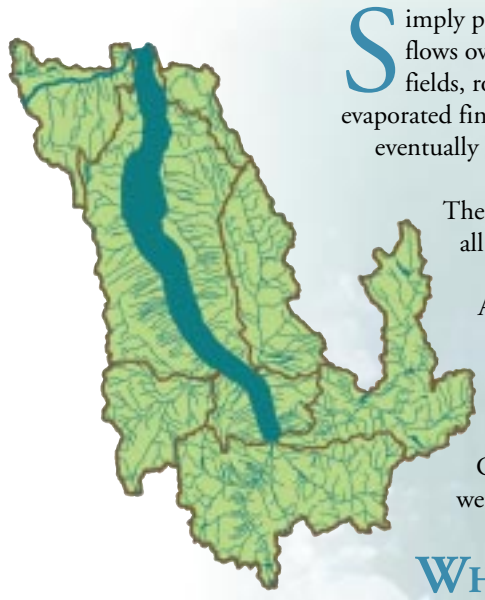
Issues in the Cayuga Lake Watershed

A publication of the Cayuga Lake Watershed Network

What Is A Watershed?



Simply put, a watershed is the land surrounding a body of water, funneling runoff down into that water. Water flows over or through the land, going from higher ground to lower ground. When rain falls on the woodlands, fields, roofs and road surfaces around Seneca Falls, for example, it moves with gravity. Any water not quickly evaporated finds its way downstream through a system of groundwater flows, road ditches, wetlands and creeks, eventually filling Cayuga Lake, the lowest point of our watershed.

The lowest point of any watershed, whether a marsh, stream, pond, lake, or ocean, inherits the qualities of all the waters that flow into it as well as the substances carried by those waters.

A watershed is more complicated than a simple physical model of water flow would indicate. For one thing, a watershed as large as Cayuga Lake's can be divided into many smaller sub-watersheds—Fall Creek watershed, Yawger Creek watershed, Lake Como watershed, etc.—each with unique characteristics. For a complete picture of a watershed, we must also take into account the impact of human culture on the land and water. In figuring out how a watershed works, land use and attitudes toward the Cayuga Lake watershed on the part of those who live, work and play in it are as important as the wetlands, ponds and streams themselves.

What is the Cayuga Lake Watershed?

First the basics. The Cayuga Lake watershed (see centerfold) is part of a large, 5,100 square-mile watershed system known as the Oswego River Basin. This basin handles runoff from all the watersheds of the Finger Lakes, plus other streams and rivers. The largest of the Finger Lakes watersheds, the Cayuga Lake watershed covers 800 square miles of land draining into Cayuga Lake, including 49 villages, towns and cities in seven counties. Cayuga, Seneca and Tompkins Counties directly border the lake, while portions of Cortland, Schuyler, Tioga and Ontario Counties contribute to the upper watershed. More than 140,000 people live and work in this area, and all are part of the watershed taken as a whole.

Bob Pfeiff

Cayuga Lake is the centerpiece of our watershed, but it owes its constant renewal to many upland tributary streams. Of the main tributaries, Fall Creek is the largest, draining an area of 128 square miles of land mainly to the northeast of Ithaca. Both Salmon Creek, which enters the lake from the east at Myers Point in Lansing, and Cayuga Inlet, entering from south of Ithaca, channel water from about 90 square miles of upland. Aside from the contributions of the Cayuga-Seneca Canal entering the lake at the far north just before it drains, the tributaries in the southern fifth of the lake supply sixty percent of the water that flows into the lake. Other major tributaries, listed clockwise from north to south, include:

- Yawger Creek, from the northeast end at Springport (25 sq. mi.)
- Great Gully, from the northeast just south of Union Springs (15 sq. mi.)
- Paines Creek, from the east at mid-lake, near Aurora (15 sq. mi.)
- Six Mile Creek, from Caroline and Dryden to the southeast (50 sq. mi.)
- Taughannock Creek, from the Trumansburg area on the west side of the lake (67 sq. mi.)

Countless other streams flow into Cayuga Lake through smaller tributaries and gullies great and small.

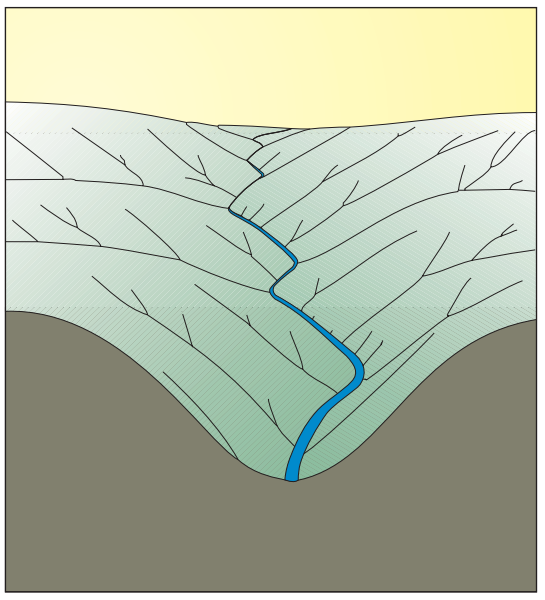
John Meuser ©

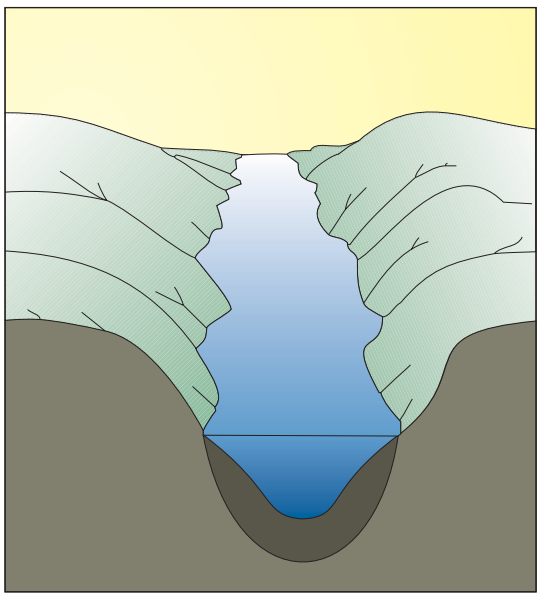
At the Cayuga Lake outlet to the north at Mud Lock, the New York State Thruway Authority has a hand in regulating the flow of water from the lake into the New York Barge Canal System, helping to control the lake level to meet the various demands of shore residents and water consumers. However, the amount of rain and snowfall in the watershed remains the single most important factor in determining how much water the lake holds.

Agriculture, especially livestock and field crops, covers about one third of the watershed's land. Another third consists mainly of forests, while the remaining third is a mix of residential, commercial, public and industrial lands as well as lands in transition between one kind of use and another.

The watershed has abundant natural resources, including wildlife, fisheries, forests and wetlands. It is a prominent stop along the migration routes of many waterfowl and songbirds. Many fish species can be found in the lake and its tributaries. The most sought after by anglers are lake, brown and rainbow trout, landlocked salmon and bass. State, county and town parks offer residents and tourists easy access to the lake as well as to other natural resources such as forested glens and wetlands.

A watershed is a complicated phenomenon, for it encompasses just about everything within its borders. It includes the vast natural environment, the people who live and work in it, and the various ways the land is used.





Originally, the streams and rivers of what is now known as the Finger Lakes region flowed south into the Susquehanna River. The valleys were scoured by advancing glaciers during the last two ice ages, creating characteristic U-shaped valleys. As the ice retreated, the exposed troughs filled in with water creating the Finger Lakes.

Origins

Cayuga Lake's "modern" geological history begins some 12,000 years ago, at the end of the last Ice Age. However, the trough now filled by lake waters was first created more than one million years ago, by what geologists call the Cayuga River. Like many others that historically dissected Central New York, the Cayuga River channeled water from areas well outside its present watershed southward into Pennsylvania and eventually out into the Atlantic Ocean, through the Susquehanna River Valley.

Several significant periods of glaciation occurred in the long Ice Age that began about 1.6 million years ago, with massive ice sheets repeatedly moving from north to south, gouging to much greater depths river valleys, such as the Cayuga, that were parallel to their movement. The effects of the last major glacial activity are most evident in the Cayuga trough area.

About 20,000 years ago the glacier advanced from the north as far south as roughly the Pennsylvania–New York border. The ice covering Central New York was approximately one mile thick. Around 15,000 years ago the ice had retreated north, only to begin a last major re-advance that created the Valley Heads moraine, a barrier of rocky glacial debris, at the southern end of each Finger Lake valley. In the Cayuga Trough the Valley Heads moraine is found in the Newfield area.

When the ice began to retreat from its Valley Heads position, lakes formed when glacial melt water was trapped between the Valley Heads moraine to the south, the valley walls to the east and west and the retreating ice front to the north. The area that is present-day Ithaca lay several hundred feet deep at the bottom of the lake. Over time, the accumulating water inundated the uplands that divided the lakes, creating one large lake that drained southward toward the Willseyville area.

Gradually, the glacier's retreat from the southern highlands opened outlets that drained the impounded waters to the north. The water level in the lake dropped, revealing ridges and leaving separate lakes—which became the Finger Lakes—in the glacially deepened north-south troughs. After flowing south for many millions of years the waters in the Cayuga and neighboring valleys flowed north.

The uplands areas between the troughs were left high above each lakes' final level. In the highlands, the tributaries flowed in their pre-glacial channels creating 'hanging valleys' when they reached the main north-south glacial trough. These hanging valleys around the southern half of Cayuga Lake formed magnificent waterfalls and gorges as they plunged to the lake below.

Photo courtesy of the Ithaca/Tompkins County Visitors' Bureau

The Taughannock Creek Valley at Taughannock Falls is a classic example of a hanging valley. This waterfall, 215 feet high, is considered the tallest free-falling waterfall in the Northeast.

Glacial scouring had set the stage for the formation of Taughannock Falls, Ithaca Falls, Enfield Glen and the like. Each waterfall is different because of a mix of factors—including the natural joint patterns and different types and thicknesses of rocks—that shape its character. Some of the sedimentary rocks in this area, such as limestone and siltstone, are more resistant to weathering and erosion than others, such as shale.

Taughannock Falls is capped by about 100 feet of resistant siltstone over 100 feet of more easily weathered shale. As the weaker shale layer crumbles way beneath the siltstone, an upper ledge is left protruding high above the valley floor creating a dramatic freefall. Eventually the siltstone will break off along natural fractures in the rock and crash to the pool below.

Lucifer Falls in Enfield Glen is made up of a set of alternating beds of siltstone and shale, resulting in a series of ledges. Frost action is slowly degrading these ledges as water seeps into the joints in the top of a ledge and freezes, slowly dislodging the protective siltstone. Buttermilk Falls is made up of hundreds of alternating beds, resulting in myriad little ledges that create the frothing or buttermilk appearance of the falls.

Ice sheets have come and gone numerous times, filling in old gorges and leaving streams that cut through freshly exposed rock that is then weathered away. The Cayuga Lake watershed is a work still very much in progress.

Pollution and the Watershed

Good water quality is of primary importance to the watershed, and not just for drinking purposes. Clean water increases our enjoyment of the lake and its tributaries; the water looks more attractive, and more people are drawn to it for recreational activities. Although the water quality of Cayuga Lake is generally quite good, there are areas of concern:

- Sediment from stream and road bank erosion
- Phosphorus pollution from animal wastes and sewage treatment
- Heavy metal concentrations (chromium and lead)
- Coliform bacteria from sewage systems and wild and domestic animals
- Agricultural chemicals in the lake and tributaries

When most people think of water pollution, they picture either a factory pipe or a drainage ditch discharging contaminants into a body of water. This kind of contamination from a clearly identifiable source is called point source pollution. But a far more common way for pollutants to enter the water is via nonpoint sources, such as runoff from roads, parking lots, construction sites and plowed fields. Nonpoint source pollution, as the name suggests, is much harder to pinpoint and control than is a specific source of direct contamination. For this reason, nonpoint source pollution is generally considered more threatening to water quality.

Sediments plumes, like this one coming from the Cayuga Lake Inlet, form when soil and other particles are carried to the lake during storms.

Cities and towns are the greatest source of nonpoint source pollution, as developed areas have far more surfaces that water cannot permeate—asphalt, for example, and building roofs. Rain and snow melt on these surfaces travel into runoff channels, flowing with more erosive energy and carrying significant pollution downstream.

Heavy metal concentrations have been detected in Fall Creek and in near-shore sediments of southern Cayuga Lake. Although the sources of these toxic metals is not fully known, it is likely that storm runoff from Ithaca and surrounding towns upstream may be responsible for their transport into the lake. As yet, little is known of the quality of urban stormwater in the Cayuga Lake watershed. The concentrations of phosphorus, heavy metals, petroleum compounds and pathogens in stormwater have not been measured. In this case, as in

others affecting water quality, we will need more rigorous monitoring programs to provide the information we need to reduce risks to human health and the environment.

Eroded soil carried in runoff is a pollutant in itself when sediment clouds the water. Soil also transports many other pollutants as chemicals that bind to soil particles are carried by runoff into streams and the lake.

Take phosphorus pollution as an example. Phosphorus is a natural element found in rocks and soil, as well as in our own bodies. An essential nutrient for animals and plants, phosphorus is a key ingredient in both fertilizers and human and animal waste. Its main mode of transport through the watershed is by attaching to soil particles.

Phosphorus poses a special problem when it becomes elevated in watersheds containing much human development. These are some of the chief sources of phosphorus that need closer monitoring:

- Lawn and garden fertilizers
- Agricultural fertilizers and milkhouse waste
- Soaps and detergents
- Poorly maintained septic systems

Phosphorus that ends up in Cayuga Lake comes from all over the watershed, not just from land right on the lake. High phosphorus levels measured in the southern part of the lake strongly suggest that sediment from the combination of Fall Creek, Six Mile Creek and the Cayuga Inlet is responsible.

Just as phosphorus in fertilizers can make lawns or gardens grow, it also promotes algae and weed growth. Excessive algae growth turns lake water green and murky, while giving it an unpleasant smell and taste. When weeds and algae die phosphorus is released by decomposers and is once again available for plant growth. This nutrient cycling perpetuates plant growth as long as other conditions for growth remain. In the process, oxygen is depleted and fish and other animals may suffocate.

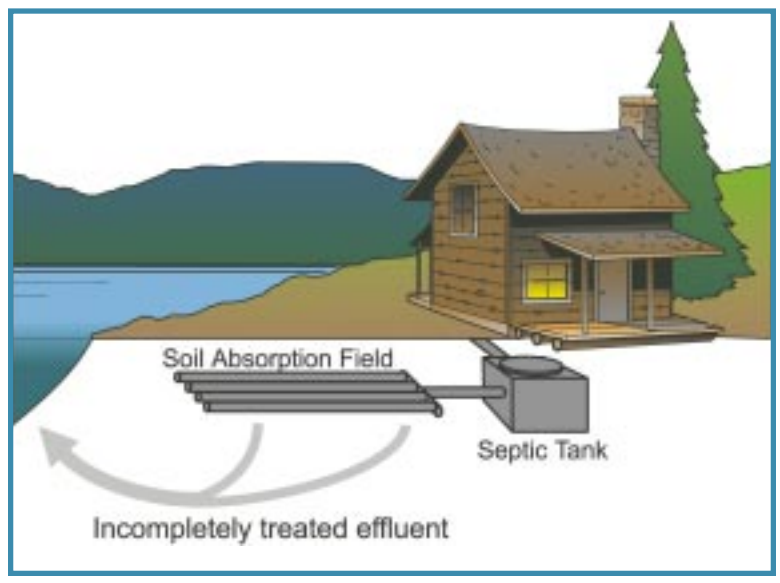
As a result, if the lake begins to lose its appeal to swimmers and boaters, the entire watershed can suffer from loss of tourism revenue as well as falling property values. When water quality begins to seriously affect the livelihoods of watershed residents, it may be too late to think in terms of simple damage control, for poor water quality is usually the result of long-term, systemic neglect throughout the whole watershed. Concern for water quality should be high on the list of priorities for those who depend on it.

Algal blooms are caused by excess nutrients (phosphorous) in a waterbody. Sources of these nutrients vary from natural processes to human activity.

On-site Wastewater Treatment Systems (Septic Systems)

Properly engineered and maintained, septic systems are an economical and environmentally protective method for treating wastewater.

So, why are septic systems a problem in the watershed? Soils in significant parts of the watershed are unsuitable for conventionally designed systems. This is particularly true in areas near the lake and in soils that are shallow to bedrock or poorly drained. Most septic systems in NYS were installed before the state adopted minimum standards. There are over 17,600 septic systems within the watershed. Unless such systems have been replaced in the past fifteen years, it may well be they do not meet current standards. Records of individual systems regarding pumping frequency, maintenance and even location are often missing. Existing records may not get passed on when the property changes ownership, and often—unless the new owner experiences a failure evidenced by a toilet backup or smelly wet areas in their yard—they may be unaware that their sewage system could be causing a problem. If the toilet flushes everything must be OK, right? Not necessarily!



Many homes and cottages have old, failing or inadequate septic systems which pose a significant threat to the health of Cayuga Lake.

Onsite wastewater disposal systems have a lifespan that may vary from a few years to 40 years or more depending on design, siting and soil conditions, and maintenance including pumping. Failing to meet the design and operating conditions for a particular system can result in premature failure that cost the homeowner thousands of dollars to fix.

When septic systems fail, ground and/or surface waters receive inadequately treated wastewater that may contain nutrients and pathogens such as E. coli bacteria, viruses and intestinal parasites. Shoreline properties with septic systems located too close to surface water or on shallow, porous or sloping soils can release sewage that is not fully treated.

Where there has been inadequate treatment of sewage near surface waters, you may see evidence of algae blooms and excess weed growth close to shore. Contact with contaminated waters imposes a real possibility of contracting water borne diseases such as hepatitis, dysentery, meningitis, or intestinal parasites. Where cottages take their drinking water directly from the lake, the problem is magnified.

Many lakeshore cottages are built on lots too small to meet current septic management standards. In these cases, owners need to be especially mindful of regular pumping (as often as every year, depending on use) or they should consider upgrading to a suitable alternative system. Many alternative systems are designed for small spaces, are actually better at treatment, and may not cost more than conventional systems.

We should be concerned about adequate sewage treatment throughout the watershed. Rural residences in limestone areas or on steep slopes (>15%) may be contaminating ground water supplying wells—either their own or their neighbors. Limestone is a special problem because water flows through cracks in the rock that develop into an interconnected system of solution channels. Therefore, if septic leach fields happen to be close to an infiltration zone leading to one of these underground channels, wells may be polluted even at some distance from the source.

People living in limestone areas need to pay special attention to proper maintenance of their septic systems, and should have their well water tested on a regular basis—especially if residents experience any symptoms of diarrhea. In the Cayuga Lake watershed nearly all the limestone rock near the surface occurs in Cayuga and Seneca Counties. **Check with your county health department for information on drinking water protection.**

How often should systems be pumped and inspected for proper operation? It partly depends on the number of occupants using the system. If five people live in a house with a thousand-gallon septic tank, it should be pumped every two years. If two people live in that house it would need to be pumped only every five years. If the tank is smaller, or the family has frequent guests, the system should be pumped more frequently.

NYS wastewater treatment standards are defined in Appendix 75-A of the NYS Health Code. Information pertaining to proper maintenance, pumping frequency and replacement systems can be obtained from each of the county health departments. For a general overview, the county Cornell Cooperative Extension offices have Home-A-Syst manuals which discuss septic systems in more detail and provide guidelines to reduce other environmental risks around the home.

Cayuga and Schuyler Counties have adopted more rigorous standards for inspection, operation and maintenance of septic systems than other counties in the watershed. The *Cayuga Lake Watershed Restoration and Protection Plan* encourages on-site wastewater management be coordinated among the counties and local municipalities. Nationwide, the U.S. Environmental Protection Agency (EPA) estimates a third of all septic systems contribute to nonpoint source pollution. While it may be true that an individual system may contribute only a small amount to the problem, a significant number of the 140,000 residents in the watershed use septic systems. As rural density increases, on-site wastewater disposal can cause cumulative

AES/Cayuga, formerly Milliken Station, continues to develop plans to reduce emissions from it's coal-fired process.

problems. However, the answer is not necessarily to extend municipal sewer lines at enormous cost, but for owners to understand how their system works, to upgrade it when necessary, and to properly maintain and operate their system.

For more information contact the County Health Departments and Cornell Cooperative Extension Offices.

About the Air

Most watershed concerns are addressed in federal and state legislations such as the federal Clean Water Act. However, the federal Clean Air Act also has considerable impact on water quality. With air quality in mind, there are watershed developments that carry a positive message.

The watershed's only large power-generating plant—AES/Cayuga (formerly Milliken Station)—is located in Lansing. Between 1993 and 1995, then-owner NYSEG took considerable steps to reduce unwelcome by-products of coal burning. New equipment reduced nitrogen oxide emissions by 40% and sulfur dioxide by close to 90%. Both nitrogen and sulfer dioxide are components of acid rain.

Since 1999 the new owners of AES/Cayuga have been further reducing toxic outputs. Recently installed selective catalytic reduction uses ammonia injections to break down nitrogen oxide to its harmless compounds, nitrogen and oxygen. Ash, another by product of coal burning, is sold for construction purposes that keep it out of the landfill. AES/Cayuga continues to look for ways to improve their operations to reduce the environmental impacts of energy production.

Another significant air quality change is coming about more indirectly, but just as significantly, with Cornell's Lake Source Cooling Project (LSC). The innovative cooling system results in an annual reduction of 25 million kilowatt-hours of electricity—enough to provide electricity to 2,500 homes—and reduction of the associated greenhouse gases.

LSC is intended as an environmentally friendly alternative. The chillers that were used to cool water for the campus, and that were powered by electricity, have been shut down. Air quality improvements are from both the significant reduction in coal burning and the elimination of substantial amounts of chlorofluorocarbons used as a refrigerant. Chlorofluorocarbon gases are linked to the thinning of the ozone layer, which protects us and other living things from potentially cancer producing solar radiation.

Perennially cold water is drawn from 250 feet deep in Cayuga Lake and piped to the LSC heat exchange facility. There it transfers its chill through solid, stainless-steel plates to water that circulates to the campus in a second pipeline loop (the two waters never mix).

The untouched lake water is returned slightly warmed. The relative change in ambient water temperature is considerably less than that produced by AES/Cayuga power plant, which has been operating at its current site for several decades. Nevertheless, because this technology introduces new variables in the lake's ecology—including the movement of phosphorus—long-term monitoring is necessary to assure that there will be no deleterious effects.

Mercury, another air-borne contaminant, affects water quality when it falls to the soil or water. The toxin then moves up the food chain as plant-eating fish are eaten by larger fish, storing ever-higher concentrations of this substance more toxic than lead when consumed. About 73% of the mercury emissions in the Great Lakes region comes from industrial point sources including coal combustion, with the next largest category being on-road sources such as heavy-duty diesel vehicles. Many states have recently passed, or are considering, new laws to reduce mercury emissions.

Protecting Our Shorelands

Hundreds of years ago almost all of Cayuga Lake watershed was deeply forested. Thick banks of trees lined the shores of the lake and its tributaries—a picture of natural shoreland health. Rain or snow falling on these pristine forests was intercepted by leaves before soaking into the ground and filtering through deep root systems on its way to the lake. Although the watershed is still mostly rural, the scale of human development in the area, and the resulting deforestation of lake shore and stream banks, threatens the health and beauty of Cayuga's waters.

When we build a road, clear a pasture, raise a building or lay down a new parking lot, we create two potential watershed problems. The first is uncontrolled runoff. Because rain cannot soak through asphalt or shingles, it quickly runs into the drains and ditches built to channel this unwanted water. As a rule, the greater the volume of water in a ditch or stream, the faster the banks erode. Secondly, development often means loss of trees and shrubs that are excellent at filtering groundwater and limiting the amount of pollution entering the lake. Restoring and maintaining vegetation, both upland and along the lakeshore and stream banks, are important ways to protect the health of the watershed.

Erosion Control

A common sight on the lake after a heavy downpour is a change in water color around the mouths of tributary streams. The water looks brown and murky, the result of eroded upland soil carried down the watershed. The appearance of some sediment in water runoff is perfectly natural, though the occurrence is exaggerated in our watershed because of the opportunities we give the rain to wash away topsoil. Plant roots hold soil in place. Remove root systems, and soil erosion follows.

Another way to look at the problem of soil erosion is to see plants as intercepting and dispersing some of the energy in rainfall that would otherwise be transferred directly to the movement of soil particles downstream. Compare the effects of rainfall on a bare field of dirt to those of rain falling in a forest—there is a big difference in the rates of erosion depending on plant cover. The forest canopy, the understory shrubs and the leaf-litter lying on the forest floor all protect the soil beneath from direct bombardment by the energy of rain. On a bare field no such protection exists. Without interference, the energy inherent in falling raindrops transfers to washing away the soil.

Soil erosion, then, is usually greatest in areas with cleared agricultural land, large construction projects and mining. The erosion of exposed stream banks is a particular problem in the southern tributaries to Cayuga Lake. Eventually eroded soil ends up in the lake as silt. Erosion not only fills the lake with murky sediment (which harms fish and other aquatic life), but also washes down nutrients that fertilize the excessive growth of algae and weeds in the lake.

The combination of sediment and plant growth gradually fills the lake up, a natural aging process in all lakes that takes thousands of years. However, increased erosion and nutrient runoff created by deforested watershed lands greatly accelerates this process. Cayuga Lake has aged more in the last two centuries than in the previous ten thousand years!

Buffering Pollution

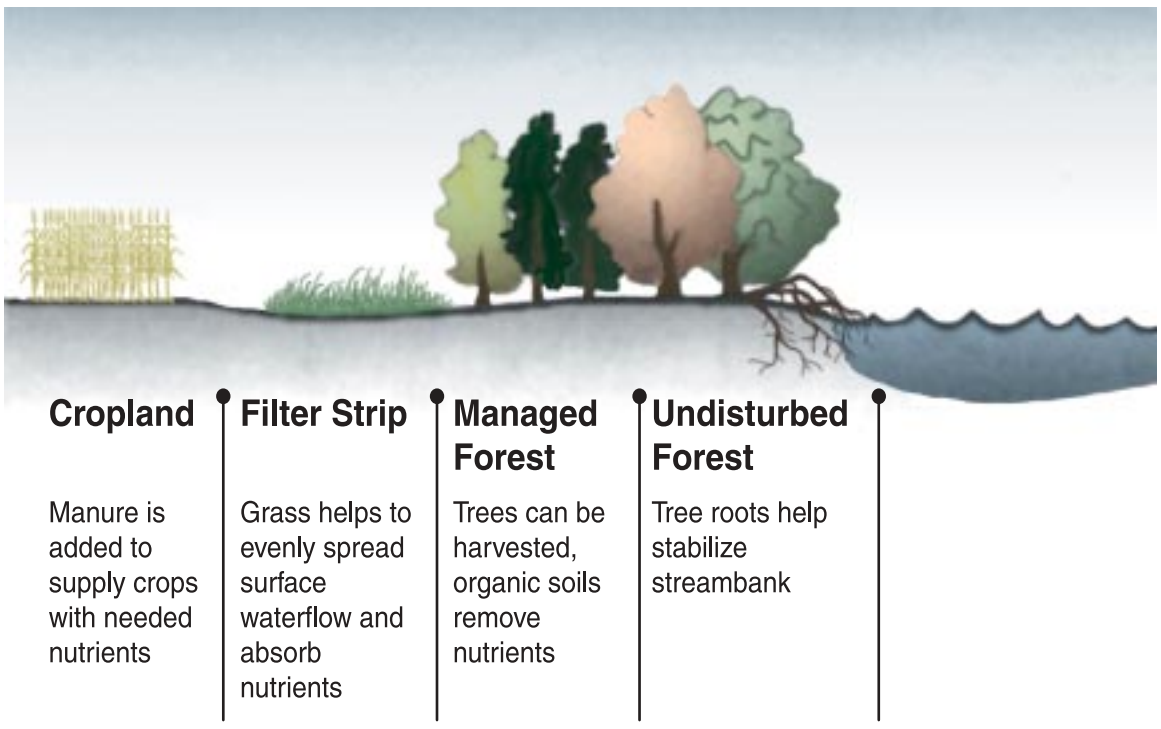
Woodland buffers along the lake and streams provide a practical and esthetically pleasing way of controlling the amount of pollution entering surface waters. Some pollutants are most easily transported through the watershed by clinging to soil particles. If a vegetation buffer along a creek, for instance, performs its key role in erosion control, then less pollution will enter the creek water flowing into the lake water. The roots of many trees and shrubs penetrate deep into the soil, tapping groundwater. Particularly where groundwater enters the surface water of a lake or stream, these root systems can play a critical role in filtering out nutrients before they reach the surface waters.

Protecting Habitat

Woodland shore cover provides vital habitat for a variety of land and aquatic animals. Fish, for example, thrive in the cooler water shaded by trees growing along a shore. Unshaded waters may grow warm, reducing the ability of water to retain oxygen. When weeds and algae complete their growth cycle and die, the decaying organic matter further depletes the oxygen level and creates a stressful environment for fish

Integrated River Solutions

New restoration techniques use vegetation along the banks and rock structures in the stream that create fish and wildlife habitat as well as a natural look.



Buffers help prevent sediment and nutrients from upland areas from reaching surface waters. Grass filter strips slow runoff and improve infiltration of water into the soil. Managed forest areas remove nutrients from surface runoff and shallow groundwater. Undisturbed forest along the banks provide additional filtration as well as providing bank stabilization.

and other aquatic life. Sediment from bank erosion can also kill aquatic bottom life and disrupt the spawning of fish.

How Can We Make a Difference?

Home owners, farmers and municipalities within the watershed can make a difference by planting and maintaining stands of vegetation alongside drainage ditches and streams as well as on lakeshore properties. The most effective buffer is a combination of mature trees, shrubs, and grasses. When we clear the natural vegetation away from lake and stream banks to create lawns, we invite erosion and at the same time lose the filtering action of mature root systems. Using plants to reduce soil erosion and pollutants contributes mightily to the overall health and beauty of our lakes and streams as well as our enjoyment of them.

Invading Exotic Species

From time to time aquatic invaders from other parts of the globe arrive both in ship ballast—as imports from commercial channels—and through natural dispersal. Cayuga Lake, along with other lakes in the region, has experienced several invasions by nonnative species. Sea lamprey, Eurasian watermilfoil, spiny water fleas and zebra mussels are examples of invasive species that are well established here. Water chestnuts are in nearby water bodies and poised to enter this watershed.

Historical events set the stage for foreign invaders to arrive and potentially upset the ecological balance in parts of the watershed. The first of these events exposing inland lakes to invasion occurred with the digging of the Erie Canal, which was expanded into the NYS Barge Canal. This opened up passages from the Great Lakes to the Hudson River estuary. With the development of the St. Lawrence Seaway and increased commercial shipping, the Great Lakes quickly became the entry way for fresh water species from other parts of the globe.

One of these invaders, sea lamprey, probably entered the Great Lakes through the locks of the St. Lawrence Seaway. Lamprey subsequently invaded Cayuga Lake from the Great Lakes, through the Barge Canal. Sea lamprey severely impacted the fishery, attaching themselves to trout and salmon and feeding on their flesh. A successful lampricide was quickly developed to kill the larval lamprey in the streams, without significantly harming other aquatic life.

Twice NYSDEC has applied lampricide to Cayuga Inlet, the favored spawning area for the sea lamprey. In addition, except during high water conditions, the Inlet's fishway physically prevents the passage of adult lampreys upstream to spawn. Trout and salmon fisheries have revived thanks to the combination of these two deterrents.

Unlike the sea lamprey effort, Eurasian watermilfoil control has had less support from federal and state agencies. Nevertheless, considerable effort is spent each year to control this plant, which may have been introduced to North America as an aquarium plant in the 1940's. It probably escaped when people dumped their aquaria into waterways.

Now Eurasian watermilfoil is a major aquatic plant pest across most of the continental United States. Millions of dollars are spent each year in NYS alone to control the plant. Besides being a pest to boaters, it is less desirable than native plants for fish habitat. Milfoil roots in shallow water ranging in depth from 3 to 15 feet and grows quickly to the surface. It emerges on the surface with flowering spikes by late May to mid-June, shading out more desirable plants and leaving a tangled mat that fouls boat propellers and limits swimming and fishing.

Ironically, lack of action on the part of federal and state agencies contributed to grassroots support for developing local solutions. In the 1960's and 1970's milfoil invaded Cayuga Lake and other nearby lakes, displacing native plants and creating a surface mat so thick that boaters were prevented from navigating shallower waters. As a result of its huge impact on recreational use, local counties organized to control the plant. County staffers seeking a solution through mutual cooperation formed the Water Resources Board that, in time, expanded to the 25 county Finger Lakes-Lake Ontario Watershed Protection Alliance.

In this region during the 1980's and 1990's, the use of mechanical harvesters was the preferred method of weed control. These machines cut and picked up plant fragments, similar to mowing a lawn. However, this method provided only a temporary solution by removing surface mats during the height of the boating season. The following year, the milfoil was back, and in some places even more lush. Part of the reason is that the plant reproduces vegetatively, and fragments left from cutting can float to new locations and reroot.

Chemical control has also been used, but extensive treatment in Cayuga Lake was tried only once. Both mechanical and chemical control are enormously expensive and at best offer only short-term relief. Additionally, most chemicals are nonspecific and will eliminate all rooted aquatic plants. This has the impact of removing rooted vegetation that protects shorelines from erosion and provides habitat for fish and other aquatic life.

Now, nature has provided a solution first observed in Cayuga Lake—an aquatic moth. This moth is also an exotic that spends essentially all of its life submerged and feeding as a caterpillar on the growing tips of the milfoil plant. It only briefly emerges from the water as an adult. Measurements of milfoil biomass have declined precipitously since the early 1990's when the moth was discovered by Bob Johnson, a researcher at Cornell University.

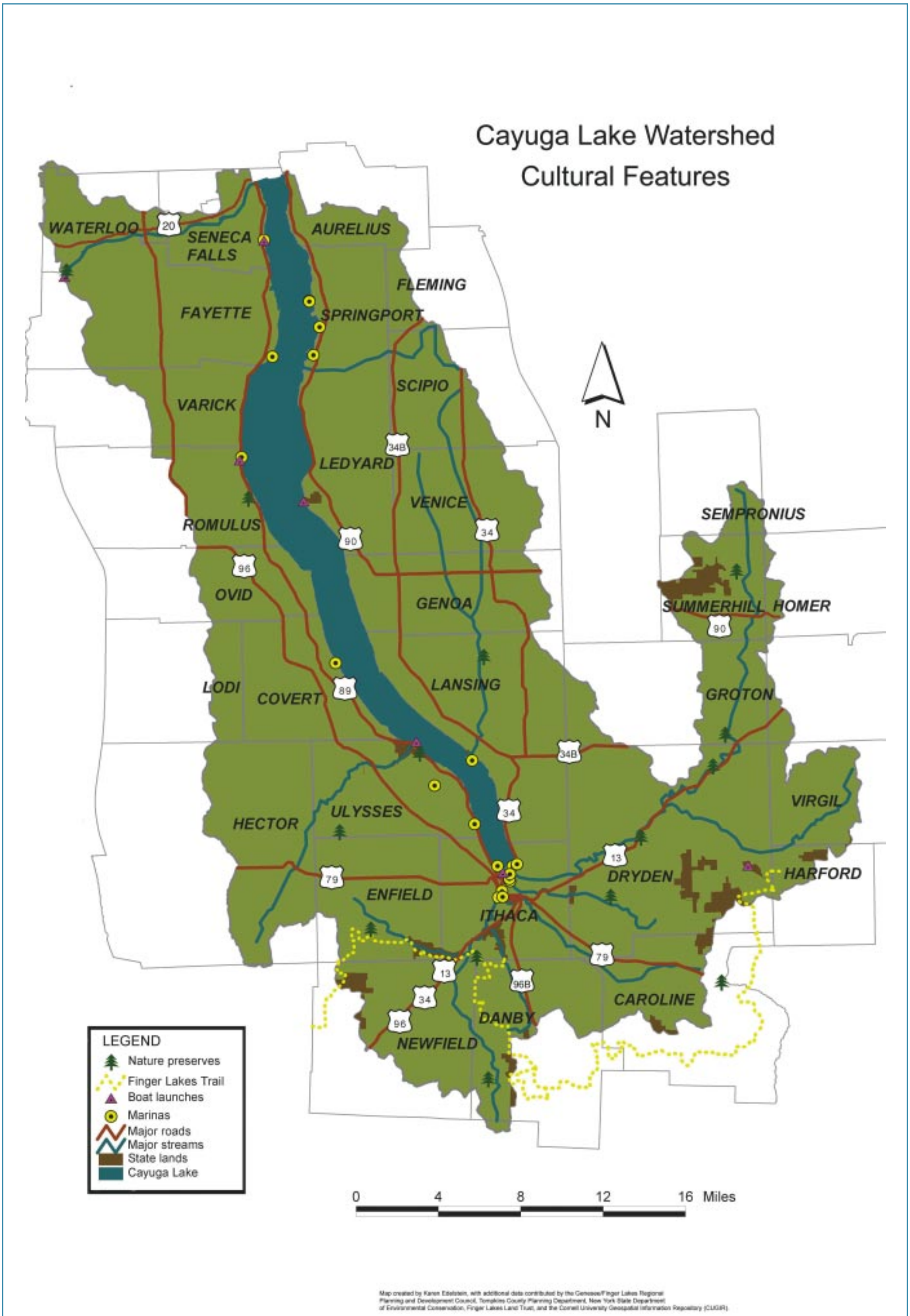
Another plant invader that is located in Cayuga Lake is curly leaf pondweed. This plant may come to the surface early in the season, but dies back in late June and early July. (Native plants such as elodea and eel grass tend to stay well below the surface as long as waters are clear.)

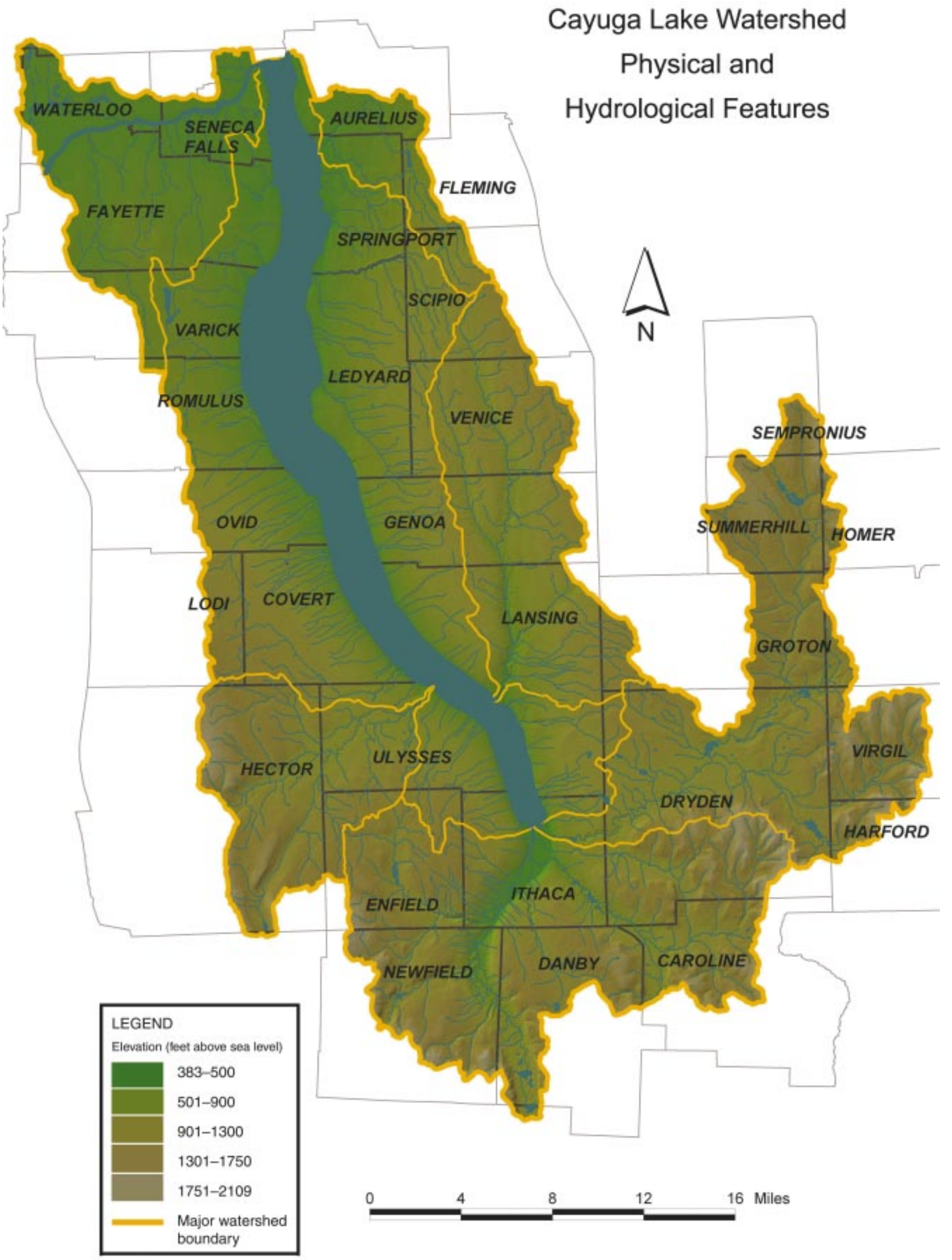
Zebra mussels are recent invaders. They attach themselves to any stable substrate and then quickly multiply. They arrived in ship ballast and were probably released into Lake St. Claire in the early 1980's. Since than they have rapidly spread and now are found throughout the Great Lakes and many of the Finger Lakes. They have caused considerable concern and expense for utilities and lake shore owners. The larval form, called a veliger, attaches itself to any hard surface such as the inner surface of an intake or outfall pipe. It then grows into an adult. Because it reproduces so rapidly, it can quickly clog pipes neccessitating costly repairs. The shells are also very sharp and can cause painful cuts when walked on.

On a positive note, zebra mussels have helped clarify

Sea lamprey—Source: Minnesota DNR and Minnesota Sea Grant. Eurasion Watermilfoil—Source: Robert Johnson, Cornell University. Water Chestnut—Source: NYS Invasive Plant Council.

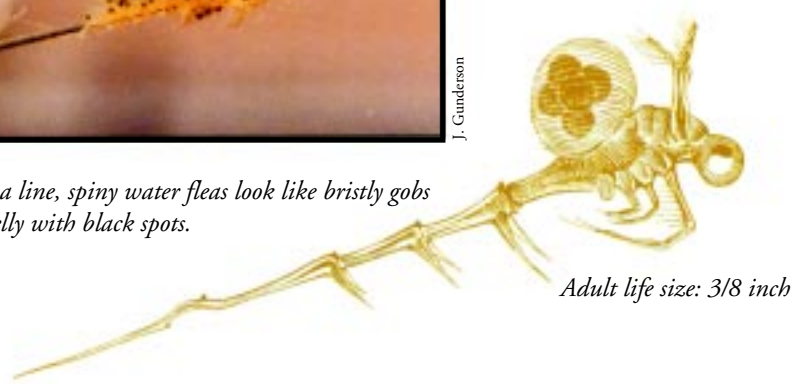
Lake Invaders: (from top to bottom) sea lamprey feed on native fish. Eurasian watermilfoil chokes waterways interfering with human and the local ecology. Water chestnuts can reach the surface even in 16 feet of water.


Cayuga Lake Watershed
Cultural Features
WATERLOO
SENECA FALLS
AURELIUS
FLEMING
FAYETTE
SPRINGPORT
SCIPIO
VARICK
LEDYARD
VENICE
ROMULUS
SEMPRONIUS
OVID
GENOA
SUMMERHILL
HOMER
LODI
COVERT
LANSING
GROTON
HECTOR
ULYSSES
VIRGIL
ENFIELD
ITHACA
DRYDEN
HARFORD
CAROLINE
DANBY
NEWFIELD
N
20
34B
90
96
89
34
13
79
96B
LEGEND
Nature preserves
Finger Lakes Trail
Boat launches
Marinas
Major roads
Major streams
State lands
Cayuga Lake
0
4
8
12
16 Miles
Map created by Karen Edelstein, with additional data contributed by the Genesee/Finger Lakes Regional Planning and Development Council, Tompkins County Planning Department, New York State Department of Environmental Conservation, Finger Lakes Land Trust, and the Cornell University Geospatial Information Repository (CUGIR).


Cayuga Lake Watershed
Physical and
Hydrological Features
WATERLOO
SENECA FALLS
AURELIUS
FLEMING
FAYETTE
SPRINGPORT
SCIPIO
VARICK
LEDYARD
ROMULUS
VENICE
SEMPRONIUS
OVID
GENOA
SUMMERHILL
HOMER
LODI
COVERT
LANSING
GROTON
HECTOR
ULYSSES
VIRGIL
DRYDEN
HARFORD
ENFIELD
ITHACA
NEWFIELD
DANBY
CAROLINE
N
LEGEND
Elevation (feet above sea level)
383–500
501–900
901–1300
1301–1750
1751–2109
Major watershed boundary
0
4
8
12
16 Miles
Map created by Karen Edelstein, with additional data contributed by the Genesee/Finger Lakes Regional Planning and Development Council, Tompkins County Planning Department, and the Cornell University Geospatial Information Repository (CUGIR).

J. Gunderson

On a line, spiny water fleas look like bristly gobs of jelly with black spots.



Adult life size: 3/8 inch

Spiny Water Flea

Bythotrephes cederstronemi

Source: Minnesota DNR and Minnesota Sea Grant

lake water through their enormous capacity to filter out algae. This increased water clarity plus predation on milfoil by the aquatic moth may be the reasons for the near total recovery of native aquatic flora in Cayuga Lake—both in terms of increased species diversity and plant dominance.

While there isn't a lot an individual can do to combat these invaders once they are established, some actions will slow their spread: do not transport zebra mussels, Eurasian watermilfoil and live bait from one location to another. Boaters should take care to drain any water from engine housing and ballast. Equipment should be thoroughly dry with all plant materials removed before moving to another location.

Watershed Watchlist

Potential invaders are approaching through various portals. While fighting established invasive exotics can be daunting, stopping newly introduced plants and animals can be effective. Early detection and prompt removal are great allies.

Having for decades battled Eurasian milfoil, we are on the lookout for a new foe, water chestnut. Neighboring Seneca River is already plagued with this glossy, triangular-leaved plant. Water chestnut's attractive appearance landed it as an ornamental in a Scotia, NY pond in 1884. Escaping to the Mohawk River and moving westward, the floating rosettes form dense mats in shallow areas, choking out the native plants that waterfowl prefer. These nearly impenetrable mats destroy fish habitat and severely limit swimming and boating. Prolific reproducers via sharp-spined nutlets, each plant yields up to 300 seeds each year. Because they are annuals, removal of these aliens before they set seed may thwart their invasion. Working together with neighboring watersheds, the Cayuga Lake Watershed Network has launched "Weeds Watch Out" to teach lake users how to identify and correctly remove water chestnuts.

Potential fish invaders include the round goby and tubenose goby, both small bottom dwellers that are voracious feeders, and the ruffe, a small spiny perch. A crustacean, the rusty crayfish, is native to some regions of the U.S. but is being widely dispersed—probably by non-resident anglers who brought them north to use as bait. Lake users should be on the alert for new invaders and report occurrences to the Cayuga Lake Watershed Network or the NYSDEC regional office in Cortland.

Tourism and Recreation

The Cayuga Lake watershed boasts extraordinary natural beauty enjoyed by residents and seasonal visitors alike. Think of bicyclists gliding over the rolling hills of Route 90 near King Ferry, broad views of Cayuga Lake across farmland unfolding north and south. Think of the opening day of trout season, with hundreds of anglers finding their spots along cool upland streams. Think of that late summer afternoon sail across the lake and back. Think, too, of hikers pausing in the woods to contemplate Lucifer Falls in Enfield Glen. Our watershed gives us a sense of rural comfort and peaceful isolation hard to resist. Indeed, many current residents came here "from away" and never could leave.

The cultural life of the area also draws many to concerts, museums and historic sites that teach and enrich us. From the Frontenac Museum in Union Springs down to Cornell University in Ithaca and up to the Seneca Museum of Waterways in Seneca Falls—and many stops along the way—you can sense the energy we put into making our watershed attractive not only to residents but to visitors as well. With the expansion of New York State's "Scenic Byway" to include 87 miles of roads ringing Cayuga Lake, we can surely expect more visitors in years to come.

The trick, of course, is how to strike a balance between maintaining a healthy tourist industry, with its economic benefits to the area, and protecting the watershed from degradation. Seasonal visitors admire many of the same natural features residents enjoy year-round. Any new development within the watershed should focus on limiting environmental disruption, or else the lake, the streams, the forests and fields will lose some of their appeal. An approach like this might be called "sustainable tourism." We don't live in a tropical rainforest, but the principles of balancing human development with preservation of the natural environment remain the same: respect nature and work with it, not against it.

Public Lands

A small but important fraction of the watershed is protected and publicly accessible. These lands include several state forests, the Finger Lakes National Forest, a small portion of the Montezuma National Wildlife Refuge, NYSDEC management areas, and state and municipal parks with recreational facilities. The majority of this public land is in Tompkins County and managed to preserve its natural character.

Other organizations such as the Finger Lakes Land Trust, based in Ithaca, secure land and easements in order to protect the natural integrity of the Fingers Lakes region.

Boating and Fishing

Public boat access is available at over a dozen launching sites and marinas ringing the lake. Much of the boating traffic occurs at the south end of the lake, near Ithaca. On a fine summer's weekend the lake can be fairly crowded, even rather noisy, especially with the increase in Jet-ski popularity. Sail boats, kayaks and canoes must contend in the open waters with motor craft. Regular boating safety precautions are vital, of course, but there are also some concerns about impacts on the health of the watershed.

Inadvertent gasoline or motor oil spills into the lake not only make the water look and feel ugly but also contribute to pollution and its consequences. Motors should be in good repair and checked regularly for any fuel leaks. Sewage wastes and trash should be properly disposed of on shore.

Many boats gain access to Cayuga Lake through the NYS Barge Canal system to the north. The canal, via its connection to Lake Ontario, can be a prime conduit for exotic species invading the lake. Zebra mussels, water fleas and other destructive exotic species can hitch rides into the lake on boat hulls. They can also be found in bilge water picked up in the canal and later discharged into the lake. Before entering the lake, boat owners should take precautions to clean out the bilge and swab the hull. Boats coming from other waterways containing exotic species should take these and other precautions to ensure the boats are "clean."

Stream anglers face another problem. For those in search of trout in Fall Creek or landlocked salmon in the Cayuga Inlet, erosion from storm runoff can muddy the water and make fishing impossible. Increased development upstream means more eroded soil in the runoff, reducing the streams' appeal to anglers.

Other problems with the fishery exist as well. Despite the fact that lake trout is native to Cayuga Lake, the species is no longer able to reproduce naturally within the lake. The lack of reproductive success is manifested in the "Cayuga Syndrome," an early life mortality syndrome evident in salmonids in several Finger Lakes and Great Lakes. Several days after hatching, close to 100% of the swim-up fry die during yolk absorption.

Various explanations for the mortality have been put forth, including contamination by chemicals or

Photo courtesy of Yates County Chamber of Commerce

Cayuga Lake provides many recreational opportunities for both residents and visitors. Recreational uses include boating, sailing, kayaking, windsurfing, fishing, swimming, bird watching and simply enjoying the view.

Fishing is a big industry around Cayuga Lake. Lake trout are the most sought after salmonid, while many come to fish for bass. In fact, Cayuga bass tournaments draw in people from all over each looking to hook into the "big one."

infectious diseases. (Source: *Cayuga Lake Watershed Preliminary Characterization.)* Initial experiments at nearby Tunison Laboratory show promise that bathing the eggs with the B vitamin thiamine may increase reproductive success.

Swimming

The unique pleasure of swimming at the base of a waterfall is available at public swimming areas at several state parks. Lake swimming takes place wherever there is a private dock or a public beach. These swimmers quickly learn that it's a good idea to wear something on their feet to protect against cuts from the sharp-shelled zebra mussels that cling to the lake's rocky bottom.

A swimmer's enjoyment of the water has everything to do with the quality of that water. One of the worries about overdevelopment of the watershed is simply that many little problems upstream combine to put a greater stress on the downstream end of things. Algae blooms in the lake, a product of too many nutrients in upper watershed runoff, can give a foul smell and taste to the surrounding water. Septic failure, whether from a private cottage or a municipal waste system, can infect lake or stream water with dangerous bacteria, threatening the health of anyone in contact with the water. The fact that occurrences of algae blooms and septic failure are only local problems should not lull us into imagining the watershed is impervious to increased stress from continued development.

Hiking

Thanks to a patchwork of preserved woodlands mostly in the southern part of the Cayuga Lake watershed, hikers (along with snow-shoers and cross-country skiers) can enjoy many miles of trails through lush hardwood forests. One popular route, the Finger Lakes Trail, winds over both public and private land across the hills south of Ithaca. The trail is maintained by a corps of volunteers who generously keep the paths accessible to fellow travelers by clearing away blowdowns and providing makeshift bridges over the rivulets that snake through the woods. Other trail systems can be found throughout the state parks. These professionally maintained trails are an invaluable resource for tourists wanting to explore the gorges in more detail. A new trail, the Black Diamond, will open in phases in the coming years, connecting four state parks from Ithaca to Trumansburg. Trail-use regulations are designed to protect both hikers and the natural habitat through which they walk.

Scenic Byway

In 1999, Governor George Pataki designated NYS Route 90 in Cayuga County from Montezuma Wildlife Refuge south to King Ferry and east into Cortland County as one leg of a proposed Finger Lakes Scenic Byway.

In 2002 the Cayuga Lake Scenic Byway was added. It begins on Route 89 in the Seneca County town of Tyre and heads south towards Ithaca. The Scenic Byway turns north along the east side of the lake, including Routes 34 and 34B, before linking to Route 90 as it wends through Cayuga County. The Byway continues a short distance west on Route 31 to connect to Route 89, completing the loop. This route has been hailed as "one of the most beautiful in the country" and will serve to attract even more tourists to the watershed.

This, of course, is welcome news for those invested in Cayuga Lake tourism. State parks and marinas will likely draw more visitors, as will wineries, which are increasingly popular with tourists.

But how will county and municipal planners responsibly handle the demand for more travel accommodations along these roads? Can rural residents be buffered from the noise and disturbance from increased traffic? How many more parking lots will dump their runoff into creeks feeding the lake? What will be the effects of additional gas stations? How many new motel septic systems must be installed to accommodate the expected increase in visitors?

Difficult questions abound for county and municipal planners. Ultimately the issues raised involve not just the land bordering the Scenic Byway but all of the watershed. Development tends to put a lot of pressure on natural resources. What might seem at first like small impacts on the natural environment and the quality of life for watershed inhabitants add up over time. The decisions we make about how to approach further development should be made in the best democratic tradition, with an informed public guiding the decisions of local and state leadership.

The Watershed and Agriculture

Agriculture has a complex relationship with both the physical and cultural components of the watershed. Agriculture is not just one type of enterprise. It includes cropping, orchards, vineyards, nurseries, forest and wood lot management, and animal husbandry. Each of these operations involves different kinds of management and associated with each are different nonpoint sources of pollution. As a result, a number of "best management practices" have been developed for each of these production areas.

Federal and state programs provide conservation practice incentives in the form of technical assistance, subsidies and cost-sharing grants to encourage farm practices that improve management of manure waste, soil erosion control and applications of fertilizer and pesticides. NYS Agricultural Environmental Management Program (AEM) protects and enhances the environment while maintaining the viability of agriculture, using a team approach that provides farmers with the technical assistance of Cornell Cooperative Extension, USDA Natural Resource Conservation Service and local Soil and Water Conservation District staff.

This voluntary program uses a multi-tiered approach. Tier I is a simple survey of basic farm information such as acreage under production, type of production, etc. Tier II involves a detailed analysis using specialized worksheets for manure management, soil management, vineyards, and barnyards. Worksheets are designed to identify potential pollutant sources and the types of management practices that would be most beneficial in environmental protection. Subsequent tiers create and implement farm-specific best management plans. Best management practices often demand significant financial and intellectual investments by the farmer.

Dairy farmers are the largest agricultural producers in terms of sales and waste. They contend with tons of manure, a variety of pesticides, milking center wastes and potential disease-causing pathogens, all of which may contaminate surface waters and/or transmit disease to humans. To minimize the risks, a number of farms in the watershed are developing whole farm plans focused on manure and nutrient management. Participating farmers can apply for cost-sharing assistance in a competitive process, which is able to fund only a small number of farms.

Changing tillage practices have already greatly reduced the loss of topsoil and the amount of nutrients being transported to surface and ground waters. Some farmers participate in "Graze NY," a program that puts livestock on pasture and helps to hold nutrients and soil in place by establishing permanent ground cover as livestock feed.

Farmers, municipal officials and Agricultural Environmental Management experts visit a farm where AEM techniques have been implemented. Demonstration projects like this farm allow the implementors to refine the techniques as well as provide interested farmers a firsthand look at a practice at work.

Jim Skaley

Many people move to rural areas for the views and to get away from the congestion of more densely populated areas. This can raise property values and taxes which encourages landowners with large amounts of property (farmers) to subdivide or sell off land. Gradually the pastoral views that drew people into the area are lost.

Agriculture and Open Space

The family farm has been and continues to be a positive contributor to the cultural landscape. Farms throughout the watershed raise products we eat. Through sales of fresh produce and specialty items at roadside stands and farmers' markets, they link directly with consumers and provide a tourist attraction.

Altogether farmers contribute substantial revenues to the local economies. As the largest landowners in the watershed, they contribute a major share of tax dollars to support schools and infrastructure. For every tax dollar contributed, farms receive fewer derived benefits from taxes paid than do other rural property owners. Farms, therefore, provide a substantial subsidy to rural residents for services as well as incidentally providing views. By working the land, farmers maintain open spaces and pastoral views that are appealing to visitors and locals alike.

Over the long term, the number of full-time farms is likely to decline through abandonment or consolidation. The change in the agricultural landscape is particularly evident in Tompkins County. Rural sprawl has become a significant issue as the county has grown in population to nearly 100,000. More than half of that population is concentrated within a few miles of the lake. As residents choose to live outside of the more densely populated areas, farms sell off small parcels of land along road frontage. Gradually roads with pastoral views are converted into a kind of rural suburbia strip development. The Department of Environmental Protection has determined that the nonpoint source pollution potential from suburban areas exceeds that from agricultural areas. Protecting the surface water quality is important for suburban land uses as well.

As a result of rural sprawl, the viewshed—everything you can see from a particular reference point—is showing the most change in Tompkins County. Recent water main construction in the Town of Lansing from the Bolton Point Water Plant to the AES/Cayuga power plant creates the opportunity for further sprawl. A number of agricultural parcels along 34B have gone out of production. With land values increasing along the lakeshore and on the bluffs overlooking the lake, and with the availability of municipal water, it may only be a matter of time before the eastern viewshed of Cayuga Lake in Tompkins County is more severely impacted with rural housing developments.

Adequate supplies of potable water are a problem for residents in hamlets and rural areas of Cayuga and Seneca Counties because most rely solely on ground water. With the extension of the water main to the AES/Cayuga facility, Cayuga County has made a request to further extend service to hamlets in the southern part of Cayuga County and along the lake.

National trends indicate that extending municipal water without adequate land use controls eventually leads to rural agricultural lands being converted to rural residential parcels. This follows, in part, because of the increased valuation placed on lands with municipal water. That eventually provides a land market value that exceeds the income derived from agricultural products. As land values increase along with local taxes, farmers sell off parcels to generate income. At some point the farm is no longer an economically viable enterprise, and the farm is lost. When farms are lost in this way usually the agricultural land is lost forever.

NYS has an Agricultural District Law that is meant to protect farming interests. Farmland located within an Agricultural District cannot be converted from agricultural use for a period of 8 years without incurring a penalty or loss in tax benefits. NYS Agriculture and Markets oversees the District Law and can require additional review and reporting for proposed developments within an Agricultural District. If they find a significant negative impact to farming, Agriculture & Markets can prevent the development from occurring. However, in practice, this provision is seldom invoked. In addition NYS has passed Right to Farm legislation that provides farmers some protection from nuisance lawsuits regarding noise and farm smells. While the Agricultural District Law provides farmers some protection, if they choose to have it, it has not made a major impact in the long-term trend of land conversion near urban centers such as Ithaca or in areas with scenic views and near the lakeshore.

Recent changes to the Agricultural District Law promote the establishment of Agricultural Farmland Protection Boards. These boards, when created, develop a farmland protection plan within a specified period of time. Of the three counties bordering the lake, only Tompkins has adopted a farmland protection plan. The principle aims of the plan are to promote education about farming and promote agriculture. Recently, farmers in Tompkins County have begun to take an active interest in and offer support for a land use policy called purchase of development rights (PDRs). PDRs permanently restrict the kind and amount of development that can occur on a parcel of land.

Two positive trends to preserve agricultural land are occurring in Seneca County. Mennonite families whose tradition is to derive a living from farming are purchasing vacant agricultural lands and farms. Seneca County also has most of the watershed's vineyards and wineries. NYS legislation passed in 1981 encouraged small vineyard/winery operations to start up and expand operations. Wineries are a boon to agri-tourism, which helps support smaller farm operations that supply grapes to the wineries and increases local markets for fresh produce. Keeping agricultural economically viable is critical to maintaining these pastoral lands that are part of the aesthetic appeal of this area.

Agricultural Economics in the Watershed

Farms provide a "free good" to rural residents, and the tourism industry by maintaining open space and views. Agriculture products provide direct support to local economies. Within the watershed, dairy and animal products are the largest components of the farm economy. The largest dairy farms are concentrated in Cayuga County. As measured in sales, field crop production is concentrated in Cayuga and Seneca Counties; fruit and berry production is concentrated in Seneca and Schuyler Counties; and vegetable production is mostly in Cayuga County. From the 1997 Agriculture Census, total product sales by county ranged from $115.4 million in Cayuga to $14 million in Schuyler. Cortland, Seneca and Tompkins were in the mid-range.

In Tompkins, Schuyler and Cortland Counties more than half of the farms produce less than $25,000 in sales annually. Many of these farms sell products at roadside stands, u-pick operations and at the Ithaca

Most of the small, family farms can no longer compete with the larger multi-farm corporations in today's competitive markets and in the face of increasingly strict regulations. Some small farms have made a revival by shifting to more specialized crops and markets such as organic farming and selling exclusively through local produce stands and markets.

Farmers' Market. Some of these operations are experimenting with organic farming to raise pesticide-free products. Others are small nursery operations that may use larger amounts of pesticides and nutrients to enhance appearance.

In recent decades, the agriculture has changed dramatically in order to remain economically viable. Many farms have become multi-family farms where numerous families work together for their mutual benefit. Whether an employee or an owner, each person aims to earn enough money to support a family, which is more likely to be accomplished on larger farms. Additionally, larger farms are better able to accurately and evenly distribute the nutrients contained in manure, properly matching the nutrients needed for crop production without over applying the nutrients.

Some farms are turning to alternatives such as composting and vermiculture to process their wastes. Recognizing the environmental risks, EPA regulates large animal operations under a program called CAFO (Concentrated Agricultural Feeding Operations). Both alternative manure management systems and best management practices necessitated by CAFO regulations are frequently very expensive and must be customized to the particular farm.

Farm expenses usually include purchase of fertilizers and pesticides. Because of the significant cost of treating many acres, farmers as well as the environment can benefit by reduced chemical use. Many farmers participate in integrated pest management (IPM) programs, which employ a combination of biological, cultural, physical, and chemical tools to reduce the amount of pesticide used while maintaining farm profitability. Because of this, on average, farmers typically use fewer chemicals per acres than people caring for residential lawns and gardens. Some crops such as cornfields and vineyards receive heavier treatment, and consumers wanting blemish-free produce can also drive up the use of chemicals.

Agriculture is a major economic and land management partner in the watershed. While the number of farmers is small relative to the population, farmers' support for conservation measures are major contributions to management and stewardship in the watershed.

Public meetings hosted by the Cayuga Lake Watershed Network kept the public informed about the watershed management process and garnered suggestions on what the plan should contain to make sure it met local needs.

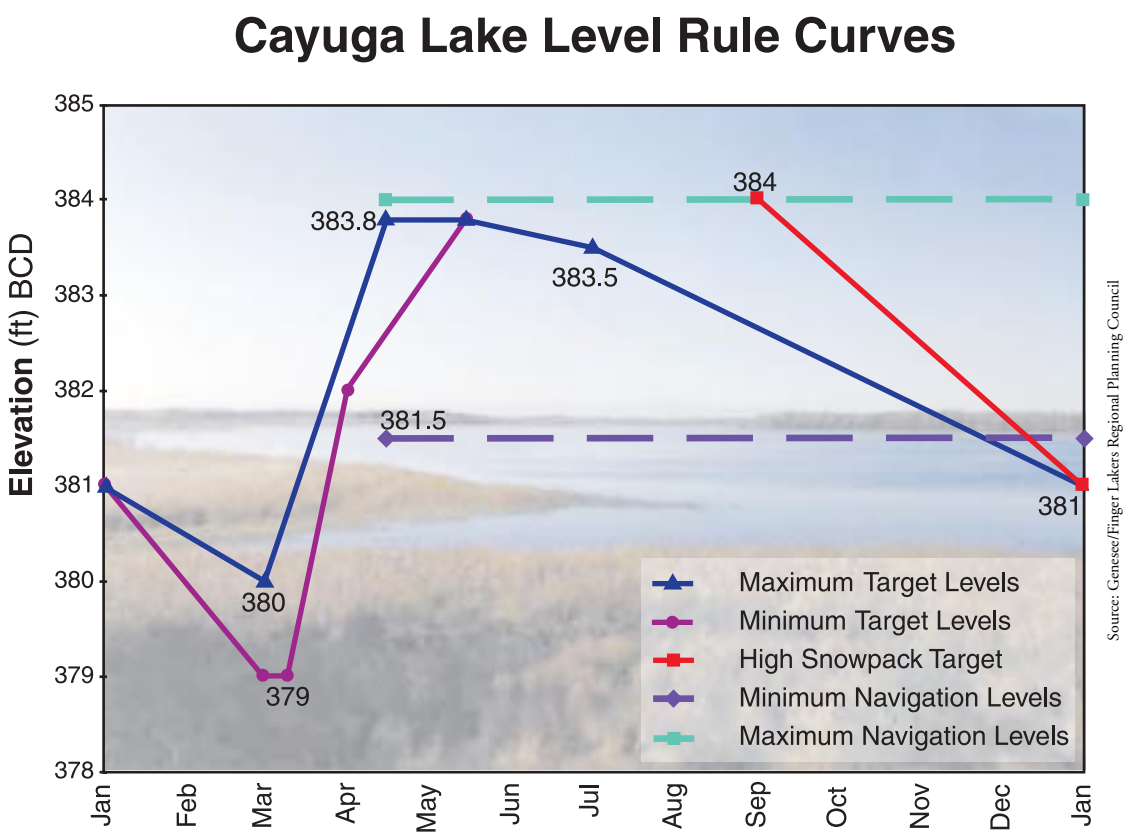
Government's Role

Managing the Watershed

Local government plays a key role in managing the watershed. It is the single largest authority outside of private landowners that determines how the landscape will be managed. Under NYS law (referred to as Home Rule), municipal government has land management authority. The exceptions are that the county health department regulates on-site wastewater treatment systems (more commonly known as septic systems), and when a town has no zoning the health department also approves subdivision plans. While local government has wide discretionary powers to approve and regulate land use, it must operate within federal and state guidelines.

The Cayuga Lake watershed has 49 municipal units of local government. Though views on zoning, comprehensive plans and subdivision laws may differ, increasingly municipalities are acting to protect water quality, realizing that clean water forms the foundation for much of the region's economy. Therefore, a consortium of municipalities formed the Cayuga Lake Watershed Intermunicipal Organization to create a watershed management plan. The resulting *Cayuga Lake Watershed Restoration and Protection Plan* helps guide the efforts of municipalities, agencies and the many other groups dedicated to protecting the watershed.

Ensuring a healthy watershed requires that we practice civic responsibility and support local actions and town boards that take up water quality and watershed protection issues.



Note: All water levels are reported as BCD (Barge Canal Datum) in feet. To convert to USGS elevation, subtract 1.43 at gauge.

Water levels in Cayuga Lake are raised and lowered seasonally to protect recreational uses, increase storage capacity, and minimize the potential for flooding. At the close of the navigation season in the fall, water levels are drawn down to provide storage for spring snowmelt and runoff. Water levels are at their annual minimum in the winter and are allowed to rise slowly in the spring in anticipation of summer recreation and navigation needs. Summer water levels are a balance between the competing needs in the system with water supply and navigation given highest priority.

Managing Lake Levels

Lake levels have been the source of considerable concern for lake cottage owners. Cayuga Lake has the largest drainage area of all the Finger Lakes. During heavy rain events, the lake can rise rapidly. The United State Geological Survey (USGS) estimated that when a single inch of rain falls on the watershed with soils saturated or frozen, the lake will rise about one foot within one or two days. Because there is very little difference in elevation (about 11 feet) between the outfall of Cayuga Lake and the Seneca River flowing downstream into Cross Lake, the hydraulic gradient is insufficient to take care of sudden rises in the lake.

To compound the problem, Cayuga Lake also receives water from Keuka and Seneca Lakes; and the whole Finger Lakes system is connected by the NYS Barge Canal. The NYS Canal Corporation, a subsidiary of the NYS Thruway Authority, manages water levels using a system of gates. The canal locks are used not for water control but to allow pleasure craft to travel through the system from the Great Lakes to the Hudson River Estuary.

The Canal Corporation tries to anticipate precipitation and resulting changes in water levels. Because the lake can only be lowered a tenth of a foot a day when water levels in the Barge Canal system are at normal levels, the Canal Corporation cannot respond rapidly to a single event. Therefore, in preparation for spring rains and snowmelt, in the fall the lake is lowered substantially to minimize the likelihood of spring flooding, but not so much that the lake is unable to refill before summer.

Over the past 150 years, wetlands have been filled in, forests lost, and the area of impermeable surfaces has increased, as have the storm drain systems. These changes all promote rapid and increased runoff during storm events and, combined, magnify the problem of maintaining steady-state lake levels. To manage lake levels is not a simple process. The combination of land use changes, interconnecting waterways and climatic conditions is further complicated by competing needs for drinking water, sewage treatment, critical fish and wildlife habitat, navigation, irrigation and property protection.

For a more detailed explanation why lake levels in the Finger Lakes are difficult to manage see *Managing the Water Resources of the Oswego River Basin in Central New York* by William Kappel (USGS) and Betsy Landre (FL-LOWPA). Copies can be obtained from USGS, 30 Brown Road, Ithaca, NY 14850.

Stewardship

Humans are successful as a species because we can readily adapt to nearly any environment on the planet. Part of our capacity to adapt is our ability to invent tools that we use to alter the natural environment to extract resources, construct homes and build industries in which we use naturally occurring minerals, plants and animals. We also have been adept in harnessing energy sources to produce electricity, support transportation needs and heat our homes. This energy production depends mostly on fossil fuels and water power.

So powerful are these technologies in our hands, that we believe a technical fix can be found for any problem that challenges our current way of living. As society has focused on tool building and harnessing energy, it has become divorced from nature's way of sustaining ecological balance and maintaining a diversity of plants and animals in a stable environment. It is this stable environment from which we enjoy rewards—whether it be sustainable agriculture, quality drinking water, recreation or simply an aesthetic experience like taking in a view, seeing an unusual warbler or catching a large bass.

Technology has in many ways separated our daily lives from nature. Most of us have an inherent appreciation for nature's diversity and beauty, but we forget that we are the largest cause of change on the landscape. We may also fail to realize that small cumulative changes over time leave significant impacts, such as loss of habitat for rarer species. Our modifications of the environment frequently encourage pests and increase rates of pollutants entering our streams and the lake. Because humans have accrued so much power to alter nature's landscapes, we bear a special responsibility to recognize where we may err. We need to learn how to restore a balance that accommodates and supports our population without damaging the Cayuga Lake watershed environment. The watershed is our home, and we want to keep it beautiful and healthy.

Bill Banaszewski ©

Early settlers arriving to this area viewed the land as abundant in resources with the streams and falls providing water power for saw and grist mills that provided necessary foundations for expanding settlements. The lake with its connection to the Barge Canal provided cheap transportation for import and export. Early views were that the land was a seemingly endless resource with ample space for expansion. That was true until the early half of the 20th century when we began to realize that some resources were being diminished and unique places were being threatened. Special areas around the watershed such as Treman, Taughannock and Buttermilk Parks were set aside and deeded to the state.

In the early 1900's Ithaca experienced a cholera epidemic from well waters polluted by outdoor privies and cess pools. This prompted the city to acquire land and build a series of dams on Six Mile Creek from which it still gets most of its drinking water. However, when landscapes upstream became largely destabilized from poor timbering and agricultural practices, these reservoirs began filling with sediment carried downstream during storm events. Even after nearly a hundred years, nature is still working to restabilize these landscapes. In recent years the city has been actively working with the Towns of Caroline, Dryden, and Ithaca to stabilize eroding stream banks.

Ithaca's cholera epidemic and the clearing of hillsides simply illustrates an early utilitarian society focused on building industries and consuming resources without the foreknowledge of the damage being caused. The accumulation of these many small alterations subsequently led to a destabilized landscape, the effects of which are still being felt. Currently we have the technical knowledge to avoid such experiences. Still, we assume that most of our "small" impacts will have little effect, and we continue to treat our landscape and its elements as consumable resources rather than assets.

Suppose we treated Cayuga Lake and all the elements of its watershed as an asset and viewed these elements as we might a stock portfolio, where the goal is to realize appreciation not depreciation. Might we not shape policies differently when it comes to land use, managing our waste stream and working to preserve the habitats and ecological character of the watershed?

We need to take responsibility for managing our own properties in a responsible manner. To be stewards for the whole watershed also involves community action, participation in decisions of local town and county boards, and support of actions that protect these assets while promoting responsible development.

A traveler coming from the southern headwaters to the northern portion of the Cayuga Lake watershed sees an expanse of 800 square miles of varied landscape with a hilly, more densely populated headwaters region and then a landscape of gentler slopes to the north that support open agricultural fields. Within this expanse are 49 municipalities, each with powers to preserve or alter the landscape according to local interests and the need to support local economies. Local governments face the challenge of making decisions that protect the watershed and still meet the needs of their locality.

Knowing what you value about the area in which you live and expressing these values in support of local efforts to protect and build sustainable economies with protection for natural and community assets will preserve the quality of life for our watershed. This requires working neighbor to neighbor to build a community collaboration in support of good watershed management locally and across municipal boundaries. From this effort will evolve a workable watershed management strategy.

How can you participate?

- Become an active member of the Cayuga Lake Watershed Network and stay informed about local developments.
- Educate yourself about watershed issues and how you can be a good steward.
- Talk to your local municipal and county representatives about the need for intermunicipal cooperation and implementation of *The Cayuga Lake Watershed Restoration and Protection Plan*.

Watershed stewardship needs a sustained community effort. Together, we can preserve our natural environment and maintain a quality of life that preserves these assets for future generations. But it will take these many local governments forging bonds and making commitments with active community support to make it happen. It all starts with neighbor talking to neighbor.

Issues in the Cayuga Lake Watershed

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The Cayuga Lake Watershed Network seeks to protect and improve the ecological health, economic vitality and overall beauty of the watershed through education, communication, and leadership.

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OPEN SPACE INSTITUTE

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Your home is our home

Together, we can keep the Cayuga Lake watershed healthy and beautiful for future generations.

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