Watershed Management Plan

2010

Schroon Lake

Photo by Carl Heilman

SCHROON LAKE WATERSHED MANAGEMENT PLAN

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Awarded To

Town of Chester

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EXECUTIVE SUMMARY

Schroon Lake

Watershed Management Plan

Schroon Lake is a major Adirondack Lake bordering northern Warren County and southern Essex Counties, and is approximately 9 miles long and over one mile wide at its widest point. It is bordered by three townships (Chester, Horicon, and Schroon) and lies within the Adirondack Park of upstate New York. Schroon Lake is a valuable resource both economically and environmentally, and local officials and lake associations have worked for many decades to strike a good balance between these two factors.

Schroon Lake Watershed Location Map

The shore of Schroon Lake is fairly developed with first and second homes, particularly on the northwestern and southeastern shores. The largest population center on Schroon Lake is the hamlet of Schroon on the northwest tip of the lake, which is a thriving community primarily based on tourism and recreation. Four public boat launches provide access for thousands of visitors to the lake every year, who enjoy excellent boating, swimming, and fishing. The water level of Schroon Lake is controlled by the Starbuckville Dam located approximately five miles downriver from the lake on the Schroon River. Operation of the dam and the water level is controlled by the Schroon Lake Park District Board of Commissioners.

This Schroon Lake Watershed Management Plan is a comprehensive review of the state of Schroon Lake and its watershed, outlining considerable information related to the lake and surrounding lands. The goal of this initiative was to identify issues affecting the water quality and ecology of Schroon Lake, and to outline specific recommendations to protect the lake for the future.

Schroon Lake exhibits very high water quality and clarity, and is considered an excellent recreational resource. Water quality sampling of Schroon Lake has been ongoing since 1987, conducted through the volunteer-driven Citizen's Statewide Lake Assessment Program. This program was augmented in 1995 by an annual sampling program undertaken by a consulting lake manager (Adirondack Ecologists, LLC) and funded primarily by the two lake associations on Schroon Lake. Water quality trends have been analyzed for this period of time, and show a very mild but statistically significant decline in overall water quality and clarity in that time, particularly in the more developed northern basin.

Schroon Lake maintains a well balanced aquatic plant community, although it does have existing populations of Eurasian water milfoil and curly-leaf pondweed. These invasive species sites are being identified primarily through a professional surveillance program, with assistance from a cooperative "Milfoil Scout Program" effort consisting primarily of lake association volunteers. Hand harvesting and benthic barrier control efforts have been undertaken by Adirondack Ecologists, LLC over a number of years. Currently, milfoil is being actively managed every summer on Schroon Lake with documented success, but the problem still persists.

The land area that drains to Schroon Lake (its watershed) is fairly sizeable at more than 316 square miles, and encompasses portions of 10 different towns. Most of this land area is forest, which covers approximately 84% of the watershed. Only a modest 2% of the watershed is developed, most of which is within the near-shore area of Schroon Lake itself. The State of New York owns 60% of the land within the Schroon Lake watershed, all of which is held as Forest Preserve.

The primary impacts to the water quality of Schroon Lake come from upland sources such as stormwater runoff from roads and properties, and sediment sources such as road de-icing materials and streambank erosion. Significant effort was undertaken in this study to identify these sources, and site-specific recommendations were developed to address these issues for both the short and long term. As part of this effort, a review was conducted of the three municipalities regarding land use regulations and policies which affect Schroon Lake. Overall, these municipalities have fairly comprehensive land use plans and zoning, and currently have adequate staffing to address local issues.

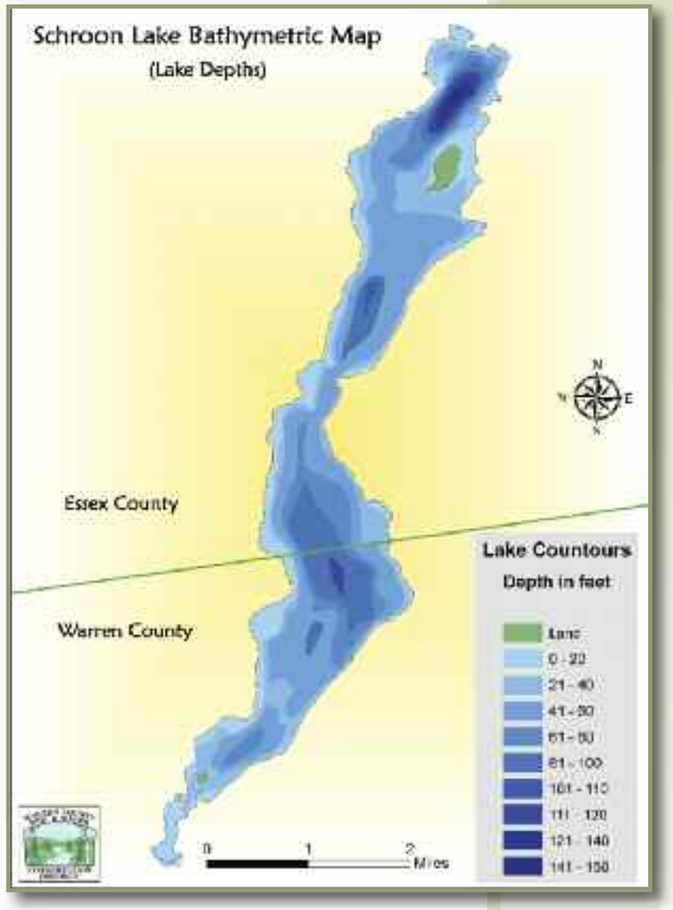
To understand the public's perception of Schroon Lake, a broad public survey/questionnaire was conducted around Schroon Lake. The vast majority of the 523 respondents showed strong interest in the lake's protection, and outlined their primary issues of concern to be development along the lake, septic system impacts to water quality, Eurasian water milfoil control, and stormwater runoff impacts from roads.

The successful future of Schroon Lake's overall water quality and ecology lies primarily in our ability to properly protect it from upland impacts and to minimize the adverse consequences of invasive species introductions. This can only be achieved through cooperative working relationships between municipalities, lake associations, public agencies, and local landowners. The recommendations outlined in this plan will help to improve the existing condition of both the watershed and the lake itself, but only if proper stewardship and diligent action are undertaken towards their implementation.

AT A GLANCE

Schroon Lake

- Lake Length: 9 miles
- Maximum Width: 1.3 miles
- Lake Surface Elevation: 806 feet
- Lake Surface Area: 4,000 acres
- Average Depth: 56 feet
- Maximum Depth: 152 feet
- Volume: 73 billion gallons
- Hydraulic Retention Time: 5 months
- DEC Water Quality Classification: AA
- Water Level Control: Yes – Starbuckville Dam
- Shoreline Length: 24.0 miles
  (Chester: 4.2 miles)
  (Horicon: 5.2 miles)
  (Schroon: 14.6 miles)
- Watershed Area: 202,575 acres
- Primary Watershed Land Use: Forested (84%)
- Highest Point in Watershed: 4,857 feet (Dix Mountain) in Keene/North Hudson
- Number of Towns in Watershed: 10
- State-Owned Land in Watershed: 60%
- Lake Associations: 2 -
  Schroon Lake Association (www.schroonlakeassociation.org)
  East Shore Schroon Lake Association (www.essla.org)



Chapter 1..... INTRODUCTION

1.1 Project Introduction and Background

Photo by Carl Heilman

Schroon Lake is a magnificent Adirondack waterbody, maintaining excellent water quality and a great diversity of aquatic life. It has long been a destination for tourists, as well as a home for many seasonal and year-round residents. With such an important natural resource comes the responsibility to protect it and manage it to the best of our ability.

Although state and federal agencies have some authority over land use and lake management decisions, most actions and activities are conducted at the local level. Municipal decisions play a far larger role in how well a lake is protected from development activities, and how impacts such as wastewater disposal and highway management operations are handled. In addition, local non-profit lake associations are a primary driver for proactive lake management activities (e.g., invasive plant control and water quality monitoring) and public outreach activities.

Schroon Lake has a strong history of stewardship by its local populace. Indeed, it has two well established and long-standing lake associations which encourage stewardship of the lake through community involvement. The municipalities along Schroon Lake's shore are also keenly aware of their vital and symbiotic link to the lake. These communities thrive on an economy driven by tourism, and that tourism is driven by the quality of Schroon Lake and the beauty of its local parks, beaches, and overall setting.

The management actions of the municipalities can have a vital and long lasting effect on Schroon Lake, and their involvement in this process was not only helpful but absolutely necessary for this Plan to be an effective management tool.

Schroon Lake is one of the few in the Adirondacks to have been professionally studied by a consulting lake manager for more than 15 years. This involvement began with a grass roots initiative in 1994 when members of the Schroon Lake Fish and Game Club and the Pharaoh Mountain Sportsman's Alliance, the Schroon Lake Chamber of Commerce, and representatives of the Schroon Lake Association (SLA), approached John Kelly, Supervisor of the Town of Schroon, with a request for the formation of a Schroon Lake Study Committee. This committee,

desiring to know the current status of the lake's water quality, retained the firm of Adirondack Ecologists, LLC to undertake an intensive five-year (1995-1999) limnological study of the lake.

The culmination of this study in 1999 provided a tremendous amount of insight into the ecology and health of Schroon Lake, and it also identified a number of issues facing the lake. It was at this time that the concept of developing a holistic lake management plan was first introduced and discussed in detail as a means for obtaining funding for remediation projects. Many granting entities require that a comprehensive study of issues and specific recommendations for improvement be in place prior to serious consideration for the funding of corrective measures.

This Schroon Lake watershed and lake planning process was initiated by the SLA in December of 2006, and in January of 2007 a planning committee was established. This group included representatives from the three municipalities surrounding Schroon Lake (Schroon, Chester and Horicon), the SLA, the East Shore Schroon Lake Association (ESSLA), Adirondack Ecologists, LLC, the Warren and Essex County Soil and Water Conservation Districts, various state agencies, the Schroon Lake and North Warren Chambers of Commerce and local citizens. These parties agreed upon a direction and goals, and set forth to develop this plan over three-year period.

Thanks to grant funding provided by the NYS Department of State through its Waterfront Revitalization Program, this effort takes a detailed look at Schroon Lake and its watershed. The outcome of this endeavor is a document which outlines the current "State of Schroon Lake" including current and historic management practices, a summary of land use practices and upland issues which affect the lake, and an array of recommendations to protect and even improve Schroon Lake for the future.

This planning process incorporated the concept of management at every level. The result is a document which is a major tool for the long-term planning and management of Schroon Lake. This Plan provides valuable information on important lake and watershed issues, and is intended for local municipal officials, land use planners and managers, lake association members and local citizens. Our collective efforts now and in the future will be required to ensure that Schroon Lake remains the beautiful, high quality waterbody that we all enjoy for generations to come.

1.2 Cultural History of the Schroon Lake Region

By Ann Breen Metcalfe, local author

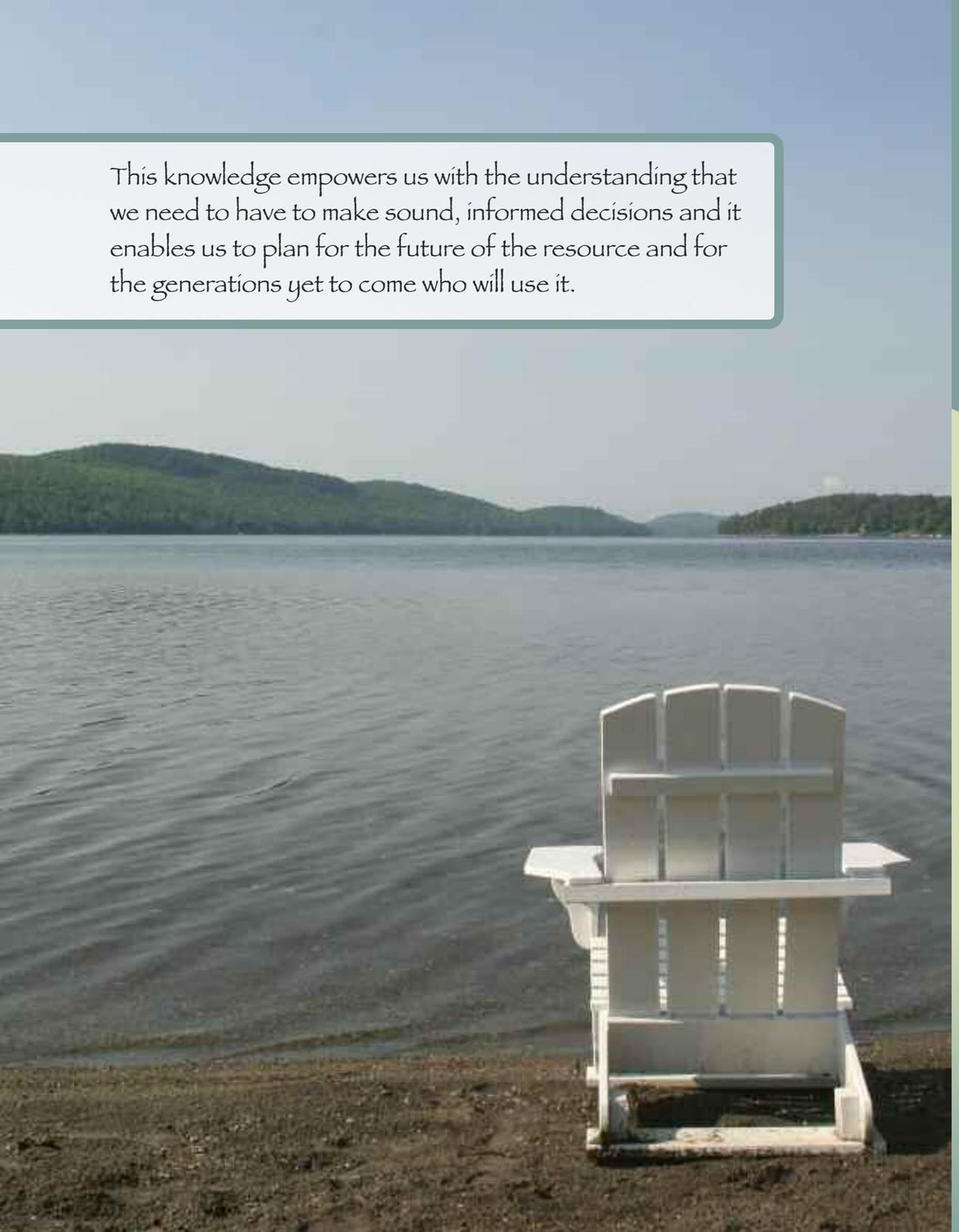
The Schroon River Valley has long been the most practical north-south travel route in the eastern Adirondack Mountains. The ancient river that often twists as an oxbow wore down the hill through the ages to form a natural channel that early in the 1800's the Great Northern Turnpike from Hudson Falls to Keeseville was laid out through the Schroon River Valley and the Bouquet River Valley. When automobiles appeared early in the 1900's the same route was chosen for Route 9. And in the 1960's the Schroon Valley was deemed the most desirable of competing routes for Adirondack Northway.

The Schroon Valley's settlement resulted from public policy from the late 1700's through much of 1900's which called for exploiting natural resources to support the burgeoning development of the United States. People were encouraged to cut trees, utilize timber, turn forest into farmland, dig up minerals and tame the wilderness. Only when the Forest Preserve and Conservation Department were established and during the last 40 years as the environmental movement developed did that trend reverse. Today the Adirondack forest land is well protected.

In the old days dams were needed to send logs downstream to market, supply water to tanneries and operate the sawmills and grist mills that fueled the economy. Many Schroon Valley waters were dammed: Minerva Stream, Trout Brook, Deadwater Pond, Elk Lake, The Branch, Schroon Falls, Rogers Brook, Crane Pond, Pharoah Lake, Mill Brook, Loon Lake, Friends Lake, Faxon's Pond, South Horicon, Brant Lake and Tripp Lake. Today the reconstructed Starbuckville dam controls water levels below the lake.

In the 1830's the Schroon Valley's beauty attracted artist Thomas Cole, who painted Hoffman Mountain and the farms north of the lake. In the 1870's summer visitors discovered the scenery when they took the new Adirondack Railroad to Riparius, and made their way to the hotels on Schroon Lake. In the 1900's the summer business expanded to include children's camps, motels, Seagle Music Colony and other attractions. Winter activities thrived. Today the valley is home to the stalwart natives whose ancestors settled the land and to people from other places who chose this lovely part of the Adirondacks for their permanent or seasonal homes.

This knowledge empowers us with the understanding that we need to have to make sound, informed decisions and it enables us to plan for the future of the resource and for the generations yet to come who will use it.



Chapter 2 ..... STATE OF THE LAKE

2.1 Overview and Summary

Schroon Lake is a beautiful and vibrant body of water that offers a variety of recreational, aesthetic, commercial and ecological uses, values and opportunities to local residents and visitors alike. The one common denominator that defines the experiences each lake user has and binds these experiences together is the quality of the lake itself.

The "quality" of Schroon Lake is ever-changing. This is natural and understood by most people. However, what may not always be understood or appreciated are the effects that some cultural activities could have on this quality. In order to protect and preserve a resource, it is important to first understand how the resource functions. We accomplish this through insightful study and research, so that we may define its current state and determine if observed future changes in its quality seem natural or unnatural.

With lakes, there are a number of important factors to consider regarding its long-term management. The physical and watershed characteristics of the lake, water quality data, information about the biological communities living in the lake, and the people who use the lake and how they use it all come into play. Obtaining this information can often be expensive and time-consuming, and understanding the relevance of the information as it pertains to lake quality can be challenging, but they are necessary steps to achieving good stewardship. This knowledge empowers us with the understanding that we need to have to make sound, informed decisions and it enables us to plan for the future of the resource and for the generations yet to come who will use it.

The thirteen seasons of Citizens Statewide Lake Assessment Program (CSLAP) water quality data and the fifteen years of data obtained by Adirondack Ecologists, LLC (AE) through various water testing and biological sampling programs provide a very powerful database for Schroon Lake. In fact, few lakes in the Adirondacks possess as much historical data as Schroon Lake does to base assessments and long-term planning upon.

These data indicate that Schroon Lake enjoys excellent water quality and water clarity. We know that Schroon Lake is a soft water lake that possesses sufficient levels of dissolved oxygen throughout the water column to support a healthy aquatic ecosystem. We also know through an analysis of the phytoplankton and zooplankton communities that the food web of the lake is, in general, healthy and in balance, and that the species assemblages observed in the various sample collections are reflective of the lake's excellent water quality.

We have determined that despite possessing relatively low levels of alkalinity (i.e., low buffering capacity), the pH of Schroon Lake is circum-neutral and that this finding is suggestive that acid deposition is not currently a significant problem on this water body. This is very good news for the fishery community of the lake, specifically, and for the entire aquatic ecosystem in general.

These data indicate that Schroon Lake enjoys excellent water quality and water clarity.

Based on the geologic age and physical characteristics of the lake (and its watershed), parameters like phosphorus, algae levels and water clarity all fall within the theoretical guidelines of what we would expect to see. In addition, it can be stated that no dramatic changes or disparities in water quality or clarity were identified in the data during the time period from 1995 to 2009. This finding is illustrated by the various graphs (Figures 1 through 10) presented in Appendix A.

Figures 1-3 plot the past fifteen years worth of total phosphorus (TP) data collected at the lake's two internal basins. Based upon a review of these graphs, it appears that there has been relatively little change in surface water phosphorus levels in Schroon Lake since 1995. When surface water TP levels are plotted for both the north and south basin (Figure 3) it can clearly be seen that phosphorus levels are consistently higher in the north basin.

A review of Figures 4 and 5 seems to indicate a long-term correlation between chlorophyll a levels and secchi disk transparency (SDT) in Schroon Lake. Mid-August north basin water clarity has gradually decreased over the past fifteen years concurrent with a slight increase in chlorophyll a levels (Figure 4). During the same time period, a long-term, slight increase in mid-August chlorophyll a levels has also been noted in the south basin, and a slight decrease in water clarity has been documented (Figure 5).

Fifteen years of aquatic plant management and research has shown that even though Schroon Lake has populations of nuisance aquatic plants like Eurasian water milfoil and curly-leaf pondweed, the overall health and diversity of the aquatic plant community is excellent.

It should be noted that it is normal for lakes to undergo both seasonal and annual fluctuations in chemical and biological parameters. In fact, we expect that to occur. Bearing that in mind, the relatively small scale changes in water clarity and chlorophyll a levels observed to date are not of great concern. However, monitoring should continue to determine whether any changes we are seeing and documenting are progressing at a speed or in a direction that seems to suggest a potential long-term problem for the lake.

Figure 6 is a comparison of historic water clarity at the two basins from 1995 to 2009. Looking at the graph, it is clear that water clarity in the south basin is consistently higher than that observed in the north basin. In fact, an analysis of the data indicates that the mid-August water clarity in the south basin generally averages 2 feet more than that of the north basin (Note: Theories that may explain the reason for this phenomenon are covered in Chapter 2.3).

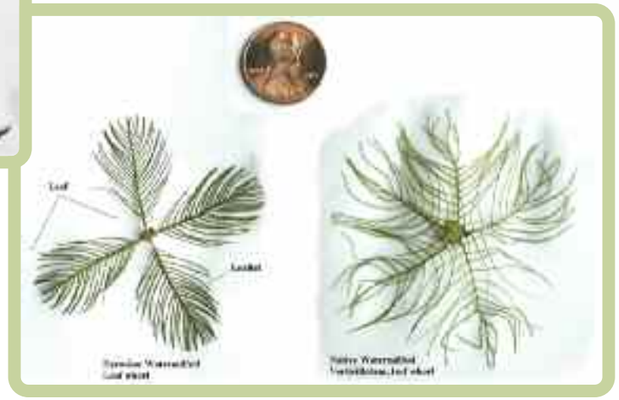
A common technique by limnologists (people who study inland lakes) to assess the productivity or "trophic state" of a body of water is to apply established standards to the data obtained from a water quality monitoring program. In order to determine the trophic state of Schroon Lake, the fifteen-year averages of surface water total phosphorus, chlorophyll a, and SDT levels in both the north and south basin were calculated based on the results of water sample analyses obtained during the 1995 to 2009 monitoring trips.

The water clarity and total phosphorus averages classify the lake as oligotrophic (low productivity), while the chlorophyll a average places Schroon Lake just inside the lower range of a mesotrophic (moderate productivity) body of water. Overall, these cumulative averages suggest that Schroon Lake is a late oligotrophic lake.

Tributary conductivity and chloride data collected during the same time period suggests that the long-term use of de-icing agents on the Northway and other roads has saturated wet areas adjacent to these highways with chloride. Figure 7 shows that inlets located on the western side of the lake (i.e., Rogers Brook, Horseshoe Pond outlet, and Thurman Pond outlet) tend to possess significantly higher conductivity levels than do those on the eastern side. Basin conductivity and chloride levels have not changed appreciably in the past fifteen years, which suggests that Schroon Lake water quality has not yet been significantly affected by the influx of de-icing agents.

Schroon Lake data obtained through the CSLAP since 1987 were also reviewed and three graphs presented in the most recent CSLAP report on the lake were extracted for use (with slight modification) in this plan. These graphs (Figures 8 through 10) present the mean readings for lake basin secchi disk transparency, total phosphorus and chlorophyll a from 1987-1991, 1997, 2002-2006 and 2008-2009 (NYSDEC. 2010).

A review of these graphs indicates that: (1) Schroon Lake TP levels remained stable from 1987 to 2004, but have increased since 2004; (2) Schroon Lake water clarity has remained relatively unchanged since 1987; and (3) there has been minimal change in chlorophyll a levels since data collection started in 1987. These results agree, for the most part, with



those results obtained via the annual monitoring program conducted by Adirondack Ecologists, LLC. Any discrepancies may be explained by different sampling and/or laboratory protocols followed by the two programs.

The total nitrogen (TN) to total phosphorus (TP) ratio is sometimes used by lake managers as an indicator of what type of algae may become dominant in any given body of water. Since blue-green algae or cyanobacteria are capable of nitrogen fixation, these planktonic organisms tend to do well in lakes with low total nitrogen levels. Some research has suggested that TN:TP ratios of less than 30 favor blue-green and diatom production.

Total nitrogen and total phosphorus data collected from Schroon Lake basin samples were evaluated and it was determined that the surface water TN:TP ratio generally exceeded 30, with only a few exceptions. In 1997, 2008 and 2009, the ratio was less than 30 in both of the lake basins, and in 1999 and 2004 the ratio was less than 30 in the north basin.

Based on this information and the above-mentioned principle, it would seem likely that the prevalence of blue-greens in Schroon Lake should have been relatively low during most of the years sampled. This is important since the presence of a large amount of cyanobacteria can often be suggestive of poor water quality, and toxins released by these algae can potentially be a hazard to humans and animals, if ingested.

Fifteen years of aquatic plant management and research has shown that even though Schroon Lake has populations of nuisance aquatic plants like Eurasian water milfoil and curly-leaf pondweed, the overall health and diversity of the aquatic plant community is excellent. Fortunately, these invasive plants were discovered before it was too late to effectively control them utilizing physical control strategies, like hand harvesting and benthic barrier applications.

Known areas of invasive aquatic plants continue to be actively managed by Adirondack Ecologists, LLC, and both professional and volunteer inspections to locate new areas of invasives are conducted annually. In addition, efforts to educate boaters on preventing the spread of these plants are ongoing and help to minimize the risk of future introductions.

This is important since lake water quality and clarity are indirectly related to aquatic plant production and the presence of large-scale invasive species populations can eventually lead to long-term water quality and ecosystem degradation. Clearly, the holistic approach to management and stewardship that the lake community and local government is pursuing will yield long-term, tangible benefits to the protection and preservation of Schroon Lake.

Schroon Lake is an approximately 4,000-acre lake situated in the eastern region of New York State's Adirondack Park. It is 9 miles long and the orientation of the lake is north-south with the Schroon River serving as its primary inlet on the north end and also as its outlet on the south end. The lake has two distinct basins separated by the "narrows", and it is bounded by two counties (Essex and Warren) and three townships (Chester, Horicon, and Schroon). It is part of the Hudson River drainage system and possesses a mean depth of roughly 56 feet and a maximum depth of 152 feet.

Possessing a 24.8-mile long shoreline, the lake was formed by glacial rubble damming an ancient valley. The valley was created by the subsidence of its underlying bedrock between two parallel faults (called a graben). The lake bottom consists of Paleozoic rock which once laid over the Adirondack anorthosite (Miller, W.J. 1918).

The watershed area of Schroon Lake is approximately 202,575 acres and it ranges in elevation from 807 feet at the lake surface to 4,857 feet at the summit of Dix Mountain located roughly 15 miles north of the lake. Roughly 2% of the watershed area is developed and the remainder is comprised primarily of forested land (84%) or wetlands (8%).

Schroon Lake is a dimictic lake, mixing (turning over) twice a year, once in the spring and once in the fall. Even though the lake possesses a moderately high mean depth, there is still a relatively extensive area of littoral zone present around its perimeter. In general, the near-shore depth tends to drop more precipitously on the eastern shore than on the western, and the lake bottom consists primarily of sand, clay, gravel, rock, cobble and copropel muck. Copropel sediments are finely grained and consist of a mixture of humus material, fine plant fragments, algal remains, grains of quartz and mica, spore and pollen relics, and the exoskeleton fragments of dead aquatic invertebrates.

The flushing rate of Schroon Lake has been estimated at 2.5 times per year by the New York State Department of Environmental Conservation (NYSDEC) and at 1.75 times per year by Market Decisions, Inc. of South Portland, Maine (Market Decisions. December 1992). It receives direct hydrologic influence from at least 12 major and minor inlets. The most significant tributaries to the lake are the Schroon River, Alder Brook, Spectacle Brook, Sucker Brook, Mill Brook, Thurman Pond Outlet, Horseshoe Pond Outlet, and Rogers Brook (refer to Map 1). In addition to surface water contributions from tributaries, the lake also receives hydrologic influence from precipitation, groundwater seepage and runoff from the shoreline. The lake's level is controlled via gates at the Starbuckville Dam, which is located approximately five miles downstream of the lake on the Schroon River.

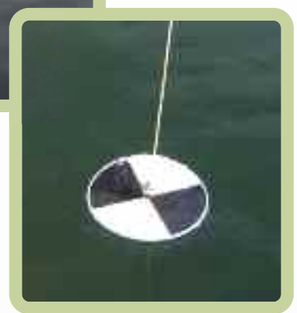
Many residences and camps are situated along the shoreline of the lake, but the hamlets of Schroon Lake on the western shore and Adirondack on the southeastern shore are the most concentrated population centers. The lake is surrounded, for the most part, by paved or gravel roads which, in some areas (e.g., East Shore Drive), are located within a few feet from the water's edge. In addition, sections of Route 9 and the Northway (I-87) run parallel to the lake's western shoreline for roughly 8 miles.

The lake enjoys a surface water classification of AA(t), meaning its "best intended uses" include water for drinking, culinary or food processing purposes, contact recreation, and trout survival. Public bathing beaches are located near the business district of Schroon Lake and in the hamlet of Adirondack. A number of non-profit organizations operate private retreats on the lake, the largest of these being the various summer camps administered by Word of Life Ministries.

In addition to mooring docks and launch sites owned by riparian landowners, the lake is accessed by a number of larger private and public boat launch sites. The NYSDEC operates three launch sites. One is situated at the Eagle Point State Campsite, a second at the Scaroon Manor day-use facility, and the third at the southern tip of the lake in the township of Horicon. The Town of Schroon maintains a smaller public launch site at the end of Dock Street, in the center of the Village of Schroon Lake. One private marina, the Schroon Lake Marina (formerly the Maypine Marine), is situated at the northern end of the lake.

Water samples have been collected from Schroon Lake every year by Adirondack Ecologists, LLC since 1995. Each summer, epilimnetic (surface) and hypolimnetic (bottom) lake water samples are collected once each August from both the north and south basins, and every third year samples are collected once from the mouth of each of the significant tributaries to the lake (Schroon River, Alder Brook, Spectacle Brook, Sucker Brook, Mill Brook, Thurman Pond Outlet, Horseshoe Pond Outlet, and Rogers Brook) and from the outlet.

Lake association volunteers measuring Schroon Lake water clarity, or "secchi depths"



In order to ensure the collection of accurate "base flow" data, no water samples were ever taken within 48 hours of a major storm event, with the exception of samples collected on February 26, March 8 and March 17, 1998, which were part of a specially-designed testing regimen to determine the "first flush" water quality conditions (conductivity and chloride levels only) of the various tributaries during a storm event.

All epilimnetic and hypolimnetic samples were collected from Schroon Lake by boat using a Van Dohrn Sampler. These samples were obtained at locations representative of the lake's two basins (see Map 1). Epilimnetic samples were taken 1.5 meters below the lake's surface and hypolimnetic samples were taken 1.5 meters above the lake bottom. Outlet water samples were collected underneath the bridge on Glendale Road.

The tributary samples were taken via "grab" sampling at various locations around the lake. Rogers Brook was sampled just above its outlet into the lake. Thurman Pond Brook and Horseshoe Pond Brook samples were obtained just east of Route 9 where these brooks each respectively pass underneath the road via culverts and enter the lake. The Schroon River and Alder Brook, which is fed by the outflow from Crane Pond and Goose Pond, were sampled just downstream of their intersection with Alder Meadow Road. Spectacle Pond Brook was sampled at its outlet just upstream of the culvert that intersects NESA Road, and Sucker Brook, which is spring fed, was sampled just downstream of the culvert that intersects the East Shore Road.

All water samples obtained were stored on ice and transported to the laboratory at the Darrin Fresh Water Institute (DFWI) in Bolton Landing, New York within six hours of collection. The following parameters were analyzed during each routine sampling trip: ortho phosphorus, total phosphorus, chloride, total nitrogen, nitrate, sulfate, conductivity, total dissolved solids, pH, alkalinity, calcium, and turbidity. In addition, the epilimnetic lake water sample obtained from each basin during each visit to the lake was analyzed for chlorophyll a.

An YSI model 50 B dissolved oxygen (DO) meter was utilized to perform a dissolved oxygen and temperature profile of the lake's vertical water column during each trip, and a secchi disk was employed to obtain secchi disk transparency (SDT) measurements. A secchi disk is a heavy

plastic disk quartered in alternate black and white that is used to measure the transparency of lake water. Both SDT and DO/temperature data were obtained at the two lake basin testing sites.

The following narrative consists of a summarized interpretation of the data collected on Schroon Lake from 1995 to 2009. Appendix A consists of ten graphs (figures). The first six graphs (Figures 1-6) plot lake basin data obtained in mid- to late-August on three important trophic parameters (i.e., secchi disk transparency, total phosphorus and chlorophyll a). Figure 7 is a pictorial illustration of

The results of fifteen years of DO and temperature profiles performed at both the north and south basin lake testing sites clearly indicate that sufficient levels of DO for fish and other aquafauna can be found throughout the entire water column of Schroon Lake during August.

the conductivity data obtained on the lake's various tributaries since 1995. In addition, historical CSLAP data from 1987 to present has been included in the form of three graphs (Figures 8-10) taken from the 2009 CSLAP annual report of Schroon Lake (NYSDEC. 2010).

DISSOLVED OXYGEN

An analysis of dissolved oxygen (DO) provides a measurement of the amount of gaseous oxygen (O2) dissolved in the lake water. Oxygen is introduced into the water column by diffusion from the surrounding air, as a byproduct of photosynthesis, and from aeration caused by turbulence (e.g., wave and wind action). In addition, the various tributaries contribute dissolved oxygen to the lake.

Oxygen is necessary to all forms of life, and aquatic organisms generally need at least 5.0 parts per million (ppm) of DO to thrive. Bacteria living in the bottom sediments of the lake decompose detritus and other material accumulating there, and the decomposition process consumes DO. During periods of extended and extensive thermal stratification, DO levels in the hypolimnion - particularly in those areas closest to the lake bottom – can become so depleted that the survival of fish is threatened.

The results of fifteen years of DO and temperature profiles performed at both the north and south basin lake testing sites clearly indicate that sufficient levels of DO for fish and other aquafauna can be found throughout the entire water column of Schroon Lake during August. This is excellent news for the fishery of Schroon Lake and, in part, explains why a quality coldwater fishery exists in the lake.

In addition, a review of the DO profiles obtained since 1995 indicates a tremendous amount of similarity between the two basins, with respect to both dissolved oxygen concentrations and thermal stratification. The depth of the thermocline (typically 5 to 6 meters by mid-August) and the width of this zone were remarkably similar from year to year between the two basins. Like many deeper Adirondack lakes, thermal stratification of Schroon Lake normally begins sometime in June and persists until fall overturn occurs in November.

SECCHI DISK TRANSPARENCY & TURBIDITY

Turbidity is a measurement of the amount of suspended materials such as clay, silt, algae and other constituents in water. These particles can cause light to be scattered and absorbed, not transmitted in straight lines through water, and thus they can affect the transparency of water. Water clarity or transparency is generally measured using a secchi disk.

Secchi disk transparency (SDT) readings observed in the south basin were consistently higher than those observed in the north during the month of August. North basin SDT readings averaged 15.5 feet from 1995 to 2009, while south basin readings averaged 17.5 feet during the same time period.

This phenomenon is likely a result of two factors. First, the prevailing wind on Schroon Lake normally blows from south to north. This means that the majority of the fetch or wind turbulence occurs

on the northern shore of the lake. Second, the inflow of water from several tributaries (including the Schroon River) into the northern end of the lake continually introduces suspended particulate material into the water column of the north basin. This material decreases water clarity by partially filtering out sunlight penetration into the water column. The resulting effect is a decrease in water clarity.

ORTHO & TOTAL PHOSPHORUS

Total phosphorus (TP) measurements include organically bound phosphates, condensed phosphates, and orthophosphates, and each water sample collected was analyzed for TP. The term phosphate is sometimes used interchangeably (and erroneously) with the term phosphorus. Phosphates are chemical compounds that contain the element phosphorus.

Since phosphorus is the most limiting nutrient in New York State lakes, it usually serves as the focus of most nutrient abatement strategies. Phosphorus is measured in parts per billion (ppb) or micrograms per liter (ug/L) and TP levels greater than 20 ppb are often found in bodies of water with significant algal growth. Conversely, oligotrophic lakes normally have TP levels less than 10 ppb.

Ortho phosphorus (OP) is the most readily available form of phosphorus to aquatic plants and algae, and it was also measured in the samples collected. It is the form of phosphorus used in fertilizers. Common cultural sources of OP may include fertilizer runoff, human waste from failing septic systems, effluent from sewage treatment plants that do not employ tertiary treatment, and detergent wastewater (Note: The impacts of these sources are discussed in Chapter 3). Some natural sources include leachate from phosphorus-rich bedrock and decomposing organic matter.

Lake water total phosphorus concentrations (Figures 1 through 3 in Appendix A) suggest that Schroon Lake is an oligotrophic lake. Average TP readings in August for north basin epilimnetic and hypolimnetic water samples collected during the fifteen-year period that AE has been studying the lake were 6.8 and 6.9 ppb, respectively. South basin August phosphorus concentrations exhibited an epilimnetic TP average of 5.3 ppb, and a hypolimnetic TP average of 5.2 ppb.

Since phosphorus is the most limiting nutrient in New York State lakes, it usually serves as the focus of most nutrient abatement strategies.

The north basin epilimnetic TP levels were almost always higher than the south basin epilimnetic levels. A review of Figure 3, which plots both north and south surface water TP readings, suggests that the epilimentic TP levels of Schroon Lake have changed relatively little over the past fifteen years.

Schroon Lake basin and tributary water OP concentrations were all within expected ranges, and since OP was rarely detectable at the 1 ppb level in lake water samples this suggests that available phosphorus is rapidly captured by algae, thus supporting the conclusion that phosphorus is the nutrient limiting algal growth in Schroon Lake.

NITRATE & TOTAL NITROGEN

Total nitrogen (TN) is a measure of all nitrogen present, including that bound in cellular materials. Nitrogen is an essential plant nutrient required by all living plants and animals for building protein, and as such, it influences the productivity of aquatic systems. Measured in ppm or milligrams per liter (mg/L), TN concentrations are usually less than 1 mg/L in most of our relatively pristine Adirondack lakes, with concentrations in the neighborhood of 0.1 to 0.6 mg/L being commonly found.

Readily available plant nutrients are mainly nitrite (NO2), nitrate (NO3) and ammonia (NH4), with nitrate normally playing the most significant role. Nitrate occurs naturally, but it can also be found in

agricultural fertilizers, livestock manure, and in sewage and industrial wastes. Nitrates in excessive amounts can result in negative human health effects like methemoglobinemia ("blue baby syndrome") in infants less than six months of age, and they can contribute significantly to the eutrophication of a body of water. Most natural lakes exhibit nitrate concentrations less than 1 mg/L, but in the Adirondacks, nitrate levels are usually below 0.3 mg/L.

Total nitrogen (TN) and nitrate (NO3-) levels were within normal limits for all of the lake and tributary water samples analyzed over the fifteen year period. The TN and NO3- levels normally ranged from between 0.1 to 0.6 mg/L and from between lt0.01 and 0.2 mg/L, respectively, and no significant trends were observed.

It is hypothesized that the elevated readings observed in the waters along the western shoreline are attributable to a long-term build-up of chlorides in the soil as a result of the application of de-icing agents by highway crews on the Northway and other nearby roads.

PH & ALKALINITY

A measure of the number of hydrogen ions in solution, pH is measured on a scale ranging from 1 to 14, with a "1" being extremely acidic in nature and "14" being extremely alkaline or "basic" in nature. Most lakes are circum-neutral (i.e., a pH range of "6" to "9"); an acceptable range for most aquatic organisms. (Note: Pure rainwater has a pH of around "5.6", while acidic precipitation can have a pH as low as "4").

Alkalinity measures the capacity of a lake to "buffer" or neutralize acidic inputs. Alkalinity usually refers to the quantity and kinds of compounds present in an aqueous solution that tend to shift the pH towards basic. The epilimnetic water of Schroon Lake enjoys a circum-neutral pH. The mid-August epilimnetic pH for both the north and south basin averaged 7.2 over the course of the fifteen-year study. The pH of the various tributaries flowing into the lake ranged between 6.5 and 7.4.

The alkalinity of Schroon Lake water and many of its tributaries is relatively low, as is the case with many Adirondack waters. This unfortunately means that the buffering capacity of these waters to resist sudden shifts in pH is poor. From 1995 to 2009, the north and south basin, mid-August alkalinity readings averaged 12.9 and 12.8 mg/L CaCO3, (calcium carbonate) respectively. Waters that possess alkalinities less than 10 mg/L are considered poorly buffered, so these values put Schroon Lake just above that theoretical threshold.

CONDUCTIVITY, TOTAL DISSOLVED SOLIDS, & CHLORIDE

Electrolytic conductivity is the ability of a solution to pass an electric current. Current is carried by inorganic solids, such as nitrate, sulphate, chloride, and phosphate ions, in water, as well as cations such as sodium, magnesium, calcium, iron, and aluminum. High specific conductance levels can sometimes be indicative of pollution from sources like septic or salt leachate. This is because chlorides (Cl-), which are present in road de-icing agents (e.g., calcium chloride, sodium chloride, and magnesium chloride) and human waste are electrolytic in nature.

Specific conductance is measured in micro Siemens per centimeter (uS/cm). Soft water lakes have relatively few dissolved ions, generally resulting in conductivity readings less than 100 uS/cm. Hard water lakes often have conductivity levels higher than 300 uS/cm.

Comparatively speaking, Schroon Lake basin conductivity and chloride levels fall within normal limits for the majority of our soft water Adirondack lakes, with basin samples always registering less than 100 uS/cm.

With the exception of the Schroon River and those tributaries that enter the lake along its western shoreline (i.e., Thurman Pond Brook, Horseshoe Pond Outlet, and Rogers Brook), the various streams flowing into Schroon Lake also exhibited relatively low levels of conductivity and chloride. It is hypothesized that the elevated readings observed in the waters along the western shoreline are attributable to a long-term build-up of chlorides in the soil as a result of the application of de-icing agents by highway crews on the Northway and other nearby roads.

Figure 7 presents tributary conductivity data collected from 1995-1999, 2000, 2002-2004 and 2007. Tributary samples were collected during the spring, summer and fall during the time period of 1995 to 1999. Starting in 2000, tributaries were only sampled during mid- to late-August.

The graph clearly shows that during those years when spring, summer and fall sampling occurred, conductivity levels were generally higher during the summer on most of the tributaries tested than during any other time of the year. This is likely due to the fact that there is usually less volume of water (and less flow) in August than there is in the spring or fall, and because of this, electrolytes tend to be more concentrated in the water.

In addition, a "first flush" sample collection was performed during a late winter storm event in 1998, and the resulting data is also included in Figure 7. The "first flush" testing was recommended and conducted in order to ascertain the dynamics of conductivity level fluctuations associated with a surge or "pulse" of melt water during a warm, rainy spell in March. Water samples were collected before (February 26), during (March 8) and after (March 17) the storm event, and these samples were analyzed for conductivity and chloride.

As expected, a noticeable "spike" in conductivity levels occurred in water samples collected from both Horseshoe Pond and Thurman Pond outlets during the peak flow of the storm event. These two tributaries have consistently possessed the highest conductivity readings observed since testing began in 1995, and it is hypothesized that the causative agent for these elevated levels is runoff from road salt-saturated soils adjacent to I-87 and Route 9.

CALCIUM

Calcium is a metal found naturally in lake systems. It is an important parameter to monitor since zebra mussels (Dreissena polymorpha), an invasive species of bi-valve mollusk discovered in North America in 1988, normally require between 10 and 12 mg/L of calcium in order to form their calcareous shell. Zebra mussels, if accidentally introduced into a body of water, can cause profound damage to the aquatic ecosystem by filtering massive amounts of phytoplankton out of the water column and consequently disrupting the food web.

A review of historical tributary data does indeed indicate that several inlets on the western side of the lake routinely possess calcium levels potentially high enough to support zebra mussels. Thus, the assumption cannot necessarily be made based on the relatively low calcium concentrations observed in the basins, that Schroon Lake is protected from zebra mussel colonization.

It was found that Schroon Lake surface water calcium concentrations normally ranged between 4 and 7 mg/L. It does appear that surface water calcium levels have increased somewhat since testing began in 1995. For example, mid-August calcium levels observed during the first four years (1995-1999) of the fifteen-year study averaged 4.8 mg/L in the north basin and 4.6 mg/L in the south basin. By comparison, the average mid-August readings from 2005 to 2009 (the last four years of the study) for

the north and south basins were 6.7 and 6.1 mg/L, respectively. It is not known why the calcium levels of Schroon Lake have gradually increased, but this change should continue to be monitored.

Even though there does appear to be a noticeable increase in calcium levels over the past fifteen years, these relatively low concentrations in the lake water suggest that Schroon Lake is still at low risk for large-scale zebra mussel colonization. However, the fairly recent discovery of zebra mussels in Lake George - a water body with calcium levels comparable to Schroon Lake – coupled with the fact that it appears that the calcium levels in the lake are gradually increasing should certainly act as a warning.

Zebra mussels in the relatively short period of time that they have been in North America, have exhibited the ability to adapt much quicker than originally expected to the environmental conditions of our region. It is now widely believed by scientists that the environmental tolerances of zebra mussels are much broader than anticipated, and that this exotic species has the ability to take advantage of certain areas within a water body (e.g., mouth of a stream possessing high calcium levels) to thrive.

A review of historical tributary data does indeed indicate that several inlets on the western side of the lake routinely possess calcium levels potentially high enough to support zebra mussels. Thus, the assumption cannot necessarily be made based on the relatively low calcium concentrations observed in the basins, that Schroon Lake is protected from zebra mussel colonization.

CHLOROPHYLL A

Schroon Lake surface water samples collected during the fifteen study years were analyzed for chlorophyll a, a plant pigment that scientists often measure to indirectly assess algal biomass. A review of the data collected during this time period indicates that there appears to be a long-term trend of increasing chlorophyll a levels in the epilimnion of both lake basins during mid-August (see Figures 4 and 5 in Appendix B). While the increase over time appears to only be slight, this parameter should continue to be monitored in order to ascertain the nature of this change.

Despite this observation, the amount of chlorophyll a present in the surface waters of Schroon Lake is certainly still at normal levels for a lake with its morphological and chemical characteristics. Mid-August north and south basin chlorophyll a levels from 1995 to 2009 averaged 3.79 ug/l and 3.54 ug/l, respectively.

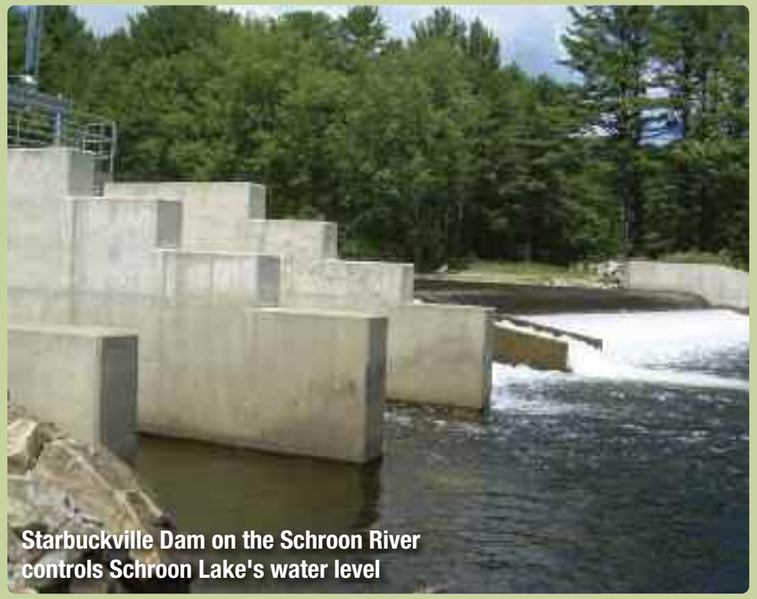
SULFATE

Sulfate levels normally observed in Adirondack lakes not significantly impacted by atmospheric deposition normally range between 1 and 3 mg/l. All of the sulfate analyses performed on samples obtained from the lake water and tributary water stations indicated levels less than 3 mg/l, with most samples ranging in between 1 and 2 mg/L. These data support the theory that Schroon Lake does not appear to be suffering from the negative impacts of acid deposition.

The water level of Schroon Lake is controlled by the Starbuckville Dam. The dam is owned by the Schroon Lake Park District (SLPD), which is a legislatively appointed board with representatives from the towns of Chester, Horicon and Schroon. The SLPD was formed by an act of the New York State Legislature set forth in Chapter 688 of the Laws of 1955, and it makes decisions regarding water level manipulation and must approve any construction work to the dam. It is a tax district and the owners of the roughly 2,250 properties situated within 1,500 feet of the shoreline pay an annual assessment to support the activities of the district.

According to Joe Koch of the SLPD, the average annual river flow over the dam is about 680 cubic feet per second (cfs). The crest elevation of the spillway is 805.7 feet. In the summer, when the lake level at the dam exceeds 806.2 feet the gates will automatically adjust every 15 minutes, as needed. From October 15 to May 15, the gates are taken off of automatic and they are left completely open. In the case of high water conditions, such as in the spring during snow melt or a heavy rain, the gates will be placed back on automatic and will also be adjusted manually, as needed, to avoid flooding both upstream and downstream. There is also a fish ladder situated at the dam which allows upstream migration of trout and salmon into Schroon Lake. This ladder was designed by the DEC and Christie Engineering and it provides a 4.3-foot elevation lift from the bottom of the ladder to the top.

The primary objective of the Schroon Lake Park District is to maintain an almost constant water level of 806 feet for the lake. This is no small feat given the size of the Schroon Lake watershed. Stable lake water level is extremely important to the ecological viability of the lake, as a whole, and to wetlands in particular. The integrity of fish spawning and nursery areas, plus the habitat of many species of amphibians, reptiles, aquatic and wet terrestrial plants, waterfowl, marsh birds, and aquatic insects all depend heavily on a relatively stable lake level environment.



Starbuckville Dam on the Schroon River controls Schroon Lake's water level

In addition, the recreational, commercial and aesthetic values of the lake can be impacted by lake level fluctuations. Access to the lake can become difficult or even impaired and bank destabilization can occur when the lake level is erratic, resulting in excessive shoreline erosion. The property of riparian landowners (e.g., docks, dock houses, beaches, lake fronts, retaining walls, etc.) can also be damaged if proper lake levels are not responsibly maintained.

2.5 Aquatic Life

FISHERIES

Schroon Lake serves as a very important regional fisheries resource. It is classified and managed as a two-tier fishery, which means that both coldwater and warmwater fish species are present and abundant. The lake provides excellent largemouth and smallmouth bass and northern pike fishing, and it supports a relatively healthy salmonid (lake trout and landlocked salmon) fishery. In addition, anglers enjoy spring and summer brown bullhead fishing on the lake and several species of panfish are extensively fished for throughout the entire year.

As a publicly-accessible body of water, the New York State Department of Environmental Conservation (DEC) has a hand in managing the fisheries resources of the lake. Part of their involvement includes stocking lake trout and landlocked salmon raised in state fish hatcheries in northern New York. The lake trout come from

the Chateauguay state fish hatchery and are the Raquette Lake strain and the landlocked salmon come from the Lake Clear state fish hatchery and are the Little Clear Pond strain.

On an annual basis, the DEC stocks spring yearling lake trout (LT) off of Taylor Point and spring yearling landlocked salmon (LLS) off of the town of Schroon-owned launch site in the village. The LT normally range between 7 and 8 inches long and the LLS

> The lake provides excellent largemouth and smallmouth bass and northern pike fishing, and it supports a relatively healthy salmonid (lake trout and land-locked salmon) fishery.

are usually between 6 and 8 inches in length. Historical records indicate that since 2000, roughly 3,100 LLS and 6,600 LT have been stocked each spring (mid-May to early June) into the lake. Stocking also occurred each year prior to 2000, but the actual number of fish being stocked into the lake varied somewhat from one year to the next.

The current DEC fish management plan directing the state's stocking policy for Schroon Lake was developed in 1997. This plan calls for a LLS stocking rate of 1.0 smolt/acre and a LT stocking rate of 1.6 spring yearlings/acre (Preall, R.J. 1997).

Several findings are stated in the DEC fish management plan as they relate to the salmonid population of the lake. One finding is that lake trout growth has declined since the 1960's and that landlocked salmon growth rates are slow. In addition, the plan narrative indicates that approximately 40% of the lake trout population is of wild origin and that natural reproductive success appears to have improved since the 1950's. The fish management plan notes that it is suspected that 5-10% of the lake's LLS population is comprised of wild salmon.

The last DEC survey of the lake was performed on July 31-August 2, 1989 when fisheries staff placed

a total of twenty-one gangs of multifilament gill nets at various locations throughout the lake. The objective of the netting was two-fold. First, it was hoped that some idea of the growth rate of the juvenile lake trout population in Schroon Lake could be ascertained from length, weight and age (from collected scale samples) data. Second, DEC fisheries personnel collected lake trout and yellow perch specimens to be sent to the Department of Health (DOH) lab for fish tissue analysis. These analyses were part of the state's toxic substance monitoring program.

A survey of the lake's fishery community is tentatively scheduled for the summer of 2010. The objective of the survey will be to obtain current insight into the growth rates of salmonids and to collect fish for the state's ongoing toxic substance monitoring program.

PHYTOPLANKTON (ALGAE)

Phytoplankton or algae are microscopic plants that live in the open waters of lakes and ponds and they serve as an important food source for many aquatic organisms. Understanding the character and function of the phytoplankton community is a key component to understanding the dynamics of any lake system and its food web. A limited study of the phytoplankton community of Schroon Lake was performed during the summers of 2008 and 2009. Since limited historical data on this population exists, the primary objective of the study was to assist in the creation of a scientific database that could be used as a historical benchmark to compare the results of future phytoplankton monitoring efforts with.

Most species of algae do not root to the lake bottom or attach themselves to other objects, but rather float freely throughout the water column of the lake. Like rooted, vascular plants, algae produce dissolved oxygen and are nutrient-limited in their growth. Cyanobacteria (blue-green algae) are also organisms that float freely throughout the water column and possess photosynthetic capabilities. Unlike green and yellow-brown algae, however, blue-green algae are not "true" algae, but instead are a type of bacteria.

The abundance and species composition of algae can have significant implications with regard to both the water clarity and quality of any given body of water. Since there is normally a strong statistical correlation between secchi disk transparency (SDT) and algal biomass, with both parameters usually following predictable seasonal patterns, a change in the composition of the phytoplankton community may result in decreased water clarity and increased nutrient loading. These changes, if observed, would likely occur during the summer, as algae metabolize more efficiently under higher water temperatures. Since algae utilize nutrients (phosphorus, nitrogen) directly from the water column for photosynthesis, the higher the nutrient concentrations the more "productive" algae become. In the spring and fall,

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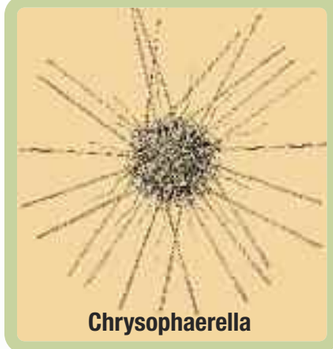


Chrysophaerella

when water temperatures are cooler and total phosphorus (TP) levels are lower, algal biomass decreases and water transparency increases.

Phytoplankton were collected on August 25, 2008 and August 27, 2009 via surface water grab sampling at both the north and south lake basin testing sites, and these samples were immediately preserved and shipped to Aquatic Analysts in Washington for laboratory analysis.

Over the two-year research project, a total of thirty-three species of phytoplankton were identified from the Schroon Lake collections. In addition, one unidentified flagellate species was observed. Those species documented were: Achnanthes minutissima, Aphanothece sp., Anabaena flos-aquae, Anabaena planctonica, Ankistrodesmus

falcatus, Asterionella formosa, Chlamydomonas sp., Chromulina sp., Chroococcus minimus, Chrysococcus rufescens, Chrysosphaerella sp., Cocconeis placentula, Cosmarium sp., Crucigenia quadrata, Cryptomonas erosa, Cyclotella stelligera, Dinobryon bavaricum, Dinobryon sertularia, Fragilaria crotonensis, Glenodinium sp., Gloeocystis ampla, Gomphonema angustatum, Hemidinium sp., Kephyrion littorale, Nitzschia dissipata, Oocystis pusilla, Peridinium cinctum, Quadrigula closterioides, Rhizosolenia eriensis, Rhodomonas minuta, Sphaerocystis schroeteri, Synedra rumpens and Tabellaria fenestrate (LaMere, S.A. 2008 and LaMere, S.A. 2009).

The amount and type of algae in a lake are heavily dependent upon the predatory effectiveness of zooplankton. This effectiveness is dependent on the zooplankton species present in the lake at any given time and their average size. The larger the zooplankter the more algae it can ingest and assimilate.

A total of twenty-eight species of phytoplankton were documented in the 2008 Schroon Lake samples. Twenty-one species of algae were observed in the collections taken from the south basin of the lake and nineteen species were observed in the north basin.

The most common algal species in the south basin were Rhodomonas minuta (29.5%), Achnanthes minutissima (20%), and Dinobryon sertularia (15.2%). In the north basin, Rhodomonas minuta (35.4%) and Dinobryon sertularia (19.5%) dominated the collections. Rhodomonas minuta is a very widespread alga (probably the most common alga in the U.S.) and it is found under a wide range of ecological conditions (LaMere, S.A. 2008).

The results of the 2009 sampling were very similar to those observed in 2008, with a total of twenty-five species of phytoplankton identified in the field collections. As in the previous year, Rhodomonas minuta and Dinobryon sertularia were two of the most dominant species of algae found in both of the basins (LaMere, S.A. 2009).

The two basins were very similar in terms of species composition and abundance, and the species composition was, for the most part, normal for a late oligotrophic or early mesotrophic lake. Most of the species in Schroon Lake are typical of oligotrophic lakes, with a few minor exceptions. Fragilaria crotonensis, Anabaena flos-aquae and Anabaena planctonica are all eutrophic algae, and A. flos-aquae can potentially be toxic if it blooms. This particular species, however, was found in very low abundance and was only observed in the south basin collections.

Trophic State Indices (TSI) are used to assess the degree of eutrophication of a body of water and they frequently are used to compare lakes. TSI values range in most lakes from 0 to 100, with 0 corresponding to the lowest productivity and 100 corresponding to the highest (Carlson, R.E. 1977). Using these values, the densities of algae in the Schroon Lake collections indicate low end mesotrophic conditions. In 2008, the TSI was 41.3 and 35.2 for the north and south basin, respectively. The TSI in 2009 for the north basin was 34.1 and for the south basin it measured 39.8. With only two years of data available it is difficult to assess whether any significant trends are noticeable within the phytoplankton community, but it is apparent that the species assemblages present in the lake are highly reflective of the current water quality condition of Schroon Lake.

ZOOPLANKTON

Zooplankton are microscopic crustaceans which inhabit lakes, ponds and rivers. Research has shown that a sound way to indirectly evaluate fish community structure is to examine the composition and quality of the food web, particularly the zooplankton community. A limited study of the lake's zooplankton community was performed during a three-year time span from 1995 to 1997. The primary objective of this study was to obtain data relative to the zooplankton community of Schroon Lake. The impetus for the study was a growing concern on the part of many fishermen for the "balance" and structure of the fish community.

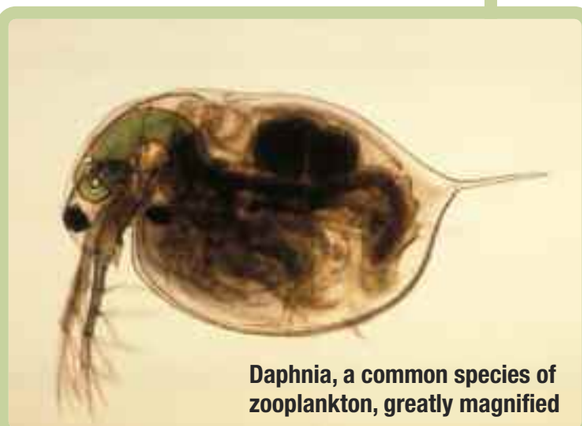
Fish production ultimately depends on production at lower trophic levels, and interrelation-ships between planktivorous ("plankton-eating") fish growth and zooplankton abundance have been well documented. It has even been suggested by some researchers that zooplankton size and abundance can be used as a predictive index in separating lakes on the basis of fish community structure (Mills et. al. 1987).

Most zooplankton range from 0.5 to 1.0 mm (millimeters) in length, and feed on algae. There are two main types of crustacean zooplankton, cladocerans and copepods. The relative abundances of zooplankton, in terms of density, vary greatly from lake to lake. The density can be as low as <1 individual per liter in oligotrophic waters and as high as 500 individuals per liter in eutrophic lake systems. Cladocerans tend to be more abundant in summer, probably due to the greater availability of food, while copepods, which are generally perennial, exhibit active over-wintering populations.

The amount and type of algae in a lake are heavily dependent upon the predatory effectiveness of zooplankton. This effectiveness is dependent on the zooplankton species present in the lake at any given time and their average size. The larger the zooplankter the more algae it can ingest and assimilate. The size and species of zooplankton in turn are often reflective of the type of fish present in any given lake system and the extent to which the fish community utilizes the zooplankton for food.

During years in which a lake is dominated by an overabundance of adult planktivorous fish or a "bumper crop" of young-of-the-year (YOY) fish during the summer, it is possible to note observable population shifts within the zooplankton community as a result of increased predation by these fish. In general, fish select the more visible, larger zooplankton species such as Daphnia, thus allowing for an increase in the relative abundance of smaller zooplankton species.

A well-established piscivorous ("fish-eating") fish population, such as walleye or lake trout, containing a plentiful number of individuals of sufficient size to effectively control planktivores is thus highly desirable, particularly in a deep oligotrophic or mesotrophic body of water. Planktivorous fish species left unchecked by natural predation have the capability of exhibiting explosive growth cycles. A commonly noticed result of such an overabundance of planktivores is "stunting" of growth within the population.



Daphnia, a common species of zooplankton, greatly magnified

Another possible effect of an overabundance of planktivorous fish is a general decline of lake water clarity. As heavy and continual foraging on zooplankton occurs, the zooplankton community eventually loses its ability to effectively control phytoplankton (algae). As a result, phytoplankton populations increase. This increase in phytoplankton may substantially alter lake water clarity, and as a consequence, localized or even lake-wide algal blooms may occur.

In order to evaluate the zooplankton community, samples were collected over a three-year period. Samples were taken in 1995 (June 14, August 22 and October 10), 1996 (June 15, July 24 and August 27) and

1997 (June 27, July 23 and August 26). Samples collected in 1995 and 1997 were obtained during the day, whereas the 1996 samples were collected in the early morning between 12:00 and 2:00 am.

The purpose of the early morning collections was to selectively sample the invertebrate community of Schroon Lake. Since an analysis of samples collected in 1995 indicated a relatively low mean zooplankton size, the decision was made to try to determine whether this phenomenon might be due to either predation by invertebrates (e.g., Chaoborus) or predation by a strong year-class of YOY fish. The phantom midge, Chaoborus spp., is a phototaxic-negative invertebrate that migrates up into the water column from the benthos (lake bottom) at night in order to prey upon zooplankton, and it is one of the more likely species that might feed on zooplankton enough to affect the community's mean size. Due to its nocturnal behavior, this species is often not found in zooplankton samples routinely obtained during the daylight hours, and thus specialized sampling strategies (e.g., vertical towing at night) are required to collect them.

All samples were collected by vertically "hand-towing" an 80 micron mesh Wisconsin-style plankton net through the water column at a constant rate of about one meter per second. Three separate tows (aliquots) were made at each of the north and south lake basin sampling stations during each visit to the lake and these samples were combined into one sample container (Note: The south basin was not sampled on June 27 and July 23 of 1997). All collected samples were immediately preserved in a sugar-formalin solution (Haney and Hall 1973) and then transported to the Cornell University Biological Field Station on Bridgeport, NY for microscopic analysis utilizing the CAPAS (Computer-assisted Plankton Analysis System).

Thirteen species of zooplankton were observed in the collections over the three years of research. Species present were Bosmina longirostris, Ceriodaphnia quadrangula, Chydorus sphaericus, Cyclops bicuspidatus, Daphnia galeata mendotae, Daphnia pulicaria, Daphnia retrocurva, Diaphonasoma spp., Diaptomus minutus, Epischura lacustris, Holopedium gibberum, Mesocyclops edax and Tropocyclops prasinus. There were tremendous similarities in terms of mean body size, species composition and relative abundance in sample collections obtained from the north and south basins. Interestingly, the mean size and the range in the mean body size of zooplankton increased progressively from 1995 to 1997.

The 1995 research yielded results that were somewhat concerning in that collections of zooplankton made at the north basin between June and August indicated that the mean body size of zooplankton ranged between 0.45 and 0.50 mm (LaMere, S.A. 1995). Mills et. al. (1987) discovered that in lakes where crustacean zooplankton size is low (< 0.8 mm) in both the spring and mid-summer, that it is reasonable to assume that a high abundance of planktivorous fish is responsible for the predominance of small zooplankton.

In 1996, the observed range of mean body size in north basin zooplankton was between 0.64 and 0.71 mm (LaMere, S.A. 1996), and by 1997 the range had further increased to between 0.63 and 1.09 mm (LaMere, S.A. 1997). The substantial increase in this size range over the course of the three years is significant, and it suggests that whatever heavy predation that might have occurred on the zooplankton community in 1995 had relaxed somewhat by 1996 -97.

Predation by a strong year-class of YOY fish (possibly yellow perch) is a plausible explanation for the depressed size structure of the 1995 zooplankton community of Schroon Lake. It is unclear, however, why there were no significant seasonal changes in zooplankton mean body size during the 1995 sampling season. If a relatively strong year-class of perch was present during that year, it would be expected that predation on large-bodied species like Daphnia would be observed in the spring and summer, but not in the fall.

Additional and more current research into the zooplankton community and the forage base and game fish populations of the lake might yield enlightening information. While it appears that by 1997 the zooplankton community had "rebounded" from what might have likely been a period of intensive predation, it is not clear whether this is the case or not. Since the relationship between a healthy fishery and a quality zooplankton community is well-documented, the importance of understanding this dynamic as it pertains to Schroon Lake is equally important.

Wetlands are transition areas between the aquatic and the terrestrial environment where the water table is normally at or near the land's surface or the land is covered by shallow water. They are diverse ecosystems and serve as habitat for a variety of organisms, including many species of aquatic and "wet terrestrial" plants, small mammals (e.g., muskrat, beaver, mink, etc.), marsh birds, waterfowl, insects and invertebrates, fish, amphibians and reptiles. Wetlands and wet terrestrial areas also play a vital role in helping to sustain many species of migratory game birds (e.g., woodcock) and waterfowl during their migration.

Approximately 14% of Schroon Lake's shoreline land coverage is comprised of wetlands. These areas are visible in Lockwood Bay, Terra Alta, Meadow Cove, the shallow region near the Horicon state boat launch site and other locations around the lake.

Unique and vital ecological resources, wetlands are among the most productive natural ecosystems on earth. They help filter and purify water, assist with nutrient recycling, and serve as effective, natural buffers to erosion and flooding. In addition to these important ecological values, wetlands also serve as unique habitats areas for amphibians. With world-wide declines in amphibian populations being documented and studied, protecting these diverse ecological zones has become even more critical.

It has been documented that thirty-five species of amphibians and reptiles reside within the Adirondacks, representing seven amphibian and five reptile families (Saunders, D.A. 1989).

Approximately 14% of Schroon Lake's shoreline land coverage is comprised of wetlands.

The southern tip (and outlet) of Schroon Lake, has a large and diverse wetland complex. (Google Earth aerial image)

It is not known how many of these species are present specifically within the Schroon Lake watershed, but certainly at least a majority of them would be expected to occupy the various habitat types present. During the conduct of field work and research on Schroon Lake, AE has observed a majority of the frog and turtle species noted in the above list. Every effort should be made to not only protect the ecological integrity and species diversity of these wetland areas, but also to inventory the species present within them. This could be accomplished at some point in the future by retaining a herpetologist to perform a limited study of this community.

2.7 Lake-based Recreation

Water-based recreational endeavors in Adirondack towns and villages fortunate enough to have beautiful lakes within their boundaries are a very important component to the local economy. The natural character and aesthetic appeal of the Adirondacks attracts thousands of visitors each year, many of them lake-users.

Schroon Lake is a recreational "Mecca", possessing a multitude of actual and potential uses. The lake is utilized primarily for recreational purposes such as boating (motorized and non-motorized), fishing (including ice fishing), water skiing and swimming. In addition, some lake users like to ice skate and cross country ski on the lake during the winter months when the ice is frozen, and some waterfowl hunting occur on a limited basis in the more remote areas of the lake during the fall. With approximately 50 miles of groomed trails in the immediate area, snowmobiling has also become a popular activity on and around Schroon Lake during the winter.

In general, the recreational use and enjoyment of a lake is a benefit for both the local economy and the lake itself. As long as the recreational uses are appropriate for and in keeping with the nature and character of the water body, a healthy balance can be maintained between the recreational value and ecological integrity of the lake. Local communities realize the importance of a healthy lake to tourism and that appreciation often wisely manifests itself in efforts to better protect and manage it.

The excellent fishing on Schroon Lake attracts a significant number of local and visiting anglers to the region each year, and it is one of the most common recreational pursuits on the lake. In addition, the Schroon Lake Fish and Game Club (SLFGC) sponsors a kids' fishing derby on the lake each summer (usually the last weekend in July) and a ice fishing derby in the winter (usually the first weekend in March) which attracts hundreds of participants.

Local communities realize the importance of a healthy lake to tourism and that appreciation often wisely manifests itself in efforts to better protect and manage it.

In the past few years, there have been discussions whether or not to support the existence of a summer bass fishing tournament on Schroon Lake. While it is true that some economic benefit could possibly be derived locally from a fishing tournament, it is also possible that this type of event could potentially cause detriment to the bass population of the lake.

Some tournaments encourage an arguably unethical practice known as "culling" to occur, where an angler continues to fish even after catching their limit of fish. If they catch a new fish that is bigger than one currently in their live well, they are allowed to throw out the smaller fish in place of the bigger one. State law allows for this type of activity. During the regular bass season, a single, uninjured largemouth or smallmouth bass can be released from an aerated, properly functioning live well. However, during the pre-season, catch-and-release regulations apply, and bass that are caught must be released unharmed back into the body of water immediately after being caught.

The concern is that this practice can result in mortality to released fish, and if done regularly on a large-scale basis, the bass population could eventually begin to suffer. Thus, in order to minimize the potential negative impact of having a bass tournament on Schroon Lake, it would be recommended that an agreement with tournament organizers be struck to not allow this practice. If this concern cannot be satisfactorily addressed by tournament organizers then it might be best to not encourage nor even support this type of event at all.

Another event that has become the subject of some debate is the practice of snowmobile drag races being held on Schroon Lake during the winter. After a four year absence, these races returned to the area in the winter of 2010. The two-day event in February is sponsored by the Eastern Speed Association.

The primary concern is about the potential problems associated with gasoline, oil or other automotive fluids leaking out of the snowmobile and onto the snow and ice, eventually making its way into the water column. A secondary concern is over exhaust emissions. Many snowmobiles are still powered by two-stroke engines, although the trend since 2003 has been toward the production of four-stroke engines. Like boat motors, two-stroke snowmobile engines are less efficient and more likely to pollute than four-stroke engines are. In the last decade, several manufacturers have been experimenting with less polluting motors, and have been putting them into production.

There is no way of accurately assessing whether this is a valid concern or not without having officials from town government or their designees physically inspect the area in and around the raceway and staging area during and after the races . A verification process would be prudent for future races and is recommended. It would also be beneficial if race organizers were required to have a plan in place to address accidental spills quickly and effectively. Exercising common sense and using due diligence often minimizes the potential risk of having otherwise beneficial recreational events.

Recreational boating is a popular activity on Schroon Lake, and the amount of boaters using the lake has been increasing over the past decade.

Recreational boating is a popular activity on Schroon Lake, and the amount of boaters using the lake has been increasing over the past decade. In the late 1990's, some members of the Schroon Lake Association board of directors expressed concern over the amount of boating traffic on the lake, and they wondered if the level of use was appropriate for the size of the lake and whether and to what extent recreational boating and jet ski use might affect the environmental quality of the lake.

As a result, during the summer of 2001 Adirondack Ecologists, LLC was contracted to perform a watercraft use survey of Schroon Lake. The primary objective of the survey was to obtain data on the character and volume of boating traffic experienced on the lake during two typical summer weekends (July 14-15 and August 4-5). A secondary objective was to determine where watercraft users were coming from to utilize the lake.

In order to attempt to cost-effectively determine the level of watercraft activity on the lake, a research effort comprised of two distinctly different phases was developed and implemented. The first phase consisted of monitoring all watercraft launch activity at both the NYSDEC launch site in the Town of Horicon and the Town of Schroon-owned launch site located in the north basin on both of the aforementioned weekends.

On each of these weekends (Saturday and Sunday from 7:00 am to 7:00 pm), volunteers from the SLA were enlisted to log and interview all watercraft users prior to launching. Aware of the fact that weather often affects the level of boating use, the survey was conducted over a period of two weekends in order to encompass a time period that would hopefully include a variety of weather conditions.

Two-thirds of the watercraft users surveyed said that they come to the lake during the summer months only.

During the survey process, information about the time and place of launch and the types of watercraft being launched was obtained. In addition, information about the watercraft users themselves was obtained. (i.e., place of residence; preferred activities on the lake while utilizing watercraft; and the time of year that their watercraft is used and the frequency of use).

The second phase of the research consisted of a lake-wide count via boat of all watercraft moored or stored within ten feet of the shoreline between the hours of 6:00 and 8:00 am on each of the two Saturdays (July 14 and August 5) that the watercraft use survey was being conducted. In addition, a survey of all watercraft utilizing the lake between 2:00 and 2:45 pm and 5:30 and 6:15 pm on all four of the weekend days was conducted.

During this "mobile" survey, AE staff and SLA volunteers traveled the entire length of the lake and logged the number, type and general location (e.g., north basin, narrows or south basin) of all watercraft that were observed in the water, whether moving or stationary. Unoccupied vessels that were moored were not counted. The purpose of this survey was to get an idea of the number of "resident" vessels potentially available for use on the lake prior to the onset of "transient" boat launches (i.e., launches made at public boat launch facilities).

On average, the Town of Schroon boat launch site experienced roughly half the amount of launch activity that the state launch site in Horicon receives. Furthermore, it was determined that "peak" launch times normally occurred between 10:00 am and 2:00 pm at both of the launch sites and that the busiest "departure" times (i.e., watercraft leaving the lake) tended to be between 4:00 and 6:00 pm on sunny, pleasant days and within an hour or so of the onset of a rainstorm. Minimal launch activity was observed at either of the launch sites during the early morning or late afternoon hours. Early morning launches were normally made by fishermen, whereas late afternoon launches were usually made by people operating pontoon boats.

Shoreline surveys (counts) of watercraft on July 14 indicated that 666 motorized, 524 non-motorized , and 94 personal watercraft (PWC) were present around the lake and presumably available for use on the lake by riparian lake users. A redundant survey performed on August 4 indicated similar results with 677 motorized, 517 non-motorized and 101 PWC being present on or near the lake.

A total of 93 and 132 watercrafts were launched on July 14 and 15, respectively, while a total of 152 water craft were launched on August 4 and 149 were launched on August 5. The "mobile" (in-lake) watercraft survey performed in July and August indicated that roughly 85% of the motorized watercraft using the lake were boats and 15% were PWC. This correlated well with the launch site data collected by the SLA volunteers. These volunteers reported that roughly 88% of those motorized watercraft put into the lake at the two public launch sites were boats and 12% were PWC.

From a review of the data, it appeared that between 50-75% of the motorized boats on the lake on the two Saturdays surveyed and a majority of them on the two Sundays surveyed were "transient". In addition, it appeared that a majority of the PWC logged during the survey were also transient in nature.

The southern basin of Schroon Lake seemed to possess more watercraft activity than the northern basin did during the survey period. Some utilization of the narrows for fishing and other recreational endeavors was observed, but predominantly, watercraft used the narrows to travel back and forth in between the two basins.

Responses to the survey questionnaire administered at the launch sites by the volunteers yielded some very useful information. Recreational boating appears to be the most popular activity for watercraft users, with 50% of all respondents indicating that it was their favorite activity. Fishing was the second most popular activity with 29% of those questioned stating that angling was their primary reason for using the Schroon Lake. Other activities included water skiing (14%) and sailing and canoeing (2%). Roughly 9% of those surveyed indicated that they come to the lake for all of the above-listed activities.

Two-thirds of the watercraft users surveyed said that they come to the lake during the summer months only. The other one-third indicated that they travel to the area on a year-round basis. When asked about the frequency of visits per year that they make to the area, roughly 47% said 1-10 times per year; 9% said 11-20 times; and about 44% said more than 21 times.

Interestingly, only one New York-registered boat surveyed came from a destination north of Schroon Lake. The majority (26%) of the boats surveyed originated from the Capital District region, while roughly 14% came from the Glens Falls/Lake George region and another 14% originated from the northern Warren County or southern Essex County areas.

Using the data obtained during the "mobile" surveys, it was calculated that at the height of watercraft activity there was roughly one boat for every 25 acres of water surface available on 8/5 (the busiest day) and roughly one boat per every 88 acres of water surface on 7/14 (the slowest day).

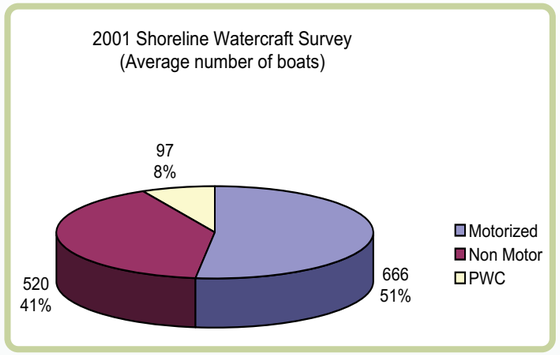
An article in the December 1991 edition (Volume 11, Issue 4) of Lake Line, a publication put out by the North American Lake Management Society (NALMS), offered the following guidelines for assessing boating traffic (density) on lakes: low density (> 25 acres/boat); medium density (10-25 acres/boat); high density (5-10 acres/boat); and very high density (< 5 acres/boat). Comparing the NALMS guidelines with the data obtained during the survey, it appears that Schroon Lake, at times, falls in between the low to medium density groupings for boating traffic.

When evaluating the recreational and aesthetic value of a body of water, in terms of watercraft usage, there are other factors to consider besides the "volume" of use (i.e., # of acres/boat). Factors like the size and horsepower of the watercraft used in the water body, prevailing speed regulations, the level of noise, the manner in which they are used, and pollution concerns associated with watercraft use are all issues to be considered.

With the advent of four-cycle outboard engines, the negative impacts of watercraft, in terms of engine pollution, have been lessened. Due to the fact that two-cycle engines accomplish fuel intake and exhaust in the same cycle, they tend to release unburned fuel along with the exhaust gases. There are over 100 hydrocarbon compounds in gasoline, as well as additives. Given these facts, it is of paramount importance for the quality of the lake, the organisms that live in it, and the people who use it that every effort be made to encourage all boaters to use four-cycle engines.

One of the recommended components of future educational efforts to protect the lake should be to establish a brochure that could be handed out to watercraft launchers and lakefront property owners about pollution concerns related to boating (e.g., gasoline and oil, antifouling paints, proper sewage disposal, etc.) and how to best manage them.

Noise and speed issues associated with watercraft use have also been a topic of interest with various organizations. A couple of years ago the SLA established a "noise and speed" committee to study the existing state and local laws and regulations as they relate to watercraft noise and speed and to develop recommendations for addressing these issues (Note: These issues were identified as items of interest by respondents to the lake user survey). The efforts of this group were also supported by the East Shore Schroon Lake Association, and both organizations have since passed resolutions supporting these recommendations. This committee expects to eventually bring their recommendations to the three towns for further review and possible action.



2.8 Aquatic Plants & Invasive Species Management

Aquatic plants and algae play a crucial role in the ecology of lakes and ponds. They provide oxygen to aquatic life via the process of photosynthesis, and serve as a refuge and food source for many types of aquatic organisms including juvenile fish, insects, crustaceans and waterfowl.

Rooted aquatic vegetation also provides lake bottom stabilization, and thus acts to prevent shoreline erosion and bottom sediment disturbance. These plants frequently improve water clarity by competing with algae for available nutrients like phosphorus and nitrogen. In addition, the presence of aquatic plants in moderate amounts often add to the value of property around a body of water by offering aesthetic and recreational (e.g., fishing) opportunities to lake users.

A limited aquatic macrophyte (rooted aquatic plant) survey of Schroon Lake was performed by Adirondack Ecologists, LLC on September 22-25, 1995. There were two primary objectives of the survey. The first goal was to determine the general character of the aquatic plant community of the lake, and the second goal was to determine whether invasive species like Eurasian water milfoil had already become established in the lake.

Rooted aquatic plants are generally grouped into three classes:
1. Emergents (e.g., cattails) are plants which, to a large extent, grow out of the water. They are normally found growing in shallow water near the shoreline.
2. Floating-leaved plants (e.g. water lilies and watershield), as the "label" implies, are macrophytes which possess leaves that float on the water's surface.
3. Submergents (e.g., pondweeds, milfoil and waterweed) are plants that grow entirely beneath the surface of the water. Due to their photosynthetic requirements, these types of plants will grow only where underwater illumination (sunlight penetration) is sufficient.

In order to obtain enough information to define the makeup of Schroon Lake's aquatic plant community, nine sites were selected from around the lake (four in the north basin, four in the south basin and one in the narrows). The selection criteria were based upon typical and unique habitat types to get a diverse cross-section of those species assemblages present in the lake.

Utilizing a schedule of abundance (% cover) code, the abundance of each aquatic plant species encountered along a straight-line transect from the shoreline out to a depth of six feet at several locations within each site was estimated. This schedule ranged from abundant (> 50% cover) to rare (< 5% cover) and allowed for a semi-quantitative analysis of the Schroon Lake aquatic plant community.

A total of thirty-one species of aquatic macrophytes and one macroalgae (i.e., Chara spp.) were observed and documented during the late September inventory. This number of species represents excellent species diversity, and the species assemblages encountered were typical of those normally present in other Adirondack lakes with similar geological and morphological characteristics.

Northern pipewort (Eriocaulon aquaticum), large-leaf pondweed (Potamogeton amplifolius), variable pondweed (Potamogeton gramineus), eel grass (Vallisneria americana), water naiad (Najas flexilis), waterweed (Elodea canadensis) and quillwort (Isoetes spp.) were the most abundant species observed overall in the lake. Ribbon-leaf pondweed (Potamogeton epihydrus), Richardson's pondweed (Potamogeton Richardsonii), and the "understory" species bog

The focus of the milfoil program over the past fifteen years has essentially remained the same since its inception, with the goal being the control of milfoil in order to foster the environmental, aesthetic, and recreational values of the lake.

rush (Juncus pelocarpus) and leafless water milfoil (Myriophyllum tenellum) were also commonly found. One species observed, little milfoil (Myriophyllum alterniflorum), is on the NYS Rare Plant List, and as such reasonable efforts need to be taken to prevent undue damage to this plant when controlling invasive species. All of these species are submergent aquatic plants. Other native species observed were: watershield (Brasenia shreberi), muskgrass (Chara spp.), three-way sedge (Dulichium arundinaceum), spike rush (Eleocharis spp.), water lobelia (Lobelia dortmanna), southern naiad (Najas guadalupensis), yellow pond lily (Nuphar luteum), fragrant water lily (Nymphaea odorata), pickerelweed (Pontedaria cordata), floating pondweed (Potamogeton natans), whitestem pondweed (P. praelongus), Robbins pondweed (P. Robbinsii), slender arrowhead (Sagittaria graminea), common three-square (Scirpus americanus), burreed (Sparganium spp.) cattail (Typha spp.), sphagnum moss (Fontinalis novae-angliae) and an unidentified grass species.

Eurasian water milfoil (Myriophyllum spicatum), hereafter referred to as milfoil, was first discovered in Schroon Lake during this survey. This initial sighting took place in the navigation canal of the Schroon Lake Marina, formerly known as the Maypine Marine, and it precipitated the eventual development of an invasive species management program for the lake. The management program was developed in conjunction with the SLA, and the Towns of Chester, Horicon, and Schroon, and it was initiated in 1996.

The focus of the milfoil program over the past fifteen years has essentially remained the same since its inception, with the goal being the control of milfoil in order to foster the environmental, aesthetic, and recreational values of the lake. While the application of the program has evolved as necessary and warranted, it still contains two basic parts - a surveillance (monitoring) component and an eradication (control) component.

The objective of the monitoring component is to find milfoil and any other invasive species wherever they might exist in the lake. In order to accomplish this objective, AE began performing annual inspections of the near-shore littoral zone of Schroon Lake. In the early years of the program, monitoring consisted of reconnaissance inspections of selected areas of the lake believed to be at high risk for infestation (i.e., boat launch sites, popular fishing spots, areas adjacent to known infestations, etc.). In 2000, funding became available to do boat surveys of the entire perimeter of the lake.

During the survey process, the littoral zone is traveled in a zigzag fashion and is inspected out to a water depth of roughly 8+ feet (water transparency-permitting). This survey method is an excellent way of locating beds of mature milfoil plants, and it can sometimes be successfully used to help identify scattered or individual plants. Normally, however, more extensive and expensive survey techniques, such as SCUBA surveys, are warranted when searching for small-scale, sparsely-established infestations.

Judging from the distribution and extent of the various populations, milfoil has certainly been present in Schroon Lake since at least the 1980's

Photo by Barry Rice, sarracenia.com, Bugwood.org

In order to help with surveillance, a volunteer milfoil watch consisting of approximately a dozen SLA members was established and trained by AE a few years after milfoil was first discovered in 1995, but the activity level of that group diminished over a period of time. A renewed interest on the part of the ESSLA and the SLA in rejuvenating this "scout program" surfaced in 2008. This trained group of volunteers worked in coordination with and under the general guidance of AE on selected aspects of milfoil reconnaissance, with the objective being a more complete coverage of the near-shore littoral zone of Schroon Lake.

As of the end of 2009, the surveillance program had been responsible for the identification and documentation of one curly-leaf pondweed (Potamogeton crispis) infestation and forty-two milfoil sites in the lake (see Map 2). The majority of these infestations were located in the northern basin, with the concentration of these milfoil sites being situated either adjacent to the eastern side of Clark Island or along the eastern shoreline of the lake itself. Another significant population was also discovered in the southern basin during the 2002 reconnaissance survey. These sites (#11-#13) are situated in the small bay just northwest of the state boat launch site at the far southern end of the lake.

The milfoil populations have historically ranged in size from a few plants to relatively large, well-established beds consisting of thousands of plants. In some circumstances, the patches were obviously sites that had only recently been colonized and they were comprised primarily of low-growing, immature milfoil plants. In other cases, the beds were extensive and very dense. These more advanced colonies have served as vector points for the spread of milfoil to adjacent or downwind (or down-current) areas in the lake for quite some time. Judging from the distribution and extent of the various populations, milfoil has certainly been present in Schroon Lake since at least the 1980's (and probably longer than that), and unfortunately since its existence went undetected for quite some time, this invasive species has had the opportunity to colonize at multiple sites around the lake.

A relatively small-scale curly-leaf pondweed infestation was discovered in Schroon Lake in June of 2003 in the navigation channel of the marina. To date, it is the only documented sighting of this species in the lake, and thus far it has been relatively easy to control at this location as long as control is initiated early in the summer each year prior to turion detachment. Curly-leaf pondweed is a submersed species that spreads by both turion (specialized overwintering bud) production and fragmentation.

The objective of the control component of the program is simple: to eliminate in as timely a manner as possible any invasive aquatic plants that are discovered. This objective has been addressed via hand harvesting, and when feasible or needed, the judicious use of benthic barriers. These physical control techniques were selected as they offered the most cost-effective and environmentally-sensitive approach to invasive plant management.

Given the size and nature of the infestation around the lake, they were also the only feasible management techniques worth considering.

Hand harvesting has normally commenced by mid-June and follow-up scouting often continues through until early October. Several divers normally work together at each infestation site, and a person works from a pontoon boat to watch over the divers and to collect any milfoil fragments that might be created as a result of the harvesting activity. The work site is cordoned off by dive flags/buoys and at some sites a canoe or kayak is even utilized to assist with the operation.

In most circumstances (when funding has been available and approval has been given), control has been initiated at sites of infestation during the same year that they have been discovered. Unfortunately, sites that have been discovered too late in the season to commence control in that year or areas of infestation that control could not be implemented in due to funding constraints, had to be left until such a time as management of the site could proceed. For example, Sites #11-13 were discovered and reported during the summer of 2002, but approval and funding to control these infestations were not forthcoming until 2004. This two-year delay afforded the milfoil an opportunity to spread significantly in this area, thus making control that much more difficult.

Funding for milfoil site identification and control on Schroon Lake has historically been low, but despite this fact, the most cost-effective and environmentally sensitive strategies available have been implemented for the management of milfoil in Schroon Lake. In early 2006, AE prepared a nuisance aquatic vegetation management plan for the lake and this plan was incorporated into a grant application assembled by Eric Cordis of the Word of Life Institute for the state's new Aquatic Invasive Species Eradication Grant Program. A three-year grant for $28,833.33 was awarded to the Town of Schroon for the implementation of this plan, and work under the auspices of this grant was initiated in June of 2006. The funds have allowed for increased management of existing milfoil infestations in the lake.

Since 2006, when records began to be kept on the amount of milfoil hand harvested from the lake, a total of two hundred and seventy-five 24" wide by 36" long mesh bags of milfoil and two mesh bags of curly-leaf pondweed have been removed from the lake. The majority of the sites have improved (i.e., less number of plants or decreased plant density) each subsequent year of control. However, hand harvesting work continues on many of the known sites, and efforts continue to identify any new sites.

The southern-most sites (#11-#13) have historically possessed the highest stem density, with 300 stems/m2 documented during the first year of control. These high densities were due primarily to the fact that funding was not available for hand harvesting and this particular infestation was allowed to grow unchecked for several years before control was effectuated. Considerable progress has been made here and over time and with ongoing vigilance, this site can be expected to continue to improve.

Funding for milfoil site identification and control on Schroon Lake has historically been low, but despite this fact, the most cost-effective and environmentally sensitive strategies available have been implemented for the management of milfoil in Schroon Lake.

The littoral zone in the area of Terra Alta and the Schroon Lake Marina are two other locations that are improving, but they require a lot of attention throughout the entire summer each season. This is partially due to the type of bottom substrate present at these locations and the relatively shallow depth. In addition, the marina provides an optimum growth medium for milfoil. Warm water temperatures due to the shallowness of the mooring canal and the lack of vegetative cover around its periphery, combined with the continual stirring up of the lake bottom (and the redistribution of nutrients from the sediment) by boats make this location a prime growth area.

2.9 Special Lake Issues

Priority Pollutants
(Mercury, PCB's & DDT)

The New York State Department of Health (DOH) issues advisories for eating sport fish. There are three fish advisories for the Adirondack Park region. These include: 1) the statewide advisory; 2) advisories for children less than 15 years old and for women who are pregnant or might one day become pregnant; and 3) specific advisories for the Adirondack Park and nearby waters.

The "specific advisory for Schroon Lake" recommends that children less than 15 years old and women who are pregnant or who might one day become pregnant should not eat ANY fish from Schroon Lake because of potentially high levels of mercury or PCB's. These advisories may change over time and they should be consulted each year prior to consuming fish.

The current "statewide advisory" recommends that not more than one meal per week of fish taken from any lake, river, stream or pond and some marine waters in New York State be consumed by anyone. The "advisory for women and children" recommends that children less than 15 years old and women who are pregnant or who might one day become pregnant should not eat ANY of the following fish species (largemouth bass, smallmouth bass, northern pike, walleye, pickerel or yellow perch greater than 10" in length) from the Adirondack Park and nearby waters because they have higher levels of mercury. The "specific advisory for Schroon Lake" recommends that children less than 15 years old and women who are pregnant or who might one day become pregnant should not eat ANY fish from Schroon Lake because of potentially high levels of mercury or PCB's. These advisories may change over time and they should be consulted each year prior to consuming fish.

Mercury (Hg) is a metal and some forms of it are found naturally in the environment. In the Adirondacks, most of the mercury found in water, sediments, and the base of the food web comes from atmospheric deposition and it is in the inorganic form.

Mercury is a powerful neurotoxin of significant environmental concern. Most of the mercury that accumulates in fish flesh is methyl mercury (MeHg). The concentration of methyl mercury "biomagnifies" as organisms feed at higher levels of the food web, and thus, older and larger fish that routinely eat other fish and various larger organisms tend to possess more concentrated levels of MeHg. Because the methyl mercury is predominantly found in the part of the fish that is eaten, cleaning and cooking methods do not reduce exposure to this heavy metal.

Exposure to high levels of methyl mercury can result in damage to the nervous system and the kidneys. It is even more of a concern for children and unborn babies because their nervous systems are still developing. It may also affect children's attention span, memory and language development.

The Federal Drug Administration's (FDA's) action level for mercury in fish is 1.0 ppm (parts per million) of methyl mercury in the edible portion. High mercury levels have been documented in the past in the largest lake trout collected from Schroon Lake and tested. In 1984, the largest lake trout tested possessed 1.43 ppm methyl mercury, while the average of all specimens tested was 0.96 ppm. Subsequent testing in 1989 indicated that the largest lake trout tested possessed 1.23 ppm of methyl mercury and the average for all specimens tested was 0.79 ppm.

PCB's (polychlorinated biphenyls) are a family of man-made chemicals that were historically used in many electrical and commercial products until they were banned for manufacture in the mid 1970's. Exposure to higher levels of PCB's can result in damage to the liver, skin, and the immune, nervous and reproductive systems. Some types of PCB's can be responsible for contributing to or directly causing birth defects in offspring born to humans or animals exposed during pregnancy, and research has indicated that laboratory animals exposed to PCB's over their lifetime have developed cancer. Since PCB's are concentrated in the fatty tissues of fish, exposure can be reduced by adhering to good cleaning and cooking practices.

The FDA's action level for PCB's in fish is 2.0 ppm. In 1984, lake trout collected from Schroon Lake and tested ranged between 0.23 and 1.99 ppm for PCB's. Subsequent testing in 1989 indicated that lake trout tested averaged 0.29 ppm for PCB's (with an overall range between 0.25 and 0.58 ppm). Thus, there is some evidence that suggests that PCB levels in the lake may be declining.

In summary, it is important to note that current data suggests the presence of these priority pollutants in Schroon Lake fish persists. While there may be some indication that levels may be declining, caution should still be exercised when consuming fish taken from the lake.

The state also measured the levels of DDT in fish collected from Schroon Lake in 1984 and 1989. DDT was widely used in the 1950's for pest control purposes, but it was discontinued in the 1960's after public awareness of the dangers of this pesticide increased. The FDA's action level for DDT is 5.0 ppm in fish. In 1984, the average level of DDT in legal-sized lake trout tested was 1.45 ppm (with a range of 0.19 to 2.10 ppm). This compared to an average of 0.38 ppm of DDT found five years later in 1989.

In summary, it is important to note that current data suggests the presence of these priority pollutants in Schroon Lake fish persists. While there may be some indication that levels may be declining, caution should still be exercised when consuming fish taken from the lake.

state fish consumption advisory should be heeded and adhered to.

Swimmer's Itch (Cercarial dermatitis)
Cercarial dermatitis, or swimmer's itch as it is commonly referred to, is a patchy, red pinpoint rash associated with itching on the parts of the body that have been in the water. The rash is caused by an allergic reaction to larval parasites called "cercaria" that are released by aquatic or amphibious (moves both on land and water) snails.

Since waterfowl are an integral component of the life cycle of the parasite, the feeding of ducks and geese should be discouraged.

These microscopic flatworm parasites normally use ducks and other waterfowl as their primary host, but sometimes they mistakenly burrow into the skin of people while they are swimming, wading or bathing. The itching, which may occur within 48 hours of exposure, can last up to 7 days. Swimmer's itch is usually not severe and normally it will disappear without treatment.

The flatworm parasite (shistosome) lives as an adult in certain mammals (e.g., mice) and birds (e.g., waterfowl). The adult worm sheds its eggs into the water via the host's excretory system. Once in the water, the eggs hatch into a free-swimming stage called a "miracidium". The miracidium searches for a suitable secondary host, a particular type of snail. Once found, it will penetrate into the snail's tissue and develop further. After a 3 to 4-week long development period, another free-swimming stage (called a "cercariae") emerges from the snail. The cercariae then searches for a suitable primary host.

The cercariae release usually occurs in late June or early July when the water temperatures reach their near-maximum summer temperature. In years of warm spring weather, swimmer's itch can occur as early as May.

Historically, the control method of choice for swimmer's itch has been the use of copper sulfate as a moluscicide. This chemical, however, indiscriminately kills a wide variety of aquatic organisms, and long-term use of copper sulfate in a particular area may lead to a build-up of copper-contaminated sediment. In addition, since cercariae tend to be concentrated near the surface, wind and currents may carry them as far as four miles from their release area. This means that the risk of cercariae drifting in from non-treated areas is potentially high, possibly nullifying control efforts in treated areas.

Thus, the best option for avoiding issues associated with swimmer's itch is prevention. Since waterfowl are an integral component of the life cycle of the parasite, the feeding of ducks and geese should be discouraged. In addition, strategies aimed at actively addressing nuisance waterfowl populations should be identified and an action plan developed in advance, just in case a problem occurs in a specific area on the lake.

Chapter 3
SCHROON LAKE WATERSHED AND LAND USE

3.1 Introduction

The goal of watershed planning is to strike a balance between the land and the lake. Ultimately, the ideal situation is an economically thriving upland community with land uses that have little or no negative impact upon the lake from which the community benefits. This Schroon Lake Watershed Plan seeks to identify if there are upland issues which affect Schroon Lake, and if so, determine how they can be addressed to ensure its long-term viability.

There is a direct link between the water quality of a lake and the land use of its watershed area. In general, the more developed a watershed is, the more the receiving waterbody will exhibit declines (short term and long) with water quality. There are dozens of studies across New York State and indeed from across the country which outline this direct and sometimes unfortunate relationship. To sum it up: taking care of the land takes care of the lake.

It is inevitable that land development will occur. Indeed, much of our economy is based upon new residential, commercial and industrial growth. We all drive on roads, eat in our local restaurants, and shop in our stores. As the saying goes, "we all live in a watershed." However, what is not inevitable is that new (and even existing) development must negatively impact our natural resources such as Schroon Lake.

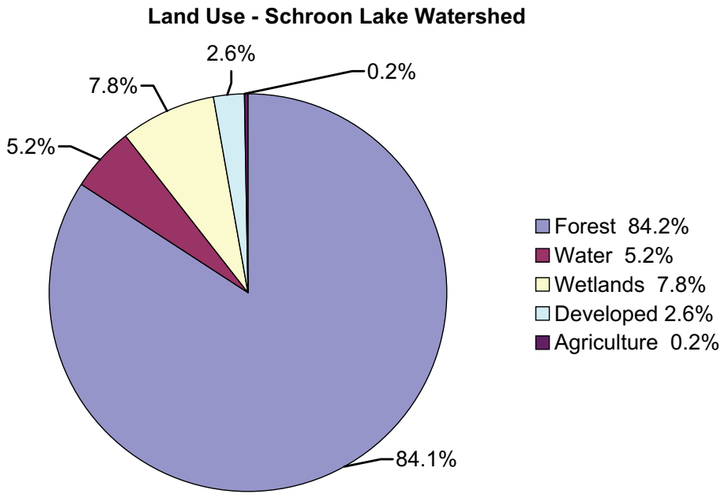
This chapter will take a look at existing land use patterns throughout the Schroon Lake watershed, and discuss impacts to the lake from upland sources. The Warren County Soil and Water Conservation District spent many hundreds of hours walking streams, roads, ditches, and more to identify these existing issues throughout the Schroon Lake watershed as part of this process. Over the period of three years, information was collected on land use, wastewater treatment issues, drainage networks, stream systems, stormwater runoff patterns, highway infrastructure, local regulations and other issues affecting Schroon Lake. Each of these issues is discussed in more detail in this document, and recommendations for long-term improvement are identified in Chapter 5 of this Plan.

3.2 Land Use and Development

Land use in a watershed plays a tremendous role in the quality of water which runs off into a waterbody. In undeveloped watersheds where no human activity is present, waterbodies are not exposed to stormwater runoff from development activities, fertilizers from homes and golf courses, or sediment from construction or logging operations. These undisturbed lakes and streams tend to be pristine and high quality, generally with excellent clarity.

While this would seem to be the ideal condition for our lakes and streams, it is not a realistic or even a practical condition for most lakes with privately held land ownership surrounding the shores. All of us live, shop, work, and recreate in a watershed somewhere, and rates of development around lakes and ponds often well exceeds other areas. Land development activities can have a significant effect on the quality of water which flows into nearby waterbodies. However, even with this development, there are many lakes which maintain excellent water quality and a well rounded ecosystem. Schroon Lake, with its moderate levels of development and history of good stewardship, is a very good example of this.

Land development activities can have a significant effect on the quality of water which flows into nearby waterbodies



To understand the land use within the 202,000 acre Schroon Lake watershed, 2001 land cover satellite imagery and data was utilized (most recently available). This base data was developed by the Multi-Resolution Land Characteristics Consortium, which is a group of federal agencies working together to make available satellite imagery for the United States. Although this land use/land cover data is from 2001, it is still felt to be very representative of current conditions within the Schroon watershed.

The predominant land cover within the Schroon Lake watershed is forest land (84%). Having the vast majority of land in forest is a benefit for the water quality of Schroon Lake. Forests allow for increased infiltration of water, have low levels of erosion, recycle nutrients efficiently and help to reduce temperatures to streams that feed lakes and ponds. Unlike developed and impervious areas, the rate of water runoff from forest land is extremely low, which reduces the impact of stormwater runoff. In this watershed, there are large sections of both deciduous forest (maple, beech, birch, etc), and evergreen forests (pine, hemlock, balsam fir, etc). As mentioned earlier, 60% of the land area within the Schroon Lake watershed is state-owned forestland, which is Forest Preserve and will never be developed.

Five percent of the Schroon Lake watershed is open water, and another eight percent is wetland. As can be seen from Map 3, there are many lakes and ponds and wetlands in the watershed. These features are valuable recreational resources within the region, and include Paradox Lake, Putnam Pond, Elk Lake, Eagle Lake, and many others. These wetlands are considered to be extremely valuable to watershed function, as they provide vital habitat for fish and wildlife, act as natural filters for water and sediment, and act as flood retention areas.

Only 2.6% of the overall watershed area is developed. This includes residential, commercial and industrial development, plus transportation corridors such as roads and highways. Agriculture comprises only 0.2% of the watershed.

Northern end of Schroon Lake, circa 1962. Courtesy of Essex County Soil and Water Conservation District

While the overall development rates in the watershed are very low, the percentage of land area developed in the area surrounding Schroon Lake itself is another story.

While the overall development rates in the watershed are very low, the percentage of land area developed in the area surrounding Schroon Lake itself is another story. An analysis of the land cover data reveals that almost 80% of the development within the Schroon Lake Watershed is found within one-half mile of Schroon Lake. When analyzing the land use within this half-mile buffer of the shore, the percentage of developed land jumps up to 16%, which is six times greater than the overall watershed development rate.

This concentration of development around the lake itself is no surprise, as lakes are a natural draw for both residential and tourist- related development activities. The nearshore development is clearly shown on Map 4, which depicts the considerable number property parcels within the nearshore area of the lake.

This trend often poses inherent stresses on lakes, due to increased concentrations of urban stormwater runoff, pesticides, herbicides, road de-icing materials, pet wastes, and other pollutants. Compounding this issue is that when most of the development took place around Schroon Lake, there were few standards for stormwater runoff or erosion control. As such, much of the runoff from these properties discharges to a road drainage network which outlets into the lake or stream. Stormwater runoff

Northern end of Schroon Lake, circa 2009. Courtesy of Google Earth

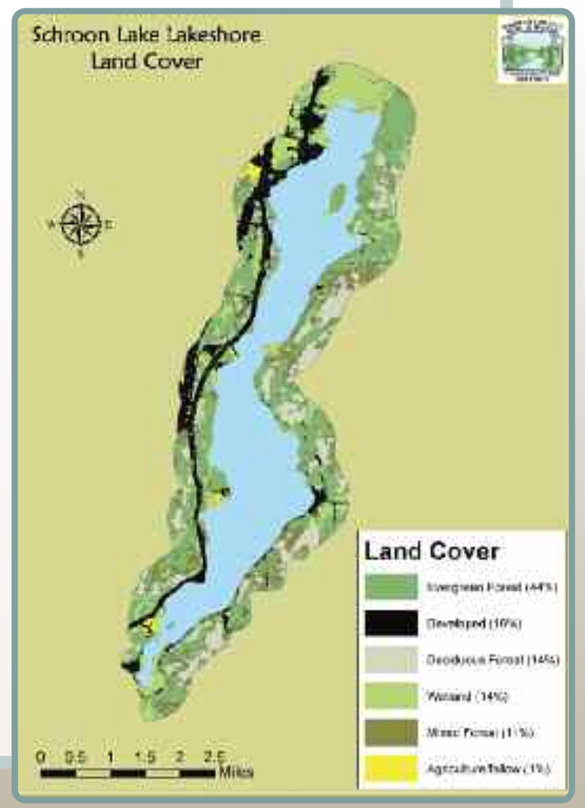
increase as well. We must take heed of how our actions can affect our surrounding environment, and work to minimize those impacts. With diligence and regard for environmental considerations at both the individual and municipal levels, we can continue to have responsible land development and economic growth without harming the natural resources we so heavily rely upon.

Given this history and trend, the need for proper development practices around Schroon Lake is exceedingly important.

from existing development (discussed in Chapter 3.4) is an issue which should be addressed around Schroon Lake to help protect it for the future.

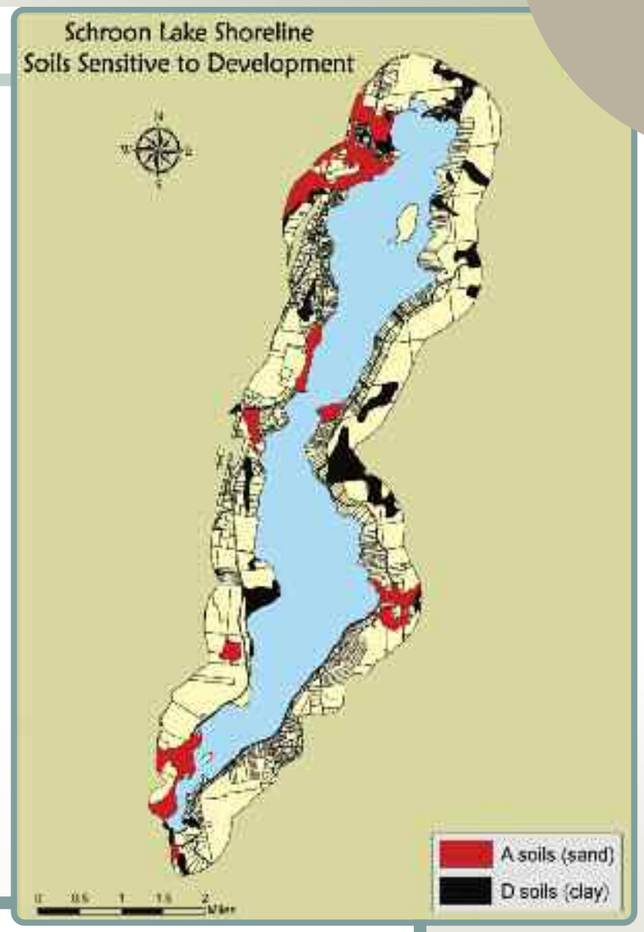
Given this history and trend, the need for proper development practices around Schroon Lake is exceedingly important. The role of the planning boards and codes officers of the three municipalities surrounding the lake is absolutely vital to the long-term quality of Schroon Lake. While residential and commercial development activities are a mainstay of economic growth in the region, these activities should be held to a high standard in the review process regarding their long-term potential impact to the lake. A discussion of these regulatory roles and responsibilities around Schroon Lake is included in Chapter 3.8.

We all share responsibility for the protection of our natural resources. As our population and economy grows, land development within our watersheds will inevitably



There are more than 50,000 different soil types across the United States, and dozens within the Schroon Lake watershed. Each of these soils maintains its own unique properties and characteristics. Understanding soils is critical in undertaking land management practices such as new development, agriculture, road construction and wastewater treatment. Soil factors and conditions also play a key role in erosion control and stormwater management, but unfortunately are often the most overlooked characteristic.

Given the number and diversity of soil types in the Schroon Lake watershed, it was more useful to break them down by their hydrologic group. A group of soils having similar infiltration characteristics are considered to be a Hydrologic Soil Group. Soil properties that influence runoff potential primarily include its physical makeup (i.e. clay, sand, silt) and its porosity. Hydrologic groups are placed into four classes: A, B, C, D, with definitions as follows:

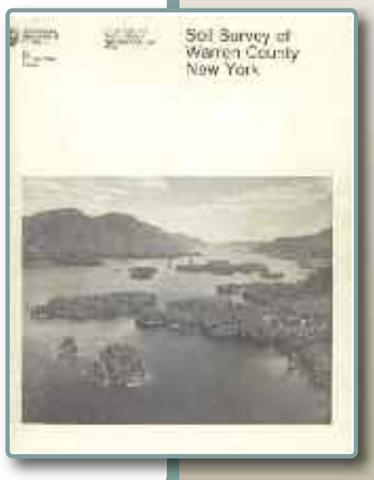


"A" SOILS: Soils with low runoff potential (very high infiltration). These soils have high infiltration rates and consist chiefly of deep, well drained to excessively well- drained sands or gravels.

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

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

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



To identify hydrologic soil types in the Schroon Lake Watershed, the watershed boundary was superimposed onto a Geographic Information System soils layer developed from the United States Department of Agriculture Soil Survey created in 1986. The majority of soils (almost 70%) within the Schroon Lake watershed are Hydrologic Soil Groups “B” and “C” (see Map 5), which generally tend to be well suited for development activities.

effluent, which reinforces the need to extend sewer service to the rest of the properties within the district.

To minimize impacts to Schroon Lake, all development activities should understand and consider soil issues in the planning stage. Even with “good” soils, development can negatively alter soil characteristics (i.e. compaction, loss of topsoil). These factors can cause water quality issues and can result in negative impacts to the environment. It is only through careful planning that erosion and sedimentation may be avoided.

HYDROLOGIC SOIL GROUP	WATERSHED %	WITHIN SHORELINE 1/2 MILE BUFFER %
A	4%	6%
B	18%	58%
C	50%	25%
D	28%	11%

An evaluation of land use within one-half mile of the shoreline of Schroon Lake reveals that 80% of the development within the watershed occurs within this relatively small area (4% of the overall watershed). Within this area, 83% of the soil types are rated “B” or “C”, which present fewer development and wastewater disposal issues than “A” or “D” soils. However, most of the land area in the Schroon Lake Sewer District which is not currently hooked up to the system are on either “A” or “D” soils. Both of these soil types are limited in their ability to treat septic

Detailed soils information and maps for both Essex and Warren Counties can be found in the “Soil Surveys” of those counties. These documents are available at both County Soil and Water Conservation District offices, or online at http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

An evaluation of land use within one-half mile of the shoreline of Schroon Lake reveals that 80% of the development within the watershed occurs within this relatively small area (4% of the overall watershed).

Stormwater Runoff and Water Quality 3.4

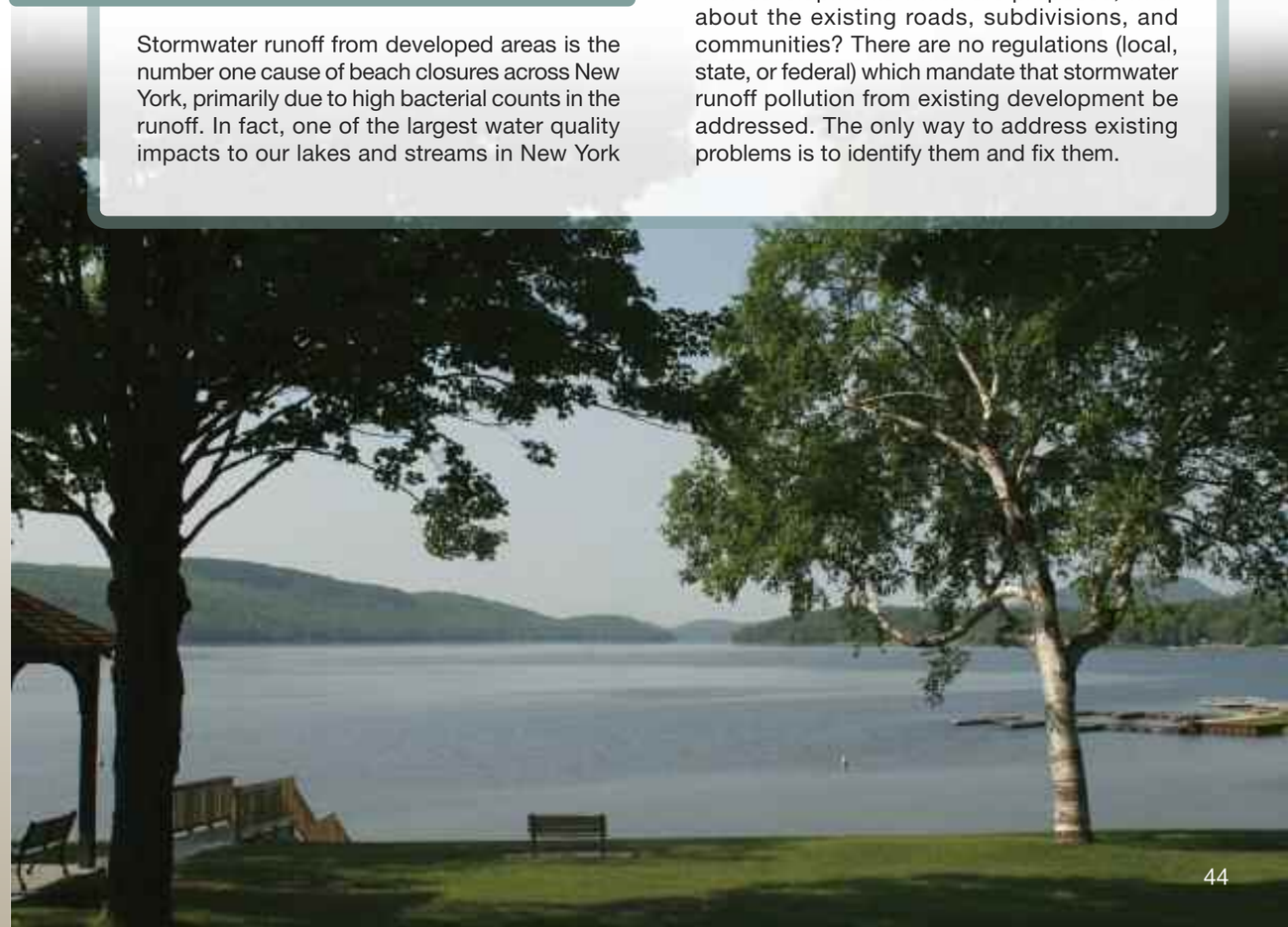
Every time it rains, water that doesn’t infiltrate into the ground often runs off into a nearby ditch, stream, or lake. This runoff can pick up different pollutants such as sand, silt, phosphorus, bacteria, oil and grease, litter, dog waste, and more. Ultimately, these pollutants can find their way into a nearby waterbody, diminishing water quality.

One of the largest water quality impacts to our lakes and streams in New York State is stormwater runoff from developed areas.

Stormwater runoff from developed areas is the number one cause of beach closures across New York, primarily due to high bacterial counts in the runoff. In fact, one of the largest water quality impacts to our lakes and streams in New York State is stormwater runoff from developed areas.

To help address this situation, the rules for new development have changed in New York State and across the entire country. Since 2003, the New York State Department of Environmental Conservation adopted new regulations on development. In what is known as New York State’s “Phase II Stormwater Program”, any development activity which disturbs more than an acre of ground is required to control soil erosion and stormwater runoff from the development. This is good news for our lakes and streams, and is a new layer of protection to help prevent any further degradation.

While these NYS stormwater regulations address new developments which are proposed, what about the existing roads, subdivisions, and communities? There are no regulations (local, state, or federal) which mandate that stormwater runoff pollution from existing development be addressed. The only way to address existing problems is to identify them and fix them.



Towards this end, the Warren County Soil and Water Conservation District undertook a comprehensive analysis of all roads and drainage networks in the developed areas surrounding Schroon Lake. The goal of this analysis was to identify and prioritize areas of significant stormwater runoff entering Schroon Lake and its tributaries, and to recommend specific solutions to address identified problems.

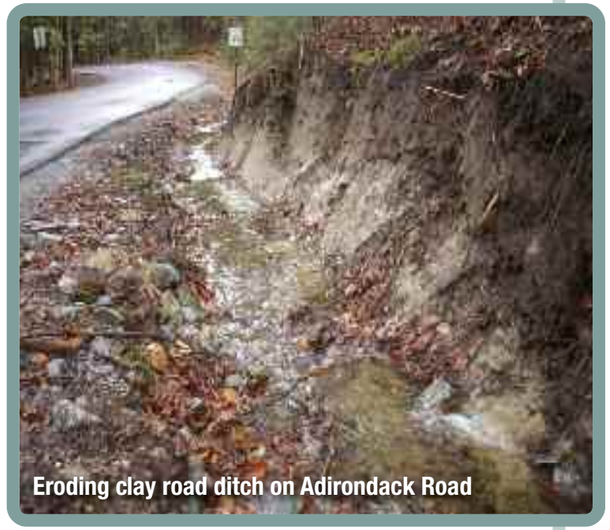
A key goal of stormwater management is to eliminate the runoff prior to it reaching the lake. Stormwater infiltration practices have been tremendously successful at achieving this goal in surrounding lakes to the south in Warren County. When stormwater infiltrates the ground, the soil acts to capture all sediments, and the microbial activity in the soil eliminates pollutants such as bacteria, phosphorus, and even oil and grease.

There are five primary areas surrounding Schroon Lake which were identified as high priority for stormwater runoff and management improvements:

1. HAMLET OF SCHROON.
2. HAMLET OF ADIRONDACK.
3. NYS ROUTE 9 CORRIDOR.
4. WARREN COUNTY ROUTE 15 (EAST SHORE DRIVE).
5. ADIRONDACK ROAD, ESSEX COUNTY.

HAMLET OF SCHROON

The Hamlet of Schroon is the largest and most densely developed area on Schroon Lake. None of the stormwater networks from Fowler Avenue north discharge into the lake, but much of the drainage from the southern end of the hamlet does connect directly to the lake. There are no stormwater improvement or flow reduction (infiltration) systems along any of the hamlet's roadways.



Eroding clay road ditch on Adirondack Road

HAMLET OF ADIRONDACK

The small Hamlet of Adirondack on the southeastern shore of Schroon Lake includes a general store, a number of residential homes, a relatively large townhouse complex (Adirondack Lodges), and a major tributary stream (Mill Brook).

Much of the area within the hamlet was well vegetated and stable and very few areas drain directly to the lake or to Mill Brook. Most of the road ditch network is lined with stone to minimize erosion, and was found to be in fair to good condition.

NYS ROUTE 9

NYS Route 9 runs along the western shore of Schroon Lake for the lake's entire length. In areas where it is relatively close to the lake, road runoff is often directed to culverts which outlet into the lake. Most road ditches along Route 9 are very well vegetated, which allows for both filtering of stormwater runoff and infiltration into the ground.

COUNTY ROUTE 15 (EAST SHORE DRIVE)

East Shore Drive runs along the east shore of Schroon Lake for just over three miles. Stormwater runoff from this road surface either sheets off into the buffer between the lake and the road, or it flows into the ditch on the east side and is piped into the lake. Most of the road ditch is well vegetated, and very little erosion is evident.

A concern along this roadway is that development and lawn management along the east side of the road has the potential to contributing phosphorus, pesticides, and other pollutants. Many houses on steep slopes are built upon along this stretch, so it is imperative that construction projects are diligent in erosion control and stormwater infiltration practices.

Typical roadside "drywell" installation to infiltrate stormwater runoff (Village of Lake George, 2009)

There are no regulations (local, state, or federal) which mandate that stormwater runoff pollution from existing development be addressed. The only way to address existing problems is to identify them and fix them.

ADIRONDACK ROAD, ESSEX COUNTY

Adiriondack Road provides access to dozens of shoreline properties on the northeast shore of Schroon Lake. Most of its length is relatively stable, although areas exist which show eroding ditch and stormwater runoff onto downhill properties. Adirondack Road north of Nesa Road exhibits miles of clay/silt ditches, much of which has little or no vegetation. Several sections of road ditch in this area had running water in them during field investigations, and erosion was evident.

STORMWATER RUNOFF AND WATER QUALITY RECOMMENDATIONS ARE INCLUDED IN CHAPTER 5

3.5 Streams of the Schroon Lake Watershed

The Schroon River and the lake's tributary streams are the lifeblood of Schroon lake. In general, the quality of the river and streams is highly correlated to the quality of the lake. The waters of even the farthest reaching point of the Schroon River or any tributary stream will reach the lake within 48 hours. The quality of these flowing waters will ultimately become the quality of the lake, so it important to understand their nature and overall condition.

The Schroon River is, by far, the principal water source to Schroon Lake by volume. However, there are an additional twelve NYS DEC classified streams that flow into Schroon Lake on a year-round basis in a typical year (perennial streams). The entire river and stream network draining to Schroon Lake is shown on the Hydrography Map 6 in the Appendices. A closer-up view of the lake's tributary streams and their names is also included.

SCHROON RIVER

The Schroon River is a highly sinuous and meandering river, and is the primary water source for Schroon Lake. Running from its origins at New Pond in Elizabethtown, the Schroon River picks up dozens of streams both large and small, and outlets at the north end of Schroon Lake. The river itself from headwaters to the lake is 31.3 miles long, but when all tributary streams to the river are added, the length of the entire flowing system exceeds 260 miles. A major tributary system to the Schroon River is the Paradox chain of lakes on the eastern side of the watershed, which includes Paradox Lake and Eagle Lake.

The geology and geomorphology of the river system north of Schroon Lake give the river its highly meandering nature. The river continually cuts on outside bends and deposits sediment on the inside bends. Dozens of old "oxbow" lakes and wetlands, formed out of old cut-off meander bends, are exhibited above the inlet to the lake adjacent to the river. These conditions prevail along the majority of the river, and considerable riverbank erosion is the result. The surface geology along the river corridor is primarily a sand/silt matrix, which has low cohesiveness and is therefore highly erodible. However, this condition is the natural fluvial geomorphic condition of the Schroon River, much to the dismay of unwary landowners who build houses and other infrastructure near the river's edge.

The Schroon River is a highly sinuous and meandering river, and is the primary water source for Schroon Lake.

Evaluating stream conditions at the Rogers Brook I87 Northway culvert crossing

Stabilizing the Schroon River through traditional bank protection techniques (riprap armoring, tree cabling, vegetative plantings) often fails because of the conditions noted above. The County Soil and Water Conservation Districts in both Warren and Essex Counties have tried to assist numerous Schroon River homeowners with ideas to protect their properties over past decades. Unfortunately, the answer more often than not is that a bank protection strategy is often more costly than to relocate the home or structure, and homes have been moved as a result. Care must be taken in the planning process for new building structures and roads within the river corridor, as highly erodible riverbank conditions are often present.

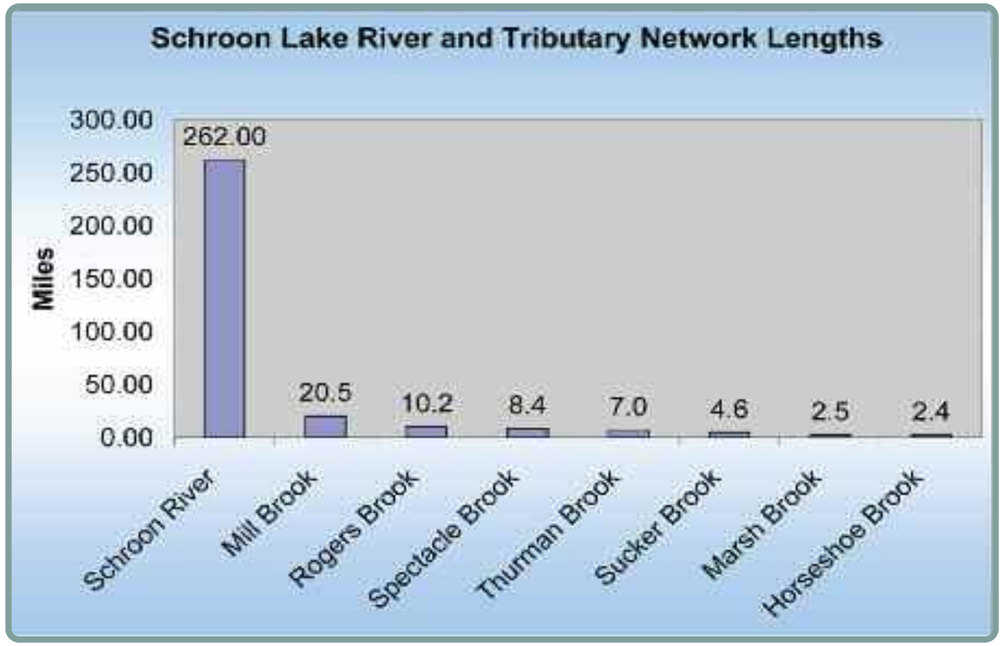
Sediment delta at the outlet of Rogers Brook, Town of Schroon hamlet

Care must be taken in the planning process for new building structures and roads within the river corridor, as highly erodible riverbank conditions are often present.

SCHROON LAKE TRIBUTARY STREAMS

Most of the 60+ miles of direct tributary streams to Schroon Lake flow through undisturbed forest, much of it on NYS owned land. These streams are in a natural condition, with no human impact. The water in these upper reaches flows clear and clean. However, towards the shoreline and in the hamlet areas, land development activities and roadways are considerably more dense. Streams flowing through developed areas tend to exhibit more degradation, due to channelization, stormwater

Aerial image of the Schroon River just north of Schroon Lake, showing old river bend ponds (oxbows)



runoff inputs, bank disturbances, and more. It is these areas that were focused upon in this watershed study, to identify areas in need of restoration activities.

Given the effectiveness of the existing vegetative buffers in protecting the streams around the lake, provisions to maintain these buffers would be beneficial within the watershed.

The Warren County SWCD staff walked more than 22 miles of the streams within the watershed, primarily in the shoreline and developed areas. The streams include Rogers Brook (3.5 miles), Horseshoe Pond Brook (2.5 miles), Thurman Pond Brook (1 mile), an unnamed stream at Scaroon Manor (1 mile), another unnamed brook at Eagle Point (1/2 mile), Spectacle Pond Brook (4 mi), Mill Creek (3.7 miles), Sucker Brook (4.6 miles) and 2 miles of the Schroon River from Alder Meadow Road to Schroon Lake. The purpose of these field reviews was to identify site specific issues such as streambank failure, any illicit discharges from illegal septic pipes, areas of road runoff affecting the brooks, the condition of stream buffers along the channels, and to get a feel of the overall condition of the streams feeding the lake.

GENERAL CONDITION AND FINDINGS

Streams within the Schroon Lake watershed are generally in excellent condition, with exceptions in areas along roadsides or development. Typical stream substrates are gravel/cobble, lending them to excellent fish propagation and habitat features. Macroinvertebrate (stream insect) populations in the streams reviewed showed high populations of pollution intolerant species such as caddis fly, mayfly, and stonefly larvae. Presence of these species indicates that these streams maintain high water quality and good oxygenation throughout the year.

As would be expected, impacts to the natural channel condition on all streams were non-existent in upland undeveloped areas, and slight to moderate in the developed areas. The two streams which exhibit the most impacts, although still relatively minor, are Rogers Brook (in the Schroon Hamlet) and Horseshoe Pond Brook, to the south of the Schroon hamlet. Both of these streams exhibit significant sediment deltas at their outlets into Schroon Lake, which have been accumulating for a considerable time according to lake association and municipal officials. Both Horseshoe Pond Brook and Rogers Brook run adjacent to roadways for part of their length, and it is highly likely that road de-icing practices have played a role in adding to the sediment deltas at their outlets. Field reviews of these streams showed minor undercutting of many streambanks at numerous locations, but no large bank failures were identified which would be cost effective to address.

Most of the streams within the Schroon Lake watershed exhibit excellent natural stream buffers (a corridor of unmanaged vegetation near the water edge), which act to retain the streambanks in good condition and minimize any potential runoff effects. However, at several locations along the more developed brooks, there is little to no stream buffer and the lawns are directly adjacent to the streambanks. These areas exhibit the highest evidence of bank failures. Numerous studies on streams in the Northeast U.S. show a strong and direct correlation between stream stability and vegetative buffers. Just to the south of Schroon Lake, the Lake George Park Commission is currently finalizing regulations requiring 50-100 foot stream corridor buffers for all new development along perennial streams in the Lake George watershed.

There is a considerable amount of streamside developable land in the Schroon Lake watershed. Municipal codes vary as to requirements for vegetative cutting and building setbacks, but no municipality has regulations requiring an undisturbed stream buffer on new development projects. Given the effectiveness of the existing vegetative buffers in protecting the streams around the lake, provisions to maintain these buffers would be beneficial within the watershed.


Streambank failure on Rogers Brook in an area with very little stream buffer vegetation

Streams within the Schroon Lake watershed are generally in excellent condition, with exceptions in areas along roadsides or development

No illegal “overflow” pipes from septic systems were identified on any of the streams. Most of the homes and other buildings identified on the stream reviews were set back from the streambank a fair distance (more than 50 feet). This helps considerably with keeping stormwater runoff from these developed areas away from the stream, as this runoff is often infiltrated into the yards and woods.

STREAM RECOMMENDATIONS ARE INCLUDED IN CHAPTER 5

3.6 Highway Management Practices

When we think of development in a watershed, we typically think of residences, businesses, and other structures. What we think of less often is the road and highway network which integrates our communities, and how those road networks are managed on a daily basis.

Town of Chester highway department installing a new culvert to improve both public safety and trout migration in the stream system

Each municipality and both counties in the Schroon Lake watershed have their own highway departments, which is responsible for the integrity and safety of their roads. In addition to these local roads, there is also a significant mileage of New York State roads (NYS Route 9 and Interstate 87) which actually account for most of the paved area in the watershed.

Each of these levels of highway administration manages its own workload and crew, and undertakes a variety of operations to manage their roadways and infrastructure. Traditional practices undertaken by highway departments include winter de-icing operations, roadside ditching, paving activities, drainage practices and new road construction. As many roads and ditches drain directly into streams and lakes, it is imperative that highway operations be managed not only for public safety, but also with consideration for environmental impacts.

WINTER DE-ICING PRACTICES

Runoff from highways and roads can have a considerable influence on the quality of adjacent streams and lakes, particularly from the de-icing materials spread on them in winter for public safety. As the traveling public has come to expect roads to be clean of snow and ice even shortly following storm events, the pressure on highway managers to achieve this goal is significant. Gone are the times when everyone used snow tires and had chains in the winter time. Now, people expect to drive at almost full speed during and after snow events, and are often chagrined to find snow on a road within 48 hours following even a significant snowfall event. Unfortunately, human nature is such that once a person has come to expect a level of service, it is difficult to reverse. Discussions with all highway managers in the watershed led to the same conclusion: their constituents want clear roads, period.

> As many roads and ditches drain directly into streams and lakes, it is imperative that highway operations be managed not only for public safety, but also with consideration for environmental impacts.

While this thought seems innocuous enough, it has significant implications on the environment. To maintain this level of service, highway departments must utilize road traction materials and de-icers at a fairly high level. The most common de-icing (and anti-icing) practices utilize sodium chloride (road salt), in combination with traction material (sand). Both of these items pose both short and long-term risks for nearby lakes and streams. Over time, these materials can have the following negative effects:

- Greatly increased rates of corrosion of automobiles, metal and concrete infrastructure.
- Sedimentation of fish spawning beds in streams from road sand.
- Increased salinity of the water in streams and lakes.
- Decrease in health of roadside plants due to chloride and nutrient imbalances.
- Impacts to nearby groundwater wells from salinity increases.
- Sedimentation of lakes, manifesting as deltas at stream outlets.
- Economic effects of addressing the above issues.

The impacts from winter road maintenance activities are well known and have been studied since the 1950's. In New York State, over the past ten years or so, the issue has received more attention as many lakes are showing clear signs of impact. To assess this issue in the Adirondacks, the Adirondack Watershed Institute recently (February 2010) completed a new study titled "Review of Effects and Costs of Road De-icing with Recommendations for Winter Road Management in the Adirondack Park" (Kelting and Laxson 2010). This study outlines the methods, costs, impacts, and alternatives of road de-icing practices, specifically focusing on recommendations for improved management practices. There are numerous results and recommendations from this study (and several others) which could serve as a guide for winter road maintenance activities in the Schroon Lake watershed. De-icing methods and alternatives are more complex than most people realize, and different conditions merit differing techniques.

To better understand road and highway maintenance around Schroon Lake, all levels of highway administration (town, county, and state) were asked about their overall programs and management practices. Items of discussion included current road de-icing practices, catch basin maintenance schedules, salt storage placement and volumes, roadside erosion control, ditch maintenance, etc.). The two county Departments of Public Works contract out all plowing and de-icing operations to the local municipalities. As such, their practices are not reviewed herein.

SCHROON HIGHWAY DEPARTMENT

The Town of Schroon highway department manages over 70 miles of roadway in the Schroon Lake watershed, significantly more than the two other lakeshore towns. According to Dana Shaughnessey, the Town of Schroon Highway Superintendent, their standard road de-icing application mixture is 80%/20% sand to salt. In the hamlet of Schroon, the highway department utilizes road salt exclusively (NaCl). Their spreader trucks have manual settings which are adjusted by the driver, depending on the condition of the road. Typical application rates range from 150-250 pounds per lane mile per pass of the spreader. The Schroon highway department conducts all de-icing operations for the county-owned roads in the Town of Schroon, using town practices.

> Given the economic and environmental impacts of road de-icing programs, it is imperative that all best efforts are applied to mitigate these impacts.

The town's supply of salt is utilized and stored at the State Department of Transportation (DOT) garage in the town, which is in good condition. All municipally-owned sediment capturing devices such as catch basins or dry wells are maintained manually with a shovel or air blower. Very few catch

basins exist throughout the town, and most are simply drop-inlets which have no capacity for sediment storage. No vacuum truck (catch-vac) is owned or rented by the town to undertake cleanout activities, and maintenance cleanouts are conducted on an as-needed basis. Schroon highway does own and operate a relatively new Elgin street sweeper, which is very active in the spring to clean up road salt and sand.

CHESTER HIGHWAY DEPARTMENT

The Town of Chester maintains less than one mile of roadway within the Schroon Lake watershed (North Old Schroon Road), although the highway department does maintain all of Pottersville at the south end of the lake. According to Gary Clark, Highway Superintendent for the Town of Chester, standard road application is 95%/5% sand to salt mixture, at a rate of 150-200 pounds per lane mile. The salt is stored in a sheltered storage on black top, near their sand pile at the highway garage. The town highway department conducts all de-icing operations for all county-owned roads in the town, using standard town practices.

18 miles of town and county roads within the Schroon watershed. According to Paul Smith, the Highway Superintendent for the Town of Horicon, the town's standard de-icing application is 90%/10% sand to salt. Their truck settings apply approximately 175-200 pounds per lane mile of the sand/salt mixture. The primary road of concern for Schroon Lake in the Town of Horicon is County Route 15 (East Shore Drive), simply based upon its proximity to the shore. This road runs directly adjacent to Schroon Lake for 3 miles, within 40 feet of the shoreline for most of that length.

Eroded soil from bare roadside ditches can be a significant contributor to water quality impairments and aquatic habitat degradation.

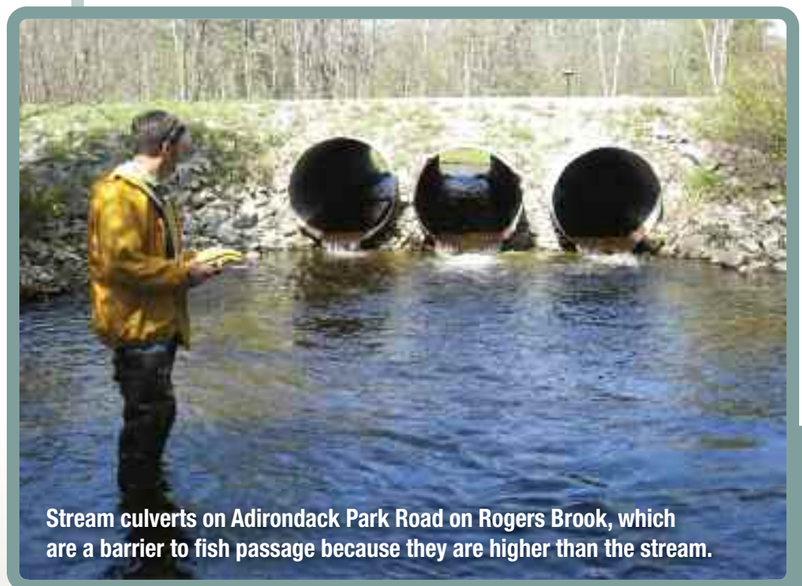
All of the sediment capturing devices such as catch basins are inspected annually and manually maintained as necessary. No vacuum truck (catch-vac) is owned or rented by the town to undertake these activities.

HORICON HIGHWAY DEPARTMENT

The Town of Horicon conducts winter plowing and de-icing operations on approximately

A section of Hoffman Road where the ditch was recently excavated to maintain drainage capacity. This ditch is showing signs of erosion and sedimentation.

Because of this proximity, the highway department actively undertakes post-winter sweeping operations on East Shore Drive. The swept-up road sand is brought back to the highway yard to be re-used for the following year's operations.



Stream culverts on Adirondack Park Road on Rogers Brook, which are a barrier to fish passage because they are higher than the stream.

The Horicon highway department has only one sediment capturing structure that they maintain, and that basin is cleaned out annually with a shovel. There are opportunities within the town to install additional sediment capturing structures, but the department currently does not have an efficient means of maintaining them.

NYS DEPARTMENT OF TRANSPORTATION

The New York State Department of Transportation (DOT) manages all state-owned roads in the Schroon Lake watershed, including all plowing and de-icing operations on Route 9 and Interstate 87. DOT contracts out plowing and de-icing work to some municipalities in the Adirondack Park, but none within the Schroon Lake watershed. The DOT highways in the Warren County portion of the watershed are managed by the Warren County DOT office in Warrensburg, and the DOT highways in Essex are managed by their office in Elizabethtown (both in DOT Region 1).

When considering the Schroon Lake watershed as a whole, the surface area of roadway and overall lane miles that DOT manages vastly outnumbers the local roads. Even when focusing only on the area within a mile or so of the lake, the state highway complex is still the largest area of road surface. Much of the DOT highway infrastructure drains either directly or indirectly to tributary streams of Schroon Lake or the lake itself. As such, it is important to understand their winter road management activities.

Many of the stream culverts reviewed on the stream walks exhibited characteristics which would be barriers to fish passage, which directly impacts spawning and reproduction rates.

According to Essex County DOT Resident Engineer Mike Fayette and Warren County Resident Engineer Frank Komoroske, all de-icing operations on state roadways in Warren

Hydroseeding in Horicon

and Essex Counties use 100% salt, and utilize no sand in the mix unless specific traction needs warrant. This is very different from the local municipalities which use primarily sand. The rate of application of the salt is highly dependent upon conditions, but the average salt spread per lane mile is 225 pounds per storm event.

The environmental benefits of using a 100% chloride mix (either straight sodium or sodium and magnesium) include minimal spring sweeping and catch basin cleanup activities, and very little sediment runoff to adjacent streams or the lake. However, as noted in the beginning of this chapter, the environmental and infrastructure corrosion issues with salt usage can be significant over time.

The DOT in both Essex and Warren County utilize traditional salt spreader with conveyors in the bed, controlled by a computer in the cab (Dickie-johns). However, the DOT in Essex County treats their road salt with liquid magnesium chloride (MgCl) as it is applied to the road. The Warren County DOT trucks from their Chestertown facility service the Schroon watershed area, and don't have the required equipment currently to do so. MgCl lowers the freezing point of snow and ice and makes it a more effective de-icer than straight sodium chloride.

Given the economic and environmental impacts of road de-icing programs, it is imperative that all best efforts are applied to mitigate these impacts. This can be accomplished through awareness, training, and implementation of the best de-icing policies possible by the highway superintendents at all levels. Numerous de-icing alternatives exist (Calcium Magnesium Acetate, Magnesium Chloride, IceBan, Magic Salt, etc), but factors such as cost and logistics play key roles in local implementation. The key is to balance these factors with environmental considerations, to achieve the best balance for both the lake and its surrounding communities.

ROAD DITCHING, EROSION CONTROL, AND DRAINAGE

A highway department's primary responsibility is the safety of their roads and other infrastructure. A key safety factor for highway safety is getting water off of roads as quickly as possible, very often into roadside ditches. While these ditches need to be cleaned out and re-shaped every few years, eroded soil from bare roadside ditches can be a significant contributor to water quality impairments and aquatic habitat degradation.

Roadside ditching activities remove the existing vegetation in the ditch, including the root networks which bind the soil in place. When removed, this soil is highly susceptible to erosion and subsequent sedimentation of streams and lakes. Dr. Rebecca Schneider of Cornell University has been studying this issue for years, and notes that road ditches are a significant contributor to water quality declines in New York's waterbodies.

To analyze the current condition of road ditches around Schroon Lake, Warren County SWCD staff evaluated all roads within a two-mile radius of the lake. Although ditch conditions are always changing based upon an ongoing maintenance schedule, there were a number of areas identified which were recently cleaned and bare of vegetation. The two largest of these bare road ditches were found to be on East Shore Road and Hoffman Road (Town of Schroon). Between these two roads, over three miles of road ditch have recently been scraped (cleaned) and are in need of stabilization.

To address these issues, both the Warren and Essex County Soil and Water Conservation Districts own hydroseeders and operate "roadside erosion control programs" for exactly this purpose. The Districts work directly with highway departments to hydroseed bare road ditches and eroding roadbanks to establish grass in these areas, effectively minimizing erosion and sedimentation. The program in Essex County is relatively new, and they are working to develop this program with all local towns, including Schroon. These three miles of exposed road ditches should be addressed as soon as possible through this hydroseeding program.

STREAM CULVERTS

There are more than 30 stream culverts for town road crossings on the direct tributaries to Schroon Lake. These culverts, while necessary for highway operations, often cause very detrimental impacts to spawning fisheries. Culverts on streams in which the bottom of the outlet side of the pipe is more than 8 inches higher than the stream are not passable by juvenile brook trout, smelt, and other species (Mihuc 2008).

Many of the stream culverts reviewed on the stream walks exhibited characteristics which would be barriers to fish passage, which directly impacts spawning and reproduction rates. As most of the direct tributary streams to Schroon Lake are DEC classified trout streams, it is likely that stream culverts are having a negative impact upon these fishery communities.

Stream culverts generally get replaced by highway departments when there are signs of structural failure or flooding. These replacement culverts often mimic the design and layout of the original culvert. However, if highway departments took fish passage considerations into effect during replacement activities, then long-term improvements to brook trout, smelt, and other spawning fisheries in the Schroon Lake watershed could be realized.

HIGHWAY OPERATIONS RECOMMENDATIONS ARE INCLUDED IN CHAPTER 5

3.7 Wastewater Management Around Schroon Lake

Every time you take a shower, turn on the faucet, run the dishwasher, and flush the toilet, the water and waste leaves your house and goes to either a septic system on your property or a community wastewater treatment plant. For the large majority of homes in the Schroon Lake watershed, wastewater treatment is done by individual household septic systems. Proper treatment of this wastewater is not only important for public health, but is critically important to maintaining a clean Schroon Lake.

Within the Schroon Lake watershed, there is only one "publicly owned treatment works" (POTW), which is the Town of Schroon wastewater treatment plant (WWTP). There are two other smaller private WWTPs in the watershed that discharge directly into Schroon Lake, namely at the Word of Life Ranch and the Word of Life Island. The remainder of wastewater treatment within the watershed consist of smaller "community" systems for homeowners associations, condos and the like, and traditional onsite wastewater treatment systems (septic systems).

Sanitary wastewater treatment in New York State is regulated by a patchwork of agencies and local regulations. POTWs are the most heavily regulated, with discharge effluent limits, reporting requirements, and regular inspections and oversight from the NYS Department of Environmental Conservation (DEC). The next step down are classified as Private/ Commercial/ Institutional (P/C/I) systems, which include restaurants, hotels, schools, and other similar facilities which are not on public sewer. These systems are also regulated by NYS DEC, but do not typically receive the same level of oversight unless DEC is notified of a failure or complaint. Certain P/C/I facilities are also subject to regulatory oversight by the NYS Department of Health (DOH).

The least regulated wastewater treatment systems are the residential septic systems, which tend to fall under the purview of the NYS Health Department and local municipal regulations. The majority of the residences in the Schroon Lake watershed are on private septic systems. There is no regular inspection of these systems required for any of the ten municipalities in the Schroon Lake watershed. However, all new systems must be designed by a NYS licensed engineer and must meet NYS health codes and local regulations.

> Proper treatment of this wastewater is not only important for public health, but is critically important to maintaining a clean Schroon Lake.

The reason for the regulation of wastewater treatment systems is to protect both human health and the environment. A failing septic system which is not properly removing bacteria and pollutants can cause health issues for homeowners with drinking water wells and for people who draw their water from the lake for consumption (not a recommended practice). Untreated septic effluent can also cause impairments to lakes and streams, causing excessive weed and algae growth, and can cause infections of people swimming in the affected area. For these reasons, it is imperative that the wastewater treatment is properly addressed in any watershed, particularly around lakeshore areas.

Schroon Wastewater Treatment Plant – Aeration Tank

A failing septic system which is not properly removing bacteria and pollutants can cause health issues for homeowners with drinking water wells and for people who draw their water from the lake for consumption

TOWN OF SCHROON WASTEWATER TREATMENT PLANT

The Town of Schroon owns and operates a wastewater treatment plant off of Fowler Ave in the hamlet, plus a network of underground pipes throughout which collect sewage from properties within the sewer district. The original treatment plant was built in 1973, and most of the plant's facilities were rebuilt or replaced in 2007.

There are currently 625 property parcels within the Schroon sewer district, but only 373 of these properties (60%) are currently hooked up to the public sewer system (see Map 7 in Appendices). The municipal sewer district spans from Continental Drive at the north end of town, down to Charlie Hill Road to the south. Most of the system is gravity feed, although the town maintains four separate pump stations throughout the hamlet. The sewer plant itself has considerable reserve capacity to treat additional sewage should the need arise.

The primary reason that there are properties within the district which are not hooked up to the system is the cost of extending sewer into the un-served locations. The current user rates for people in the Schroon sewer district are currently above the state average, and the cost of running new sewer lines is considerable. Adding new service lines would increase the per-user rates to an unacceptable level, according to municipal and agency officials. The cost of bringing service to the un-sewered areas in the district would be substantial, based upon the presence of shallow bedrock and lack of density in many areas.

Town of Schroon Lake□' s wastewater treatment plant. The facility was mostly rebuilt in 2007 and exceeds all water quality discharge standards, and is in excellent operating condition

The Schroon treatment plant operates under a NYS Department of Environmental Conservation SPDES Permit, which has thresholds for discharge water quality. The treatment plant discharges its wastewater directly to Schroon Lake via an outlet pipe approximately 30 feet below water surface in a deepwater channel, about 650 feet out into Schroon Lake. The average discharge volume is approximately 200,000 gallons per day (gpd) to Schroon Lake, and the allowable discharge by permit conditions is 350,000 gpd.

Within the DEC permit, there are strict thresholds for pollutants such as phosphorus and bacteria. According to Licensed Plant Operator Jim Roblee, the typical effluent discharge averages 0.3 parts per million of phosphorus, which is significantly below their permit limit of 0.8 parts per million. Discussions with NYS DEC Division of Water staff and the design engineering firm AES both confirm that the plant operates considerably under all of its allowable effluent limits (Kavanagh, NYS DEC, 2010).

In 2009, the Town of Schroon was awarded almost $4.4 million in grants and debt forgiveness for upgrades to the sewer plant and to replace and repair existing sewer infrastructure within the sewer district. Funds include $3.2 million in debt forgiveness for plant construction from the American Reinvestment and Recovery Act (federal stimulus program), $300,000 from USDA Rural Development, and $580,000 from the NYS Office of Community Renewal.

RECENT AND PENDING IMPROVEMENTS TO THE INFRASTRUCTURE INCLUDE:

- The relocation of a sewer main from Olden Drive to the sewer plant.
- Reconstruction of the sewage pump station at Dock Street.
- Rehabilitation of the sewage pump station known as the Horseshoe Pond or Tamarac station.
- Replacement of existing sewer mains along Rogers Brook behind the existing businesses, including the installation of a new pump station and connection to the sewer main on Route 9.

RECENT AND PENDING IMPROVEMENTS TO THE SEWER PLANT INCLUDE:

- A new control building was constructed in 2007, which is the operational center of the sewer plant.
- New clarifiers were added in 2007 as well.
- Ultraviolet disinfection will be added to the treatment train which will improve bacteriological disinfection and reduce chemical use.
- New sludge drying beds will be installed to improve efficiency and reduce cost of sludge transport.
- Replacement of all fencing surrounding the plant for improved security.

The Town of Schroon has an active committee which is studying how the sewer system can be extended and improved throughout the town, primarily the collection system. Community wastewater management is an ongoing venture, and the Town of Schroon has been very proactive in trying to meet the needs of their residents and the lake.

WORD OF LIFE WASTEWATER TREATMENT PLANTS

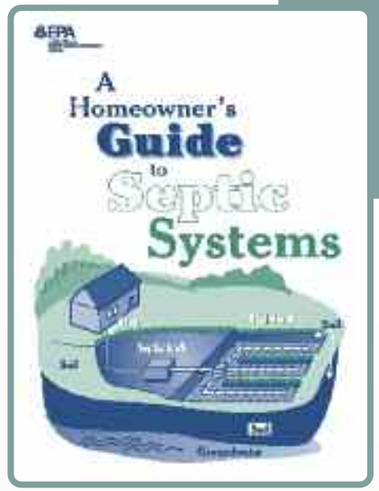
The Word of Life (WOL) Fellowship is a large Christian ministry complex in the towns of Schroon and Chester. The organization maintains considerable properties and buildings on these complexes, and operates as a retreat center for religious camps, meetings, and other functions. The WOL Fellowship also owns and maintains a 48 acre island on Schroon Lake (Clark's Island), which acts as an activities area for attendees and campers.

WOL maintains two separate but similar wastewater treatment plants: one at their Ranch complex approximately one mile north of Pottersville on NYS Route 9, and another on Clark's Island in the northern part of the lake. Both plants are extended aeration plants with tertiary treatment through mixed media filtration. The Island complex plant was built in 1973, and was expanded in the 1980's. It is permitted by NYS DEC under the State Pollutant Discharge Elimination System (SPDES) Program to discharge 38,700 gpd of treated wastewater effluent into Schroon Lake. The plant, while 30 years old, has had regular upgrades and maintenance according to Eric Cordis, Engineer for WOL. In 2003, they replaced the main aeration tanks, and in 2007 they were upgraded to increase efficiency. In 2008 the plant switched from chlorine tablets to liquid chlorine which improves efficiency, and in the summer of 2010 they are installing a new control panel and will be adding a dechlorination process.

The Ranch plant was installed in 1978 and was designed for 100,000 gpd discharge, although the plant averages 30,000 gpd in peak season. The plant design and components are very similar to the plant at the Island complex. According to NYS DEC Division of Water, both WOL plants have currently been meeting all NYS DEC standards for effluent discharge, and are not under Orders on Consent from DEC (Dauphinais and Kavanaugh, NYS DEC, 2010).

EAGLE POINT CAMPGROUND AND SCAROON MANOR

Two other relatively large complexes on the west shore of Schroon Lake include the NYS Department of Environmental Conservation-owned facilities of Eagle Point Campground and Scaroon Manor. Both of these facilities discharge their treated wastewater to groundwater. Eagle Point campground maintains a day use area and 69 overnight campsites, and has been operating as a public camping facility since the 1930's. Given the size of this facility, it maintains a fairly large wastewater treatment system. This campground operates under a SPDES permit for two groundwater discharges: an 8,325 gallon per day discharge from the bathroom and building complexes, and a smaller 1,440 gallon per day greywater (shower and washwater only) discharge from the showers. The treatment system utilizes three pump stations to direct septic tank effluent to the absorption field located approximately 1,600 feet north of the campground area into a large infiltration bed for the primary discharge, and drywells for the greywater discharge. Both of these infiltration systems are located at least 150 feet away from the lakeshore at their closest point. The conveyance pipe system runs along NYS Route 9 for a length, and it has been compromised several times over the years by signage installations and other roadside activities, but failure or discharge has never been noted as reaching Schroon Lake. The system's septic tanks and pump stations receive routine maintenance and a number of system upgrades have been conducted over the years (Dauphinais, NYS DEC, 2010).



Scaroon Manor is a new campground and day use complex, located to the north of Eagle Point campground. The day use area was opened in 2009, but the camping facilities are still under construction. This complex also has a SPDES groundwater discharge permit for two of its three new septic systems: a 1,600 gallon per day discharge system for the day use area, and a 1,485 gallon per day discharge system for one of the pending camping loops. The third system does not require a SPDES permit, as it is rated for only 825 gpd, which is under the 1,000 gpd to groundwater threshold of the SPDES permit system. All systems are gravity fed and do not rely on any pump stations for operation. All three systems are brand new, and only the 1,600 gallon per day system is currently operating as of early 2010. As such, no problems have been reported or are expected from this new facility.

There is a common misunderstanding that septic systems are "self maintaining", and that "out of sight, out of mind" is the right way to go. Unfortunately, this is far from the truth.

RESIDENTIAL SEPTIC SYSTEMS IN THE SCHROON LAKE WATERSHED

Outside of the Schroon Sewer District, all households own and operate individual onsite wastewater treatment systems (septic systems), or are part of a smaller cluster-type system. New septic systems for all residences and commercial development must meet strict design and performance criteria as defined by both the state Department of Health or by NYS Department of Environmental Conservation, depending upon its size. By law, all new septic systems must be designed by a NYS licensed engineer, and must have local approval by the municipality in which it is to be installed.

When properly designed, constructed and maintained, individual household septic systems do a very good job of treating wastewater. However, if one of these steps fails, then the system breaks down and problems arise. There is a common misunderstanding that septic systems are "self maintaining", and that "out of sight, out of mind"

is the right way to go. Unfortunately, this is far from the truth.

Septic systems need regular cleanouts to be effective (usually every three to five years), or they will eventually fail. Traditional septic systems consist of a septic tank which holds the solids, and a "leach field" which infiltrates the wastewater into the ground. If the tank gets too full, the solids will flow out into the leach field and clog it. The result is a failure of the system which can result in costly fixes and public health issues. Failing septic systems which are on shoreline properties have the added issue of causing problems for their lake, including increases in nearshore algae blooms and sometimes dangerously high bacteria counts in the water.

Along the Schroon Lake shoreline, there are 647 property parcels (see Land Ownership Map 4 in Appendices). An analysis of Essex and Warren County 2009 tax parcel data reveals that out of those 647 parcels, 116 are undeveloped and 48 are on public sewer. That leaves 483 lakeshore parcels with onsite wastewater treatment systems (75% of the total lakeshore parcels). Most of these buildings are primary or secondary residences, many of which are located within 200 feet of the shoreline. NYS health codes require all new construction to have 100 foot setbacks for septic leach fields from any water source or well. However, a number of the residences on Schroon Lake date back to the 1940's, 50's and 60's, prior to such requirements.

New septic systems typically have a design life of approximately 30 years. Older systems, particularly built for seasonal camps, often lacked qualified design for sizing and separation distances, and would not meet today's standards. These tend to be the systems which are found to be failing, both from age and inferior design or construction. In 1980, the Essex County Board of Supervisors commissioned the "Essex County Water Quality Management Study" (Cahn Engineers, 1981), to study wastewater disposal problems in the communities of Essex County. A sanitary survey was undertaken for the Town of Schroon, which reviewed a total of 122 seasonal camps and 23 year-round residences from both west side and east side of the lake. The report outlines numerous systems which were either identified as having "reported" septic problems, or "potential" problems. On the west shore, 36 systems were reviewed, and 6 reported problems, and another 11 were potentially problematic. On the east shore, 58 systems were reviewed, with five reported problems and 32 with potential problems. Overall, more than 50% of the systems involved in the study had either "reported" or "potential" problems. Many of the surveys came back inconclusive.

No comprehensive study of the septic systems along Schroon Lake has been conducted since that 1980 sanitary survey, some 30 years ago. Many homes along the Schroon Lake shoreline have changed from seasonal camps to year-round residences in the past 30 years, and many more new ones have been built. These two factors only add to the potential impact on Schroon Lake from less than ideal systems. On the positive side, as older camps get replaced with newer homes, they are (in most cases) required to upgrade the septic system to meet current codes.

No comprehensive study of the septic systems along Schroon Lake has been conducted since that 1980 sanitary survey, some 30 years ago.

Generally speaking, the overall condition of onsite wastewater management on Schroon Lake is largely unknown at this time. As septic failures arise on a lot by lot basis, they are dealt with by the local municipality and upgraded as best as possible. No comprehensive database exists at any regulatory level documenting the age of existing systems, upgrades, or maintenance schedules. Compounding this issue is that there are three municipalities with shoreline on Schroon Lake which administer their own sets of local codes and regulations. Without a comprehensive onsite wastewater assessment project or system, the status of this issue will remain largely unknown.

WASTEWATER RECOMMENDATIONS ARE INCLUDED IN CHAPTER 5

Assessment of Local Laws which Impact Schroon Lake 3.8

Maintaining a high quality waterbody such as Schroon Lake takes not only public awareness and education, but also well-thought land use laws and regulations. How a municipality regulates development activities at the local level can have a tremendous impact on a waterbody. How close can a home be built to a lake or stream? Does the town have a Planning Board to review development? Are there regulations regarding stormwater runoff and erosion control? These issues and a great deal more can greatly affect the long-term quality of Schroon Lake.

Local land use plans, including regulations for zoning, site plan review and subdivision regulations can be seen as needless governmental bureaucracy by some. However without these provisions, there is often a decline in the quality of the local resources that are so highly valued. Finding a good middle ground between unrestrained development and ungainly regulations is always a difficult local issue.

How a municipality regulates development activities at the local level can have a tremendous impact on a waterbody.

Looking West Across Schroon Lake

This section provides a brief review of the local planning and zoning laws of the three municipalities which border Schroon Lake. It is by no means a comprehensive analysis of all such laws on the books, but rather a review of what regulations exist (or don't exist) that help protect Schroon Lake. All local laws and codes are available for public review at that municipality's town hall.

In a watershed that encompasses several municipalities such as Schroon Lake does, it is useful to have a commonality of regulations between these municipalities. However, this is rarely the case. "Home Rule" in New York State is very strong, and every municipality sets its own land use codes and regulations as they best see fit. Indeed, the three municipalities bordering Schroon Lake, while similar in size and demographics, vary in their local planning and zoning laws.

Making the issue even more complex is the Adirondack Park Agency (APA), which has regulatory authority over development projects in the Adirondack Park. A detailed discussion of how these local and APA regulations are integrated at the municipal level is complex and is beyond the scope of this document. The goal here is to identify any recommendations for local codes which could ultimately help protect Schroon Lake.

In assessing the current status of land use regulations, the Town Supervisors and Code Enforcement Officers from all three municipalities were interviewed to determine their Town's policies in caring for and protecting the resources. The discussions also included their thoughts on potential improvements to the existing codes and laws which might help protect Schroon Lake. Following this, a review of all pertinent local zoning codes and regulations was conducted by SWCD staff. A similar review was conducted by the Warren County SWCD in 2005 for the Towns of Horicon and Chester regarding local stormwater laws, and these results were coupled into the documentation as well.

A summary matrix of municipal regulations surrounding Schroon Lake is detailed below. Highlighted are the key local regulatory issues and codes which play a role in protecting Schroon Lake and other waterbodies in these municipalities.

LOCAL REGULATIONS SUMMARY MATRIX

ITEM	SCHROON	CHESTER	HORICON
Land Use Master Plan	No	Yes- APA approved	Yes- APA approved
Zoning Laws	Yes	Yes	Yes
Planning Laws	Yes	Yes	Yes
Site Plan Review	Yes	Yes	Yes
Subdivision Regulations	Yes	Yes	Yes
Stormwater Management	Yes	Site Plan Review	Site Plan Review
Shoreline Cutting Restrictions	APA	APA	APA
Waterfront Setbacks	Town and APA	APA only	Town and APA
Wetlands regulations	APA	APA	Town zoning / APA review
Erosion Control	Yes, under stormwater management	Guidelines only	Yes, under stormwater management
Septic Regulations	Dept. of Health	Dept. of Health	Dept. of Health
Mandated Septic Inspection and Maintenance	No	Resale inspection by engineer	No
Zoning Staff	1 full time	2 part time	2 part time
Junk Storage laws	Yes	Yes	Yes
Timber Harvest	No	No	No
Dock regulations	Yes	Yes	Yes

TOWN OF SCHROON REGULATORY HIGHLIGHTS

Town Supervisor Cathy Moses and Building Codes Official Donald Sage provided a summary of their town's laws for the development of the Schroon Lake Management Plan. The Town employs one full time zoning staff person. Although the town does not have a Land Use Master Plan, it does administer local laws and ordinances and it adheres to state laws and federal guidelines to protect the watershed and lake.

The Town of Schroon has both Planning and Zoning regulations, and has a Planning Board and a Zoning board which meet monthly. The Planning Board administers site plan review for housing unit development, commercial development, and industrial development. It also manages special use permits and expansion of non-residential facilities. The Zoning Board controls and issues variances for land use, development and subdivision activities which are not allowed under existing zoning regulations without first receiving a variance.

Both the Town Board and Planning Board are responsible to administer the State Environmental Quality Review Act (SEQRA) for development projects or zoning changes. SEQRA guides these boards and requires them to take environmental impacts into consideration when approving the above activities.

The 1995 Town of Schroon Flood Damage Law refers to the 1995 Flood Insurance Rate Map. It bans structures, excavation and fill in flood hazard areas. This is enforced by the Zoning Enforcement Officer who reviews all subdivisions and new developments and identifies all flood- ways utilizing water surface elevation data and other available resources.

The town's site plan review process considers the traditional issues of onsite septic systems, drinking water wells, roads, drainage, and setbacks. The subdivision regulations comply with the SEQRA process and APA regulations where applicable. In managing stormwater, the town encourages the use of erosion control techniques and discourages direct nonpoint source deposition into the lake. However, there are no separate stormwater management regulations that the town administers that developers must adhere to aside from conditions placed upon the developer during the site plan review process.

There are no local wetland, stream or flooding regulations in the municipal codes, but the town defers to state and federal regulations for oversight. The Federal and State regulations that apply towards streams, lakes, wetlands and stormwater are summarized later within this chapter. The town does not have any timber harvest laws on the books, but APA jurisdiction would apply to clearcutting over 25 acres upland or 3 wetland acres.

The town's zoning officer felt that long-term lake quality was the biggest concern, not only for Schroon Lake, but also for Paradox Lake and the other waterbodies in town. He supported reevaluating older regulations and bringing them up to date in a comprehensive process.

The Town of Schroon codes and zoning map can be viewed at the Town's website at http://www.schroon.net/planning%20board.html.

TOWN OF CHESTER REGULATORY HIGHLIGHTS

The Town of Chester Zoning Administrator, Walter Tennyson and Patricia Smith are the two part time zoning staff in the town. The Town of Chester operates administers land use through the "Town of Chester Zoning Local Law". The purpose of this law, as stated, is to "promote the health, safety, and general welfare of the community and protect the property values and aesthetics of the community by channeling and directing growth... to ensure optimum overall conservation, protection, development... to preserve the beauty and character of the Adirondack Park... to the benefit of the residents and visitors of the community."

The Town of Chester has an Adirondack Park Agency approved Comprehensive Land Use Master Plan. According to the APA Act, this approval transfers considerable permitting authority from the Agency to the Town of Chester. However, there are still many land development transactions which require APA approval as well as local municipal approval. Local law does not supersede the determination of the Adirondack Park Agency on any matters of land use within APA jurisdiction. On the other hand, the APA cannot override a local decision not to permit a given land use or development.

All applicants must comply with the local law regarding shoreline and other zoning issues within the Town of Chester. A subdivision review is required for all proposed subdivisions within the town.

The APA may claim jurisdiction in certain environmentally sensitive areas at their discretion and as their authority designates. The town, although in possession of an APA approved master plan, defers to the APA on matters involving lakes, wetlands and environmentally sensitive areas. The town defers to NYS DEC on enforcement and regulations for stormwater management and erosion control. The Town of Chester has no permit system or requirements for timber harvesting, and the Chester Codes Officer felt that this issue should be addressed in the next municipal codes update.

Regarding natural resources protection statutes in the Town codes, there are a few items which specifically focus on safeguarding waterbodies and overall lake water quality. Surface water protection is encouraged within the municipal guidelines recommending buffer strips, minimization of stream channel disturbance, managing stormwater runoff, and installing erosion control techniques during construction activities. Ground water is also protected in Chestertown, with the objectives stated in Appendix D, Section D "preserving the quality, infiltration rate and levels". Guidelines include: compliance with regulations on pollutant discharge and the protection of aquifer recharge areas.

In addition to the land and water protections, the law's objectives in Appendix D encourage limiting the use of fertilizers and other toxins that may make their way into water bodies. However, there is no specific statute controlling these substances, only recommendations. The Town of Chester does not have any timber harvest laws on the books, but APA jurisdiction would apply to clearcutting over 25 acres upland or 3 wetland acres.

Septic setbacks and regulations adhere to Appendix 75a of the Public Heath Law, Wastewater Treatment Standards. Upon property resale, septic systems are required to be inspected by an engineer. This provision is intended to protect both the new homeowner and to protect nearby properties and waterbodies from the effects of failing septic systems.

The Town of Chester's Planning and Zoning documents can be viewed online at the Town's website http://www.townofchesterny.org/planzone-3.html.

TOWN OF HORICON REGULATORY HIGHLIGHTS

According to Gary McMeekin, the Zoning Administrator for the Town of Horicon the town has a local land use plan for zoning and project review as well as subdivisions and sanitary regulations. The plan was adopted for use in 1976 to promote health, safety as well as the moral and general welfare of the community. Like the Town of Chester, the Town of Horicon has an APA approved Land Use Master Plan, giving Horicon authority over most development activities. There is also a Comprehensive Master Plan for the town that is currently being updated by a steering committee.

Subdivision regulations were adopted in 1963 and all subdivisions in the Town of Horicon are subject to the town's Planning Board review process. Those subdivisions which are unable to meet the zoning codes must first go in front of the town's Zoning Board of Appeals for a variance of those noncompliant issues. Variances are subject to both Town of Horicon and APA review before approved.

The town relies on NYS DEC review for stormwater management on developments over one acre of land disturbance (as per the NYS DEC Stormwater Permit Program) but stormwater management for all projects is under the purview of a Planning Board review as well. This process encompasses compliance with wetlands, streams and flooding regulations, but being within the Adirondack Park activities may also be subject to state agency review.

All new septic systems must adhere to all codes in Appendix 75a of the Public Heath Law. Systems on difficult lots may be granted approvals to use alternative onsite wastewater treatment systems if approved by an engineer. These alternative systems generally require more maintenance, and often require contracts with qualified outside maintenance firms.

The town does not have any timber harvest laws and interviews indicated that it would be beneficial to have some regulations and guidelines for the community to follow. APA jurisdiction would apply to clearcutting over 25 acres upland or 3 wetland acres.

The Town of Horicon's Comprehensive Master Plan and its documents can be viewed online at the Town of Horicon's website which can be viewed at http://www.horiconny.gov/comprehensiveplan/documents.php.

A copy of the zoning and project review as well as subdivisions and sanitary regulations can be obtained at the Horicon Town Hall.

STATE AND FEDERAL REGULATIONS PROTECTING WATER QUALITY

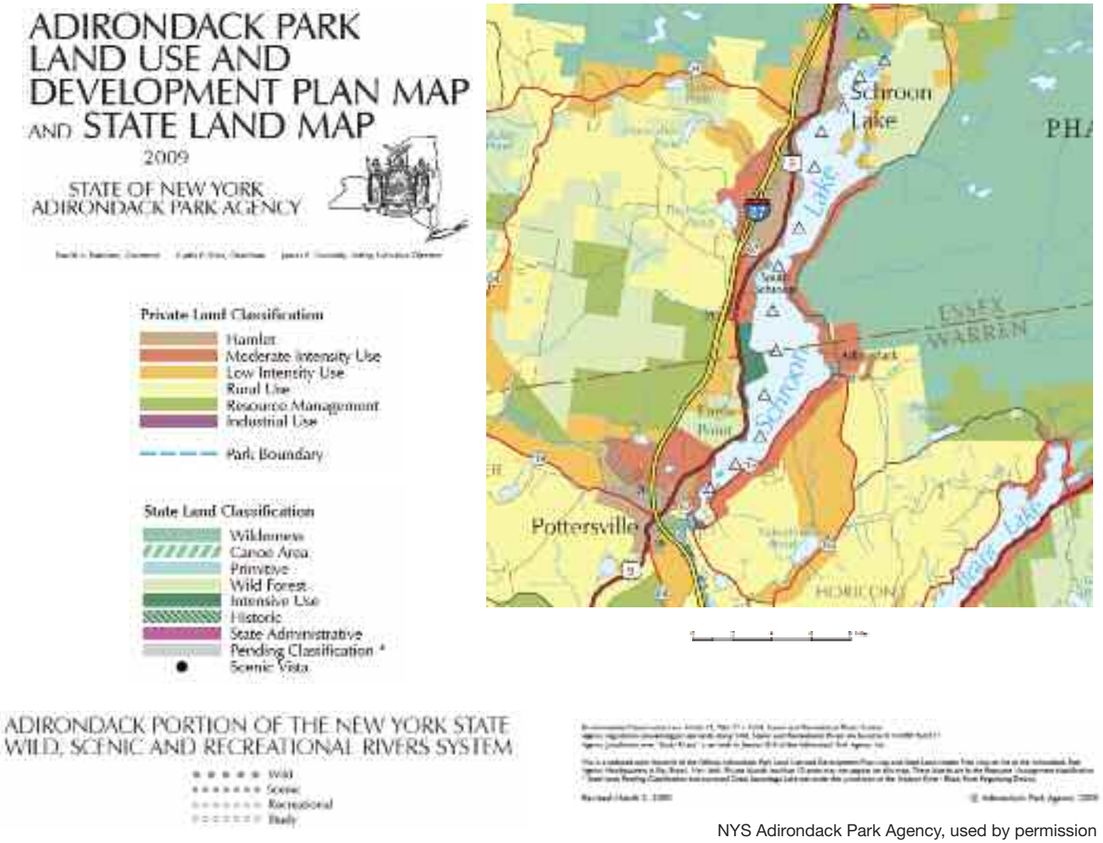
In addition to local municipal regulations, there is also an array of state and federal regulations in place to protect the natural resources of New York State. The principal state agencies which are charged at environmental protection in the Schroon Lake region are the NYS Department of Environmental Conservation and the Adirondack Park Agency. On the federal level, waterbodies and wetlands are regulated by the U.S. Army Corps of Engineers under various statutes. There are numerous other agencies which regulate specific issues, but these three are the dominant permitting agencies from a natural resources perspective.

The following table outlines selected topics and the agencies that often have jurisdiction over those issues.

(Note: this table is informational only and not intended to be used in place of a thorough permit jurisdictional review.)

COMMON TOPICS	APA	NYS DEC	U.S. ARMY CORPS
New Development	✓		
Stormwater (New Development > 1 acre)		✓	
Shoreline Disturbance	✓	✓	✓
Streambank Disturbance	✓	✓	✓
Wetlands	✓		✓
Logging	✓	✓	
Shoreline Cutting	✓		
Docks	✓	✓	
Wastewater Treatment		✓	
Lake Dredging	✓	✓	✓
Aquatic Plant Management	✓	✓	

As can be seen, most land disturbance and lake management practices require some level of state or federal review. Although the permit process can often be daunting, the regulatory framework is intended to provide environmental protections while allowing landowners appropriate usage of their properties.



NYS Adirondack Park Agency, used by permission

Within the Adirondack Park, the Adirondack Park Agency (APA) has jurisdiction based on land use and critical environmental area determination. In the APA's Adirondack Park Land Use and Development Plan all private lands in the Park are classified into six categories: hamlet, moderate intensity use, low intensity use, rural use, resource management and industrial use. Each category allows varying levels of development activities within the Park.

The APA Act states that local governments in the Park can develop their own local land use programs therefore transferring, upon APA approval, some permitting authority from the Agency to the local government's jurisdiction. The Towns of Chester and Horicon have APA approved plans, the Town of Schroon does not.

There is a Citizens Guide available at APA's website:
http://www.apa.state.ny.us/Documents/Guidelines/CitizensGuide.pdf

which provides a more thorough overview of the APA's roles and jurisdictions. A Jurisdictional Inquiry Form should be filed with the APA to determine permitting authority over any proposed development or land modification project in the Park.

REGULATORY RECOMMENDATIONS ARE INCLUDED IN CHAPTER 5

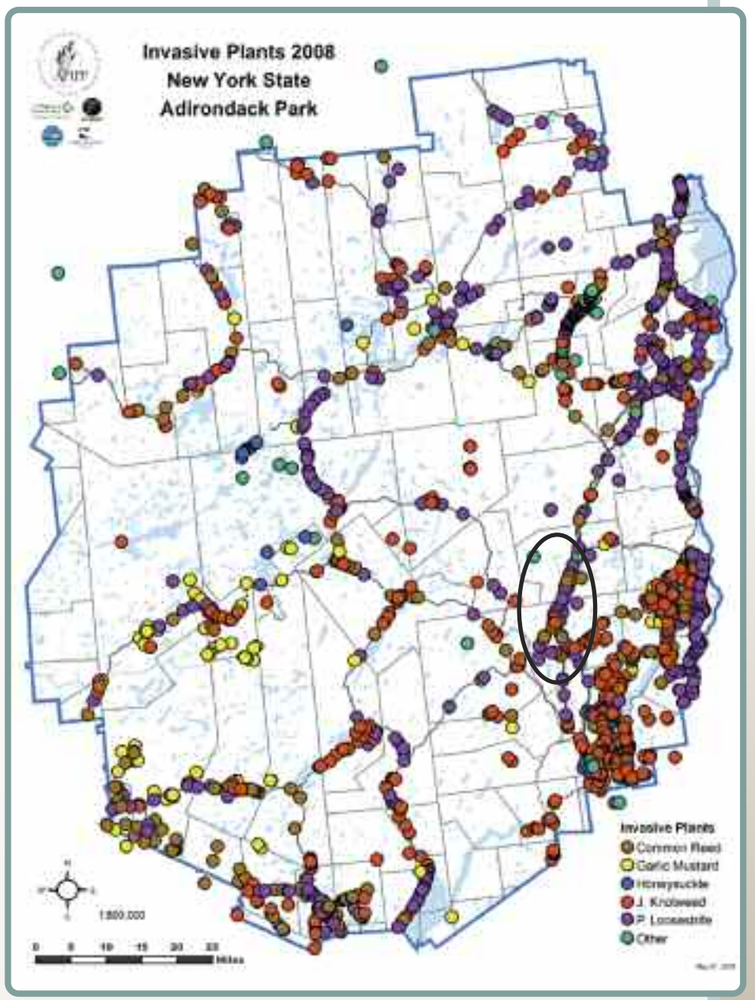
An "invasive" species is one which is not native to the area, grows and reproduces aggressively, and can do extensive damage to the local ecosystem. The focus of this section is on invasive plants and two invasive insects.

INVASIVE PLANTS

The diversity of vegetation in an area can be substantially reduced when invasive plants are present, thereby reducing the habitat value for wildlife. Some invasive plants grow so aggressively that entire swaths of land become covered with the one species (creating a "monoculture"). In areas of farmland and pastureland, particularly out in the western United States, invasive plants have a tremendous economic impact, estimated in the billions of dollars in lost production and control costs.

Closer to home, the Schroon Lake watershed is home to a few species of upland invasive plants as well. Thankfully, most of these plant populations are currently more of a nuisance than an economic impact. However, without public education, management and control methods, these plants have the ability to clog our wetlands, roadsides, and other scenic areas.

There are three primary invasive plants of concern in the Schroon Lake watershed: Purple loosestrife (Lythrum salicaria), Japanese knotweed (Polygonum cuspidatum), and common reed (Phragmites australis). Other invasive plants such as Tatarian Honeysuckle, Garlic Mustard and Oriental Bittersweet are currently present in the watershed as well, but in only in very minor and scattered populations. None of these invasive plants are poisonous or toxic to humans, they are simply very aggressive and can take over wetlands and other areas very quickly. Purple loosestrife and common reed live in wetland areas and can completely displace all other species in only a few years. Japanese knotweed can thrive in wet or dry conditions, and is often found along roadsides and along stream corridors.



APIPP Invasive Plant Map of the Adirondacks, 2008. The Schroon Lake area is shown within the black oval.

To begin to address this concern in the Adirondacks, the Adirondack Park Invasive Plant Program (APIPP) was created in 1998. APIPP is a coalition of nonprofit groups and state agencies with the mission of "protecting the Adirondack region from the negative impacts of nonnative invasive species".

Their work and dedication have shown that individual efforts can have a great impact on environmental issues.

Based out of Keene, NY, this group is the nexus for education, training, and management techniques to control invasive plants in the Adirondacks.

PURPLE LOOSESTRIFE

So far, the only upland invasive plant management efforts in the Schroon Lake area have been conducted on purple loosestrife, primarily by individuals and members of the Schroon Lake Association with support from the NYS DEC. Under the direction of Schroon Lake Association

Purple Loosestrife

SLA developed an educational program for school children who raised Galerucella beetles to combat invasive purple loosestrife plants.

members Don and Ellie Searles, the SLA developed an educational program for school age children to help control loosestrife. The kids raised and released Galerucella beetles which feed solely on loosestrife plants, eventually killing them. The program makes a contribution both to the educational and practical components of invasive plant management.

In addition, the Searles' have directly taken on the cause of loosestrife control around Schroon Lake by digging up plants wherever they are found. They have spent hundreds of hours on this endeavor, and have made an impact on the loosestrife populations locally around the hamlet of Schroon. Their work and dedication have shown that individual efforts can have a great impact on environmental issues.

JAPANESE KNOTWEED

Japanese Knotweed is an extremely fast growing perennial plant which primarily colonizes roadways and riparian areas. It grows up to 10 feet in height, has hollow stems, and produces tiny white flowers in

Japanese knotweed

late summer. In winter, only the stalks remain, and are reddish in color, generally without any other plants living within the affected area. Transport of these plants is primarily a result of highway maintenance operations and by the transport of seeds and roots by streams when established along riparian corridors.

The best control of the spread of Japanese knotweed is to identify existing plants and not inadvertently move them. Highway road ditching activities are one of the main causes of new colonies of knotweed. Even small sections of plant roots which are dug up will establish a new colony wherever it is deposited, often in other roadside areas. In many cases, landowners who are the recipients of roadside fill from a highway department have found themselves with a new colony of knotweed on their property. Once established, it is extremely difficult to eradicate.

COMMON REED

This plant is a tall, perennial grass (somewhat resembling wheat), which is most often found along road corridors and wetland areas. It can grow up to 15 feet in height and spreads very quickly into surrounding areas. Common reed can completely take over entire wetland complexes by outcompeting all other species, creating a monoculture. It spreads through prolific seed production and also by extensive underground root systems. Common reed

roots can run underground and surface into a new plant many yards away, which happens over and over to create large colonies. Monocultures of common reed of up to 7,000 acres have been documented (APIPP, Fact Sheets).

Control of common reed is primarily done through herbicides, applied through licensed

Some invasive plants grow so aggressively that entire swaths of land become covered with the one species

pesticide applicators. However, these control efforts are expensive, and often have to be repeated multiple times to eliminate the plant colony.

In the Schroon Lake watershed, common reed is present primarily along the NYS Route 9 corridor and between the lanes of Interstate 87. However, it can be found in small patches in many other areas of the watershed, often in wet areas and road ditches.

Common Reed

INVASIVE INSECTS

Along with invasive plants, there are also insects which are not native to the area which could cause tremendous economic and environmental damage if they make their way into the region. Of particular concern are two species of insects: the Asian Longhorned Beetle and the Emerald Ash Borer. There have been no confirmed sightings of these insects in the Schroon Lake Watershed currently, but vigilance is very important.

The Asian Longhorned Beetle (ALB) is a serious threat to New York State. This beetle originally from Asia, has been found in the New York and surrounding states. The adult female ALB bores into a tree to lay eggs, and as the eggs hatch and the larvae

Asian Longhorn

mature they feed on the tree. Upon maturity, the adult beetle will bore out the tree and will leave behind a hole of approximately 1⁄2 inch in diameter. An infestation of these insects can decimate large tracts of Ash forest. The ALB is up to 1 1⁄4" in length and has numerous white spots on its back and its antennae are long and black and white stripped. This species does look similar to our native White Spotted Pine Sawyer. The Adirondacks are of special concern, because the ALB feeds upon many tree species that

Emerald Ash Borer

are commonly found here. That list includes its preferred species of maples, elms, poplars and birch. Many other hardwood trees can be hosts for this insect as well.

For further information on the ALB, go to www.dec.ny.gov/animals/7255.html.

A more recent invasive insect introduction to the United States that can have major impacts to the Adirondacks is the Emerald Ash Borer (EAB). The EAB was introduced to the US from Asia in 2002. The EAB are small (up to 5/8" in length) with green metallic wings and a reddish underside. A female EAB will lay eggs in an ash tree and as the larvae mature, they feed on the tree. When the adult EAB bores out of the tree a D-shaped exit hole remains. All ash trees are susceptible to this insect, and once they are infected they will generally die within 2-4 years. Over 50 million ash trees in the United States have been killed due to the EAB infestation.

For further information, please check the NYSDEC website at www.dec.ny.gov/animals/7253.html.

INVASIVE SPECIES RECOMMENDATIONS ARE INCLUDED IN CHAPTER 5

Webster's dictionary defines "stewardship" as "the careful and responsible management of something entrusted to one's care", and is an often used term in the realm of lake and watershed management. While it can be argued that state and federal agencies are the primary stewards of Schroon Lake, their role is often one of reaction to human activity (i.e. granting permits for lakeshore modifications, regulating disturbance of wetlands, implementing fines for water quality violations). These roles, while not appreciated by all, are necessary and very important for the long-term viability of Schroon Lake. State and federal agencies can also play a role in lake management through funding of watershed and lake protection projects (such as this initiative funded by the NYS Department of State). State agencies such as the NYS Departments of Environmental Conservation and NYS Department of State provide grants to municipalities and County Soil and Water Conservation Districts to undertake these projects.

At the local level, the connotation of stewardship invokes the thought of nonprofit lake associations, which are groups of local citizens working together in the interests of their lake. Their focus tends to be on public involvement and education; networking and outreach. The involvement of local citizens and community leaders is at the heart of stewardship on Schroon Lake, and has been for a very long time.

The involvement of local citizens and community leaders is at the heart of stewardship on Schroon Lake, and has been for a very long time.

Bill McGhie of ESSLA looking for the invasive plant Eurasian Watermilfoil in their "Milfoil Scout Program"

When all of these groups come together, as is the case for this Schroon Lake Management Plan initiative, the best and most fruitful efforts are achieved. All parties are at the table, bringing their expertise, knowledge, and passion, and the outcome is not simply a document but a framework for the future. Stewardship is a long-term endeavor, and it takes the commitment of all groups to truly achieve the balance between the lake and its surrounding communities. Through this process we see perhaps the most important actions to protect and improve the lake.

SCHROON LAKE ASSOCIATION
(By President Helen Wildman)

For almost 100 years, the Schroon Lake Association Inc. has been caring for the lake, its watershed and the local community. Formed in 1911 to prevent the flooding of the Schroon Lake Valley and to control the lake level for the surrounding land owners, the organization was instrumental in caring for the Starbuckville Dam, leasing the structure for over forty years in order to maintain and rebuild it before the formation of the Park District. As the years went on the Schroon Lake Association's incorporation was updated to 501c3 (nonprofit) status. Our stewardship extended beyond the shores of the lake to watershed tasks such as ragweed control and even beyond as they fought acid rain. On the alert for Eurasian Watermilfoil, the SLA formed a group of volunteer "milfoil watchers" who surveyed the lake for this invasive plant as early as the 1980's. Today, in partnership with our sister organization, ESSLA, we are participating in a lake wide Scout Program to continue the volunteer surveillance for this invasive plant.

For 40 years the SLA has raised funds for stewardship of the lake through its annual Arts and Crafts Fair held in the park beside the lake

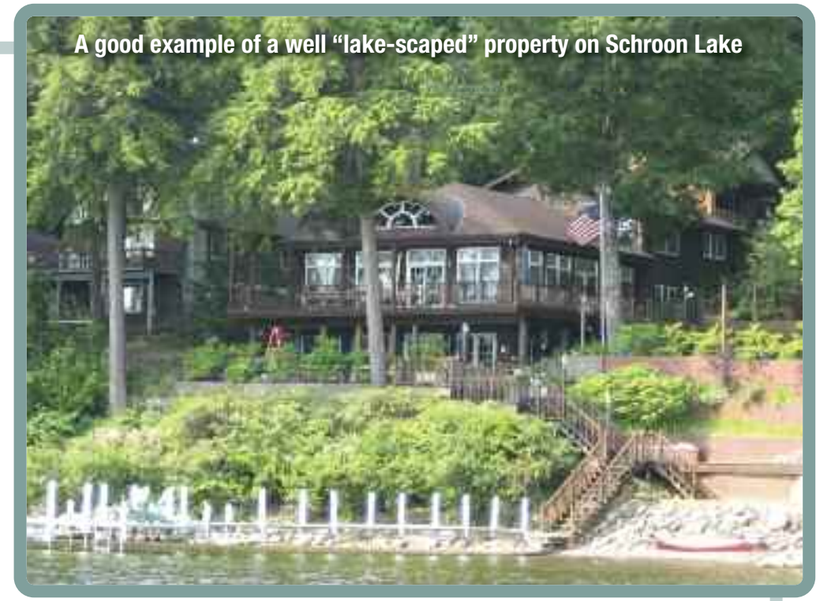
While these two lake associations are the hub of organized steward-ship activity on Schroon Lake, there is a tremendously important role to be played by individuals and property owners.

Ever mindful of the need to collect scientific data and prioritize watershed tasks, the organization saw the need to retain a professional Lake Manager to direct their stewardship of the lake. In 1995 the SLA retained Steve LaMere of Adirondack Ecologists, LLC, one of the first twelve lake managers in the United States and the first to be certified in New York State. Our group has been working under his guidance since that time funding studies, broadening educational outreach at the lake's launch ramps, mailing information on septic systems, lake-scaping and vegetative barriers to taxpayers, and through hand harvesting of milfoil, mapping and controlling purple loosestrife and other invasive species, holding open public meetings each summer to disseminate information. In partnership with our sister organization ESSLA, we are participating in a lakewide Scout program to continue the volunteer surveillance of Eurasian Watermilfoil. The Schroon Lake Association, Inc. proudly continues this 99-year long tradition of devoting its funds and volunteer time to lake and watershed stewardship by spearheading the development of this Schroon Lake Management Plan. Visit www.schroonlakeassociation.org for more information.

EAST SHORE SCHROON LAKE ASSOCIATION
(By President Bill McGhie)

Since its inception in 1964, with the objective of maintaining the water quality of Schroon Lake, the East Shore Schroon Lake Association (ESSLA) has been active in lake stewardship. As stewards of our lake we initiated a program for biological testing of the water quality at various locations around Schroon Lake. For chemical testing, our volunteers go out on the lake eight times during the summer and collect surface and deep water samples from the deepest section of the south basin. Our sister association the SLA collects samples from the north basin.

We partnered with Paul Smith's College to train volunteers to inspect boats entering the lake at the State Boat launch. In 2008 under the leadership of Vince Blando, the ESSLA created a "Milfoil Scout Program. We recruited 45 volunteers who checked for milfoil, we created a training video and set up a phone line (494-4849) so milfoil scouts could report their findings.



A good example of a well "lake-scaped" property on Schroon Lake

Joined by our sister association the SLA we increased the number of volunteers to 65. In 2009 our collective effort has resulted in surveying the entire shoreline in Warren County and 47% of the shoreline in Essex county.

We expect to continue our joint efforts each year and eventually provide 100% surveillance of the entire lake shore line including the River. Our objective is to prevent Eurasian Watermilfoil from entering the lake on boats and to educate boaters on the threat it poses to our waters. We also attend various events on Schroon Lake and inform people what milfoil looks like and how they can report finding a suspect plant.

Our Association conducts boater safety courses and participates in the Adopt-A-Highway program. We organized several local lake associations to meet and share ideas and expertise. Each year we attend conferences to learn about the latest developments in lake stewardship. We then share this information with our members and others.

Throughout the entire year, ESSLA informs our members via e-mail and letters of items which may impact or interest them. We also conduct open meetings twice a year where members and the public may voice their concerns and opinions. Once a year we conduct a social activity where our members may gather and socialize. Visit www.essla.org for more information.

ESSLA volunteers cleaning up roadside trash, under the NYS "Adopt-a-Highway" program

THE IMPORTANCE OF INDIVIDUAL STEWARDSHIP

While these two lake associations are the hub of organized stewardship activity on Schroon Lake, there is a tremendously important role to be played by individuals and property owners. Schroon Lake has a fairly densely developed shoreline, with hundreds of homes within a half-mile of the shoreline of the lake. How these properties are managed can have a tremendous impact on the water quality and aquatic plant community in the lake.

FERTILIZERS AND BUFFERS

Almost all of the homes surrounding Schroon Lake have managed landscapes, including lawns. With lawns, invariably comes the need for maintenance, often including the application of fertilizers and pesticides. These chemicals, even if properly applied, can run off after storm events and leach into the lake or nearby stream. The results can range from algal blooms to excessive shoreline weeds to fishkills.

One of the single largest impacts from property management is the application (and over application) of phosphorus in lawn fertilizer. Phosphorus is called the "limiting nutrient" in lakes, which means that the growth of algae and weeds in lakes is directly dependent upon the amount of phosphorus in the water. Most water quality protection projects for watershed and lake management are intended to reduce or eliminate the introduction of additional phosphorus to the lake.

> To help reduce runoff from a property (particularly lakefront) a good practice is to establish a "buffer strip" of vegetation. They can be beautiful additions to a property's aesthetic look, while providing the lakeshore with protection from fertilizer-laden runoff.

Each bag of lawn fertilizer identifies its three primary components: nitrogen, phosphorus, and potassium. For example, a fertilizer with a 20-10-5 analysis means that it is 20% nitrogen, 10% phosphorus, and 5% potassium. Most homeowners apply fertilizer as per the recommendation on the bag, and many times through out the growing season. However, very few of those homeowners have their soil tested prior to application to see if the soil actually needs these chemicals. Inexpensive soils tests ($5 or so) are available from local home improvement warehouses, or more detailed tests can be done through Cornell Cooperative Extension.

Numerous studies have shown that soils are often saturated with phosphorus and do not need additional applications. In addition, if the pH of the soil is too low or too high, grass cannot uptake the phosphorus in the soil anyway. Further applications are a waste of money and a potential issue for an adjacent waterbody or even their personal drinking water well.

> The NYS Department of Health recommends that septic tanks be pumped out every 3-5 years. This keeps the solids from overflowing into the infiltration lines, causing the system to fail.

To help reduce runoff from a property (particularly lakefront) a good practice is to establish a "buffer strip" of vegetation. These areas tend to be slightly elevated (to inhibit runoff) or depressed (to capture runoff) and planted with a variety of plants. They can be beautiful additions to a property's aesthetic look, while providing the lakeshore with protection from fertilizer-laden runoff. The term "lake-scaping" describes the use of vegetative buffers and screened views for shoreline properties.

SEPTIC SYSTEMS AND WATER CONSERVATION

With the large number of septic systems on Schroon Lake (discussed in Chapter 3.7), homeowner management of those systems is paramount to protecting the lake. All homeowners should know what type of system they have, its location, and when it was last pumped out. Recent septic pumpout programs conducted by the Warren County SWCD on surrounding lakes have found that the vast majority of homeowners near lakeshores have not pumped their tank within the past five years. In fact, a large number of those individuals did not even know where their septic tank was located.

The NYS Department of Health recommends that septic tanks be pumped out every 3-5 years. This keeps the solids from overflowing into the infiltration lines, causing the system to fail. There are many septic haulers in the Schroon Lake area that pump out septic tanks, at a cost of $200 or less. The hauler will even locate the tank for you if you don't know where it is. The Department of Health does not advocate the use of "septic tank additives" which are available at stores and seen on television, as they do not improve the efficiency of the system and can actually impede the function of the tank.

To extend the life of residential septic systems, water conservation is an important item. When water use is reduced, the solids in the tank have more time to settle and the microbes have more time to break down the waste. Most toilets purchased now are "low flow" at 1.6 gallons or less per flush, which is a good standard. Each home should have faucet aerators, low-flow showerheads, and newer toilets. By having these items in a house, water usage can drop as much as 50% (as can your water bills). Less water going to the septic system means less water to be disposed.

Lawns and gardens is a standard practice for many homeowners. To optimize the use of the water, early morning or in the cool of the evening is the best time for watering. Evaporation is greatly reduced and fungal growth on lawns and plants is minimized. Simple management changes, even by one individual, can result in significant change locally.

CHEMICAL USE AND WASTE DISPOSAL

Household chemicals (cleaners, bleach, etc.) should never be disposed of down a sink drain. Septic systems are not capable of breaking down or treating these chemicals, so they will flow into the ground untreated. In addition, those chemicals can often kill the "good" bacteria which break down human waste, and thus render the system non-functional. Alternative, less toxic home and garden products should be used whenever possible. There is an array of "green" products on the store shelves now, which are significantly less harmful to the environment while doing the same job.

In addition to household cleaners, recent evidence has shown that the disposal of unused pharmaceuticals (prescription and over the counter medicine) is becoming a problem in many of our nations waterbodies. Wastewater treatment plants cannot treat or remove these chemicals from the waste stream, and studies are showing that dozens or even hundreds of chemical residuals from medications are showing up in small amounts in our waters. To properly dispose of unused medicines, simply throw in the garbage. All garbage around Schroon Lake is transported to the DEC regulated Hudson Falls Burn Plant for final disposal.

> There is an array of "green" products on the store shelves now, which are significantly less harmful to the environment while doing the same job.

Even in our era of heightened environmental awareness, many people don't give much thought to their actions on disposal of household and other chemicals. There are often articles in the newspapers about a home or business owner who dumped paint or oil down a road grate, resulting in a plume into a lake. These result in a large cleanup cost, and fines, all of which are borne by the responsible person. For information on the proper disposal of household chemicals, contact the NYS Department of Environmental Conservation at 623-1200.

3.11 The Human Component

By Roger Friedman, Schroon Town Councilman

The Schroon Lake Watershed Management Plan is a consensus building effort aimed at all residents and users of the Schroon Lake Watershed. While 60% of the Watershed is Forest Preserve and will never be developed, the area around Schroon Lake is primarily residential in nature. Thus the human component is of primary importance and the Plan provides a blueprint for the optimal use and enjoyment of Schroon Lake as a natural, recreational and economic resource.

For years the emphasis within the Adirondack Park has been on how to preserve the natural resources of the Park. In recognition of the need to preserve these natural resources the Adirondack Park Agency (APA) Act was passed in 1971. The APA provides regulatory guidelines for development within the Adirondack Park and in theory "recognizes the complementary needs of all the people of the state for the preservation of the park's resources and open space character and of the park's permanent, seasonal and transient populations for growth and service areas, employment, and a strong economic base".

For years many local officials within the Adirondacks have been apprehensive about a possible crisis concerning the overall condition of many Adirondack communities. In 2009 the Adirondack Park Regional Assessment Project (APRAP) report was released providing the first comprehensive baseline data for understanding socio-economic trends and projecting future outcomes for the Adirondack Park. The data clearly demonstrates that the Blue Line is not just a geographic boundary, but defines a region with unique socio-economic characteristics.

The results of the APRAP illustrate the challenges facing most Adirondack communities with respect to community life, demographics, employment, emergency services, schools and infrastructure. These trends include but are not limited to: lack of jobs (particularly in the private sector), shortage of affordable housing, shrinking school enrollments, an aging population, reduced and deteriorating economic infrastructures and diminished community services. Many of these trends might be ongoing in other regions of the United States, however in the Adirondack Park the "unique experience" of man and wilderness living side by side may be in jeopardy in which the protected wilderness will survive, but the viability and sustainability of these communities within this magnificent 6 million acre park might not.

A healthy watershed equals a successful community and a healthy community equals a successful watershed

It is imperative that Schroon Lake protections keep in balance the human role in the substance of the area's environment. One of the outcomes of the Schroon Lake Management Plan is that we are striving and will continue to strive for equilibrium. This equilibrium can be defined as a symbiotic relationship in which a healthy watershed equals a successful community and a healthy community equals a successful watershed.

The following paragraph in the executive summary of the APRAP embodies both of these goals: "The obvious need to merge long-term economic revitalization with environmental protection must occur soon for the towns and villages within the Adirondack Park. Bold new strategies and investment will be required to address the complex needs of communities within a protected landscape. Such strategies must support sustainable development of communities consistent with both quality of life and environmental stewardship. The data presented assesses the need for targeted and timely utilization of resources to address the questions listed above and to drive the planning process to meet the fundamental needs of the people of the Adirondack Park."

The APRAP report is downloadable or can be ordered by going to the Adirondack Association of Towns & Villages website at: http://aatvny.org/content/Generic/View/1.

Chapter 4... OPINION SURVEY RESULTS

4.1 Background

Watershed planning is not only about natural resources protection and improvement, but also about the people who use and enjoy those resources. Towards this end, in 2007 the Schroon Lake Management Planning Committee developed a "Resident and Visitor Survey", which went to over 2,000 residents and visitors of Schroon Lake. How do people perceive Schroon Lake's water quality? What are the big issues affecting the lake? Who should be involved and be providing funding for lake management activities? These questions and much more were asked of those who chose to be involved in the survey response, and the outcomes are very interesting.

The Committee's objective was to develop a questionnaire that not only looked at people's opinions and outlook of the lake itself, but also their views of what is happening in the watershed. This survey was very comprehensive, including such topics as lake usage, perceptions of lake condition, and the public's thoughts on the Lake Management Planning initiative. The goal was to get the opinions of a representative cross section of everyone from full time local residents to casual users of Schroon Lake, such that we could better understand the public mindset during this planning process.

The Committee's objective was to develop a questionnaire that not only looked at people's opinions and outlook of the lake itself, but also their views of what is happening in the watershed.

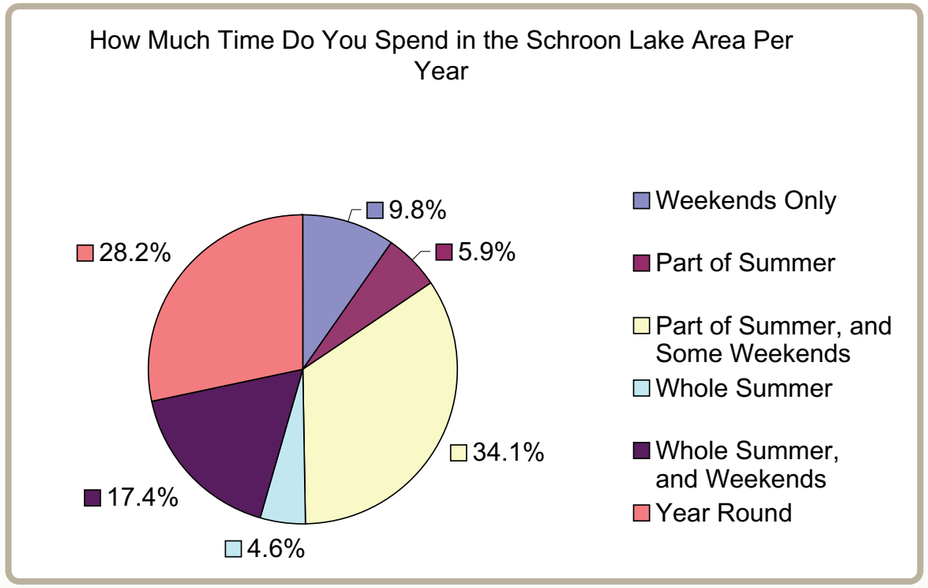
4.2 Tabulation and Results

The Committee received 523 completed surveys back, which was felt to be a good response overall and a reasonable representation from the public at large. Staff at the Warren County Soil and Water Conservation District spent over 150 hours tabulating the combined 56,000 answers on the survey forms. The resulting information was collated and analyzed, and resulting charts were developed for visual interpretation.

Through the volumes of data, clear interests and opinions came through from the survey respondents. The graphical results of the survey highlights are as follows:

WHO RESPONDED?

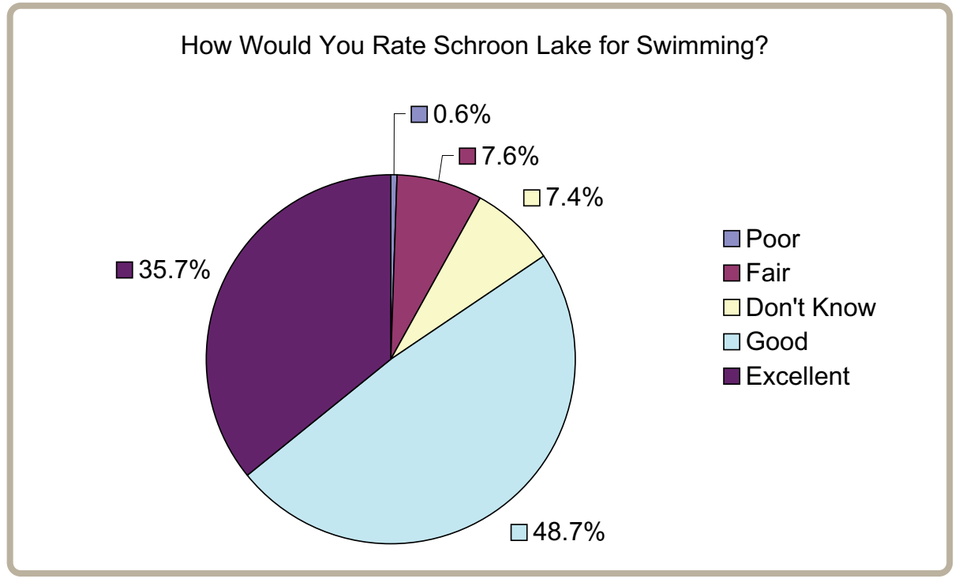
Only 28% of respondents were year-round residents, with the remaining 72% being part-time residents or visitors.



WHAT SHOULD THIS PLAN ADDRESS?

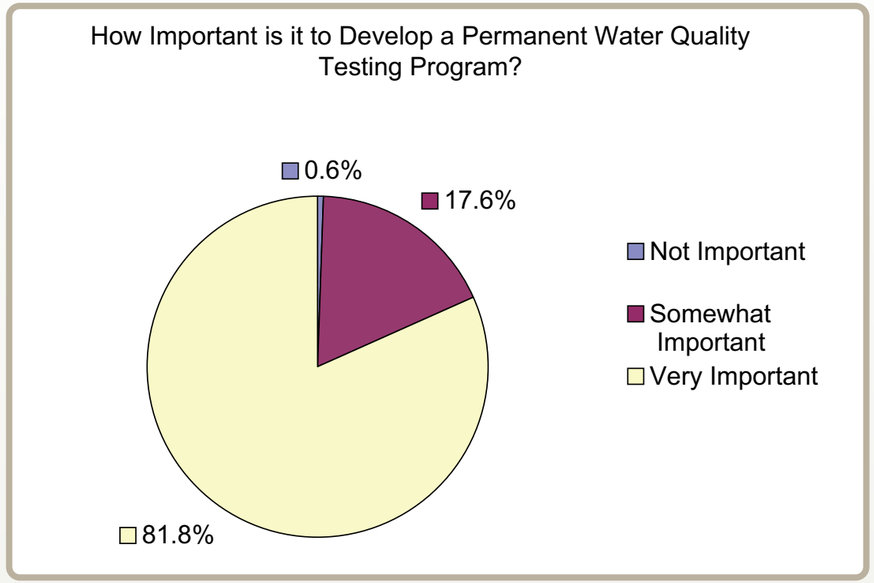
PERCEPTIONS OF LAKE QUALITY

85% of people believe that Schroon Lake is “good” or “excellent” for swimming.
Less than 0.6% of people rated it as “poor”.



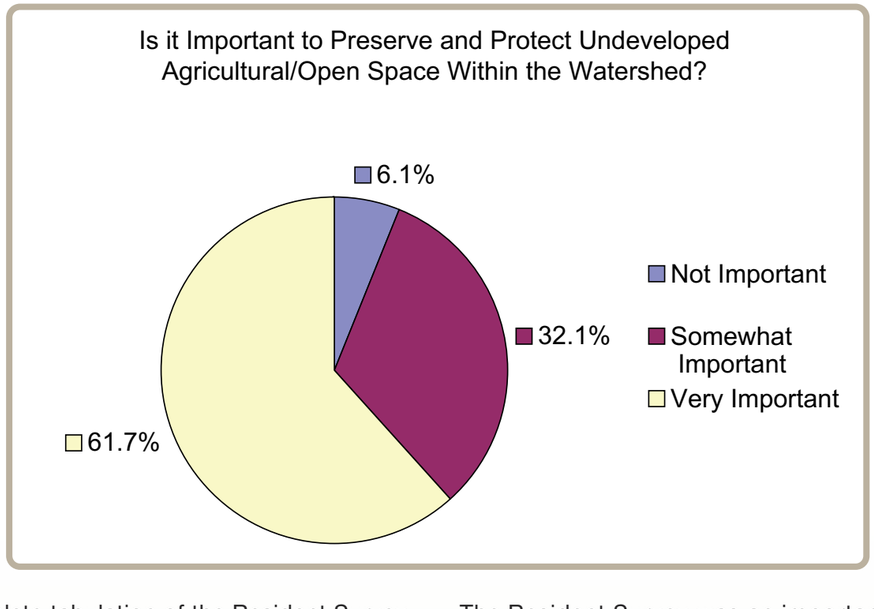
IMPORTANCE OF LONG-TERM WATER MONITORING

The vast majority of people (82%) believe that having a permanent water quality testing program on Schroon Lake is important.

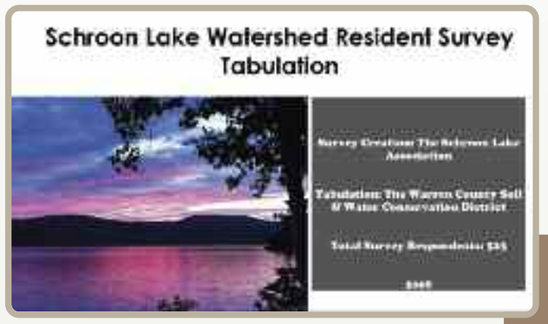


IMPORTANCE OF UNDEVELOPED/OPEN SPACE IN THE WATERSHED

94% of survey respondents think that it is important to preserve and protect open spaces in the Schroon Lake watershed.



The complete tabulation of the Resident Survey is available at the websites of both the Schroon Lake Association and the East Shore Schroon Lake Association. Included within this Watershed Plan are merely the highlights of the Survey Tabulation, focusing on the highest priority items. However, there is a considerable amount of insight and information which can be gleaned from a review of the full report.



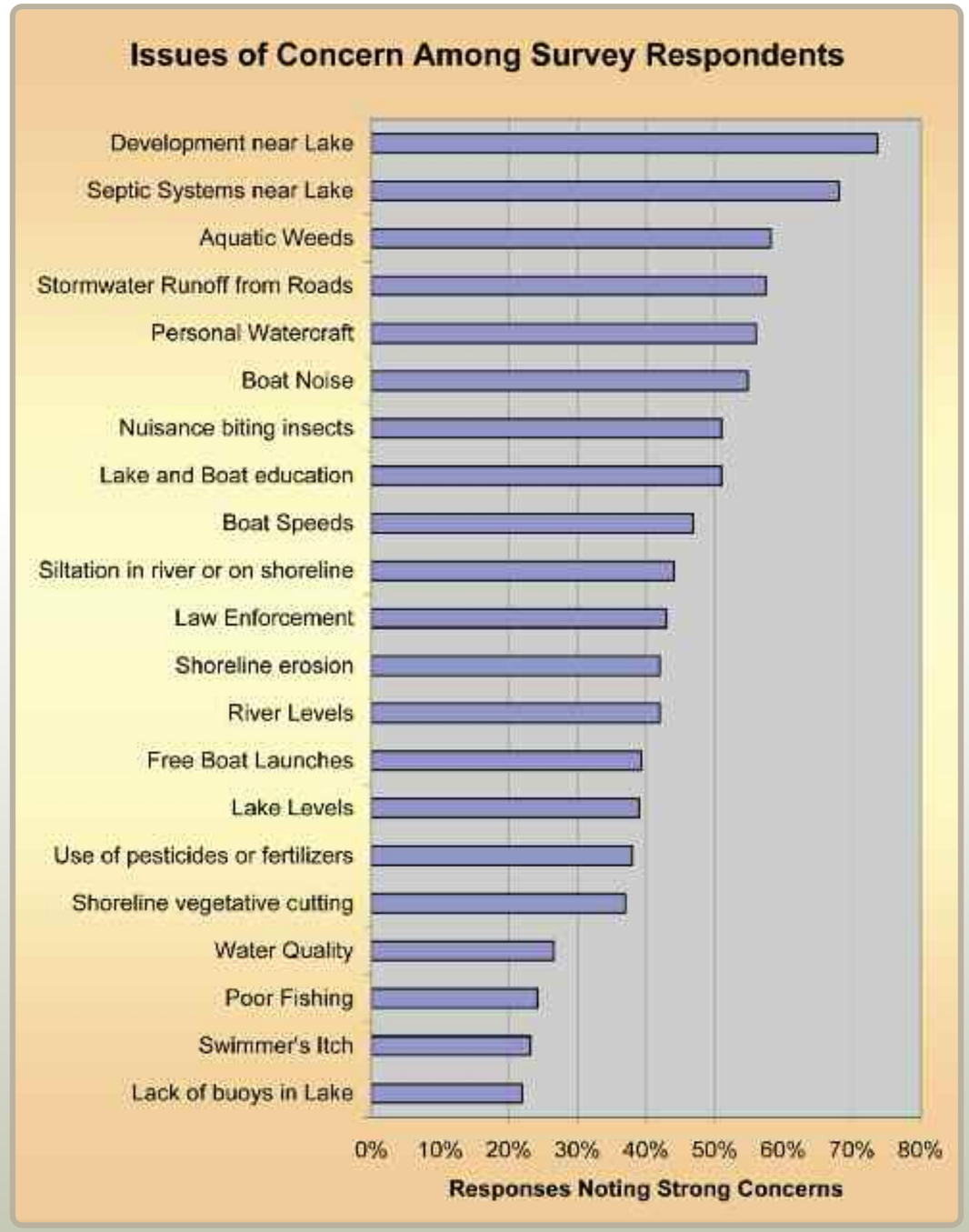
The Resident Survey was an important step in progressing a comprehensive watershed and lake planning initiative for Schroon Lake. It gave valuable input to the Lake Management Planning Committee regarding issues of concern, demographics within the watershed, and people's perception of Schroon Lake.

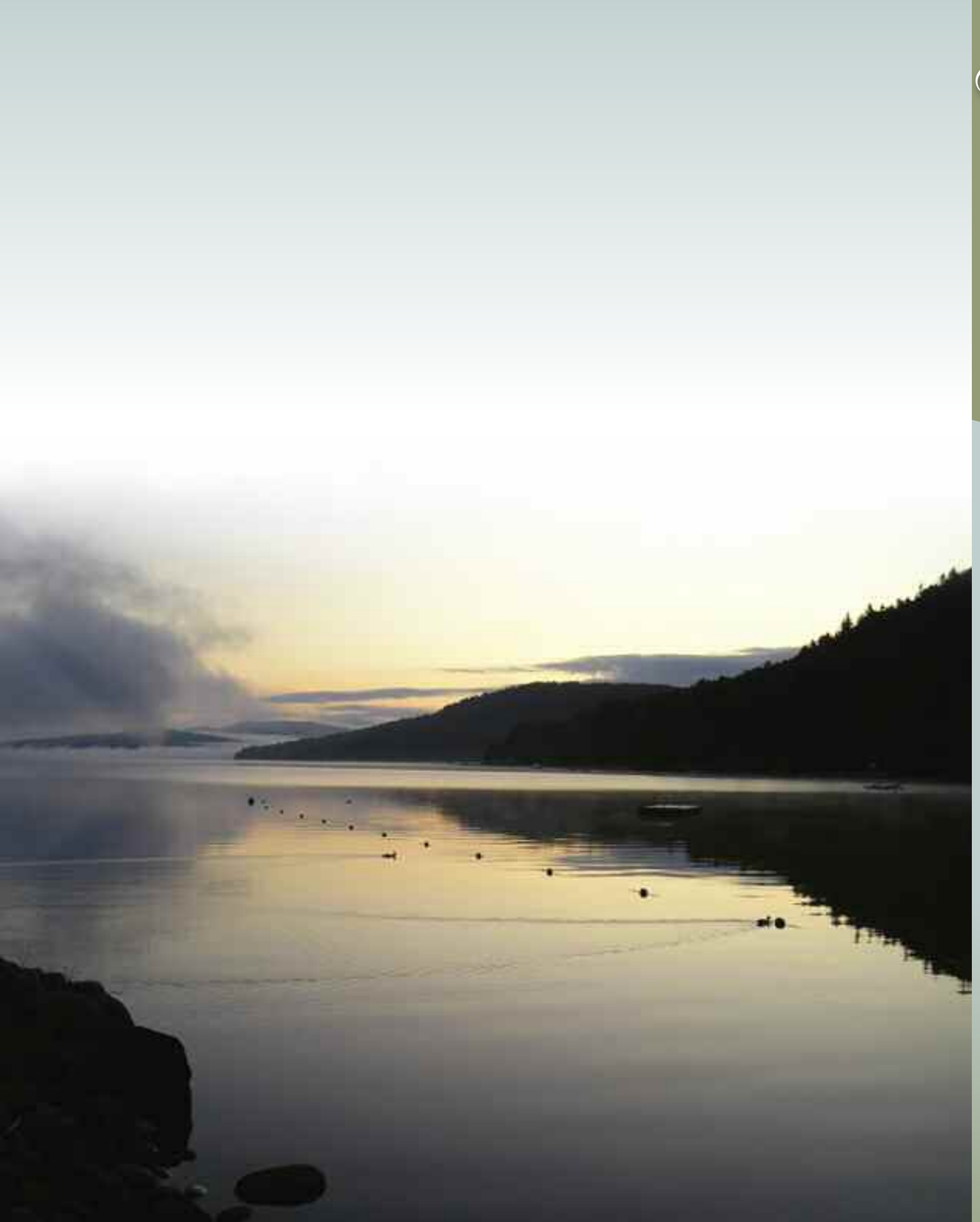
These responses helped focus the Committee's work on this management plan. While sometimes the results confirmed the perception of Committee members and community leaders, other times the results were less evident (and therefore even more constructive). For the long-term, these survey results will be utilized by the two lake associations as they conduct educational and outreach activities throughout the watershed for the future.

This full report can be found at www.schroonlakeassociation.com or www.essla.org

ISSUES OF CONCERN

The largest concerns for Schroon Lake among respondents were development related (nearshore development, septic systems, stormwater runoff from roads). Also of high priority among surveyed individuals were in-lake issues, such as invasive aquatic plants and boating issues.





Chapter 5 ... RECOMMENDATIONS

The ultimate goal of the Schroon Lake Watershed Management Plan is not just to educate local citizens and civic leaders about Schroon Lake, but also to identify key recommendations to protect it for the future. Towards this end, the work undertaken on this plan was focused not only on identifying various issues which affect Schroon Lake, but also on specific strategies to address these issues.

This document outlines a number of recommendations for the long-term protection and improvement of Schroon Lake and its watershed. Those recommendations are compiled as tables below, based upon the topic and issue. Outlined in these tables are the issue, an estimated cost of remediation, the likely party (or parties) to address the issue, and the timeframe which the issue is likely to be addressed. Many of these initiatives will involve funding from outside sources, such as state and federal government grants. However, a good deal of the recommendations can be implemented by local government and the two lake associations.

Ultimately, the protection and improvement of Schroon Lake comes not from a Plan, but how that Plan is implemented. This plan was not written to sit on a shelf as a memorial to itself, but is intended to be acted upon on a regular basis as a working document. These recommendations provide the framework and background for future grant applications to any number of funding sources. Indeed, it is fully expected that the actions noted in this plan will form the core of numerous project applications for the betterment and protection of the lake for the future. This is one of the last steps in the planning process for the Schroon Lake Watershed, but it is only the beginning of a new era of projects and programs to benefit the lake itself, its local communities, and the thousands of visitors who enjoy Schroon Lake every year.

RECOMMENDATION	INVOLVED PARTIES	FUNDING REQUIRED	SOURCE OF FUNDS	TIMEFRAME
Develop a comprehensive plan to address known Eurasian Milfoil and Curly-leaf Pondweed sites	Municipalities, Lake Associations, Consultant	$3,000-$5,000	Municipal, Lake Associations	Short term
Hand harvest of identified scattered and moderately dense populations	Consultant	Variable $5,000 to $50,000 annually depending on program	NYS, Municipal, Lake Associations	Long term
Install benthic mats in dense areas of milfoil as needed	Consultant	Variable	NYS, Municipal, Lake Associations	As needed
Continue and enlarge volunteer "Milfoil Scout Program"	Lake Associations	Minimal	N/A	Immediate
Continue and enlarge of boat launch steward program	Lake Associations	Minimal if volunteer, $5,000-$10,000 if paid	Municipal, Lake Associations	Immediate
Continue participation in the CSLAP volunteer water quality monitoring program	Lake Associations	Under $5,000	Municipal, Lake Associations	Ongoing
Continue professional water quality monitoring as needed to ensure valid long-term dataset for the lake	Consultant	Variable depending upon parameters measured	Lake Associations, Municipal	Ongoing
Conduct a comprehensive aquatic plant survey of the lake every five years using consistent methodology	Consultant	$5,000-$10,000	Lake Associations, Municipal	Short term
Conduct storm event tributary water quality sampling of Rogers Brook and Mill Brook which are adjacent to beaches and developed areas	Consultant	$2,000-$3,000	Lake Associations, Municipal	Short term

STORMWATER RUNOFF GENERAL

RECOMMENDATION	INVOLVED PARTIES	FUNDING REQUIRED	SOURCE OF FUNDS	TIMEFRAME
Install storm drain markers saying "Don't Dump, Drains to Lake" on road storm grates in highly developed parts of the watershed.	Lake Associations, Municipalities	$3,000-$5,000	Municipal, Lake Associations, NYS	Short term
Over time, work to add stormwater treatment or infiltration structures to all existing public road drainage systems which outlet directly into the lake	Municipalities, SWCD's	Varies by project	NYS, Municipal	Long term

STORMWATER RUNOFF HAMLET OF ADIRONDACK

The small Hamlet of Adirondack on the southeastern shore of Schroon Lake includes a general store, a number of residential homes, a relatively large town-house complex (Adirondack Lodges), and a major tributary stream (Mill Brook). Much of the area within the hamlet was well vegetated and stable and very few areas drain directly to the lake or to Mill Brook. Most of the road ditch network is lined with stone to minimize erosion, and was found to be in fair to good condition.

RECOMMENDATION	INVOLVED PARTIES	FUNDING REQUIRED	SOURCE OF FUNDS	TIMEFRAME
1. CHURCH/ BELLE STS. – Re-ditch, landscape channel Installation of one drywell system at the Intersection of Church and Belle Streets, clean out rock lined ditch, and create a landscaped rock lined channel to the Lake.	Town of Schroon Highway	$1,000-3,000	Municipal	Short Term
2. ADIRONDACK LODGES – Review stormwater management practices Given the size of the Adirondack Lodges complex, review their stormwater runoff management system to determine if it is effective and is being properly maintained.	Town of Schroon, SWCD Adirondack Lodges, Town of Horicon	-	-	Short Term

STORMWATER RUNOFF
HAMLET OF SCHROON

The Hamlet of Schroon is the largest and most densely developed area on Schroon Lake. None of the stormwater networks from Fowler Avenue north discharge into the lake, but much of the drainage from the southern end of the hamlet does connect directly to the lake. There are no stormwater improvement or flow reduction (infiltration) systems along any of the hamlet's roadways.

RECOMMENDATION	INVOLVED PARTIES	FUNDING REQUIRED	SOURCE OF FUNDS	TIMEFRAME
1. DOCK STREET – Subsurface stormwater infiltration system. Most of the stormwater from Dock Street currently drains down the boat ramp and outlets directly to the lake. To intercept this drainage, an open top slotted trench drain should be installed across the upper area of the launch, outleting into an array of subsurface stormwater infiltration chambers.	Town of Schroon Highway Dept, SWCD	$50,000-$75,000	NYS, Municipal	Based on Funding
2. FAIRFIELD AVENUE – Drywell installation Installation of three separate stormwater infiltration systems (drywells) along the roadway; two on the north side of the road and one on the south just to the east of the tennis courts.	Town of Schroon Highway, SWCD	$15,000-25,000	NYS, Municipal	Based on Funding
3. LELAND AVENUE – Single/double stack drywell Currently there is a drop inlet on the inside of the curve that drains to a culvert, which then outlets on a steep bank to the lake. Install a single or double stack drywell infiltration system to replace the current structure, and reinforce the outfall location.	Town of Schroon Highway, SWCD	$15,000-25,000	NYS, Municipal	Based on Funding
4. DOCK ST./ RT.9 - Two double-stack drywells At the top of Dock Street adjacent to Rt. 9 there are storm drains that collect approximately 500 feet of stormwater from both roads combined. The outfalls from these drop inlets discharge directly into Rogers Brook. These locations would benefit greatly from two double stacked drywells.	Town of Schroon Highway, NYS DOT, SWCD	$15,000-25,000	NYS, Municipal	Based on Funding
5. TOWN OF SCHROON – Stormwater Codes amendment Consider a Town of Schroon codes amendment requiring redevelopment activities in the hamlet area to consider and address stormwater runoff from the site.	Town of Schroon	-	-	Short Term
6. INCORPORATE BMP'S INTO ALL NEW PROJECTS CONSTRUCTION All new roadway and highway reconstruction projects (local, county, state) should incorporate stormwater capture and infiltration practices into the design and construction.	Town of Schroon Highway, NYS DOT, SWCD	-	-	Short Term

STORMWATER RUNOFF
NEW YORK STATE ROUTE 9

NYS Route 9 runs along the western shore of Schroon Lake for the lake's entire length. In areas where it is relatively close to the lake, road runoff is often directed to culverts which outlet into the lake. Most road ditches along Route 9 are very well vegetated, which allows for both filtering of stormwater runoff and infiltration into the ground.

RECOMMENDATION	INVOLVED PARTIES	FUNDING REQUIRED	SOURCE OF FUNDS	TIMEFRAME
1. The Route 9 section between Charlie Hill Road and Rogers Brook on the south side of the Hamlet of Schroon is more than a mile long. It has over 20 drop inlets which ultimately direct stormwater runoff to the lake. There is great opportunity to retrofit the Route 9 drainage system with stormwater treatment and infiltration systems along this stretch of highway.	NYS DOT	$100,000+	NYS	Long Term
2. All future NYS DOT Route 9 reconstruction jobs should incorporate improved stormwater management practices, including infiltration in the areas which have deep sandy or loamy soils.	NYS DOT	-	-	Long Term
3. Retrofit drainage, install hydrodynamic separators Route 9 in the Hamlet includes a complex series of drop inlets and subsurface pipes which discharge into the lake by the boat launch. That stormwater drainage system collects runoff from a large area and has been problematic through the years. This system should be more thoroughly reviewed for opportunities to improve the runoff quality through hydrodynamic stormwater separators and infiltration practices.	NYS DOT, Town of Schroon Highway, SWCD	$100,000 +	NYS, Municipal	Long Term

STORMWATER RUNOFF
COUNTY ROUTE 15 (EAST SHORE DRIVE)

East Shore Drive runs along the east shore of Schroon Lake for just over three miles. Stormwater runoff from this road surface either sheets off into the buffer between the lake and the road, or it flows into the ditch on the east side and is piped into the lake. Most of the road ditch is well vegetated, and very little erosion is evident.

A concern along this roadway is that development and lawn management along the east side of the road has the potential to contributing phosphorus, pesticides, and other pollutants. Many houses on steep slopes are built upon along this stretch, so it is imperative that construction projects are diligent in erosion control and stormwater infiltration practices.

RECOMMENDATION	INVOLVED PARTIES	FUNDING REQUIRED	SOURCE OF FUNDS	TIMEFRAME
1. Property stewardship is very important along this section of the shoreline. Use of zero phosphorus fertilizers, maintaining buffer strips between managed lawns and the road ditch, and proper erosion and sediment control are critical in this area.	Private homeowners	-	-	Immediate
2. Reduce mowing of the ditch vegetation to encourage denser growth, which can greatly increase stormwater nutrient uptake and improve pollutant reduction.	County DPW, Town Highway Dept	-	-	Immediate
3. Undertake a detailed evaluation of Lake View Drive and Shaw Hill Road, both of which drain to East Shore Drive and show evidence of sedimentation below the intersection. Improve drainage situation through stormwater retrofit, improved vegetation and sediment capture.	County DPW, Town Highway Dept, SWCD	$20,000+	Municipal, NYS	Long Term

STORMWATER RUNOFF
ADIRONDACK ROAD (ESSEX COUNTY)

Adirondack Road provides access to dozens of shoreline properties on the northeast shore of Schroon Lake. Most of its length is relatively stable, although areas exist which show eroding ditch and stormwater runoff onto downhill properties.

Adirondack Road north of Nesa Road exhibits miles of clay/silt ditches, much of which has little or no vegetation. Several sections of road ditch in this area had running water in them during field investigations, and erosion was evident.

RECOMMENDATION	INVOLVED PARTIES	FUNDING REQUIRED	SOURCE OF FUNDS	TIMEFRAME
Much of the road ditch in the northern portion of Adirondack Road is in need of stabilization, through rock lining and vegetative measures. Given the heavy clay soils, care must be taken to minimize sediment suspension and turbidity.	County DPW, Town Highway Dept,	$2,000-$3,000	Municipal	Immediate

STREAMS

The Schroon River and the lake's tributary streams are the lifeblood of Schroon lake. In general, the quality of the river and streams is highly correlated to the quality of the lake. The waters of even the farthest reaching point of the Schroon River or any tributary stream will reach the lake within 48 hours. The quality of these flowing waters will ultimately become the quality of the lake, so it important to understand their nature and overall condition.

RECOMMENDATION	INVOLVED PARTIES	FUNDING REQUIRED	SOURCE OF FUNDS	TIMEFRAME
1. Develop an education and outreach program to target streamside property owners highlighting the benefits of creating and maintaining vegetated stream buffers. Numerous excellent sources of information exist that are geared toward homeowners on this topic, available from Cornell Cooperative Extension, the Lake George Association, and other groups.	Municipalities, Cornell Cooperative Extension, SWCD	-	Lake Associations Municipalities	Short term
2. Consider public discussion regarding creation of municipal codes for new development requiring a vegetative buffer be maintained (a no-cut zone) adjacent to the stream.	Municipalities	-	-	Long Term
3. Any areas of streambank erosion identified should be directed to the local Soil and Water Conservation District for design assistance. Encourage the use of vegetative protection methods over hard armoring where possible.	Municipalities, local SWCD	-	-	Short Term
4. To minimize the growth of the Rogers Brook delta, research the possibility of utilizing the concrete channel/reservoir just downstream of NYS Route 9 as an in-stream sediment pond (i.e. clean out on a regular basis with machinery). If this is unfeasible, then areas upstream of Route 9 could be reviewed to install an in-stream sediment pond in the brook to capture excess sediment.	NYS DOT, Municipalities, SWCD	$20,000-$40,000	NYS, Municipalities	Medium Term

HIGHWAY OPERATION RECOMMENDATIONS

Each municipality and both counties in the Schroon Lake watershed have their own highway departments, which is responsible for the integrity and safety of their roads. In addition to these local roads, there is also a significant mileage of New York State roads (NYS Route 9 and Interstate 87) which actually account for most of the paved area in the watershed.

Traditional practices undertaken by highway departments include winter de-icing operations, roadside ditching, paving activities, drainage practices and new road construction. As many roads and ditches drain directly into streams and lakes, it is imperative that highway operations be managed not only for public safety, but also with consideration for environmental impacts.

RECOMMENDATION	INVOLVED PARTIES	FUNDING REQUIRED	SOURCE OF FUNDS	TIMEFRAME
1. Convene a series of forums of highway officials from the towns of Schroon, Chester, and Horicon, the two county DPW's and NYS DOT to discuss de-icing practices within the watershed. Discuss the state of the science and the cost of management practices and de-icing alternatives which would benefit Schroon Lake. Review Kelting's 2010 study and others prior to the meeting for an overview of potential alternatives.	Town highway DPWs, County DPWs, NYS DOT	-	-	Short Term
2.Make it a priority in highway budgets to fund high-quality winter spreading equipment and training for departments. Send all appropriate personnel to Cornell's annual highway school and the NYS DOT de-icing workshops.	Town highway DPWs, NYS DOT	Variable	Municipal, NYS	Long Term
3. Highway departments at all levels should engage the services of the Essex and Warren County SWCD's to undertake hydroseeding operations for all bare road ditches and banks within the watershed area, particularly those areas identified in this plan. All departments should develop an annual review of all road ditches and banks and address as needed. Make seeding and restoration activities a regular part of all highway maintenance practices.	Town highway DPWs, NYS DOT, SWCD	-	-	Ongoing
4. Undertake a field evaluation of all stream culverts in the watershed to determine whether they are passable to fish (brook trout). Use evaluation criteria developed by Mihuc (noted earlier) for this study. Create a list of culverts which are both structurally deficient and are impassable to fish, and work with highway departments to get these culverts replaced over time.	Town highway DPWs, NYS DOT, SWCD, Lake Assns.	$10,000-$15,000	NYS, Municipal,	Short Term
5. For all future stream culvert replacements, utilize new NYS DEC General Permit criteria for design. All stream culvert replacements should be conducted with the local Soil and Water Conservation District, who has a standing permit to undertake this work, and will properly size and design the system.	Town highway DPWs, NYS DOT, NYS DEC, SWCD	-	-	Short Term
6. Consider the purchase of a "catch vac" truck between the towns of Chester, Schroon and Horicon to clean out catch basins and new stormwater treatment systems	Municipalities	$50,000	Municipal	Medium term

WASTEWATER RECOMMENDATIONS

For the large majority of homes in the Schroon Lake watershed, wastewater treatment is done by individual household septic systems. Proper treatment of this wastewater is not only important for public health, but is critically important to maintaining a clean Schroon Lake.

RECOMMENDATION	INVOLVED PARTIES	FUNDING REQUIRED	SOURCE OF FUNDS	TIMEFRAME
1.Develop an electronic database for the Town of Schroon sewer infrastructure, including maps, outlining pertinent information on the age of pipes, type of pipes, known condition, pump systems, etc. Develop long-range plan to upgrade and replace aging infrastructure within the sewer conveyance system.	Town of Schroon, Contractors	$30,000-$50,000	Municipal, NYS	Long Term
2. Develop a prioritized list of areas within the Schroon sewer district which would be most cost-effective to add to the sewer system, based upon density, estimated cost of design and construction, and overall feasibility. Seek funds for a full feasibility study to update older information.	Town of Schroon, Contractors	-	-	Long Term
3. Develop a program to conduct a sanitary survey of all septic systems within a specified buffer width around the lakeshore (+-300 feet) to get a baseline understanding of the integrity of the shore-area septic systems. Consider a cost-shared pump-out and water conservation kit program to obtain landowner buy-in to this initiative.	Municipalities, SWCD's	Variable based upon sanitary survey comprehensiveness	Municipal, NYS	Medium Term
4. Add a provision to the town of Schroon and Horicon municipal codes requiring an engineer's inspection of all septic systems upon home ownership sale. Chester already requires this (Town of Chester Onsite Wastewater Treatment Local Law, page 12). Engineer's report should be provided to the municipality and kept on file.	Towns of Schroon and Horicon	-	-	Short Term

Wastewater Recommendations continue on the following page

RECOMMENDATION (Continued)	INVOLVED PARTIES	FUNDING REQUIRED	SOURCE OF FUNDS	TIMEFRAME
5. Most septic failures result from lack of homeowners awareness of maintenance requirements. To address this, an educational flyer could be sent as part of an annual municipal mailing (tax bill, water bill, etc). Cornell Cooperative Extension FS1 “Your Septic System” and EPA’s “Homeowner’s Guide to Septic Systems” are excellent.	Towns of Schroon, Horicon and Chester	Minimal	Municipal	Short Term
6. Evaluate the feasibility of creating a “Septic Maintenance District” along densely developed shoreline and stream areas (i.e., east shore). These districts mandate routine pumpouts and inspections every 3-5 years. These districts have been used successfully in many areas around NYS in areas of dense development but no sewering.	Towns of Schroon, Horicon and Chester	$10,000-$20,000	NYS	Long Term
7. Undertake a project to evaluate the comprehensiveness of the DEC Private/Commercial/Institutional (P/C/I) inventory of septic systems within a ½ mile radius of Schroon Lake. Determine additional properties which are not in DEC’s database and work with DEC to get all properties under the permit program. The Lake George Watershed Coalition is currently working on a similar initiative for Lake George.	SWCD's	$10,000-$15,000	NYS	Medium Term
8. For new residential septic systems, encourage the installation and use of effluent filters (i.e. Polylok, Tuf-Tite, as, many others) on all septic tanks. These filters are inexpensive ($50-100), easy to install, and can greatly increase the life of the leach field, leading to less failures and better water quality protection.	Towns of Schroon, Horicon and Chester	$50-100 per household	-	Short Term

REGULATORY RECOMMENDATIONS

This regulatory review identifies that between the existing federal, state, and local regulations, the Schroon Lake watershed has numerous layers of regulatory reviews and protections. Local municipal regulations and codes often control most of the development in a community, and it is these regulations and their enforcement which often have the greatest long-term impact upon a waterbody. Based upon the municipal reviews and interviews, the following recommendations were developed:

RECOMMENDATION	INVOLVED PARTIES	PROBABLE COST	SOURCE OF FUNDS	TIMEFRAME
1. Municipal Land Use Plans and Codes are essential to sustainable growth and to the protection of local natural resources. Several of the municipal officials felt that a review of their codes was warranted, particularly relating to conservation issues such as erosion control, stormwater management, and timber harvesting. Several excellent model laws exist for such topics, and the NYS Department of State is an excellent resource for this information.	Towns of Schroon, Horicon and Chester	-	-	Medium Term
2. The NYS DEC has stormwater regulations that apply to land disturbance of one or more acres, mandating the development of stormwater and erosion control plans (Stormwater Pollution Prevention Plans – SWPPP’s). No local code was found to acknowledge these regulations. Planning Boards should require that all proposed development activities over one acre in size provide copies of these plans to the board during the municipal site plan approval process. Municipalities should also require proof of DEC permit compliance prior to commencement of land disturbance activities.	Towns of Schroon, Horicon and Chester	-	-	Short Term
3. Professional review of timber harvest activities can significantly reduce impacts to the water or land resources from poorly planned logging activities. None of the three towns reviewed have regulations for timber harvest and silvicultural activities. For commercial logging activities (typically those greater than 25 cords per year), the towns should consider requiring a permit and review process. A plan including log road layout, stream crossings, landings, and erosion and sediment control should be included. Review by either the Code Enforcement Officer or the Planning Board should also be incorporated. Example language can be found locally at the Town of Lake George or Town of Bolton, or a comprehensive forestry law can be found from the Town of Bristol, NY. All loggers should conform to the practices outlined in the NYS Forestry BMP Field Guide. http://www.nycwatershed.org/pdfs/BMP%20Field%20Guide.pdf	Towns of Schroon, Horicon and Chester	-	-	Short Term

INVASIVE SPECIES MANAGEMENT

The Schroon Lake watershed is home to a few species of upland invasive plants as well. Thankfully, most of these plant populations are currently more of a nuisance than an economic impact. However, without public education, management and control methods, these plants have the ability to clog our wetlands, roadsides, and other scenic areas.

RECOMMENDATION	INVOLVED PARTIES	FUNDING REQUIRED	SOURCE OF FUNDS	TIMEFRAME
1. Provide training to all highway personnel from the Towns of Schroon, Chester and Horicon on the identification of invasive plants, including proper disposal techniques.	SWCD's, Cornell Cooperative Extension	-	-	Short Term
2. Discontinue the practice of donating road ditch soil to landowners or re-using the soil on other fill projects. Temporarily dispose of all ditch soils which are suspected of containing invasive plants at the local highway garage on an impervious area.	Towns of Schroon, Horicon and Chester	-	-	Short Term
3. Continue and increase public education and outreach programs about invasive plants through the SLA, ESSLA, APIPP and the municipalities.	Lake Associations	-	-	Short Term
4. Map and Inventory all existing known locations of these three invasive plants every few years, and provide these documents to APIPP so they can keep an updated database.	Lake Associations	-	-	Short Term
5. Put in place an eradication program for any identified small plots of invasive plants, either through the municipality or one of the lake associations. Follow APIPP guidelines regarding control and eradication methods.	Towns of Schroon, Horicon and Chester, Lake Associations APIPP	-	-	Short Term
6. “Burn it where you buy it”: The best recommendation for trying to control the spread of invasive insects is to not move firewood. It has been determined that firewood transport from infected areas is the number one vector in the spread of ALB and EAB. The NYSDEC has issued a firewood regulation that restricts the movement of all non-kiln dried firewood to within 50 miles of its origin.	Towns of Schroon, Horicon and Chester, Lake Associations	-	-	Short Term
7. “Buy Local, Buy Native”: Another area of concern regarding these insects is through infected tree and shrub stock. When selecting and planting, please check to see if the stock is of a local origin or from a non-infected area. Work with your local extension agency or soil and water conservation district to find out where local plant sources can be obtained.	Towns of Schroon, Horicon and Chester, Lakes Associations APIPP	-	-	Short Term

STEWARDSHIP RECOMMENDATIONS

Stewardship is a long-term endeavor, and it takes the commitment of all groups to truly achieve the balance between the lake and its surrounding communities. Through this process we see perhaps the most important actions to protect and improve the lake.

RECOMMENDATION	INVOLVED PARTIES	FUNDING REQUIRED	SOURCE OF FUNDS	TIMEFRAME
1. Continue and expand municipal financial support for the growth of both the Schroon Lake Association and East Shore Schroon Lake Association’s programs. All funds put towards these groups are multiplied many times over by their volunteer efforts.	Towns of Schroon, Horicon and Chester	Variable	Towns of Schroon, Horicon and Chester.	Ongoing
2. Education/ outreach programs Expand municipal and lake association education and outreach efforts to nearshore residents regarding issues such as septic system maintenance, water conservation, and the benefits of vegetative buffers and lake-scaping initiatives.	Towns of Schroon, Horicon and Chester, Lakes Assns.	-	Towns of Schroon, Horicon and Chester, Lakes Assns.	Long Term
3. Continue and expand the “Adopt-a-Highway Program” to more roads within the Schroon Lake watershed, to keep litter out of the lake and steams.	Lakes Assns, volunteers	-	-	Long Term
4. Work with local lawn-care dealers to promote and sell zero-phosphorus (P) fertilizers. Consider a Don’t “P” on your lawn outreach and educational campaign, such as developed by the Lake Champlain Basin Program.	Towns of Schroon, Horicon and Chester, Lakes Assns.	-	-	Long Term
5. Work with Warren and Essex County SWCD’s to obtain funding for a “Septic System Pumpout, Water Conservation and Education program”, which has been tremendously successful on four lakes in Warren County.	Towns of Schroon, Horicon and Chester, Lakes Assns., SWCD	-	NYS, Towns of Schroon, Horicon and Chester	Medium Term
6. Undertake a “Clean Sweep” chemical disposal program for homeowners in the Schroon Lake area in cooperation with municipalities and DEC, which will provide safe and free disposal of unwanted household chemicals, fertilizers, pesticides and paints.	NYS DEC, Towns of Schroon, Horicon and Chester, Lakes Assns.	$20,000-$40,000	NYS, Towns of Schroon, Horicon and Chester	Long Term
7. Work with all parties to obtain state grant funding and private foundation funding for these and other identified stewardship and conservation initiatives.	Towns of Schroon, Horicon and Chester, Lakes Assns., SWCD	-	NYS, Federal Towns of Schroon, Horicon and Chester, Lakes Assns., SWCD	Long Term
8. Evaluate implementation progress of this Watershed Plan and update recommendations every five years.	Lake Associations, SWCD’s, Municipalities	-	Long term	

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Maps & Graphs

APPENDIX 1: Maps

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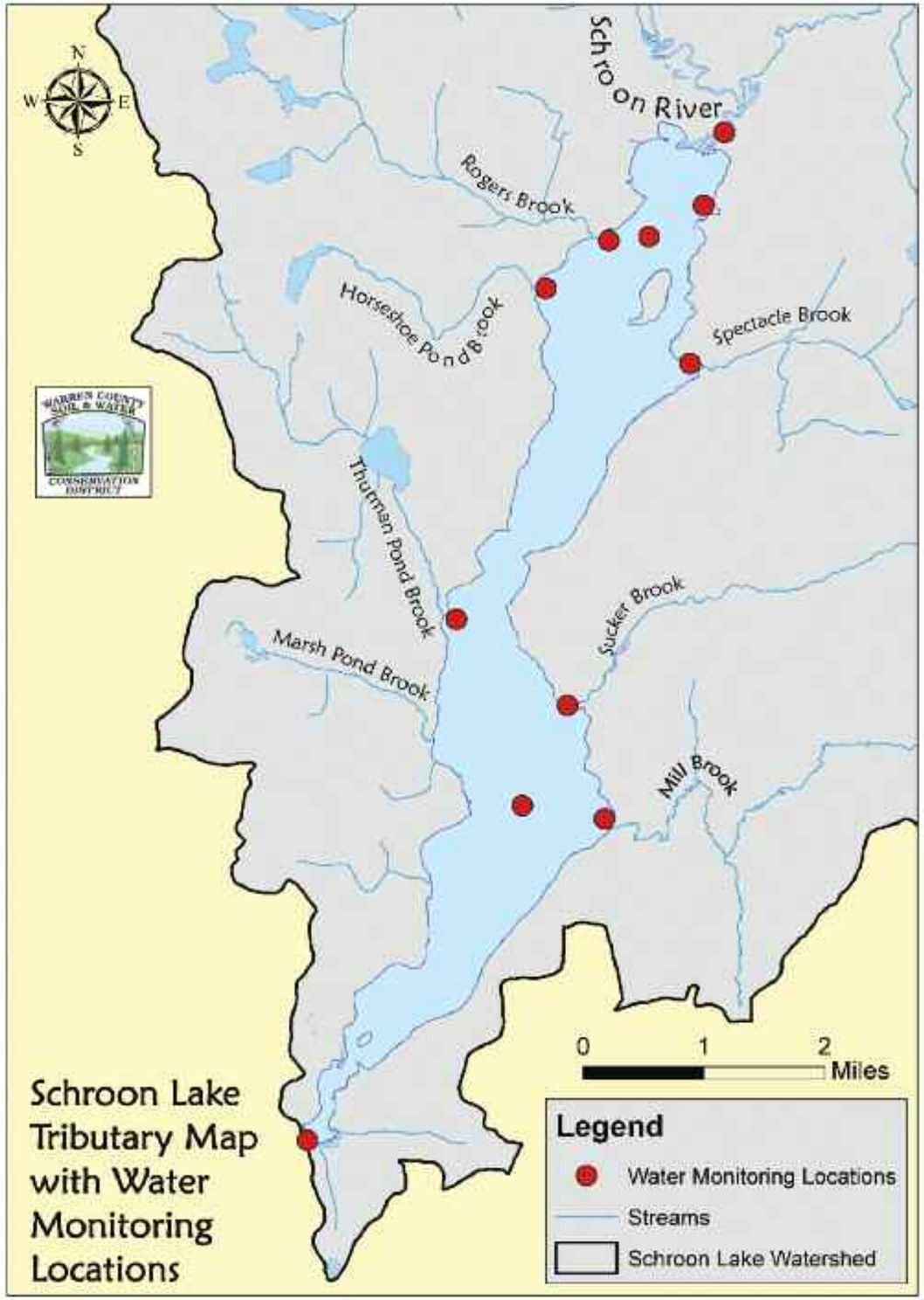
Map 2 - Known Eurasian Watermilfoil Sites on Schroon Lake, 2009
Map 3 - Schroon Lake Watershed Land Cover, 2001
Map 4 - Schroon Lake Land Ownership
Map 5 - Schroon Lake Watershed Hydrologic Soil Groups
Map 6 - Schroon Lake Watershed Hydrography
Map 7 - Town of Schroon Sewer District
Map 8 - Schroon Lake Watershed Municipalities
Map 9 - Schroon Lake Watershed Topographic Image
Map 10 - Schroon Lake Bathymetric Map (Lake Depths)
Map 11 - Schroon Lake Watershed State Land
Map 12 - Schroon Lake Park District Boundary
Map 13 - Schroon Lake Lakeshore Land Cover

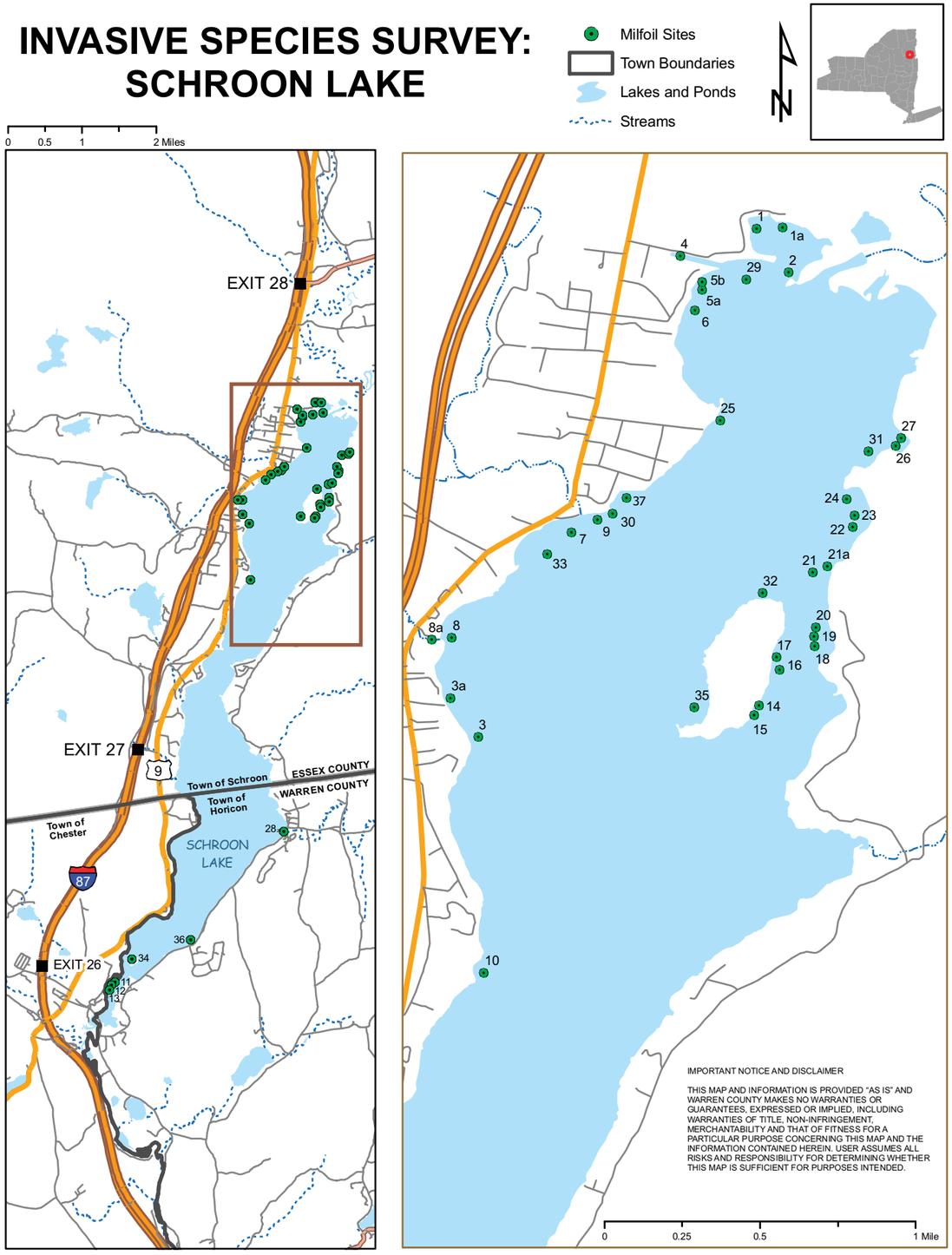
APPENDIX 2: Graphs

Figure 1 - 1995-2009 Schroon Lake North Basin Total Phosphorus Levels
Figure 2 - 1995-2009 Schroon Lake South Basin Total Phosphorus Levels
Figure 3 - 1995-2009 Schroon Lake North vs. South Basin Epilimnetic Total Phosphorus Levels
Figure 4 - 1995-2009 Schroon Lake North Basin Chlorophyll a vs. Secchi Disk Transparency
Figure 5 - 1995-2009 Schroon Lake South Basin Chlorophyll a vs. Secchi Disk Transparency
Figure 6 - 1995-2009 Schroon Lake Secchi Disk Transparency Levels
Figure 7 - 1995-2007 Schroon Lake Tributaries Conductivity Levels

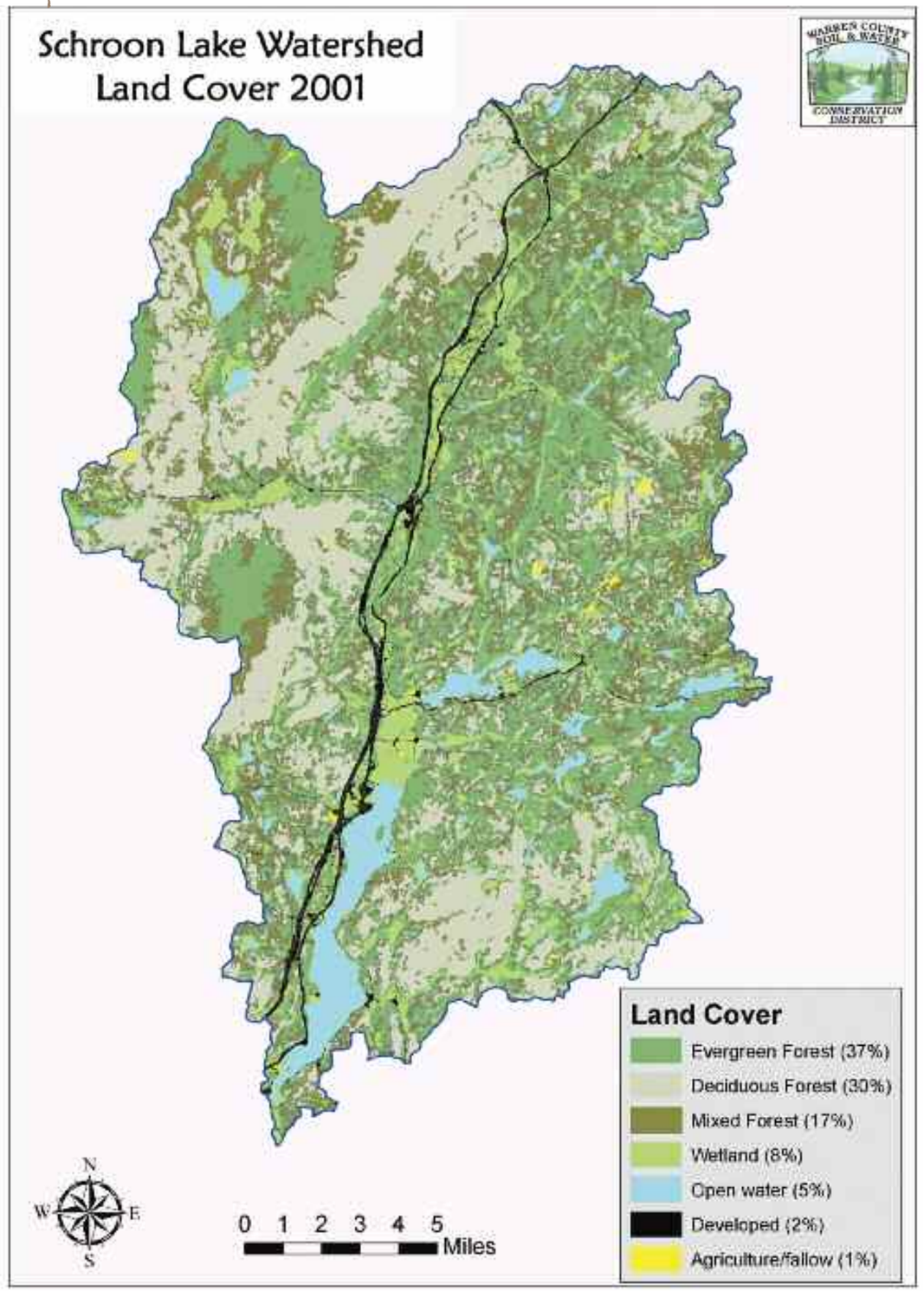
Map 1



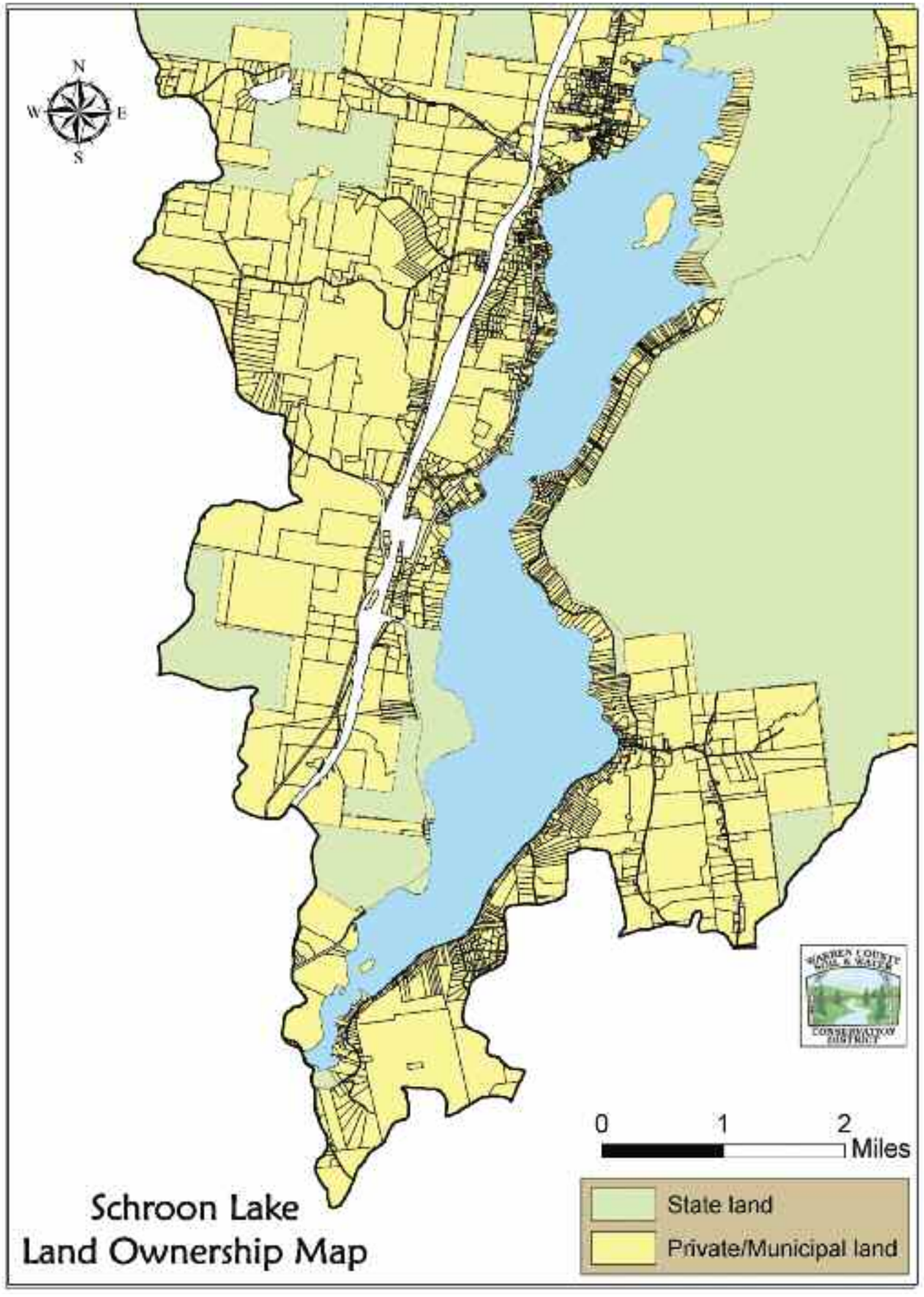
INVASIVE SPECIES SURVEY: SCHROON LAKE



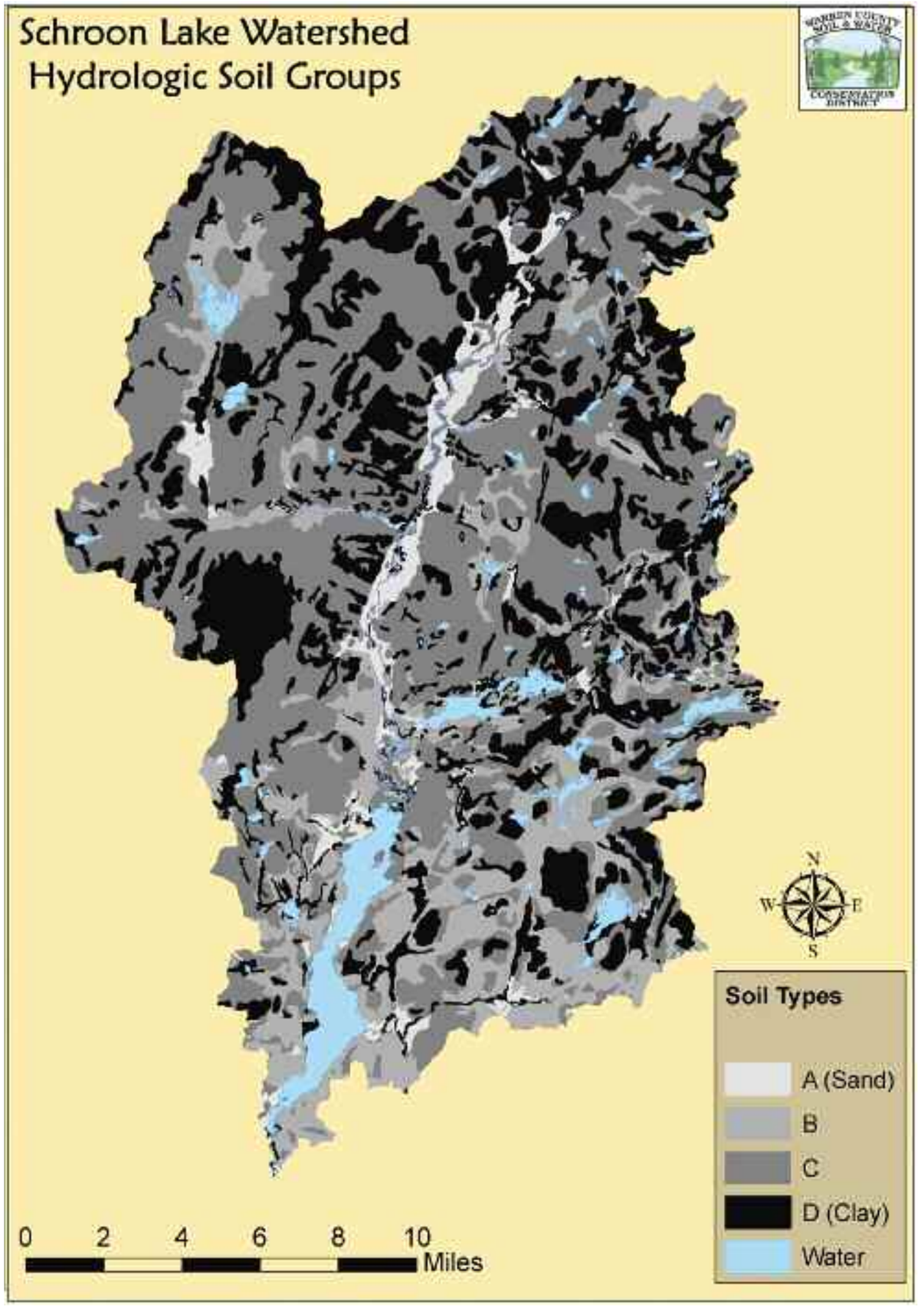
Map prepared by the Warren County Planning Department in October 2009

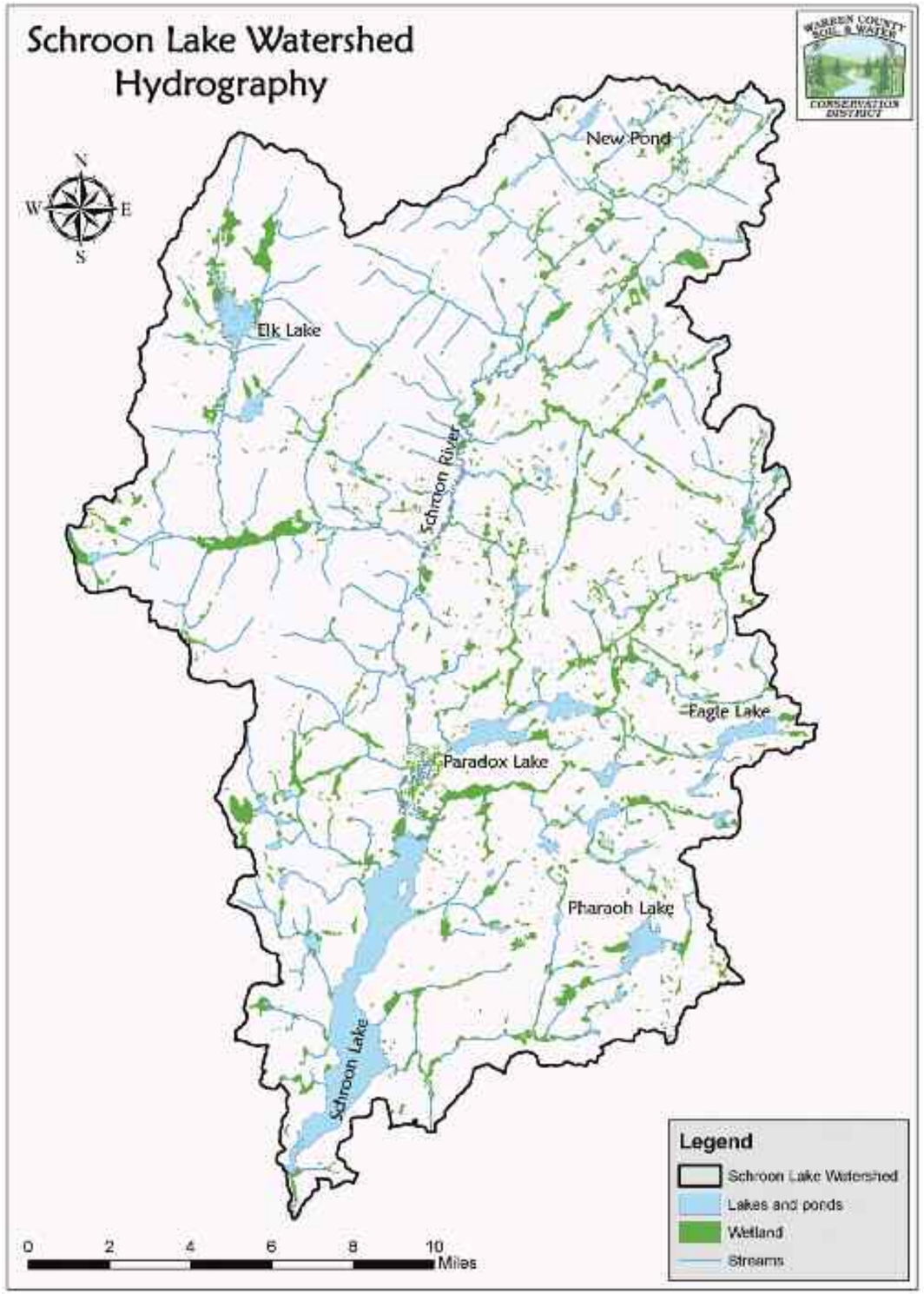


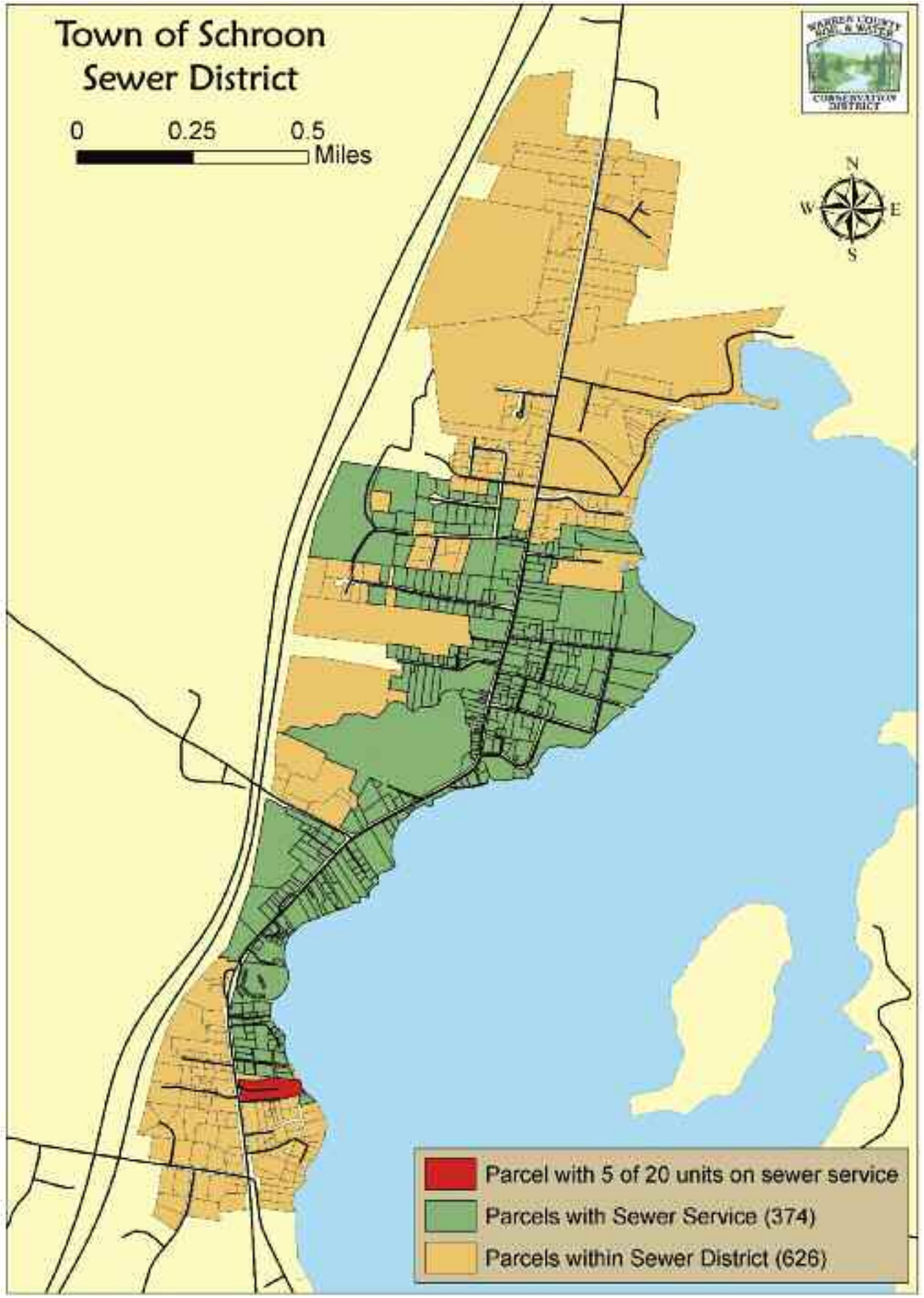
Map 4


N
W
E
S
0
1
2
Miles
State land
Private/Municipal land
Schroon Lake
Land Ownership Map

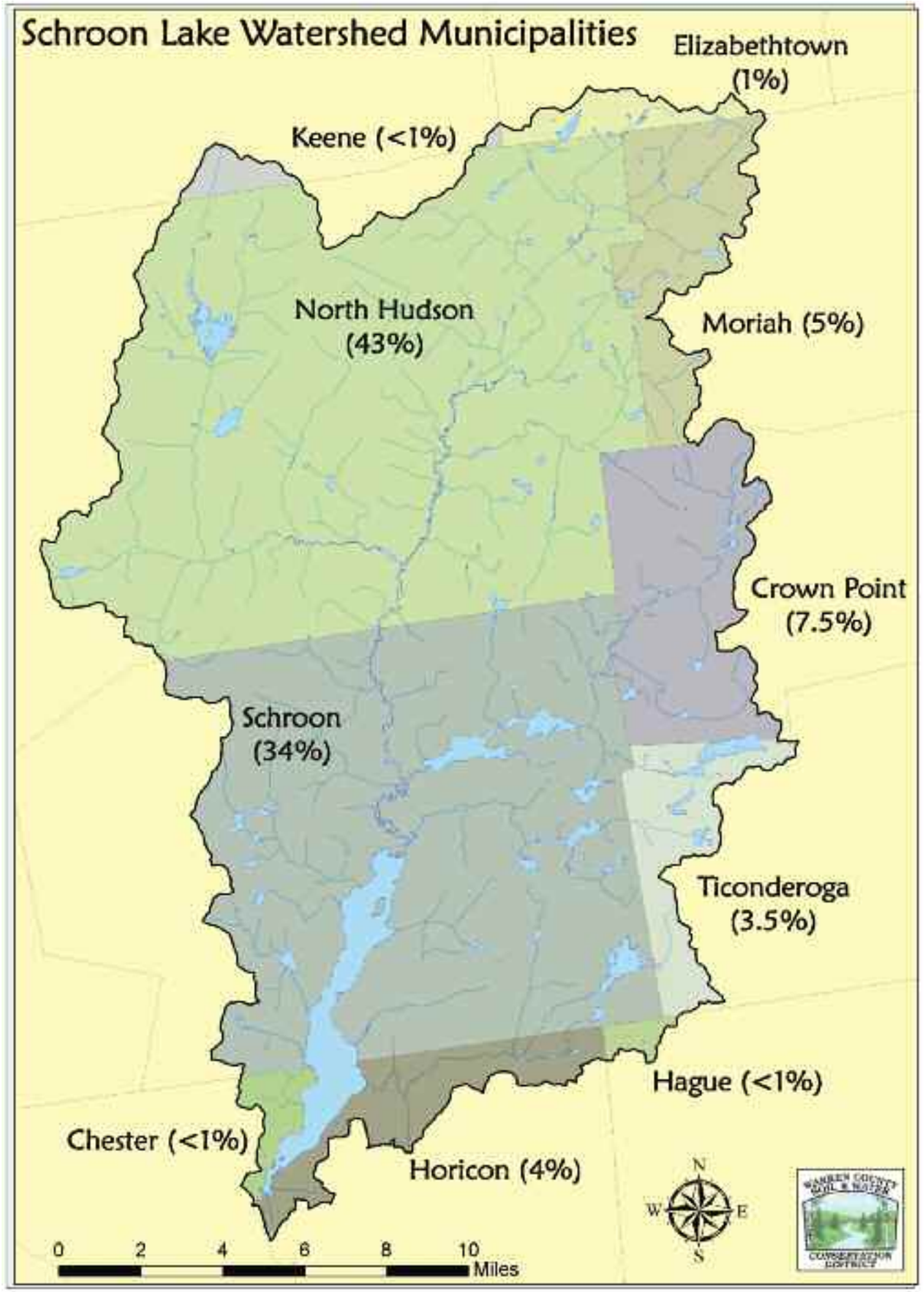
Map 5


Schroon Lake Watershed
Hydrologic Soil Groups
N
W
E
S
Soil Types
A (Sand)
B
C
D (Clay)
Water
0
2
4
6
8
10
Miles

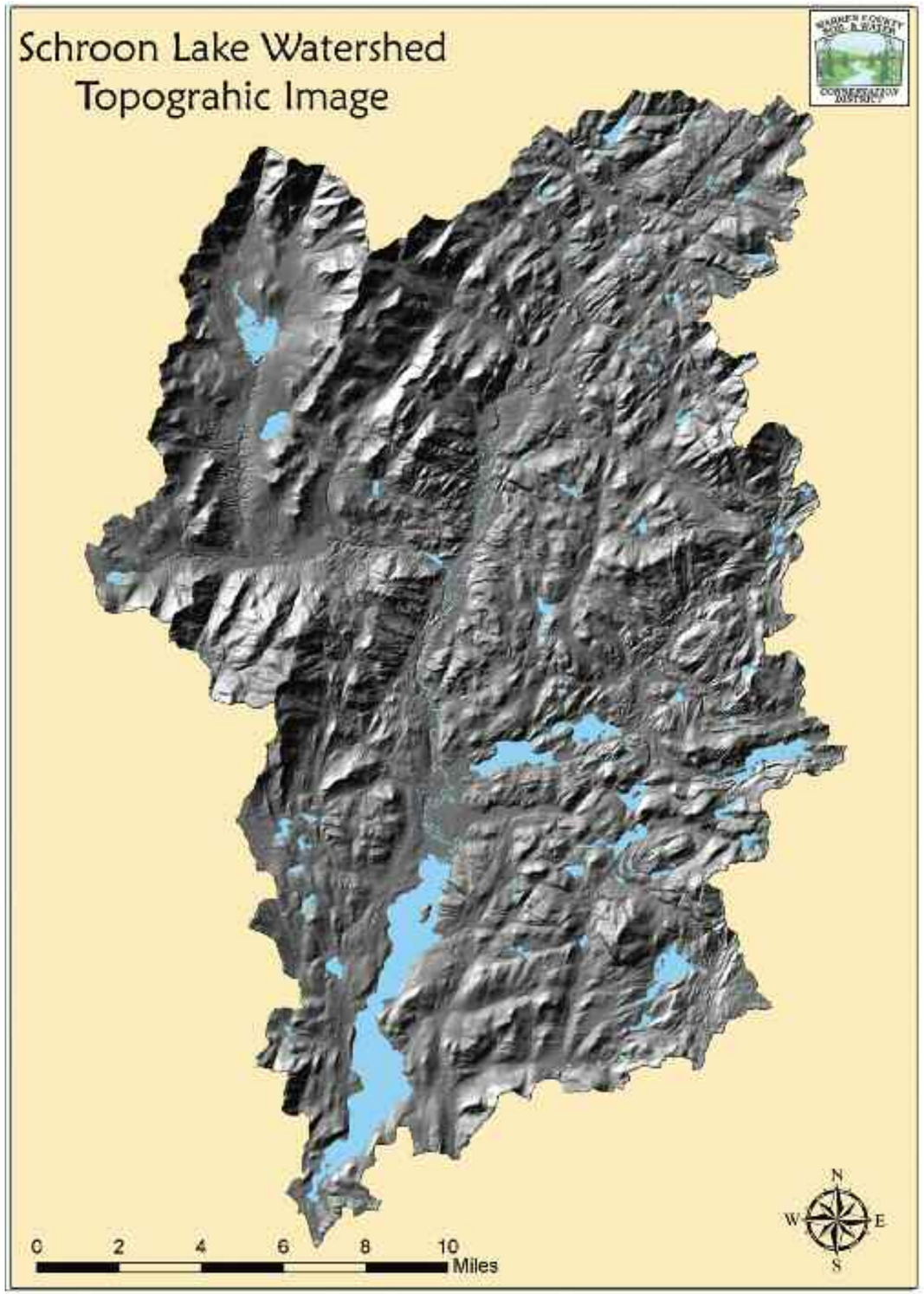

Schroon Lake Watershed
Hydrography
WARREN COUNTY SOIL & WATER CONSERVATION DISTRICT
N
W
E
S
New Pond
Elk Lake
Schroon River
Eagle Lake
Paradox Lake
Pharaoh Lake
Schroon Lake
0 2 4 6 8 10
Miles
Legend
Schroon Lake Watershed
Lakes and ponds
Wetland
Streams


Town of Schroon
Sewer District
0 0.25 0.5
Miles
WARREN COUNTY SOIL & WATER CONSERVATION DISTRICT
N
W
E
S
Parcel with 5 of 20 units on sewer service
Parcels with Sewer Service (374)
Parcels within Sewer District (626)

Map 8

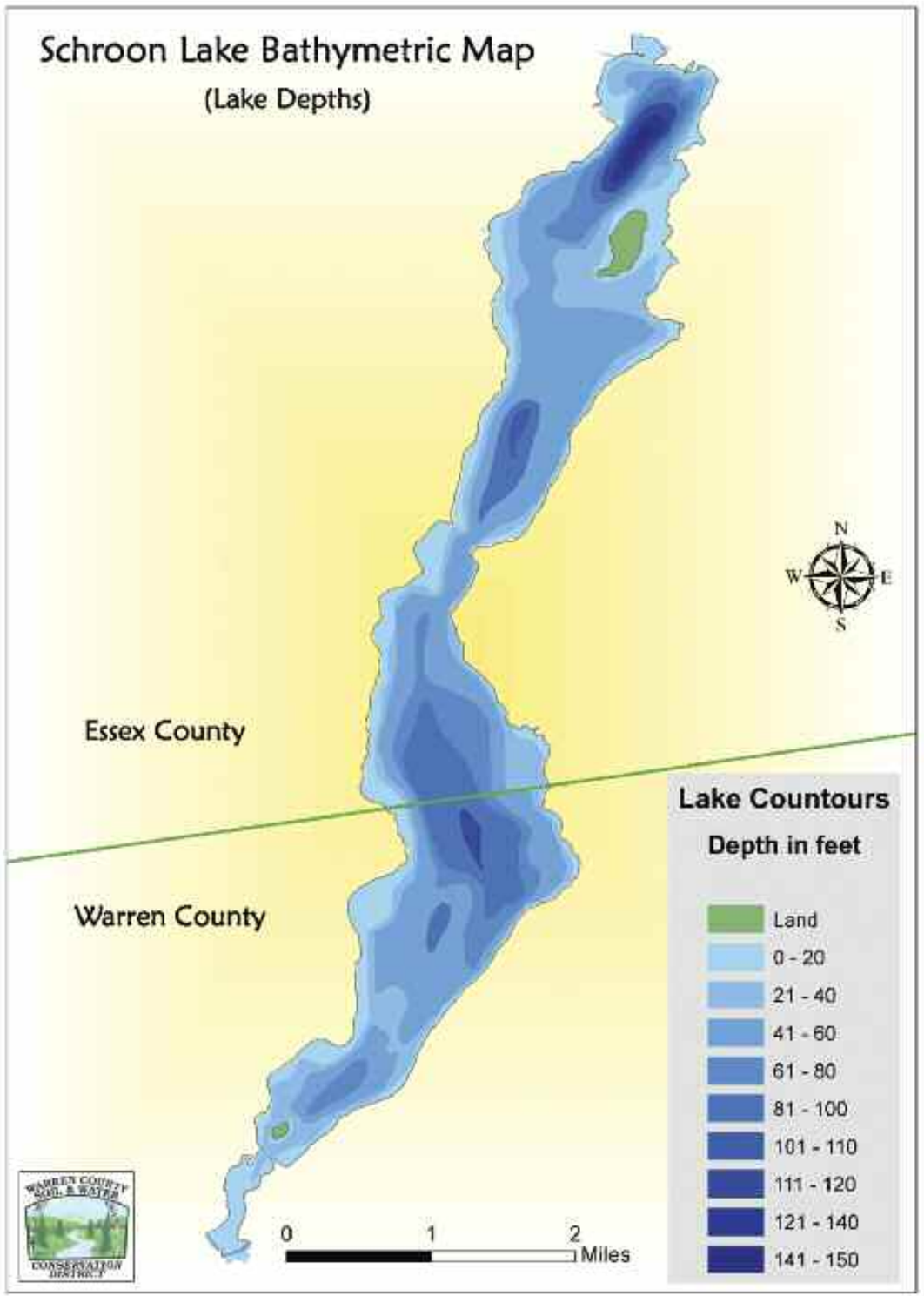

Schroon Lake Watershed Municipalities
Elizabethtown (1%)
Keene (<1%)
North Hudson (43%)
Moriah (5%)
Crown Point (7.5%)
Schroon (34%)
Ticonderoga (3.5%)
Hague (<1%)
Chester (<1%)
Horicon (4%)
0 2 4 6 8 10 Miles
N
W
E
S

Map 9

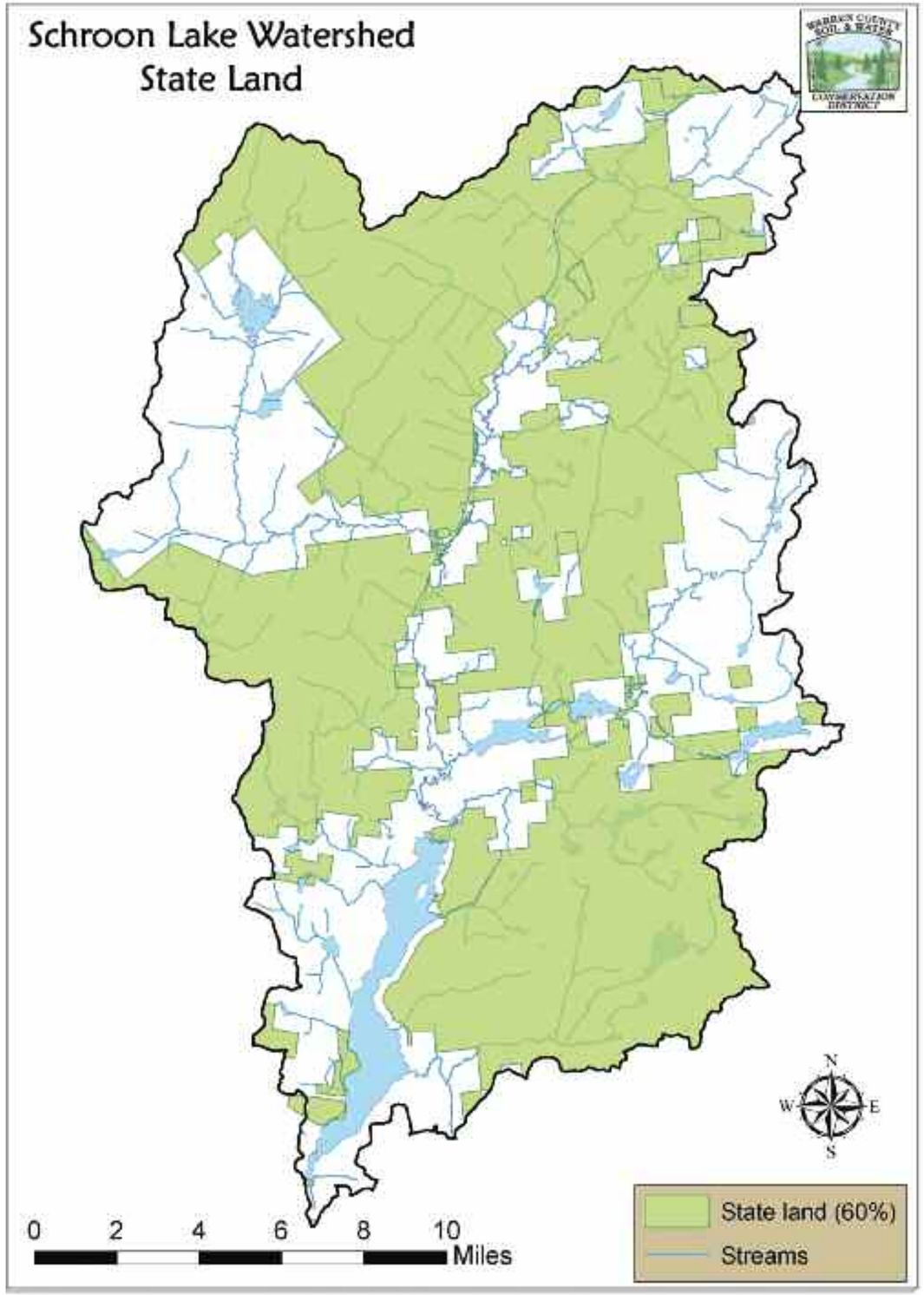

Schroon Lake Watershed
Topograhic Image
0 2 4 6 8 10 Miles
N
W
E
S

Schroon Lake Bathymetric Map

(Lake Depths)



Schroon Lake Watershed State Land



Map 12


Schroon Lake
Park District Boundary
Boundary shown is approximate and is not intended for official use
Rogers Brook
Horseshoe Pond Brook
Spectacle Brook
Sucker Brook
Marsh Pond Brook
Mill Brook
0 0.5 1 1.5 2
Miles
Schroon Lake Park District
Town of Schroon
Town of Horicon
Town of Chester
N
W
E
S
WARREN COUNTY SOIL & WATER CONSERVATION DISTRICT

Map 13

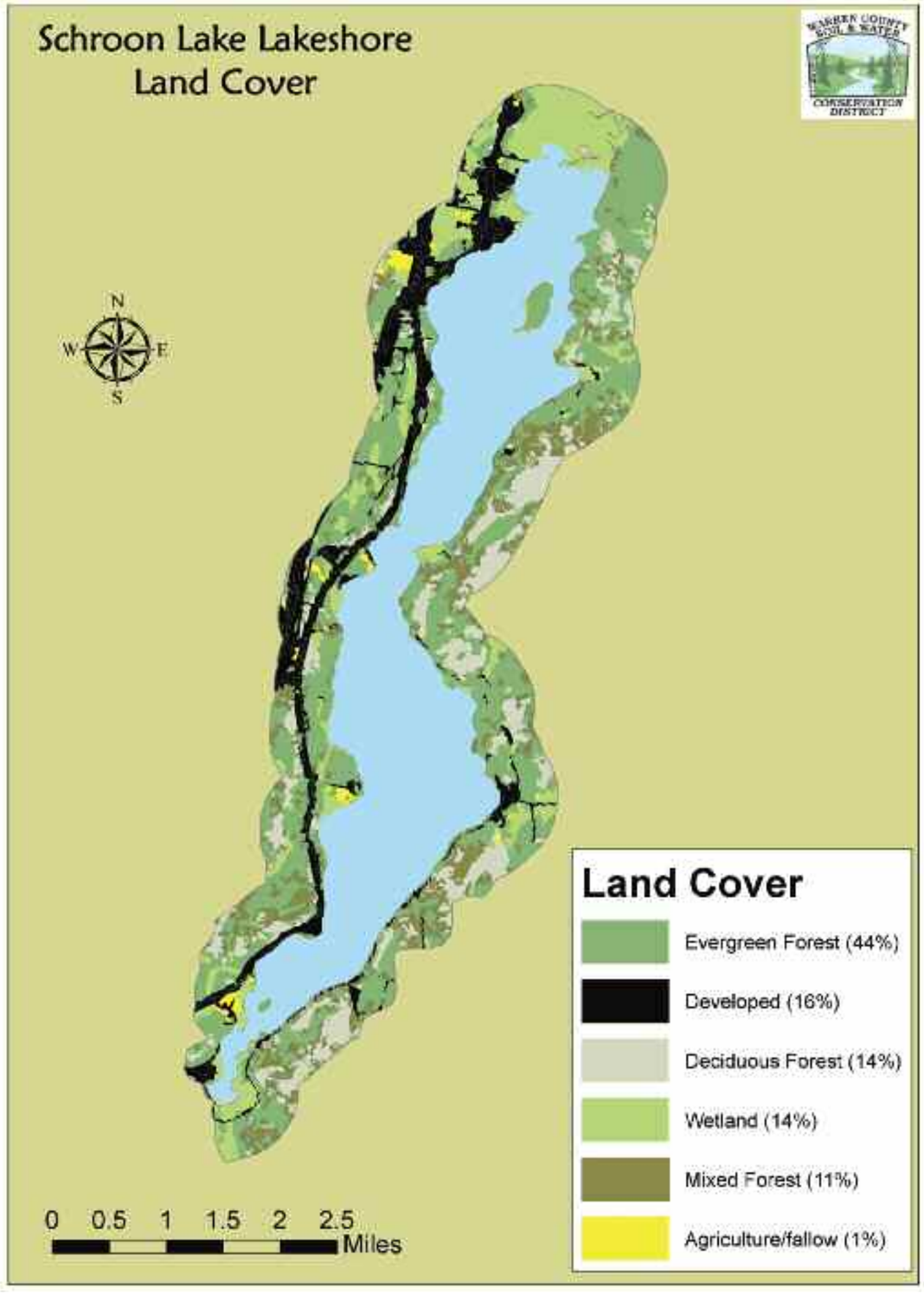

Schroon Lake Lakeshore
Land Cover
N
W
E
S
WARREN COUNTY SOIL & WATER CONSERVATION DISTRICT
0 0.5 1 1.5 2 2.5
Miles
Land Cover
Evergreen Forest (44%)
Developed (16%)
Deciduous Forest (14%)
Wetland (14%)
Mixed Forest (11%)
Agriculture/fallow (1%)

Figure 1. 1995-2009 Schroon Lake North Basin Total Phosphorus Levels

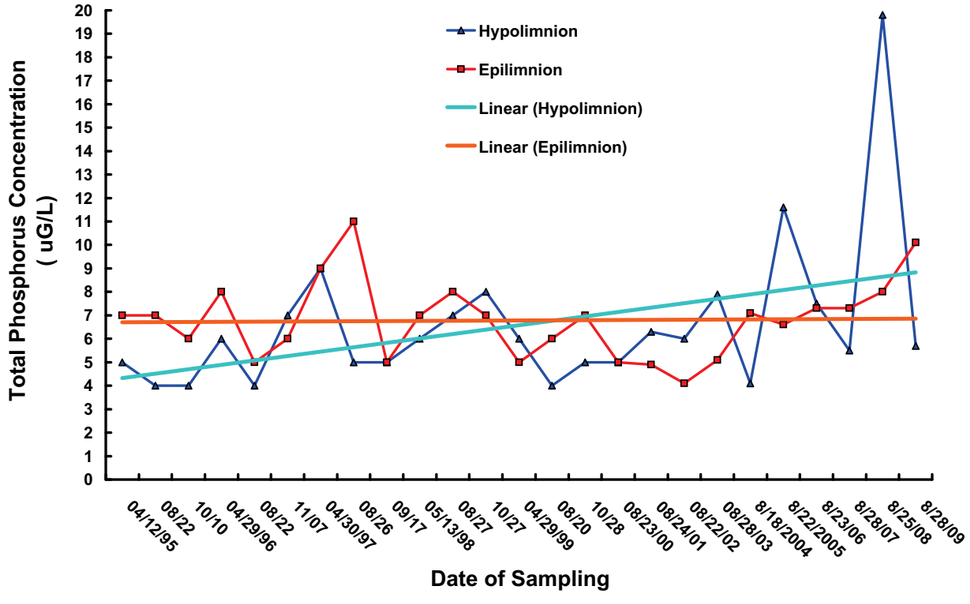


Figure 2. 1995-2009 Schroon Lake South Basin Total Phosphorus Levels

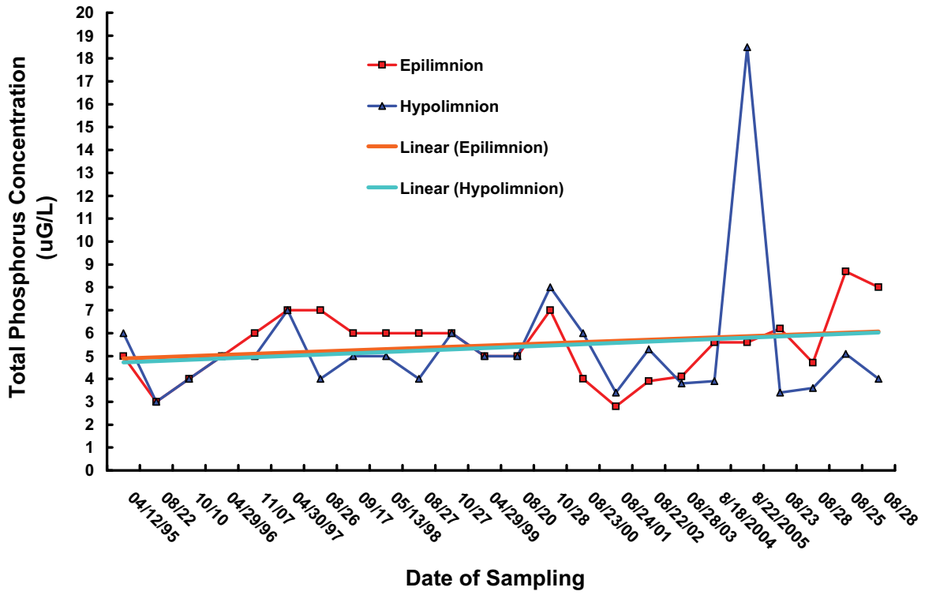


Figure 3. 1995-2009Schroon Lake North vs. South Basin Epilimnetic Total Phosphorus Levels

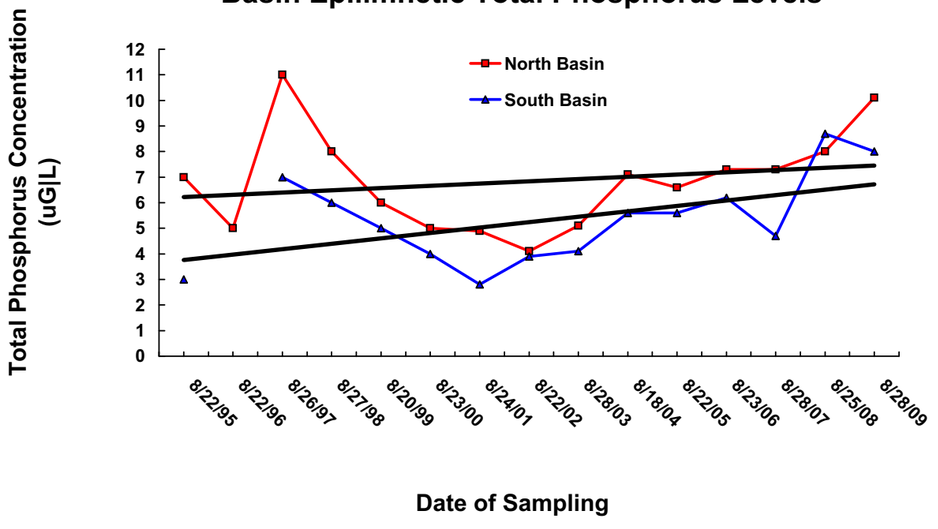


Figure 4. 1995-2009 Schroon Lake North Basin Chlorophyll a vs. Secchi Disk Transparency

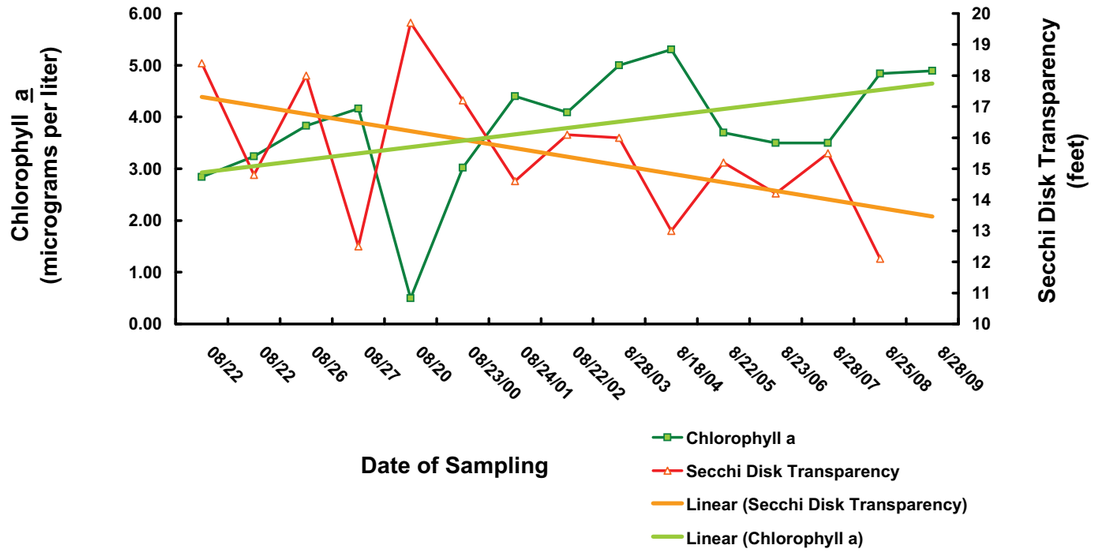


Figure 5. 1995-2009 Schroon Lake South Basin Chlorophyll a vs. Secchi Disk Transparency

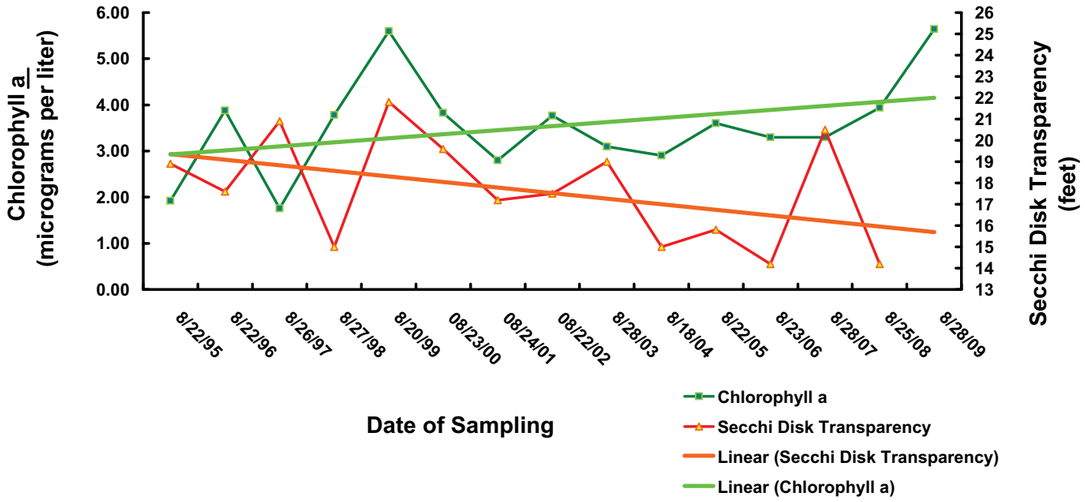


Figure 6. 1995-2009 Schroon Lake Secchi Disk Transparency Levels

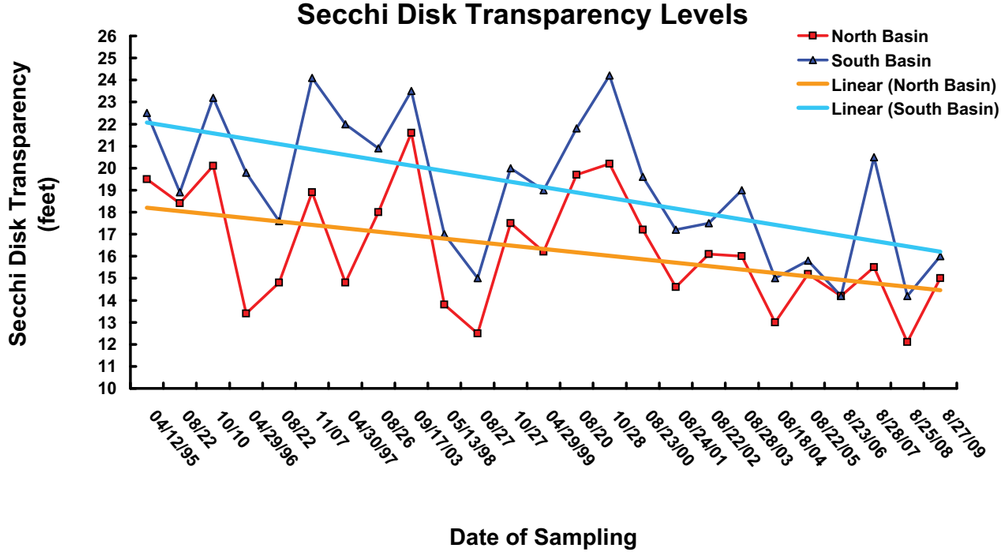
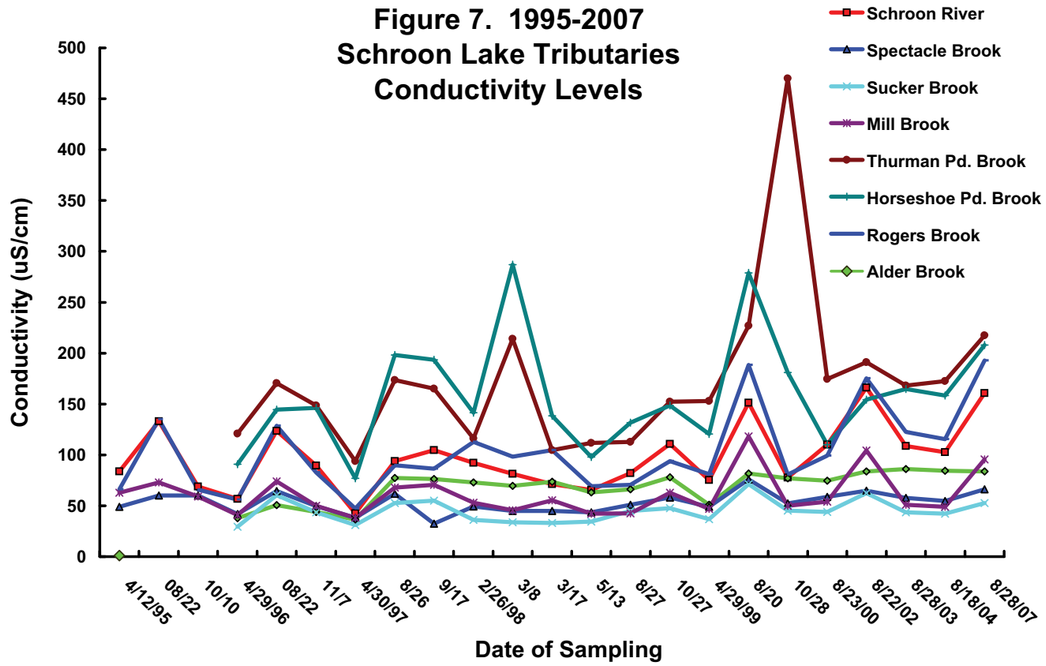
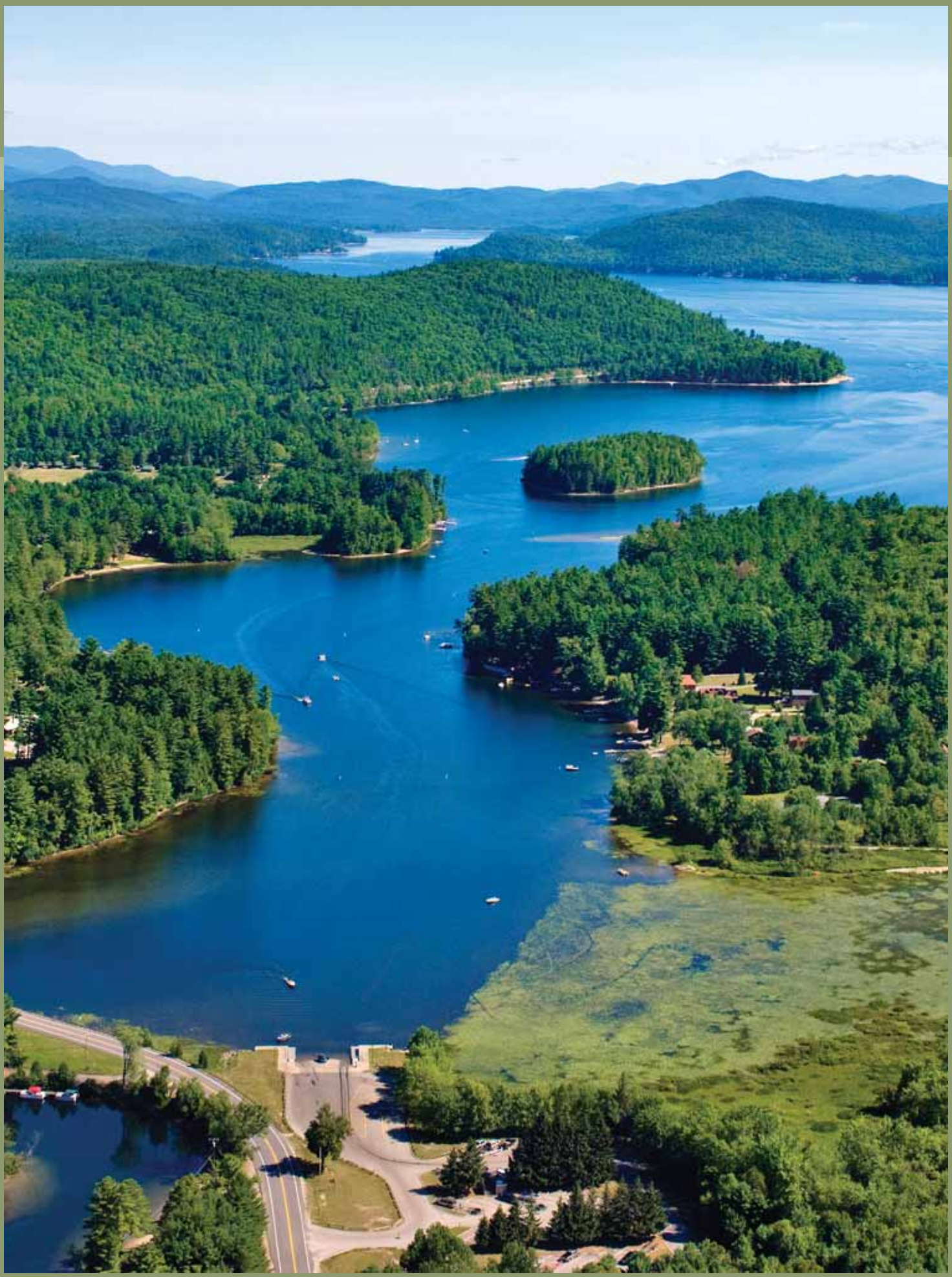


Figure 7. 1995-2007 Schroon Lake Tributaries Conductivity Levels





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