

# Lake Luzerne

# Watershed Assessment



Prepared by the

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## Table of Contents

### **Introduction 1**

### **Lake and Tributary Characteristics 2**

Overview 2  
Lake Water Quality 3  
Lake Luzerne Tributaries 4  
Aquatic Plants in Lake Luzerne 4

### **Soils in the Watershed 5**

### **Land Use in the Watershed 6**

### **Land Use Considerations on Water Quality 7**

Septic Systems 7  
Soil Erosion in the Watershed 8  
Lawn Care and Fertilizer Use 8  
Road Runoff 9

### **Recommendations to Protect the Quality of Lake Luzerne 10**

General Recommendations 10  
Nuisance Aquatic Plant Recommendations 10  
Water Quality Recommendations 11  
Stormwater 11  
Septic Systems 11  
Lawn Care/Fertilizers 12

### **Summary and Conclusions 12**

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## Table of Maps

Map 1: Watershed Location (page 1)  
Map 2: 1995 Infrared Aerial Photo (page 2)  
Map 3: Soils in the Watershed (page 5)  
Map 4: Land Use in the Watershed (page 6)  
Map 5: Residences in the Watershed (page 7)  
Map 6: Roads and Drainage in the Watershed (page 9)

# Lake Luzerne Watershed Assessment

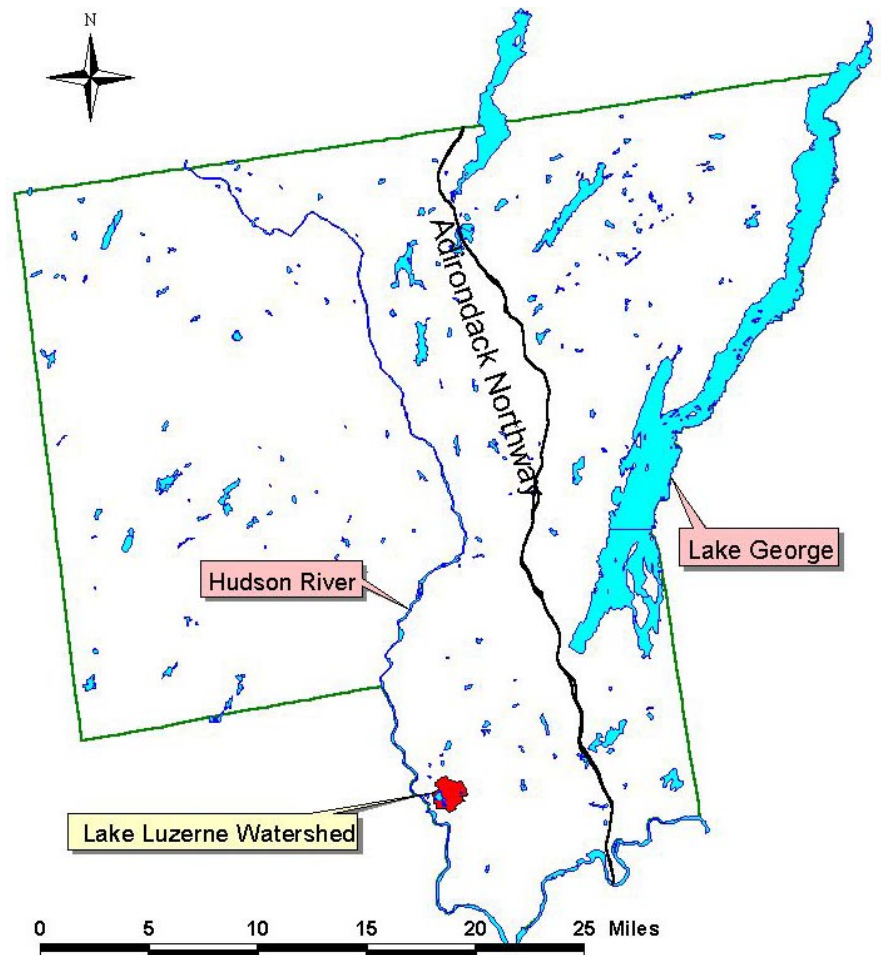
## Introduction

Lake Luzerne is a small lake within Warren County (approximately 111 surface acres), located in the Town of Lake Luzerne. The Lake Luzerne Association has recognized a need to understand the current condition of the lake and surrounding watershed, so that they might be better equipped to protect and improve it for the future. Forming a “water task force”, the Association began to look at ways to undertake a planning effort on this behalf. Working with the Warren County Soil & Water Conservation District, an effort to evaluate the condition of the watershed and the lake itself was begun in 1999. A component of this effort was to complete an assessment of potential and existing nonpoint sources of pollution and nutrients into Lake Luzerne, in order to find practical means to minimize these inputs. Nonpoint source pollution is defined as any pollutant which enters a waterbody that does not come directly out of a point source, such as a pipe. Examples of nonpoint source pollution include runoff from fertilized lawns, failing septic systems, agricultural runoff, and runoff from roads and other asphalt surfaces which may have gas and oil on them. The District in conjunction with the Lake Luzerne Association has conducted a watershed wide assessment of potential and existing sources of these pollutants entering Lake Luzerne, and is undertaking an effort to educate the lakeside residents about failing septic systems, lake management, and other water quality related issues.

This assessment is part of a larger project which is intended to raise the awareness of water quality and other issues on Lake Luzerne, and to determine the existing condition of the lake and its surrounding watershed. This project was funded through a small grant from the New York State Soil and Water Conservation Committee. Other components of this overall effort include an aquatic plant

survey conducted by the Darrin Freshwater Institute (a separate document available through the Lake Luzerne Association), and an ongoing water sampling program (Citizens Statewide Lake Assessment Program) being undertaken by the Lake Luzerne Association. These efforts are intended to give local residents and the Town of Lake Luzerne a better view into the condition of the lake, and to provide insight into issues that may be negatively impacting Lake Luzerne.

The following report is a brief review of the findings related to an assessment of the lake itself and the land use conditions within the watershed, and it includes specific recommendations for improvement projects and educational efforts which could be undertaken to protect and improve the lake.



Map 1: Watershed Location



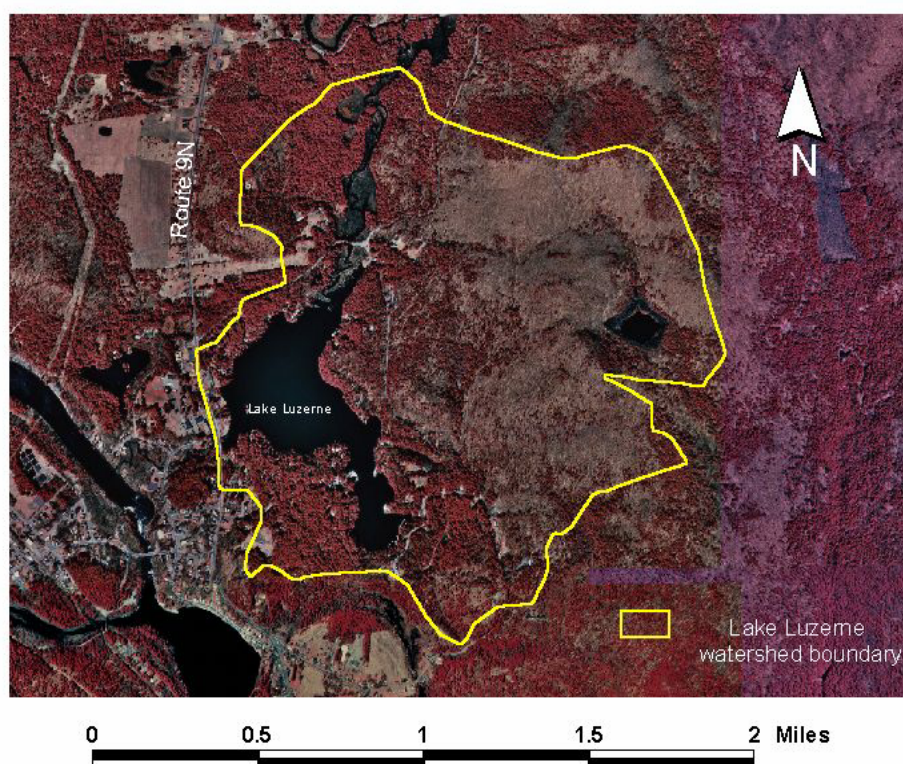
## Lake and Tributary Characteristics

### Overview

Lake Luzerne is located in Warren County, in the Upper Hudson River watershed drainage. The lake itself is encompassed solely within the Town of Lake Luzerne, and its surface area coverage is approximately 111 acres. The maximum depth of Lake Luzerne is 52 feet, with an average lake depth of approximately 24 feet. The volume of Lake Luzerne is approximately 2,664 acre-feet (acre foot equals the amount of water which would cover an acre to the depth of one foot). With this volume of water, the hydraulic retention time within the lake is approximately one month. In other words, it takes about one month for the lake to flush itself out. The NYS DEC water quality classification of Lake Luzerne is a "B", which is suitable for contact recreation, fishing, and other related uses.

This study is primarily intended to get a snapshot in time as to the condition of Lake Luzerne including the overall water quality of the lake, and to determine the existing and potential pollutant sources to Lake Luzerne. It was first necessary to determine the extent of the watershed for the lake. Being the last in a chain of lakes including Lake Vanare, Forest Lake, Fourth, Third, and Second Lakes, Lake Luzerne has a very large overall watershed (over 14,000 acres). However, the majority of the water from this large watershed ends up in one main stream which flows into Lake Luzerne from Second Lake. This being the case, it is relatively easy to determine whether pollutants are coming from the nearshore areas of Lake Luzerne or whether they are coming from up higher in the watershed from the other lakes and lands surrounding them. By analyzing the water quality of the inlet stream into Lake Luzerne, we could determine if we needed to look at the land uses in a much larger geographical perspective or whether we needed to focus on the shoreline area of Lake Luzerne itself.

## Lake Luzerne Watershed (below Second Lake Outlet)



Map 2: 1995 infrared aerial photo of Lake Luzerne with sub-watershed boundary drawn

Water samples were taken from the inlet to Lake Luzerne and analyzed for phosphorus and chlorophyll to help determine if the water quality of the inlet tributary was better, worse, or about the same as the water quality of the lake itself. If it was worse, we would have to look at the much larger watershed above Lake Luzerne to determine pollutant sources. If it was better, then we could focus on the more localized land area affecting the lake. Water chemistry results from the inlet to the lake showed low phosphorus and chlorophyll readings, which indicate that the water quality coming into the lake is relatively good overall. With these results, a more localized focus could be taken which resulted in the study of the Lake Luzerne sub-watershed (below Second Lake outlet, see above) to determine where existing and potential sources of pollutants may be coming from. This study and the land related issues discussed below focus on this sub-watershed.

## Lake Water Quality

To help determine the future of a lake in terms of its water quality and aquatic plant community, it is very helpful to evaluate past studies and try to determine a trend of what is happening. For Lake Luzerne, there are both historical water quality data as well as aquatic plant data. This section will look briefly at the water quality of Lake Luzerne.

In 1982 and 1987, the NYS Department of Environmental Conservation undertook water quality sampling on Lake Luzerne. In 1989, the RPI Freshwater Institute also undertook water quality studies of the lake, and compiled a comprehensive assessment of the lake in 1990 (FWI Report 90-2, February 1990). The RPI assessment reviewed the earlier data and provided insights into the trends of water quality of Lake Luzerne, with recommendations regarding how to protect and improve this water quality. Their summary findings show that in that seven year timeframe, changes in the lake water chemistry were minor, however Secchi transparency was greater in 1989 than in either 1982 or 1987. The FWI Report 90-2 is comprehensive in a review of water quality and aquatic plant issues and concerns from that time period, and serves as an excellent historical document for the lake. This report also provides recommendations for action in relation to these two issues. For more information on this report or its findings, it is available at the Darrin Freshwater Institute in the Town of Bolton, Warren County (518-644-3541).

To continue the evaluation of water quality trends in the lake, in 1999 the Lake Luzerne Association got Lake Luzerne admitted into the NYS Citizens Statewide Lake Assessment Program (CSLAP) for the ensuing five years. The purpose of the CSLAP program is to obtain some relatively general information on the lake's water quality for a five year period, in an effort to determine any problems or negative trends in the lake's water quality. In this program, volunteers from the lake association collected samples, offered them to NYS DEC for analysis, and collated the data via an annual CSLAP report. As of this time, the 1999 CSLAP report is complete, and summary results of this sampling period show the lake was in overall good health, with no obvious water quality problems detected.

The water clarity (determined by Secchi depth) during the 1999 sampling period ranged from approximately 4.5 meters in July, to almost 6 meters in September, to 3.5 meters in October. The nutrient levels (phosphorus) were fairly low at levels of 8 to 11 micrograms per liter, which is typical of moderately unproductive lakes. These readings among other characteristics make Lake Luzerne would be classified as an "oligotrophic to mesotrophic" lake, which in plain language means that it is neither crystal clear nor heavily algae laden.



*Lake Luzerne, viewed from Wayside Beach*

In comparison to the 1982 and 1987 sampling dates, the transparency of Lake Luzerne's waters in 1999 was relatively the same. Also, the phosphorus levels found within the lake in 1999 were similar to what was found in 1982 and 1987, within a total range of 8 to 19 micrograms per liter. For a full review of water quality parameter comparisons from 1982 to 1999, refer to the CSLAP Annual Report of 1999. Lake Luzerne will be in the CSLAP Program until 2003, at which time a full report on the findings and trends over the period of 1999-2003 will be presented by NYS DEC. This report will also review the overall trends from 1982 up until that time as well for a longer term perspective.

In addition to the sampling of the lake proper, in July of 2000 the Lake Luzerne Association undertook water sampling of the two beach areas on Lake Luzerne. Joseph Biss III of JB3 Consulting took and analyzed water samples to determine if the bacteria levels at those beaches were within NYS Department of Health accepted

levels. Results from various locations at both beaches showed that the coliform bacteria (both total and fecal) were well below DOH standards for contact recreation, swimming and diving.

Although Lake Luzerne has good water quality, it is important that people do their part to keep it that way. Small increases in phosphorus from lawn fertilizers or failing septic systems can cause increases in lake algae content and a corresponding decrease in water clarity and quality. Once a lake has reached a lower level of water quality, it is very difficult to regain its original state. Information on lake management and water quality is available through the Warren County Soil & Water Conservation District (518-623-3119), the Darrin Freshwater Institute (644-3541) and the NYS Department of Environmental Conservation (518-623-1200).

### **Lake Luzerne Tributaries**

There is one primary stream flowing into Lake Luzerne that comprises most of the lake's water budget: the outflow from Second Lake. This streamflow was measured at four different times in the Fall of 2000 to get a snapshot in time of the tributary component of the Lake Luzerne watershed. The streamflow ranged from 8 to 30 cubic feet per second (cfs) during this period, with an average flow of 15 cfs. This tributary provides the greatest surface water portion of the water budget for Lake Luzerne. Being the largest surface water source to Lake Luzerne, the outflow of Second Lake should be kept as clean as possible and future development and land use changes taken into consideration with careful planning. As mentioned earlier, this tributary was sampled four times in the Fall of 2000 to determine the water quality of the lake's inlet. Phosphorus and nitrogen levels in the inlet samples were found to be at levels at-or-below what was found in the lake proper. Although not a large scale sampling program, this information implies that the water quality coming into the lake is at least as clean as the lake water itself. This information was important when reviewing what portion of the overall watershed to review when looking for potential water quality impacts. With the inlet water quality being very good, it then follows that overall or localized water quality problems are likely coming from the watershed directly adjacent to the lake.

The only other tributary to Lake Luzerne is from Bullhead Pond. The Bullhead Pond outflow did not reach Lake Luzerne as surface water during the sampling period, but instead contributed to recharging the groundwater. During high flow events (after a storm event or spring melt) this tributary enters the lake as surface water.

### **Aquatic Plants in Lake Luzerne**

The Darrin Freshwater Institute (DFI) was commissioned to comprehensively survey aquatic plants in Lake Luzerne in 1989, and again in 1998 with the New York State Department of Environmental Conservation. The initial survey indicated extensive growth of Eurasian watermilfoil in the Lake. This invasive plant grows quickly and aggressively in the right environment, potentially causing problems with recreation and ecosystem function. In 1992 hand-harvesting milfoil was conducted under the auspices of Warren County and the Town of Luzerne. This management reduced scattered growth of milfoil but did not address a number of dense growth areas. The second Aquatic Plant Survey was designed to reproduce the 1989 survey, focus on the status of Eurasian watermilfoil and to provide management recommendations for aquatic plants.

The 1998 Aquatic Plant Survey documents 33 species of aquatic plants in Lake Luzerne, indicating excellent diversity similar to other nearby lakes. Included in this species count is Eurasian watermilfoil, a major component of the overall aquatic plant community in Lake Luzerne. There are six areas of the lake supporting dense growths of milfoil, covering 1.4 acres of the littoral or near shore zone (about 1% of the lake surface area) though scattered growth was observed throughout the lake. This species is an invasive exotic whose explosive growth can outcompete native plants, alter habitats and food resources and interfere with recreational use of waterbodies. To manage this aquatic invasive,

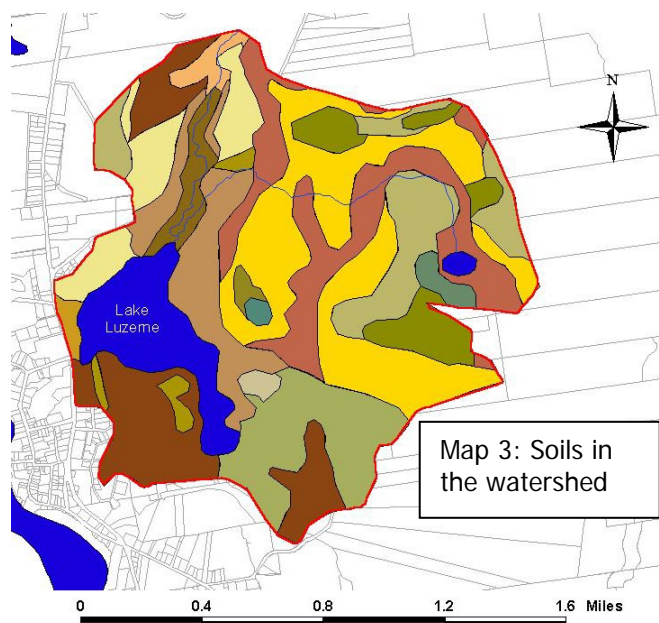




DFWI has addressed long term management for milfoil control activities, included in the “Recommendations” section.

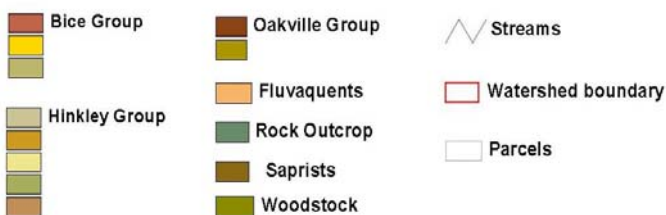
Each Eurasian watermilfoil management technique has positive and negative aspects, and a plan should be developed with key stakeholders such as the Town of Lake Luzerne and the Lake Luzerne Association. Aquatic plant management requires a long-term strategy and it is important to fully review the consequences before plant management activities begin.

### Soils in the Watershed



Map 3: Soils in the watershed

#### Soils



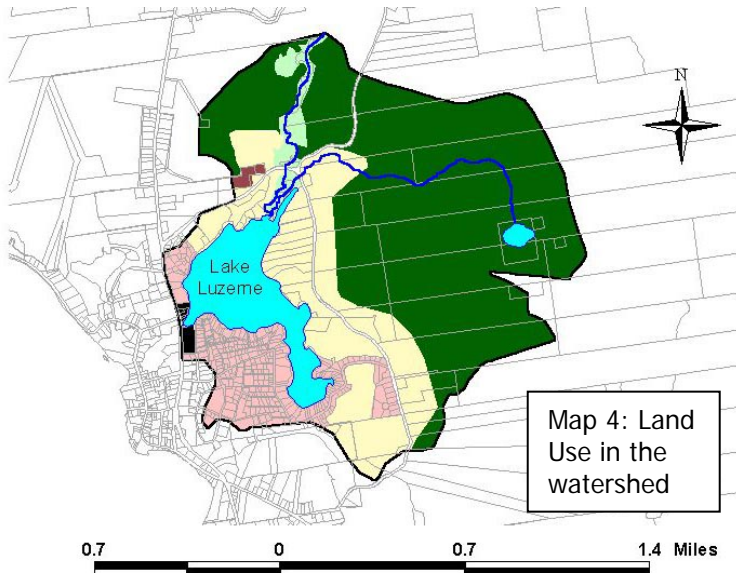
What benefit is it to know what the soils are within a watershed or along a shoreline? This question is often asked by lakeshore residents and communities when evaluating potential water quality impacts. The soils lay the framework that all land uses are based upon, and they have a direct correlation to what type of land uses may be suited to a particular location. Very sandy soils may pose serious problems with siting a septic system for a house, whereas soils with a high clay content may cause difficulties with house foundations and construction. This section briefly evaluates the soils within the nearshore area of Lake Luzerne to summarize what some of the potential concerns might be with land uses and water quality within the lake. Please note that this is only a brief summary of the soil conditions, and much more detailed information and maps are available in the Warren County Soil Survey available through the Warren County Soil & Water Conservation District.

The soils in the 1,165 acres of the Lake Luzerne sub-watershed are primarily (86%) sandy soils. The rest of the soils are either shallow to bedrock soils and rock outcrop or organic soils that are under water or frequently flooded. Most of the western portion of the watershed is characterized by forested areas with steep slopes and shallow to bedrock soils or rock outcrop. The eastern and southern portions are the most developed partially because the limitations to development presented by the soils are the least severe in this area of the watershed.

The most developable soils – Bice, Hinkley, Oakville, Plainfield soils at less than 15% slope cover about 55% of the watershed because they present only slight to moderate limitations to building site development (see Soils Map). About 30% of the soils with greater than 15% slope present severe limitations to development because of their steepness. In addition, many areas along the shoreline are steep [in localized areas not picked up by the soil survey mapping] and are subject to erosion by recreational activities. Measures such as installation of steps, walls, and planting vegetation have been and will need to be taken in the future to address these localized situations. The remaining 15% are considered “not developable” because the soils are flooded frequently or are shallow to bedrock. Development is further limited in the areas with Hinkley, Oakville, and Plainfield soils with less than 15% slope due to severe limitations for septic systems because these sandy soils are considered to be poor filters of septic effluent. This situation does present a potential environmental impact to the lake. This leaves BdC - Bice very bouldery fine sandy loam at 8-15% slope as the most developable soil type in the watershed, which comprises 124 ac. or 11% of the watershed. Soils do present limitations to land uses in the watershed and to further development; therefore, they need to be considered in land use planning and water quality protection efforts.

Whatever the soil conditions, whenever modifying an existing land use for development it is a good practice to control for erosion with a good site plan and follow-up. Erosion of soil into Lake Luzerne can cause problems with increased algae and weed production, both of which negatively impact the quality of the lake and its surrounding community. Erosion control advice and technical assistance is available at no charge from the Warren County Soil & Water Conservation District (518-623-3119).

### Land Use in the Watershed



Land use information is very important when characterizing a watershed and determining potential impacts to water quality of a lake. The extent to which an area is developed and where the development has occurred can play a key role in the contaminant loading to a waterbody. To determine the land uses within the Lake Luzerne watershed, a geographic information system (GIS) was employed to develop a coverage related to the various land uses. Initially the watershed was delineated on USGS 7.5 minute topographic maps. Using 1990 aerial photos as well as 1995 digital aerial photos, land uses were identified and referenced back to the topographic maps.

There are approximately 1165 acres of land within the Lake Luzerne sub watershed studied here. Approximately sixty percent (700 acres) of the watershed is forested and undeveloped, and another 111 acres of water.

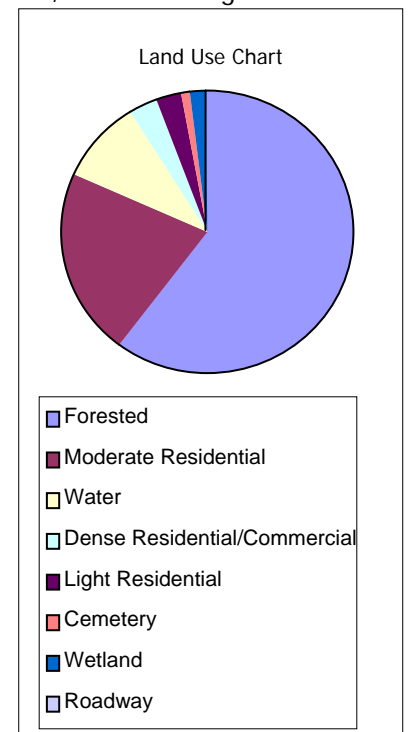
The most heavily developed areas are along the shoreline on the western half of the lake. Except for a few scattered lots, the land along the

- Lakes and ponds
- Streams
- Parcels
- Watershed boundary
- Forest/ Undeveloped
- Wetland
- Low development
- Cemetery
- Parks
- High Development

western shoreline of Lake Luzerne is fully developed. The land along the eastern shoreline is zoned to allow for more development, but the lack of sewer and water service along with poor soils and steep slopes will mean that a lot of care should be taken to avoid negative impacts on water quality if more development does occur. As mentioned in "Soils in the Watershed", natural resource conditions impose various limitations which can restrict development within the near shore area and in many other locations within the watershed.

For the purposes of this assessment, the land uses in the developed areas were categorized as follows:

Forested	700 acres	60 %
Moderate Residential	252 acres	22 %
Water	111 acres	10 %
Dense Residential/Commercial	38 acres	3 %
Light Residential	33 acres	2 %
Cemetery	12 acres	1 %
Wetland	18 acres	1 %
Roadway	1 acre	1 %
TOTAL	1165 acres	100 %





## **Land Use Considerations on Water Quality**

One of the overriding factors affecting the quality and health of a lake is the composition of its surrounding watershed. In lakes with heavily developed watersheds, there tend to be more impacts to the lake from stormwater runoff, erosion, failing septic systems, and other development related issues. In largely forested watersheds, these impacts are generally minimal or largely nonexistent.

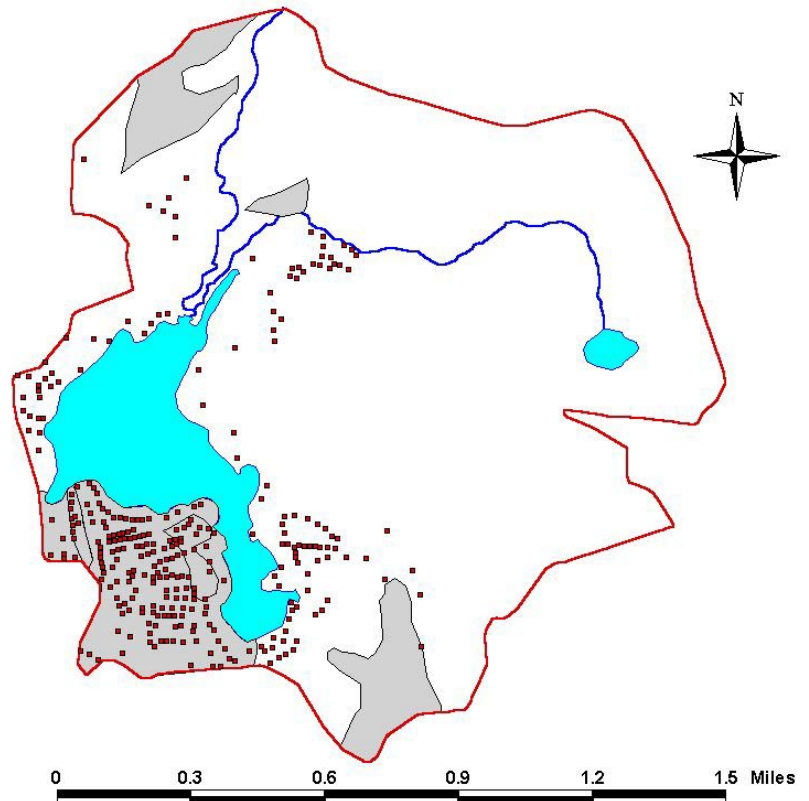
As seen from the land use map of the Lake Luzerne watershed, the strong majority of the 1,165 acre watershed is forest land. In a water quality sense, this is very good for Lake Luzerne.

### **Septic Systems**

On-site wastewater treatment systems (septic systems), when properly designed, installed and maintained, have no adverse impacts on water quality or public health. When one of these three criteria fall short, there may be impacts to water quality of a nearby lake. In addition, there may be health concerns related to improperly treated septic effluent, as bacteria may reach the groundwater and may end up in a private or public well. Effluent from a standard septic system flows out of an absorption trench or a seepage pit and into the ground where the soil provides the final treatment and uptake of nutrients and pollutants. If the system is very old or is not properly maintained, it has a good chance of failing and not providing the treatment that it should. This is a major concern especially on lakes where lot sizes are small and many of the structures on these lots are older.

Lake Luzerne has numerous year-round residences and camps upon its shoreline. Many of these residences were built in the mid 1950's and 1960's, and less concern was given to the potential development impacts upon the water quality of the lake than is today. The building lot sizes around the southern side of Lake Luzerne are relatively small, with camps and small homes built close to the shoreline. As many of these structures were seasonal camps, the septic systems were designed as such and generally consist of small septic tanks and seepage pits. There is little room on most of these lots for a standard leach field type system, and therefore very few are likely to exist. The issue that arises is the level of treatment that the septic effluent receives may not be as high as on a larger lot with a leach field system because the effluent is localized in a seepage pit. In addition, many of the residents on the lake do not know exactly what type of septic system is located on the property. This is a concern because if they do not know what type of system is on the property, then there is little likelihood that this system has been properly maintained.

As can be seen from map 5, most of the residential development within the watershed is clustered on the southwest corner of the lake. The soils at this location (as seen in gray) are Oakville loamy fine sand. As defined in the Warren County Soil Survey, these soils "are used as sites for septic tank absorption fields, ground water



Map 5: Residences within the watershed (approximately 300, shown by red dots). Grey areas represent "Oakville" soils, which provide "poor" filtering of septic effluent as defined in the Warren County Soil Survey.

contamination is a hazard because of poor filtering of effluent." In the "Sanitary Facilities" table of the soil survey, it is stated that there are "severe" limitations on siting of septic tank absorption fields due to these soils being a poor filter.

With relation to lake water quality, with the poor filtering capability of the Oakville soils there exists the possibility that some improperly treated septic effluent reaches the lake. However, this has not been documented, and summer 2000 bacteriological sampling of the two public beaches revealed that bacteria levels were within state guidelines for contact recreation. A shoreline water quality sampling program geared to determining septic influences should be undertaken to more quantitatively determine if there is a problem which impacts the lake.

### **Soil Erosion in the Watershed**

Eroding soils are cause for concern when they are carried to a nearby waterbody. Eroded soils can carry large amounts of phosphorous and nitrogen with them, which aids in the growth of algae and aquatic weeds. A complete roadside survey of existing bare banks, ditches and other potential erosion sites within the watershed revealed no considerable concern for soil erosion at the present time. However, new construction on or near the lakeshore, if improperly undertaken, can be a substantial source of eroding soil at any time in the future. This is particularly true given the steep slope conditions close to Lake Luzerne in developed areas of the watershed.

Road ditch maintenance activities undertaken by local highway departments, if improperly seeded and mulched, can be a direct source of erosion and sedimentation to a nearby waterbody. It is very important to keep soil in place during construction activities by proper planning and installation of erosion control devices such as silt fence and hay bales. Staff from the Warren County Soil and Water Conservation District are available to landowners at no charge to assist with recommendations for erosion control.

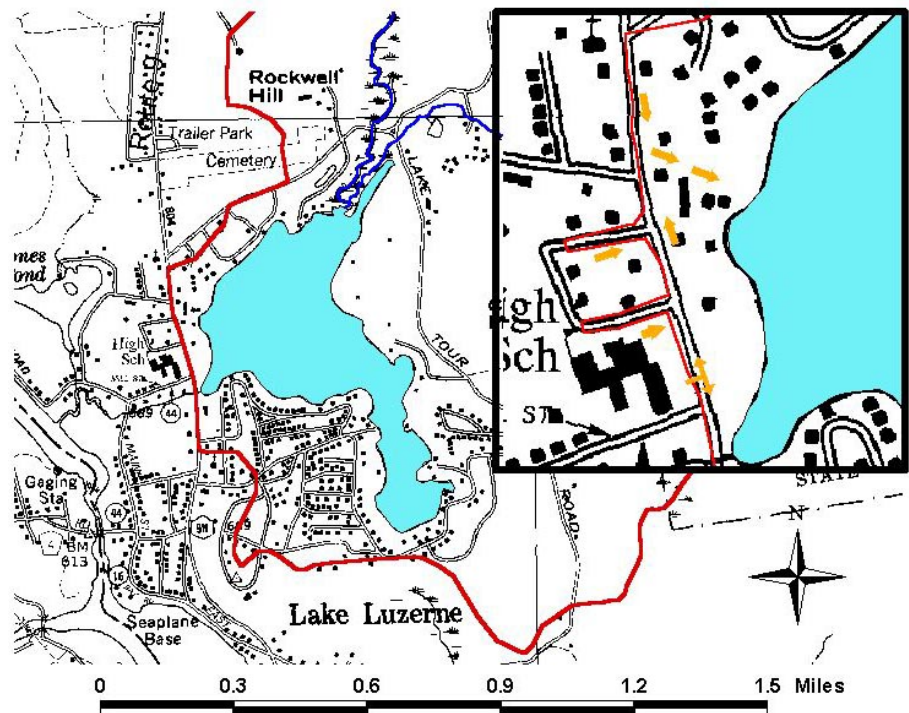
### **Lawn Care and Fertilizer Use**

Lawn care activities are a concern along the shoreline of lakes because they are potential non-point sources of pollution either through the excessive use of lawn care products (fertilizers and pesticides) or by disposal of lawn clippings and other debris close to the water. By definition, fertilizers are created to provide nutrients to improve the growth of lawns and other vegetation. If a landowner puts down more fertilizer than a plant can uptake, the remaining fertilizer may run off into the nearest waterbody. If this fertilizer reaches the waterbody, it acts in exactly the same way as it does on a lawn. The nutrients in fertilizer allow for much more aggressive growth of aquatic plants and algae, which may cause problems with the water quality and recreational opportunities for the lake. With such a large percentage of the Lake Luzerne shoreline area in residential development, the use of fertilizers on properties adjacent to the lake is a very real concern for water quality impacts. Lawns in and of themselves are not a concern, as the grasses in a lawn actually slow the flow of runoff and allow for infiltration of stormwater runoff. Where it does become a concern is when landowners *over-fertilize* in an attempt to create the perfect lawn.

The degree to which the shoreline landowners apply fertilizers and pesticides to their lawns is not known on Lake Luzerne. As there are no regulations or statutes regarding lawn care, there is no good way to control the application of these chemicals to shoreline areas. The best means of minimizing the impacts from over-fertilization from these landowners is through education. Suggestion for educational efforts are outlined in the "Recommendations" section that follows.

## Road Runoff

One of the primary factors in lake quality and health of the aquatic ecosystem is the quality of the runoff which enters the lake. As land gets developed and roads are constructed, the flow patterns of rain runoff get altered in these areas. In most cases, runoff which once infiltrated into the ground before development now runs off into drainage ditches and storm drains. The eventual outlet of these storm drains and ditches is the lowest point in the area, most times being the lake itself. The result is a larger amount of surface runoff going directly into the lake, and in many cases the water quality of this runoff is generally less than it would have been under pristine conditions. As this runoff flows across blacktop and other impervious surfaces, it picks up contaminants on the road such as salt and sand from winter de-icing operations, oil and other chemicals, metals, and possibly fecal coliform bacteria from animal wastes. These pollutants are conveyed into the lake via the constructed drainage system, i.e. the stormwater inlets and pipes and roadside ditches.



Map 6: Locations of roads and buildings (main map), and road drainage into lake (yellow arrows on inset map).

Lake Luzerne, like most other developed lakes, has this roadside drainage network surrounding the lake. Every road within the Lake Luzerne sub-watershed was evaluated on site for potential road runoff impacts to Lake Luzerne. Even with the extensive road network, fortunately there is only one section of road or highway that drains into the lake; Route 9N near the high school. Fortunately in the case of Route 9N, there is no commercial development such as gas stations, convenient marts, large parking lots and other such things which might harbor potentially harmful substances on their surfaces. This is a definite plus in terms of the runoff water quality. In essence, the only contaminants coming from this section of highway should be winter road de-icing products (salt and sand), possibly some oil and grease and anti-freeze from leaking automobiles, fecal coliform bacteria from animals, and thermal impacts from hot road surfaces. To date, there has been no comprehensive study of the water quality of the stormwater coming out of these culverts, and therefore no quantitative measure can be given herein. However, the above mentioned pollutants are likely present on this roadway to some degree based on visual inspection, mandatory roadway maintenance (de-icing activities), and common sense. With having just one area, it will be easier to concentrate on a potential solution that would allow the stormwater to be treated before it goes into the lake.

Overall, the impacts to Lake Luzerne from road runoff are seen as moderate, and can be minimized through some roadside drainage improvements. These drainage suggestions are listed in the "Recommendations" section below.



## **Recommendations to Protect the Quality of Lake Luzerne**

Currently, the Lake Luzerne watershed appears to be in very good condition related to the level of pollutants which enter the lake, and in good condition regarding the amount of nuisance aquatic weeds within the lake. However, there are situations that exist within the watershed which may have negative impacts on the water quality and overall health of Lake Luzerne. It is these situations which the following recommendations have been put forth to improve upon.



The following recommendations are intended to provide specific, cost effective means to protect the quality of the water of Lake Luzerne. They entail both educational efforts and on-the-ground tasks to be undertaken to help ensure the long term water quality of the lake. These recommendations do not go into issues regarding zoning regulations around the lake, nor do they look at statutory changes to the Town of Lake Luzerne codes. They are primarily geared towards local stewardship of the lake and projects that can be done locally to protect this lake. The Lake Luzerne Association will likely be the catalyst for much of the protection and improvement efforts to be undertaken for Lake Luzerne, with assistance from the Town of Lake Luzerne, the Warren County Soil and Water Conservation District, and many others. By increasing the awareness of the issues on Lake Luzerne, the lake association can begin to achieve support from all landowners on the lake and undertake many of the improvements to protect it for the future.

### **General Recommendations**

1. Maintain an active lake association to act as a hub to address issues of concern on Lake Luzerne, and to provide information relating to issues on Lake Luzerne to all shoreline and association residents. The ongoing activity and interest within this association is paramount to the continued long term health of Lake Luzerne.
2. Give an annual presentation to the Lake Luzerne Town Board relating to work accomplished on Lake Luzerne and the status of water quality, nuisance aquatic weeds, and other related issues.
3. Maintain status in the Citizens Statewide Lake Assessment Program, which is a voluntary lake water quality assessment program administered by the NYS DEC. As this is a five year on / five year off / five year on program, determine a way to fund those middle five years so that a continuous record of water quality data will be created for the lake.
4. Conduct frequent roadside surveys of potential soil erosion sites, on road ditches and banks and new development sites. Contact the Warren County Soil and Water Conservation District if any sites of significance are found, so that technical assistance may be given to correct the situation.
5. Have copies of this document and the Darrin Freshwater Institute's report on nuisance aquatic plants (or subsections of these) sent to all residences along the lake with a cover letter encouraging them to get involved with their lake association if they are not already.

### **Nuisance Aquatic Plant Recommendations**

1. The Lake Luzerne Association should consider the formation of an aquatic plant management committee, if one does not exist. The committee should review the recommendations contained in this report and initiate aquatic plant management.
2. The scattered populations of Eurasian Watermilfoil could be managed via hand harvesting similar to that conducted in 1992. Results for the 1998 survey indicate that the relative abundance of Eurasian Watermilfoil

in Lake Luzerne is less than in 1989 when the original survey's were done. The cost for hand harvesting in 1992 was approximately \$30,000. This cost may be realistic for 1999.

3. The dense growth areas can be managed with a combination of benthic barrier and suction harvesting. With 1.4 surface acres of milfoil beds, the cost of benthic barrier installation would be about \$30,000.
4. The Lake Luzerne Association could also consider the use of an herbicide such as fluridone (SONAR™). Low concentration, whole lake treatments are reported to be most effective for Eurasian watermilfoil control. Whole lake herbicide treatment can also address scattered populations and dense growth of Eurasian watermilfoil simultaneously. The cost of this treatment would be about \$50,000.
5. The Lake Luzerne Association should post all boat access areas both on Lake Luzerne and the upstream chain of lakes, with posters identifying Eurasian watermilfoil and urging boaters to clean their boats prior to launching and upon retrieval. This would help prevent the spread of Eurasian watermilfoil from Lake Luzerne as well as further introductions into Lake Luzerne.

### **Water Quality Recommendations**

#### **Stormwater**

1. Work with NYS DOT on designing and installing stormwater improvement structures for the one identified drainage site (see map 6). This structure should be retrofitted or replaced with a structure which has the capacity to act as catch basins/infiltrators to infiltrate the first flush of stormwater and remove road sand and debris from road runoff before it reaches the lake. These structures (pre-cast dry wells) have been proven to be effective at infiltrating stormwater in sandier soils such as are present on the shore of Lake Luzerne.

#### **Septic Systems**

1. Contact Adirondack Community College professor Holly Ahern to determine the feasibility of the college in undertaking a water quality sampling study to determine the degree to which septic systems are failing along the lakeshore (particularly the heavily developed southwest shoreline). Professor Ahern and her students conducted a comprehensive study on Glen Lake in 1997-1998 on this topic, and may have interest and availability of doing it for Lake Luzerne.
2. Contact John Miller, past president of the NYS Federation of Lake Associations (FOLA) to get the Lake Luzerne Association involved with their volunteer septic monitoring program. This program works on the Lake Association level through cooperation with local landowners to dye test individual septics to check for failures. The number for FOLA is (800) 796-3652.
3. Conduct a voluntary survey of lakeshore landowners to obtain information regarding individual septic systems regarding their age, size, and maintenance schedule. This will give the lake association a clear idea of the necessity of upgrading or maintaining systems around the lake. Since this is always a sensitive issue among homeowners, the association should network with their friends around the lake to get as much cooperation as possible.
4. Create a water quality section in the Lake Luzerne Association's newsletter which would feature articles on such topics as the impacts to water quality from failing septic systems, septic system maintenance tips, who to call if you have a septic problem, and any others related to this topic.
5. Contact a reputable septic system pumper to work out a bulk deal whereby many landowners get their septic tanks pumped out at a reduced cost. Network with the landowners on the lake to generate interest in this. If it works out, attempt to make this a three year program whereby these landowners know that this deal will come around only once every three years and to get involved.

6. Sponsor an annual water quality workshop and invite interesting speakers to discuss the issues surrounding Lake Luzerne. A general rule: feed them and they will come...

### **Lawn Care/Fertilizers**

1. Through the Association's newsletter, educate watershed residents about the issues related to over-fertilization of lawns and gardens and the impacts to water quality on their lake from these activities.
2. Contact a local landscape nursery to determine the most environmentally friendly (low phosphorus) fertilizer which would be recommended for lawns on a shoreline. Discourage fertilizer use on any lawn which is adjacent to the lake shore and is sloped towards the lake.
3. Contact Cornell Cooperative Extension to obtain soil sample bags for use by landowners to determine the nutrient needs of their lawns. To increase participation, create a "lawn care program" where the cost of analysis (\$17) is cost shared or paid for by the Association.

## **Summary and Conclusions**

Lakes are one of our most precious natural resources. As population increases and development pressure expands its force on these resources, it is imperative that we strive to maintain these natural systems in a state where it can continue to support the aquatic ecosystem that it has developed. One key component in this effort is watershed management. By understanding the lands surrounding a lake, we can begin to understand how lakes respond to man's influence.

Over the past year, a watershed planning effort has taken place on Lake Luzerne to determine the current health of the lake and its surrounding watershed. Local citizens, the Lake Luzerne Association members, the local Soil and Water Conservation District, municipal officials and other parties joined together in this undertaking, utilizing their diverse backgrounds and expertise in this endeavor. A close look was taken at the current and historical water quality of Lake Luzerne, the status of nuisance aquatic plants in the lake, and the condition of the land surrounding the lake. By reviewing all of this information, we get a feel for the health of the lake in its current state. Perhaps more importantly however is that this information gives us a perspective on where the lake is headed in the near future in relation to these issues.

Through a volunteer water quality monitoring effort, the Lake Luzerne Association collected information on various parameters including lake clarity, algae content, phosphorus, and others beginning in 1999. With proper land use management, it is likely that the lake will continue to exhibit good overall health.

A primary concern in lake management today is nuisance aquatic plants. One specific plant is of considerable concern for residents and visitors to Lake Luzerne; Eurasian Watermilfoil (milfoil). Milfoil is an aggressive plant which grows quickly and abundantly, with the potential to create large dense beds in water depths of up to twenty feet in good conditions. Milfoil does exist in Lake Luzerne, but it was not known to what degree. To determine this, the Darrin Freshwater Institute was commissioned in the summer of 1999 to undertake a survey of the lake and report on current conditions. Their findings indicate that there are approximately 1.4 acres of dense milfoil in Lake Luzerne (about 1% of the surface area), and many scattered areas of sparse growth throughout the lake. Recommendations for management include hand harvesting the scattered areas, and looking into other possibilities such as benthic barriers for managing the dense beds. Copies of the complete report are available through the Lake Luzerne Association or the Warren County Soil and Water Conservation District.

The third component of this study was an evaluation of the watershed lands surrounding Lake Luzerne. The quality of a lake's water and ecosystem are largely a result of the lands surrounding the lake. As development



increases, many times there becomes a corresponding decrease in water quality due to road runoff, construction practices, and other related items. In the case of Lake Luzerne, most of the development in the watershed is adjacent to the shoreline, which creates a higher potential for impacts to the lake.

Road runoff in intensely developed areas can be a major contributor to lake water quality decline, if this runoff picks up contaminants which lie on road surfaces. To determine any potential impacts to Lake Luzerne, a watershed wide study of the roads and highways was conducted. Route 9N on the south side of Lake Luzerne is of concern, and an area was identified for stormwater drainage retrofitting. Working with the NYS Department of Transportation, this site can be improved to a state where stormwater impacts to Lake Luzerne are minimized.

Another potential water quality concern for lakes is failing on-site septic systems. It is difficult to determine whether one of these private wastewater treatment systems is working properly, but through nearshore water sampling, some of these sites can be detected. A good volunteer program exists through the NYS Federation of Lake Associations regarding volunteer testing of private systems, with a main component being homeowner education. To minimize the impacts of failing septic systems on Lake Luzerne, a strong educational effort for shoreline residents is strongly recommended regarding the necessary maintenance of their systems and other potential water quality impacts such as excessive lawn fertilizing.

Lake Luzerne as a waterbody will be around for many hundreds or thousands of years. Development around Lake Luzerne is at a point that approximately one half to two thirds of the shoreline is fully developed. Poor management of these lands can strongly impact the water quality and aquatic ecosystem of Lake Luzerne. It is incumbent upon the residents and visitors of this precious resource to be vigilant in protecting this lake for the future. We have the potential to pollute this beautiful lake but we also have the potential to keep it in its current state. With a strong stewardship of the lands within the watershed of Lake Luzerne, it will continue to be a natural resource that our generation and future generations can greatly enjoy.