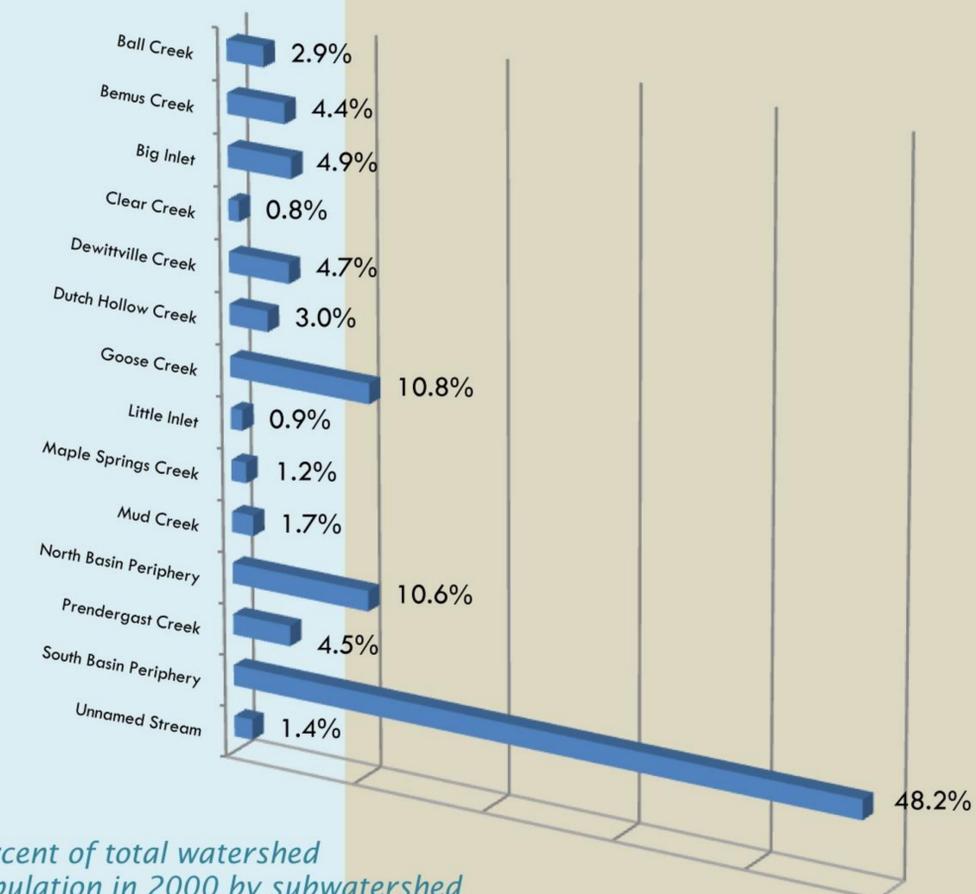
Subwatersheds are those areas from which groundwater and surface water drain and contribute to the flow of a larger watershed or drainage basin. The Chautauqua Lake watershed covers 160 square miles and can be subdivided into 14 primary subwatersheds, including the North and South Basin peripheral drainages. All of the creeks flowing to the lake exhibit dendritic drainage patterns (i.e., random branching), indicating that the underlying shale bedrock is relatively flat. Many of the small upland streams flow parallel to each other in northwest-southeast directions, their orientations controlled by glacial landforms.



Subwatersheds of the Chautauqua Lake watershed

POPULATION

The current number of permanent residents in the Chautauqua Lake watershed totals approximately 18,951 people, with close to two-thirds living in close proximity to the lakeshore. However, long-term population trends in the region point towards an ongoing depopulation of Chautauqua County, including the Chautauqua Lake watershed. From 1990 to 2020, the population of the watershed is expected to decrease by three percent, with gains and losses varying by subwatershed. This loss of population, however, is projected to increase the amount of urban areas as a result of sprawling development patterns



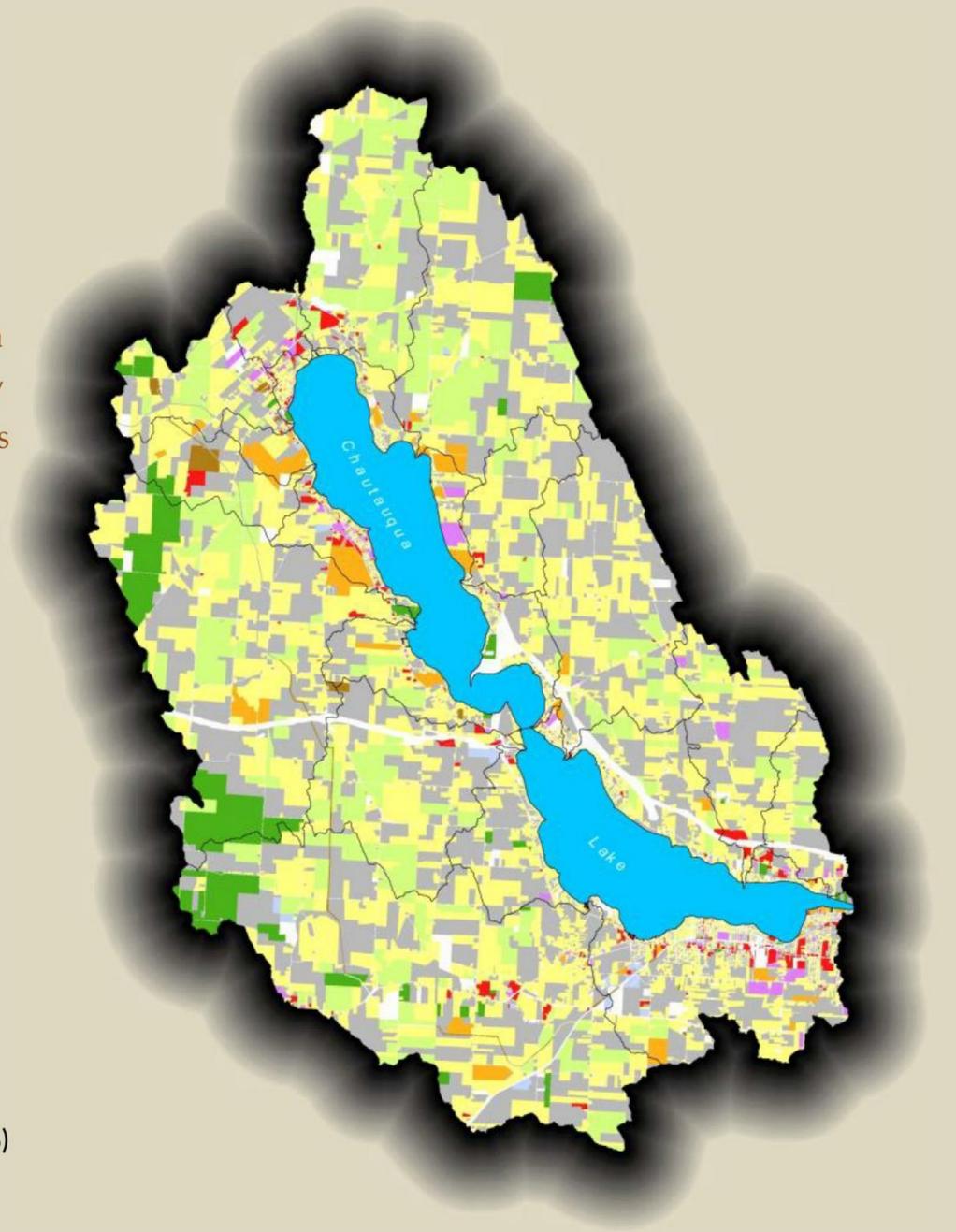
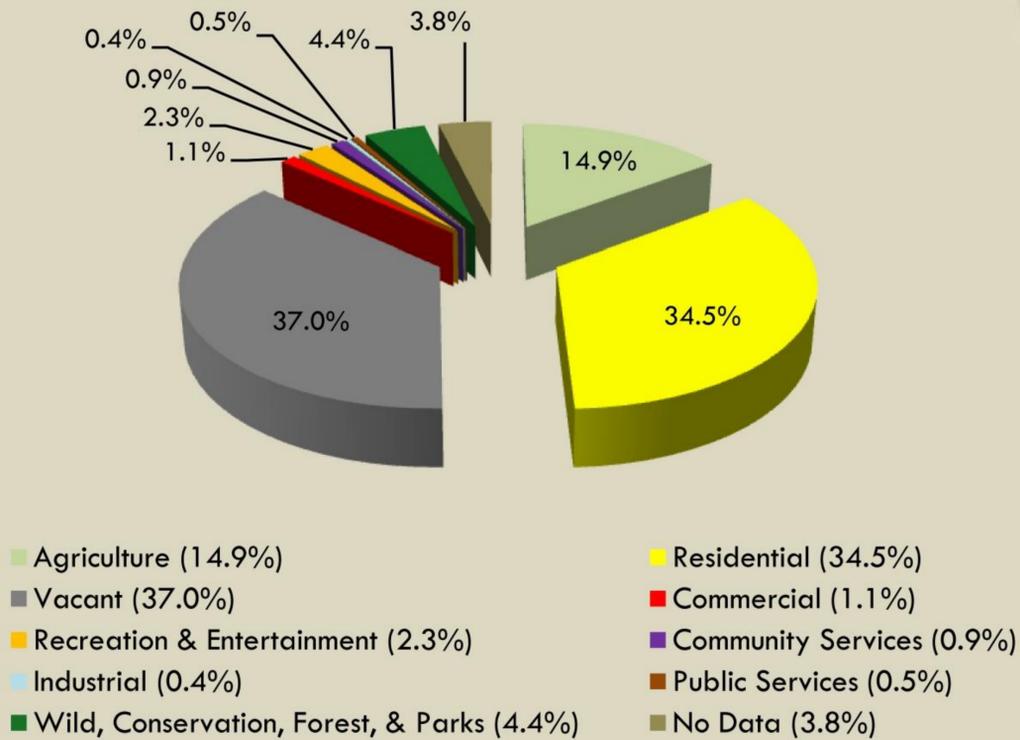
Percent of total watershed population in 2000 by subwatershed

Watershed Quick Facts:

- An estimated 26 percent of the County's assessed property value is located between the lake shoreline and surrounding State roads; this represents less than 1 percent of the County's total land area.
- The lake serves as a source of drinking water for the Chautauqua Institution, the Chautauqua Heights Water District, and 19 private water intakes
- Approximately 75 percent of residential parcels in the watershed are served by municipal sewer systems
- The watershed receives, on average, approximately 46 inches of precipitation each year
- Approximately 21 percent of the stream miles in the watershed are classified as trout waters (T) or suitable for trout spawning (TS)

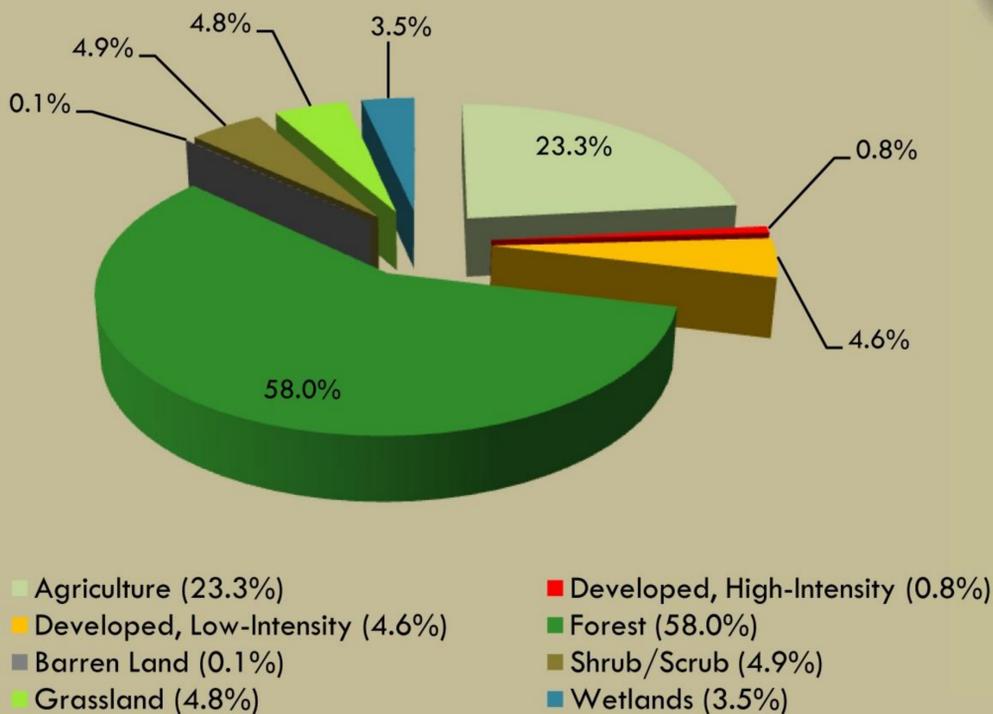
LAND USE

Land uses within the basin are important to the watershed's hydrologic cycle because they have one of the greatest impacts on water quality. Land use refers primarily to the built environment, is defined at the parcel level (i.e., only one use is assigned to each parcel), and typically does not account for the vegetation present on a given parcel. Land use (as defined by the NYS Office of Real Property Services) in the Chautauqua Lake watershed is presented in the figures below.



LAND COVER

Land cover classifications represent what is covering the ground in a particular area and is not constrained by parcel boundaries. Land cover (and land use) is a primary driver affecting water quality, exerting considerable influence on the chemical, physical, and biological characteristics of waterbodies. Removing natural land cover types diminishes the soil's ability to absorb nutrients and trap sediments, resulting in increased amounts of runoff and pollution. An updated land cover data set reflecting current conditions was created for the Chautauqua Lake watershed and is presented in the figures below.



Characteristics of the Chautauqua Lake Watershed (cont.)



An example of a forested riparian buffer along Prendergast Creek

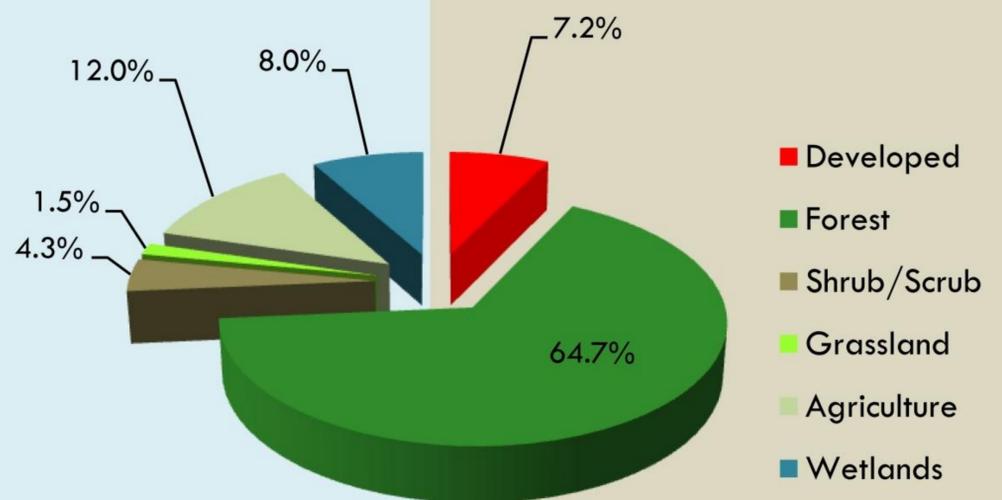
RIPARIAN AND SHORELINE LAND COVER

Riparian areas are those lands adjacent to a body of water, serving as an interface between the surrounding upland areas and the waterbody itself. These areas play an important role in terms of water quality and other ecosystem services. By trapping soil and sediments, riparian lands can reduce the amount of soil and nutrients entering a given waterbody, thus improving water quality and reducing the loss of in-stream habitat through siltation.

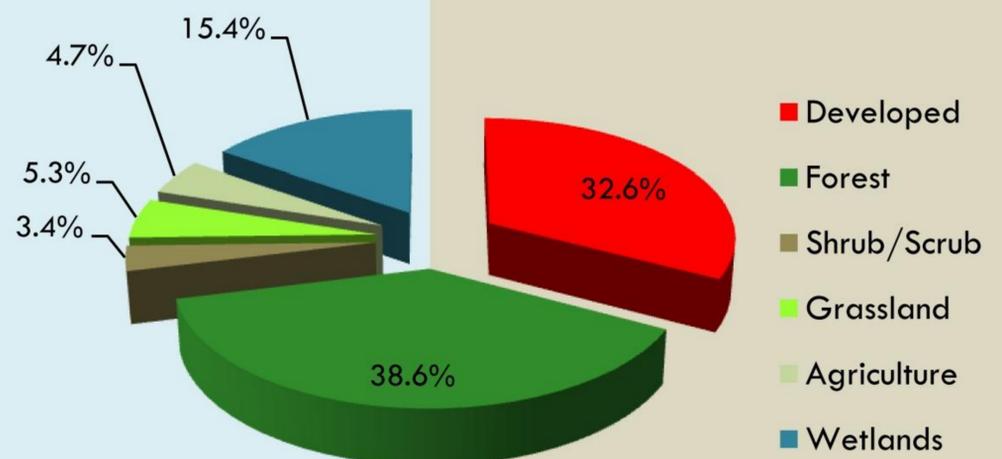
The extent of water quality benefits provided by riparian areas varies, however, depending on the type and amount of land cover present. Forested areas typically provide for the highest quality water by stabilizing the soil, decreasing erosion, and absorbing nutrients. By slowing overland flow from developed land, wetlands can filter runoff prior to it entering streams, thus improving water quality. Wetlands located along streams and rivers also provide valuable flood protection, acting as storage basins and reducing the amount of downstream flow.

While not providing the same level of benefits as forests or wetlands, other natural vegetation (e.g., grasslands/old fields, scrublands) also filter out nutrients and sediments before they reach a waterbody. Agricultural lands and urban development located adjacent to waterbodies provide less water quality benefits and will generally cause water quality to degrade.

Within the Chautauqua Lake watershed, almost 65 percent of all riparian areas are forested, with other natural vegetation types comprising an additional 14 percent. The Chautauqua Lake shoreline, however, has only 39 percent of its land area in forests, with urban development comprising the next largest shoreline land cover type (33 percent).



Land cover within 100 feet of creeks and streams in the Chautauqua Lake watershed



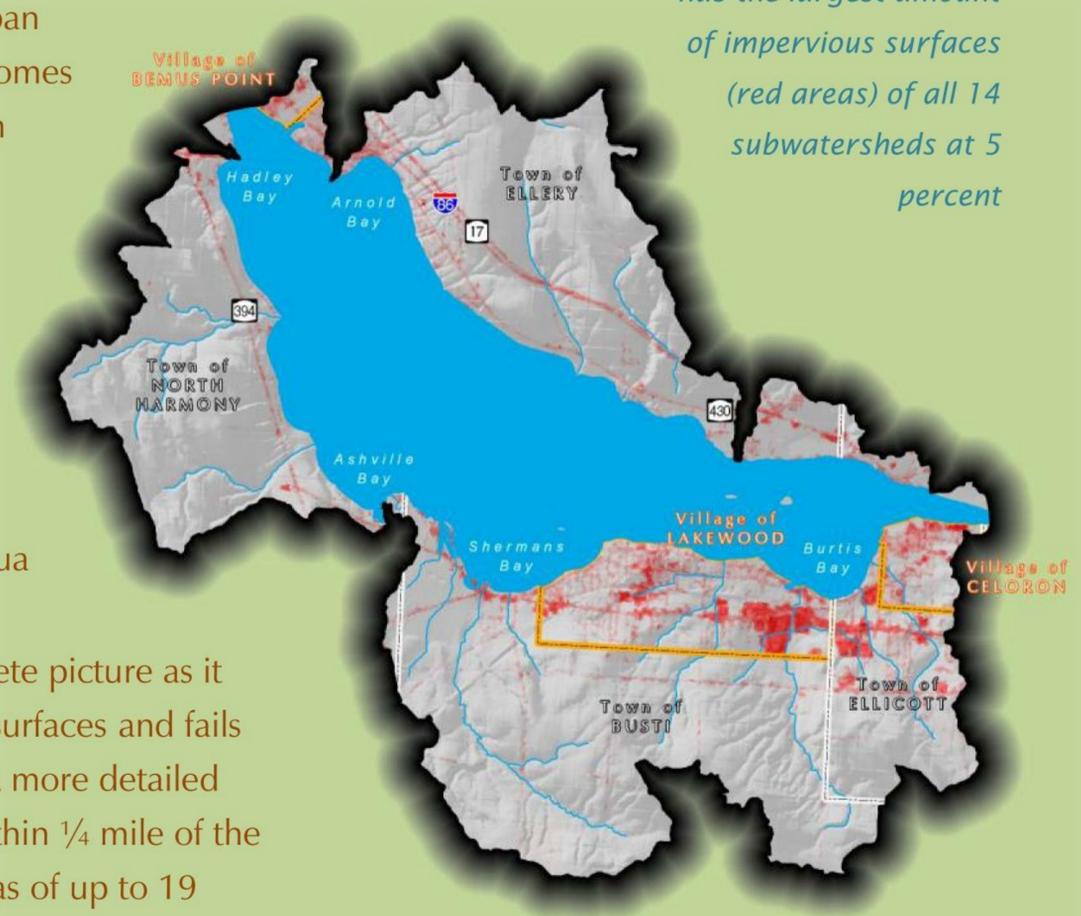
Land cover within 100 feet of the Chautauqua Lake shoreline

IMPERVIOUS SURFACES

Impervious surfaces, such as roads, parking lots, driveways, sidewalks, roofs, and heavily compacted soil prevent infiltration of water into the ground. Across the watershed, urban and suburban land uses are rapidly expanding. Along with this urbanization comes an increase in impervious surface area. The resulting changes in watershed hydrology negatively impact water quality since the natural filtering function of the soil is bypassed. These changes increase the amount and velocity of stormwater runoff, thus increasing soil erosion and the frequency and magnitude of floods.

Generally, watersheds characterized by more than 10 percent imperviousness show clear signs of degradation – the Chautauqua Lake watershed, as a whole, is characterized by 1.3 percent imperviousness. This, however, falls short of providing a complete picture as it does not account for the geographic distribution of impervious surfaces and fails to identify where concentrations of impervious surfaces exist. A more detailed look reveals that impervious surface area jumps to 8 percent within ¼ mile of the lake, with some subwatersheds realizing impervious surface areas of up to 19 percent within ¼ mile of the lake.

The South Basin Periphery subwatershed has the largest amount of impervious surfaces (red areas) of all 14 subwatersheds at 5 percent



QUICK FACT: Typical, compacted residential lawns are generally closer in impermeability to concrete than to any natural land cover

SUBMERGED AQUATIC VEGETATION

Submerged aquatic vegetation (SAV) is important for many organisms as it provides spawning, nursery, or adult habitat for a variety of species (e.g., muskellunge). Densities of many macroinvertebrates are higher in areas of SAV, while seeds and/or shoots of SAV are important foods for many waterbirds. SAV can also moderate wave intensity and shoreline vegetation and provide a zone for suspended particle deposition. Excessive amounts of SAV, however, can create problem odors and can interfere with lake recreational activities by ensnaring boats and making swimming impossible.

The ongoing mechanical harvesting program, biological control methods (e.g., moths) and the U.S. Army Corps of Engineers Aquatic Weed Study are positive efforts that are needed now to improve in-lake conditions to support recreational uses. However, none address the underlying problem of nutrient contamination from lands surrounding the lake, which is the primary driver of SAV growth. Reduction of nutrient inputs, particularly phosphorous, would inhibit the growth of SAV and increase the efficiency of other techniques (e.g., mechanical harvesting). The reduction of nutrient inputs may also reduce the dominance of Eurasian water milfoil, which is an exotic, nuisance plant species.



Eurasian water milfoil stripped of leaflets by caddis fly moths in Chautauqua Lake



Mechanical harvesting of SAV in Chautauqua Lake

Water Quality in the Watershed



The primary concern in Chautauqua Lake is the impact that excessive aquatic weed growth and algal blooms (including invasive species) have on recreational uses and drinking water. While the lake is considered eutrophic, nonpoint source pollution (i.e., nitrogen, phosphorous, and sediment) resulting from agricultural activity and urban and residential development, as well as point source pollution from wastewater treatment facilities, have led to conditions allowing SAV to thrive. The input of these pollutants has resulted in the lake's classification as an impaired waterbody, leading the NYSDEC to prepare Total Maximum Daily Load requirements.

Nonpoint source loadings were estimated for the watershed using the ArcView Generalized Watershed Loading Function (AVGWLF) model (see facing page). AVGWLF uses weather data to estimate runoff, which, in conjunction with land cover, soil features, and slope is used to calculate erosion. Based on the erosion calculations, the amount of sediments and

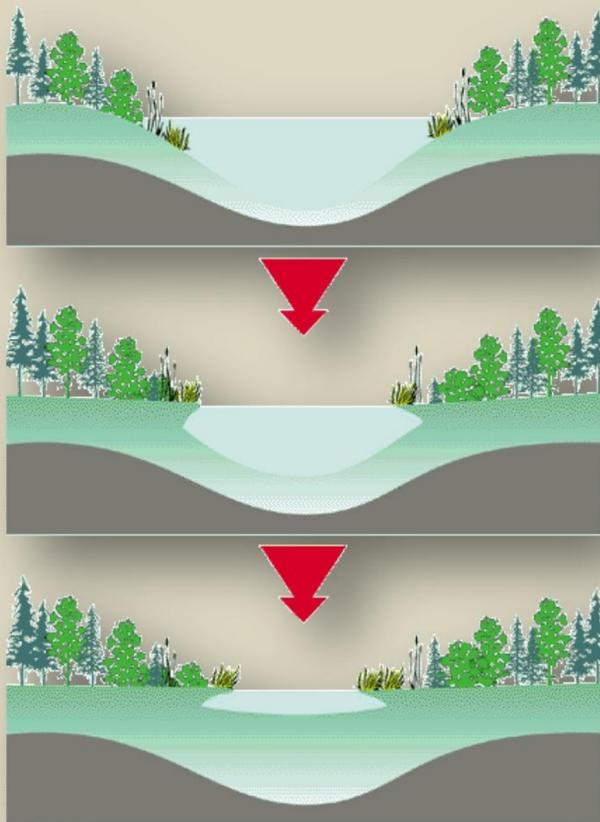
nutrients entering the watershed were estimated.

The AVGWLF model also incorporated Best Management Practices (BMPs) that are currently used in the watershed, such as the use of cover crops or nutrient management plans. However, BMP data was available for large farms only and it is likely that there are additional BMPs being used on smaller farms. In terms of streambank erosion, AVGWLF uses a general sub-model to estimate this process, so that many site-specific conditions which affect erosion may not be accounted for. Given that this watershed is characterized by numerous areas with active erosion, it is likely that the model underestimates the relative importance of streambank erosion.

Deep-rooted trees purify and slow the flow of water off the land, controlling flood water and pollutants

“Let us have a splendid legacy for our children. . . let us turn to them and say 'this you inherit and guard it well, for it is far more precious than money . . . and once it is destroyed, nature's beauty cannot be repurchased at any price.”

— Ansel Adams



Eutrophic lakes are those with high primary productivity resulting from high nutrient content and, as a result, are often subject to excessive algal blooms, suffer from poor water quality, and can “fill-in” over time.

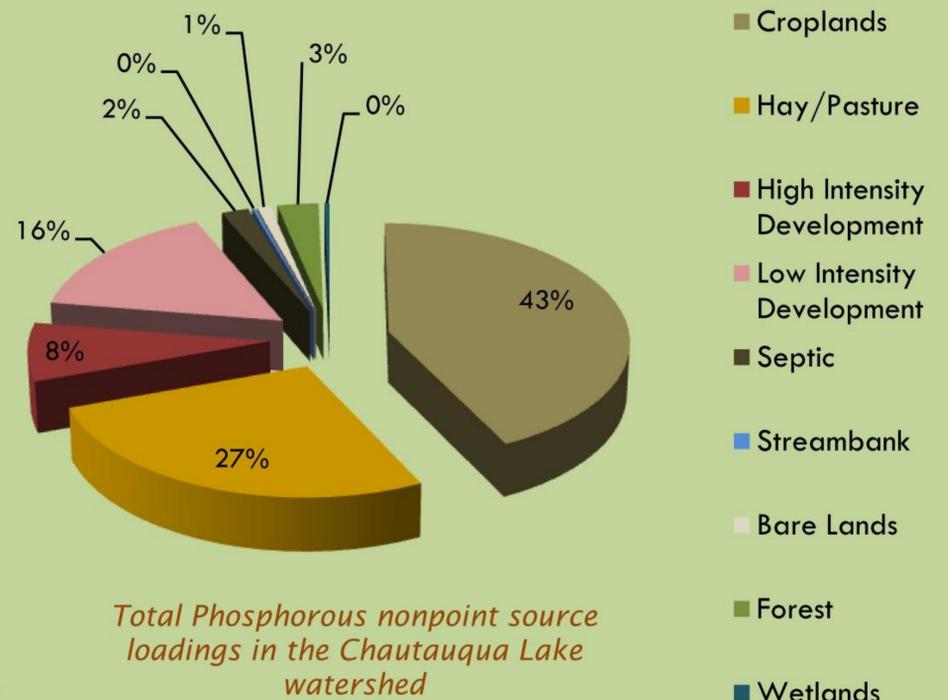
Total Estimated Annual Watershed Loadings

Total Phosphorous Loadings

Of the more than 9,900 kilograms of total phosphorus (TP) discharged into the Lake each year, 7,212 kilograms (73 percent) are discharged from nonpoint sources and 2,710 kilograms (27 percent) are discharged from wastewater treatment facilities (WWTFs). Excluding WWTF inputs, the following subwatersheds are responsible for 50 percent of TP discharges:

- South Basin Periphery subwatershed – 14.6 percent
- Goose Creek subwatershed – 13.0 percent
- Big Inlet subwatershed – 12.7 percent
- Prendergast Creek subwatershed – 9.7 percent

Total phosphorous loads from WWTFs are actual values extracted from the *State of the Lake Report (2000)* and were not modeled by AVGWLF.

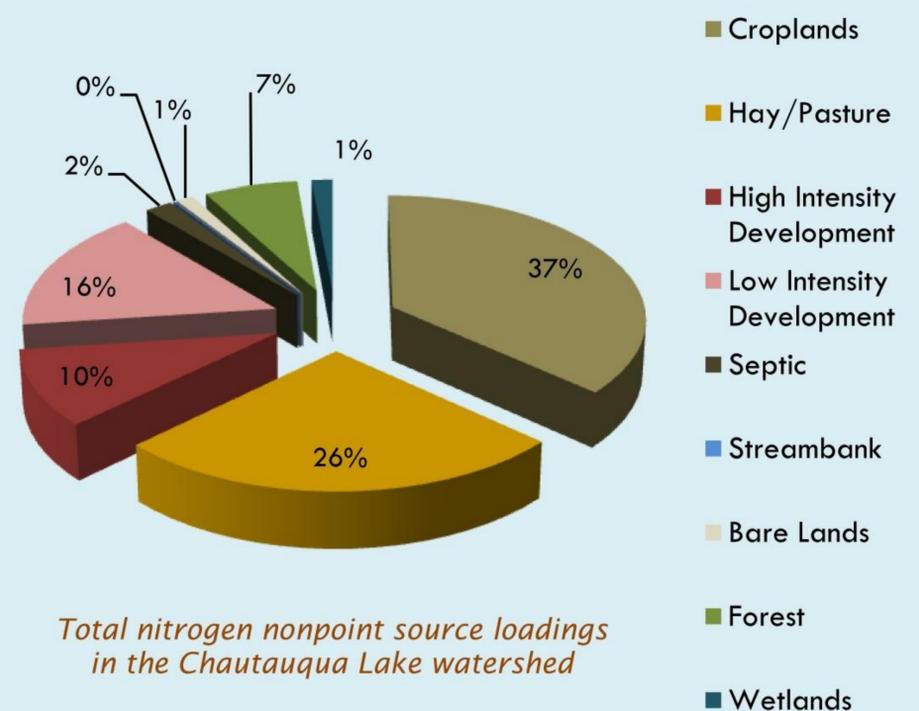


Total Nitrogen Loadings

In terms of total nitrogen loading, the 14 subwatersheds of Chautauqua Lake combine to discharge approximately 225,000 kilograms per year, with the following four subwatersheds are responsible for almost 53 percent of this total:

- Goose Creek subwatershed – 19.3 percent
- Prendergast Creek subwatershed – 12.7 percent
- South Basin Periphery subwatershed – 10.4 percent
- Dewittville Creek subwatershed – 10.2 percent

Total nitrogen loads were not provided for WWTFs in the *State of the Lake Report (2000)* as phosphorous is considered to have a greater impact on water quality and SAV growth.

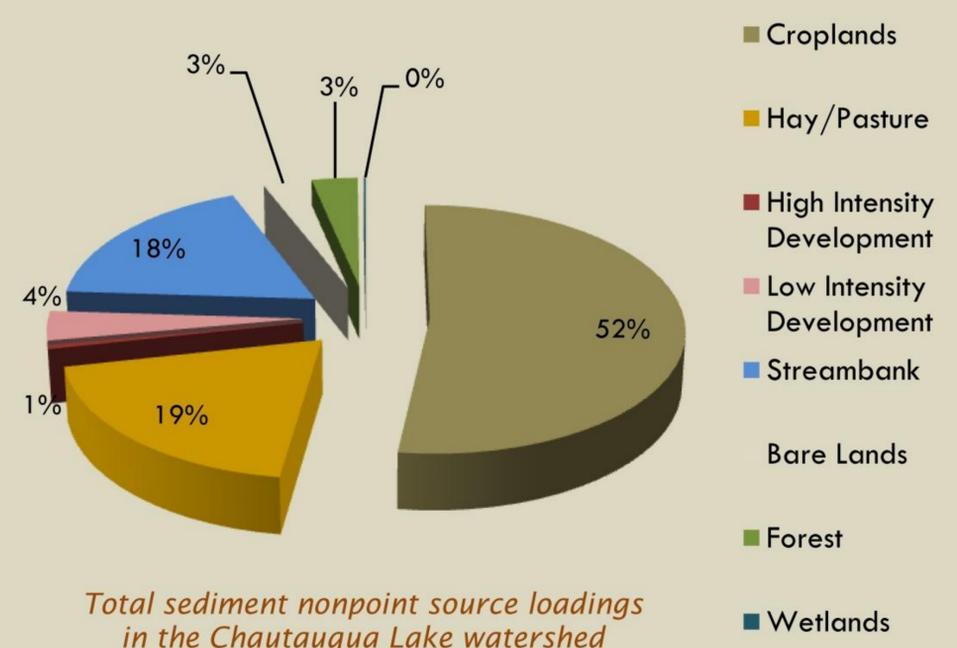


Total Sediment Loadings

The Chautauqua Lake watershed releases a combined 1,938,791 kilograms of sediment annually into Chautauqua Lake, with more than one-half coming from four subwatersheds:

- Goose Creek subwatershed – 361,023 kilograms (18.6 percent)
- Prendergast Creek subwatershed – 263,425 kilograms (13.6 percent)
- Big Inlet subwatershed – 234,304 kilograms (12.1 percent)
- South Basin Periphery subwatershed – 224,801 kilograms (11.6 percent)

Sediment load results from the *State of the Lake Report (2000)* indicated that 1,270,000 kilograms of sediment was discharged into the lake during non-storm events.



Why Stewardship is Important



First, what is *Stewardship*?

Stewardship, as it relates to watershed management and water quality, is a principle that advocates for the cooperative planning and management of

natural resources by individuals, communities, organizations, agencies and other interested parties to improve water quality and ensure the long-term sustainability of the watershed.

Why is watershed stewardship important?

Not only does stewardship protect and preserve the multiple environmental functions provided by the watershed's natural resources, it also preserves the beauty of the watershed, from its lakeshore wetlands to its forested highlands. As watershed stewardship is cooperative by its very nature, it ensures a comprehensive approach that identifies and integrates goals from its various participants. By preserving and protecting watershed resources, we ensure they can be enjoyed by future generations.

How do I become a watershed steward?

Without you, ensuring the long-term sustainability of the Chautauqua Lake watershed will not be possible. The following pages provide the various roles and stewardship activities that members in each of the following groups can undertake to become active watershed stewards and make a positive contribution to watershed health:

- Municipal Officials
- Agencies & Organizations
- Watershed Residents
- Farmers
- Project Managers & Developers
- Lake Users



Municipal Officials: Your Decisions Matter



Chautauqua County Legislature

PRIMARY RECOMMENDATIONS

- Sign on to a Chautauqua Lake Watershed Compact
- Coordinate and cooperate with other municipal officials, relevant agencies, and non-governmental organizations to implement water quality recommendations
- Encourage the addition of tertiary treatment at wastewater treatment plants in the watershed
- Incorporate effective water quality practices into local regulatory structures
- Identify approaches to advance implementation to ensure that no one community is bearing the burden for improving water quality in the watershed
- Adopt improved maintenance practices for County and Town highway departments

As the New York State Constitution provides for home rule, the primary authority for guiding community planning and development is vested in cities, towns and

villages. This provides local municipalities with the power to define how their community grows, or doesn't grow. Watershed boundaries, however, do not coincide with political boundaries, making watershed management and the implementation of commendations and strategies to improve water quality more complicated as the number of municipalities increases. As such, the central role of local government leadership in watershed protection cannot be overstated. Without the necessary leadership, water quality in the Chautauqua Lake watershed will continue to decline. Municipal officials should thus implement the following recommendations:

Sign on to a Chautauqua Lake Watershed Compact

The purpose of a watershed compact is to establish a representative forum by which issues and opportunities can be affected, to coordinate watershed management plan implementation activities, and to provide for a system of regular communication and cooperation between watershed communities. By signing on to this compact, municipalities would be accepting the principles and strategies identified in the plan and identifying their willingness to be a partner in implementation. Signing onto the compact would not require municipal adoption of the watershed management plan.

Coordinate and cooperate with other municipal officials, relevant agencies, and non-governmental organizations to implement water quality recommendations

Improving water quality will not be possible without the collaboration between the watershed's many stakeholders, much of which will occur through the framework of the compact. Groups to be involved include the CLMC, the Water Quality Task Force, the Chautauqua County Department of Planning, the Soil & Water Conservation District, and the Chautauqua Watershed Conservancy.

Encourage the addition of tertiary treatment at wastewater treatment plants in the watershed

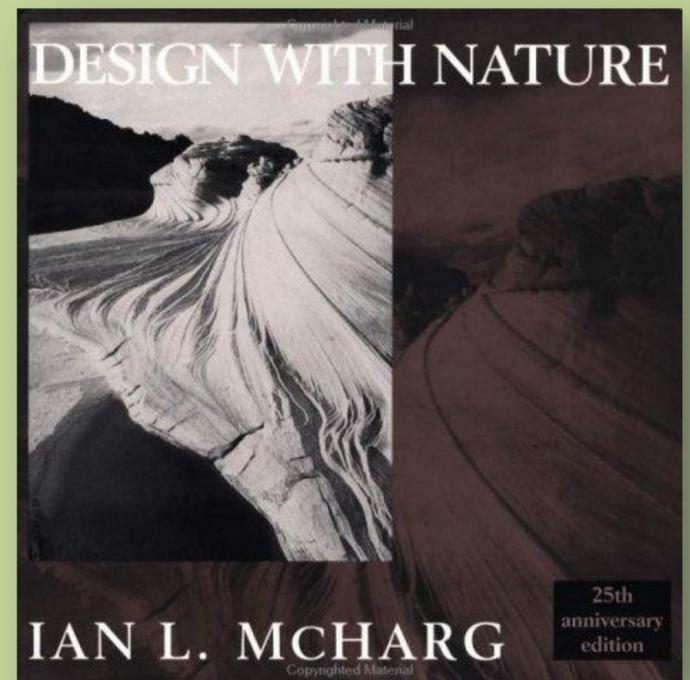
As wastewater treatment plants are the largest single contributor of phosphorous in the watershed, municipal officials should work to acquire the funds necessary to upgrade these facilities with tertiary treatment capabilities.



Incorporate effective water quality practices into local regulatory structures

The following practices should be considered for inclusion in local regulatory frameworks if not already in place:

- Impervious surface regulations/limits
- Low Impact Development (LID) stormwater and erosion control practices (www.lowimpactdevelopment.org)
- Streamside buffer regulations to preserve stream and lake corridors
- Stormwater and erosion control ordinances
- Site plan review standards for water quality
- Smart growth techniques
- Framework for identifying and protecting important natural resources
- Non-phosphorous use ordinances



Many principles discussed by Ian McHarg can be effective at protecting water quality

Identify approaches to advance implementation to ensure that no one community is bearing the burden for improving water quality in the watershed

Due to the very nature of watersheds, communities in the lower reaches of a watershed often bear the largest burden in terms of negative water quality impacts and the costs associated with remediating these impacts (e.g., increasing treatment capacity at wastewater treatment plants). Conversely, communities in the upper reaches often bear the largest burden when it comes to watershed restoration and protection, with forest lands being protected and removed from the tax rolls or by limiting the amount and type of new development. To ensure that the burden of improving water quality is spread equally throughout the watershed, municipal officials should work together to identify approaches that allow each community to contribute what it can (e.g., in-kind services, cost-sharing, and other tradeoffs).



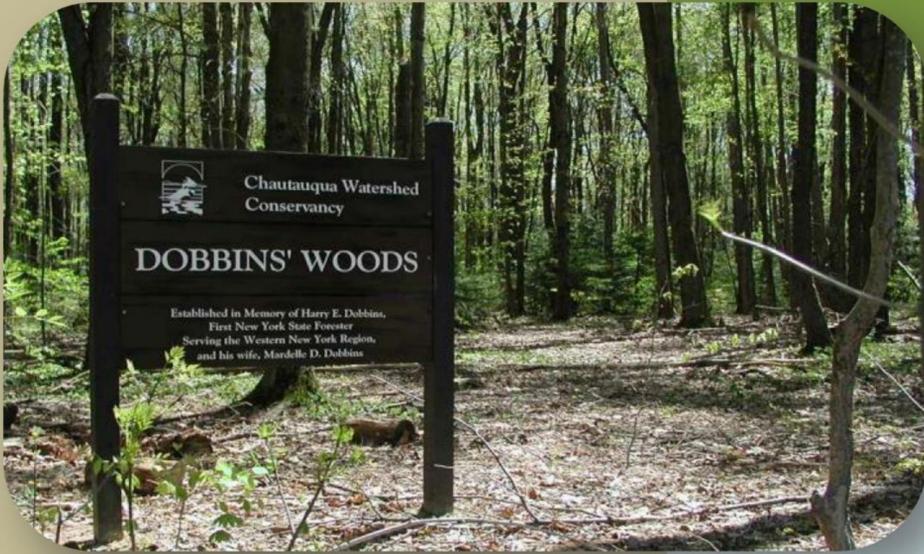
Adopt improved maintenance practices for County and Town highway departments

Roads permeate all aspects of our daily lives and play a crucial role in our local, regional, and national economies. Roads, however, can also have substantial impacts on water quality and the functioning of natural waters. Unpaved roads can be a significant source of suspended sediment in rural watersheds, accounting for 25 percent or more of the sediment load. Paved roads often increase both the amount of water and the amount of road pollutants delivered to waterbodies. Watershed municipalities should implement the appropriate roadway, ditch, and stormwater conveyance facility Best Management Practices (BMPs), such as check dams, hydro-seeding bare soils, or splash/plunge pools. The International Stormwater BMP Database (www.bmpdatabase.org) features more than 300 BMP studies and performance analysis results.



Rock-lined ditches and check-dams are a cost-effective technique for reducing runoff from roads and ditches

Agencies & Organizations: Your Role in the Watershed



Forest lands protected by the Chautauqua Watershed Conservancy

PRIMARY RECOMMENDATIONS

- Work directly with landowners and communities to implement water quality Best Management Practices (BMPs)
- Provide technical expertise to communities, municipal officials and agency personnel
- Expand upon existing and implement new watershed education programs to increase the awareness of water quality issues in the watershed
- Promote the networking of watershed stakeholders
- Restore and Stabilize Eroding Streambanks



The Chautauqua County Soil & Water Conservation District is one of the leading agencies in implementing water quality BMPs

Collaboration and strong partnerships between agencies, organizations and citizens is fundamental to the successful creation and implementation of any watershed planning process. Specific to the Chautauqua Lake watershed, there are a number of agencies and organizations that will be involved with plan implementation whose programs address water quality, environmental education, habitat protection, and restoration activities (see pages 3 and 4 for a list of agencies).

Bringing together these agencies and organizations with their individual resources and knowledge provides the opportunity to combine technical and financial capacities from a variety of sources. This type of collaboration often results in the identification of new and innovative ways to address watershed problems. Given the diversity of agencies and organizations in the watershed, the recommendations provided below are general; more detailed recommendations can be found in Sections 4, 5, and 6 of the plan.

Work directly with landowners and communities to implement water quality BMPs

Several agencies and organizations are already working directly with landowners to control and prevent of erosion, to acquire conservation easements and a variety of other projects designed to improve water quality. The Soil & Water Conservation District, for example, works with local farmers to improve erosion control practices on their lands. Given this familiarity with the local communities, as well as with implementing water quality projects, these agencies and organizations should continue to direct their technical, financial and regulatory resources to assisting watershed landowners.

Provide technical expertise to communities, municipal officials and agency personnel

Many watershed communities do not have the resources or capacity to identify the proper conservation practices, implement those practices, or adequately review practices proposed as part of a new development. agencies and organizations should work with watershed communities, municipal officials and planning and zoning boards to provide training, technical expertise and planning assistance to ensure that conservation practices are properly implemented in the Chautauqua Lake watershed.

Expand upon existing and implement new watershed education programs to increase the awareness of water quality issues in the watershed

An important component to watershed management is that of education. By educating stakeholders and decision makers on the general function of watersheds, as well as to the specific issues facing the watershed, support is generated for the various initiatives designed to improve water quality.

Examples include:

- Issue-specific brochures that detail successful strategies for improving water quality
- Brochures for seasonal residents informing them on how their actions can impact water quality
- Workshops for municipal officials and employees on erosion control, stormwater management, agricultural BMPs, proper streambank and shoreline management, and any other watershed issue of interest

Local school children learning about watersheds

Promote the networking of watershed stakeholders

To improve communication and coordination between watershed stakeholders, build relationships and heighten water quality awareness, the various agencies and organizations should actively promote the networking of stakeholders. This can be accomplished by providing an avenue for participants to input, share and compare information to increase environmental knowledge, stewardship and community service in the basin. Some suggestions include:

- Meeting regularly with stakeholders, decision makers, and other interested parties throughout the watershed
- Organizing an annual Watershed Day or conference/symposium
- Developing an internet-based forum (e.g., Facebook and other social networking tools) where stakeholders can meet to discuss issues and ideas

Restore and Stabilize Eroding Streambanks

Although bank erosion is a natural process that occurs in all waterbodies, human alterations to the natural system can result in erosion rates hundreds of times greater than those seen in natural stream channels. In the Chautauqua Lake watershed, many communities are experiencing extensive problems with streambank erosion. To address this issue, detailed stream surveys should be conducted to determine the locations of the most actively eroding and unstable reaches and assess the causes of instability. Restoration activities should then be prioritized based on the results of these surveys. The Watershed Coordinator and other appropriate agencies and organizations should work with the Soil & Water Conservation District to develop and implement a program to restore and stabilize eroding streambanks.

Watershed Residents & Landowners: You Can Make a Difference



PRIMARY RECOMMENDATIONS

- Get involved in your community and watershed
- Properly maintain on-site septic systems
- Minimize household impacts to water quality
- Maintain healthy, native streamside and lakeshore buffers

Everyone lives in a watershed. Watersheds are where we live, work and play. All that we do on the land impacts the quality of water on which we rely for drinking, recreation, irrigation and industry. From the disposal of household and yard wastes to the maintenance of healthy, native streamside and lakeshore buffers, residents of the Chautauqua Lake watershed play a major role in improving and maintaining water quality. There are several key actions that residents of the Chautauqua Lake watershed can take to sustain and improve water quality.

Get involved in your community and watershed

Individual and community involvement was a vital component in the watershed management plan and will be essential to its successful implementation. Public meetings, hearings, and workshops are excellent opportunities for residents to learn about what is occurring in their watershed, ask questions and express concerns about water quality. By becoming involved in local land use decisions, residents can encourage local officials to consider how these activities affect the watershed. Watershed residents are also encouraged to get involved by volunteering with and joining local organizations and agencies that participate in watershed projects. Each individual has a different set of skills and interests, so there are a variety of ways to volunteer time – participating in streamside clean-up activities, monitoring water quality in local streams, or educating children about watersheds and water quality.

Properly maintain on-site septic systems

Approximately 25 percent of residential parcels in the Chautauqua Lake watershed use on-site septic systems to manage their sewage. While on-site treatment systems can be a cost-effective solution, they require regular inspection and maintenance to ensure proper functioning. Failing to maintain these systems can result in untreated wastewater being introduced into streams and the lake. This negatively affects water quality by increasing the amount of pollutants, particularly phosphorous, which leads to water that is unattractive and unsuitable for use. Watershed residents using on-site septic systems should ensure that these facilities are properly maintained.

“We never know the worth
of water till the well is
dry.”

— Benjamin Franklin
(*Poor Richards Almanac*)

Minimize household impacts to water quality

There are a multitude of small changes that households can make that, collectively, will have a large beneficial impact on water quality, including:

- Storing pesticides and chemicals, automotive wastes, grass clippings and yard waste, pet and animal manure and winter salt and de-icers in areas not accessible by stormwater;
- Disposing these materials properly when no longer needed (not down a drain or into streams, septics, or stormwater collection systems);
- Using alternatives such as “green” household products, or reusing and recycling hazardous fluids and other products;
- Installing rain barrels or rain gardens, thus reducing the amount of overland runoff and the pollutants it carries.



Rain barrels collect and store water from your roof that would otherwise be lost to runoff and diverted to storm drains or streams

QUICK FACT: 1 inch of rain on 1,000 ft² of roof will produce 640 gallons of runoff

Maintain healthy, native streamside and lakeshore buffers

By trapping soil and sediments, streamside and lakeshore buffers can reduce pollutant inputs to waterbodies, thus improving water quality, reducing streambank erosion and decreasing the loss of in-stream habitat through siltation.

For those residents whose property abuts a stream, lake, or other waterbody, buffers should either be expanded, or created where they are currently lacking, to a minimum of 50 feet by planting native trees and shrubs. By leaving openings in your landscape design, you can still have visual and physical access to the waterbody for enjoyment and recreation. Other ways in which residents can maintain healthy, native waterbody buffers include:

- Create a “no-mow” zone near the waterbody;
- Mulch grass clippings and leaves as far from the shoreline as possible;
- Replace existing vertical break walls with uneven rock or natural vegetation;
- Properly remove large debris from the stream channel that are causing erosion; and
- Remove invasive and non-native plants.



Lakeshore residents may want to consider non-forested buffer strips to preserve the scenic views from their property. Both images above depict buffers of native grasses and wildflowers designed to protect water quality and to preserve lakeshore access and views.



Farmers: Good Stewards of the Land



PRIMARY RECOMMENDATIONS

- Participate in the Agricultural Environmental Management (AEM) program
- Maintain healthy, native streamside buffers
- Minimize nutrient-laden runoff from croplands
- Reduce livestock impacts to streams, rivers, lake, and other waterbodies



Covering approximately 23 percent of the land area within the Chautauqua Lake watershed, agriculture plays an important role in the watershed's economy, provides highly valued open space and scenic vistas and contributes important habitat for a number of wildlife species. Certain agricultural practices, however, can also be a significant contributor of sediment and nutrients (e.g., nitrogen, phosphorous) to streams and the lake.

The predominant agricultural use in the basin is hay production and pasture, comprising just over 71 percent of the agricultural lands; cultivated crops comprise the remaining 29 percent. These distinctions are important as each type requires the application of different strategies and recommendations to achieve the desired results.

Based on the state of farming activities currently occurring in the Chautauqua Lake watershed, it is apparent that recommendations targeted towards agricultural land uses should focus on improving agricultural environmental management without creating additional regulations and restrictions. As such, the recommendations provided below focus on the voluntary actions of local landowners, such as implementation of Best Management Practices (BMPs) designed to reduce the degradation of water resources through cost-effective means, or through participating in any of the voluntary agricultural management programs provided by the State.

To reduce the impact of farming activities on water quality, watershed farmers should implement the following voluntary recommendations where appropriate:

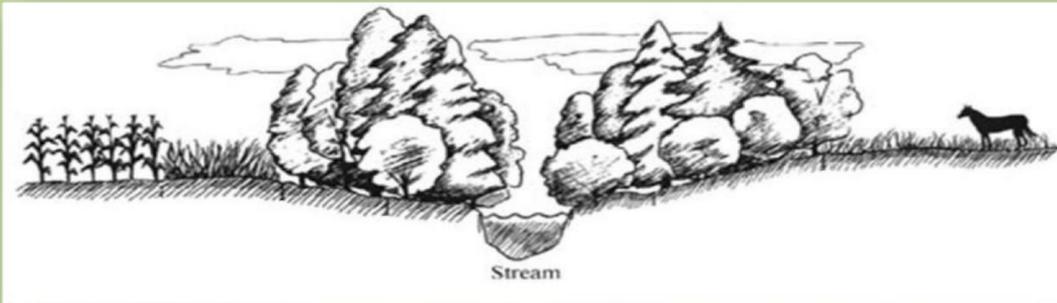
Participate in the Agricultural Environmental Management (AEM) program

Enroll in the AEM program as an initial review tool through which additional needs can be determined. New York State has been promoting the AEM program as an essential watershed management program as it has been very effective at reducing nutrient inputs to waterbodies. The AEM program is a voluntary incentive-based program that helps all farmers operate environmentally sound and economically viable businesses by assessing environmental concerns associated with their farming operations, documenting current stewardship, developing management plans and implementing environmentally sound practices to address identified concerns.



Maintain healthy, native streamside buffers

Streamside buffers play an important role in terms of water quality (see Page 7), particularly on agricultural lands. By trapping soil and sediments, these areas can reduce the amount of soil and nutrients moving from upslope areas into streams, resulting in improved water quality, reductions in streambank erosion and minimizing the loss of valuable agricultural land. For example, 50-foot streamside buffers have been shown to remove approximately 70 percent of the total nitrogen load from adjoining croplands and pastures.



Farmers should try to maintain as much natural vegetation near streams as possible

“Riparian buffers have been shown to be effective in controlling non-point source pollution by removing nutrients, especially nitrogen, and sediments.”

— U.S. Department of Agriculture

Minimize nutrient-laden runoff from croplands

In addition to streamside buffers, there are several other Best Management Practices (BMPs) designed to reduce runoff and nutrient and sediment loads from croplands. These can

include, but are not limited to:

- Installing vegetative filter strips
- Using cover crops during off-season
- Implementing strip cropping
- Implementing no-till crop production
- Using diversion ditches to intercept runoff water and reduce soil erosion on steep slopes

Farmers should work with the Chautauqua County Soil & Water Conservation District to identify the most suitable BMPs for their land.



An example of strip cropping

Reduce livestock impacts to streams, rivers, lake, and other waterbodies

Allowing livestock access to streams often results in bank destabilization and the deposition of manure and urine directly into or near surface waters. This can accelerate erosion and sedimentation, change stream flow and destroy aquatic habitats. Additionally, grazing in riparian areas can reduce their capacity to filter nutrients and stabilize stream banks. Reducing livestock access to streams involves two separate activities – off-stream watering tanks and controlled stream crossings and exclusionary fencing. More information is available from the Chautauqua County Soil & Water Conservation District.



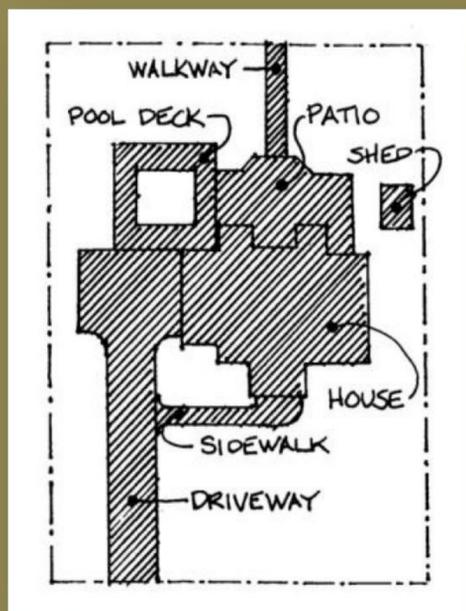
Project Managers & Developers: Water Quality through Site Planning



Construction site in the
Chautauqua Lake watershed

PRIMARY RECOMMENDATIONS

- Stay out of floodplains
- Minimize the amount of newly created impervious surfaces
- Incorporate effective stormwater, erosion and sediment control practices
- Maintain healthy, native streamside and lakeshore buffers
- Implement cluster development approach

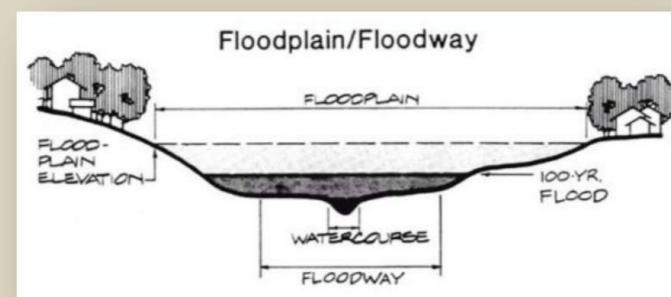


All of these features are
considered impervious
surfaces and result in
increased runoff volumes

As precipitation falls over naturally vegetated areas, most of it infiltrates slowly into the ground, with only a small percentage flowing overland as runoff. The infiltrating water is cleansed as it moves through the soil, while runoff is slowed by vegetation resulting in the settling of particles and sediment. In both situations, natural processes remove pollutants and sediments from the water before it makes its way to nearby waterbodies. Development often results in a significant change to these natural conditions, resulting in increased rates and volumes of runoff and accelerated erosion and downstream sedimentation. This increased runoff takes up pollutants from roads, parking areas, roofs, lawns and other developed surfaces and deposits them into downstream waterbodies, significantly decreasing water quality. To reduce these impacts from construction activities, the following recommendations should be incorporated into new construction:

Stay out of floodplains

Floodplains are low-lying areas adjacent to streams that are most subject to recurring inundation. In terms of water quality and watershed



management, floodplains provide a number of communal benefits and can be far more effective than many man-made structures (e.g., floodwalls, channelization) in reducing downstream flood peaks. Maintaining natural floodplain vegetation and topography also provides positive impacts to water quality by trapping sediments and capturing pollutants before they reach the stream while also providing groundwater recharge by storing floodwaters and promoting aquifer infiltration.

Minimize the amount of newly created impervious surfaces

Impervious surfaces are surfaces covered by an impenetrable material (e.g., concrete) and include artificial structures such as parking lots, sidewalks, and roofs, as well as heavily compacted soils. Increases in impervious surfaces are a direct result of increased development, which can be directly correlated to reduced water quality. New construction in the watershed should implement measures such as rain gardens, rain barrels, and other Low Impact Development (LID) practices to reduce the amount of newly created impervious surfaces in the Chautauqua Lake watershed.

Incorporate effective stormwater, erosion and sediment control practices

The stormwater pollution issue has two primary components – the increased volume and rate of runoff from impervious surfaces, and the concentration of pollutants in runoff. Both are directly related to development in urban and urbanizing areas. The effective management of stormwater runoff offers many possible benefits, including improved water quality, reduced flooding/improved flood control and the protection of wetlands and other aquatic ecosystems. New construction in the Chautauqua Lake watershed should implement the appropriate set of Best Management Practices (BMPs) to reduce the negative impacts to water quality that can result from increased stormwater flows and erosion. Stormwater BMPs are generally broken out into structural (e.g., bioswales) and non-structural (e.g., minimizing soil compaction) strategies. See the International Stormwater BMP Database (www.bmpdatabase.org)



WRONG! An example of an ineffective erosion control practice – silt fencing should be buried to a depth of about 8 inches and should not be used in drainage ways

“A hundred years after we are gone and forgotten, those who never heard of us will be living with the results of our actions.”

— Oliver Wendell Holmes

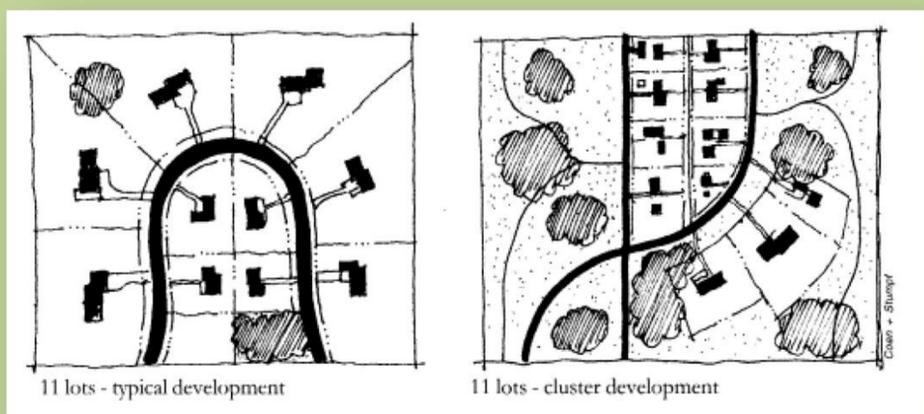
Maintain healthy, native streamside and lakeshore buffers

Streamside buffers play an important role in terms of water quality and other ecosystem services. By trapping soil and sediments, these areas can reduce the amount of soil and nutrients moving from upslope areas into streams, thus improving water quality, reducing streambank erosion and decreasing the loss of in-stream habitat through siltation. Streamside buffers are also important in the lifecycle of many native plants and animals by providing food, cover, corridors for movement and refuge during time of drought or fire. Ideal buffer conditions are rarely encountered in urban watersheds; however, it is in these areas where buffers are exceedingly important due to the large amount of impervious surfaces associated with urbanization. New development in the Chautauqua Lake watershed should strive to preserve at least 50 feet of lakeshore and streamside buffers.

Implement cluster development approach

The intent of cluster development is to develop less land area while allowing the same number of housing units that would be permitted under standard subdivision ordinances. The purpose for using cluster development varies from preserving agricultural lands and open space to protecting critical habitat. Most relevant in terms of water quality is to preserve naturally vegetated buffers adjacent to lake and streamside areas located on the property.

The stormwater management and wastewater treatment systems located in cluster developments can also be designed to be more responsive to the land's environmental constraints, reducing the infrastructure investment and minimizing their adverse environmental impacts.



The cluster development approach (right) results in the same number of lots and the conservation of a greater amount of open space

Lake Users: Enjoy the Water Responsibly



The management and culture of muskellunge was born on the waters of Chautauqua Lake in 1888

PRIMARY RECOMMENDATIONS

- Prevent the spread of invasive species
- Reduce the impact of boating on water quality
- Fish responsibly



The Clean Boats, Clean Waters program in Wisconsin trains volunteers to organize and conduct boater education programs in their community

[\(www.uwsp.edu/cnr/uwexplakes/\)](http://www.uwsp.edu/cnr/uwexplakes/)

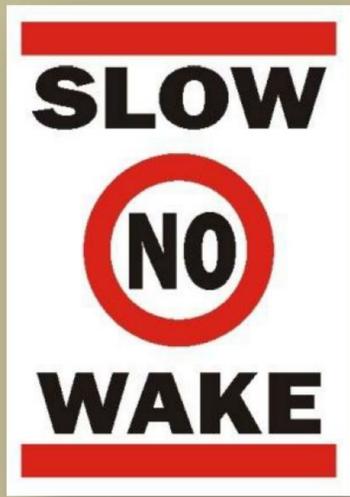
Chautauqua Lake, one of the highest navigable lakes in the world, is used extensively for recreational purposes including passive viewing of the lake, sailing power boating, swimming, and fishing. In addition to the 19,000 year-round residents in the watershed, Chautauqua County attracts an additional 35,000 summer residents. This does not account for the more than 8,000 summer visitors each day at the world-famous Chautauqua Institution. Of the \$142 million in annual tourist spending in the county, visitors to the Chautauqua Lake watershed contribute approximately one-half.

Given the beauty of Chautauqua Lake, it should come as no surprise that outdoor recreation opportunities add to the quality of life and play an important role in the region's economy. To ensure that lake-based recreation occurs in a responsible manner, the following recommendations should be followed:

Prevent the spread of invasive species

One of the major threats to the lake is invasive submerged aquatic vegetation that forms dense, impregnable floating canopies. This invasive vegetation discourages swimming, fouls boat motors, snarls fishing lines, produces noxious odors and consequently may reduce real estate values. The following recommendations will help minimize impacts from invasive species:

- Inspect boats and trailers to avoid transporting invasive species to and from other waterbodies;
- Drain livewells, bilge water, and transom wells before leaving the vicinity of where the boat was used;
- Empty bait buckets on land, never into the water;
- Never dip a bait or minnow bucket into a waterbody if it contains water from another waterbody;
- Never dump live fish or other organisms from one body of water into another one; and
- Once home, wash the boat, tackle, downriggers, and trailer with hot water and flush water through the boat motor's cooling system and other parts of the boat that normally get wet.



Reduce the impact of boating on water quality

In addition to the transportation of invasive species between waterbodies, recreational boating can impact water quality by spilling petroleum-based products into a waterbody, increasing shoreline erosion, or introducing toxic chemicals into a waterbody. The following recommendations should be implemented to ensure that boating activities do not adversely impact water quality:

- Reduce the use of toxic cleaning products by choosing less toxic cleaning products (e.g., non-phosphate based products) and/or by using more “elbow grease”;
- Conduct fueling and maintenance work on dry land, not on the docks or over the water;
- Keep boat engines well tuned to prevent fuel and oil leaks;
- When operating a boat, reduce the wake to prevent shoreline damage and erosion;
- Take advantage of onshore facilities to recycle/dispose of plastic, glass, metal and paper;
- Site fuel storage tanks as far from the waterbody as possible; and
- Properly dispose of materials in on-board waste tanks.

“A lake is the landscape's most beautiful and expressive feature. It is earth's eye; looking into which the beholder measures the depth of his own nature.”

— Henry David Thoreau

Fish Responsibly

Chautauqua Lake offers some of the best fishing in Western New York. The lake is recognized as a premiere, world-class muskellunge fishery and ranks among the better bass lakes in New York State. To ensure the long-term sustainability of this fishery, all recreational anglers should act as responsible stewards of the lake by minimizing their impacts on fish populations. This can be accomplished by adhering to the following recommendations:

- Practice proper release handling;
- Use tackle that minimizes unintended harm;
- Carefully release all fish that are unwanted, or prohibited by regulation;
- Reduce the fight time to reduce the stress level for the fish and increase the chance for recovery upon release;
- Do not damage the habitat;
- Properly dispose of trash and unwanted tackle; and
- Limit take to only what is needed for consumption rather than aiming for the bag limit every trip.



Remember...



We're all in this together!

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