Cossayuna Lake is a relatively small fertile warm-water lake of probable glacial origin. Cossayuna Lake is designated as a Class A waterbody by the DEC. The best use of Class A waters is as a source of water supply for drinking, culinary or food processing purposes, primary and secondary contact recreation, and fishing. Cossayuna Lake was listed as impaired for boating and bathing activities on the 1993 and 1996 New York State Priority Water Problem Lists (PWL) due to the presence of dense aquatic vegetation in the lake. The Washington County Water Quality Coordinating Committee (WCWQCC) listed Cossayuna Lake number two on its own PWL. This distinction denotes Cossayuna Lake's importance as a recreational body as well as the WCWQCC's concern for the future of the water quality. It will enable future funds to be used for special projects on Cossayuna Lake.

Past studies have all made note of the fact that macrophytes have been a problem in the lake for as long as residents can remember. However, Eurasian watermilfoil (*Myriophyllum spicatum*) was introduced in the mid 1970's and has become a major nuisance since. The expansive growth Eurasian watermilfoil is due to several contributing factors including the shallowness of the lake which allows light to penetrate to the bottom in many areas. In addition, the fertility of the lake which aids the growth of aquatic vegetation, is at least partially due to the nutrient-rich soils in watershed which have found their way into lake bottom sediments. This information has been documented by the Darrin Freshwater Institute in two recent studies, "Report on Temperature and Dissolved Oxygen" (1999) and "Phosphorus Concentrations Associated with Sediments in Cossayuna Lake" (1998).

Four other significant water quality studies have been conducted over the past 67 years. The first data collected about Cossayuna Lake was reported in A Biological Survey of the Upper Hudson Watershed in 1932 by the New York State Conservation Department. The next effort was launched by the Greater Adirondack Resource and Development Council and resulted in "The Cossayuna Lake Technical Report" (1975). The third report, "The Cossayuna Lake Water Quality Study" (1988), was prepared by Skidmore Professor David Smith, Ph.D. in 1988. The last water quality study was conducted by Association volunteers through the Citizen's Statewide Lake Assessment Program (CSLAP). The group participated in the five (5) year program from 1992-1996 and a summary report was prepared by the DEC's Lakes Services Section. Three new studies were conducted by the DFWI over the past several years including "Internal Phosphorus Loading Estimates for Cossayuna Lake", "Temperature and Dissolved Oxygen Report", and "Phosphorus Budget Report." Summaries of each these reports can be found below.

2.1.2 Biological Survey of the Upper Hudson Watershed (1932)

The State of New York Conservation Department published the results of a biological survey conducted on many lakes and rivers in the upper Hudson watershed during the early 1930's. Cossayuna was considered a very important fishery in the region and was, therefore, included in the study. The survey primarily focused on the Cossayuna

Lake fishery and this information appears in Section 2.2 of this document. There are valuable water quality data and observations of conditions on the lake at that time included in the report. The Survey acknowledges the fact that even 60 years ago the entire lake became "almost one large weed bed by midsummer." The most abundant plant was *Potamogeton crispus*. Bottom sediments were reported as the richest in the entire study area comprised mostly of rich organic ooze with a layer of dust fine detritus. Water temperatures measured in1932 ranged from a low of 23.7 degrees C on June 21 to 24.2 degrees C on September 1 at the surface and 18.6 degrees C on June 21 to 23.2 degrees C on September 1 on the bottom. Water transparency was highest in the beginning of the season at 6.0 meters falling to the low of 1.8 meters on September 1. Cossayuna Lake registered as alkaline with a surface pH ranging from 8.2 to 8.5 during the 1932 sampling season. The percent of oxygen saturation was high for Cossayuna Lake at the time of the reading registering at 62.7 percent. Excerpts from this report can be found in Appendix F.

2.1.3 Cossayuna Lake Technical Report (1975)

A water quality survey was conducted on August 4, 1975 by DEC as part of a state of the lake study conducted by the Adirondack Resource and Development Council. Results indicate that the pH was 10.0 at the surface and varied to 7.5 at the 20 foot level. Total alkalinity was 171 ppm at the surface and 205 ppm at the 20 foot contour. Variation of the pH and alkalinity is due to photosynthetic action of the aquatic vegetation and is normal for a eutrophic, heavily vegetated lake in midsummer. Alkalinity concentrations are indicative of the fertility levels and are an index of the productivity potential of Cossayuna Lake. In contrast, many sterile, clear, unproductive lakes in the Adirondacks have alkalinity levels of between 0 and 5 ppm. A copy of the full report can be found in Appendix C.

2.1.4 Cossayuna Lake Water Quality Study (1988)

David L. Smith, Ph.D., formerly of Skidmore College, conducted a study from 1984-1987 and developed a report on Cossayuna Lake's water quality in March 1988. The objectives of the study were to determine the baseline water quality of the lake and its major streams and find out how it is related to the macrophyte problem. His approach was to determine whether seasonal changes occur in the water quality parameters, to determine whether there are significant inputs of nutrients entering the lake via stream inflows, and to determine whether there are any correlations exist between lake water quality and the resident population of Cossayuna Lake. Five in-lake locations and six streams were sampled over a period of four years with the following parameters measured: depth, cross-sectional and current velocity (streams only), temperature, dissolved oxygen, nitrate-nitrogen, ortho-phosphate, fecal coliform counts, fecal streptococcus counts.

Dr. Smith found that during the time of the study the streams flowing into the lake exhibited ortho-phosphate concentrations at least twice those found in the lake. This

data, combined with the in-lake data, suggests that a considerable amount of nutrients move into and are found within the lake at any given time. Lake bacteria counts were generally low and at all times well below the water quality criterion established by the EPA for primary contact recreation (200 colonies per 100 ml of water).

Dr. Smith concluded that "the state of the lake at the present time could be considered analogous to a person who is still generally healthy, but who has been feeling unwell for some time as a result of some as yet unspecified terminal disease." To the goal of lake restoration, the report recommends a coordinated attack on the eutrophication of Cossayuna Lake through the reduction of nutrients, aquatic plant harvesting, flushing, and chemical treatment. The roots of the problem must also be addressed through soil conservation practices, zoning, and land use management.) The full study is available in Appendix D.

2.1.5 The Citizen's Statewide Lake Assessment Program (CSLAP) 1992-1996

The Cossayuna Lake Improvement Association was selected to participate in the Citizen's Statewide Lake Assessment Program (CSLAP) from 1992-1996. Since it is a five year program, the Association did not sample in 1997, but rejoined in 1998 on a pay-as-you-go basis. CSLAP utilizes volunteers from around the lake to collect water samples. The samples are processed by the volunteers and sent to a certified lab to be analyzed for a number of parameters. The data provides insight into the overall health of the lake and its suitability for various activities. CSLAP is a water quality monitoring program whose goal is to collect enough data to pinpoint trends and determine if water quality is improving, degrading or remaining stable. Such a determination is a critical first step in the lake management process.

CSLAP measures water quality by water temperature, secchi disk transparency, conductivity, pH, color, phosphorus, nitrogen and chlorophyll *a*. Table 5, "CSLAP Parameters," explains the significance of each of the above measures. The relationship between phosphorus, chlorophyll *a*, and Secchi disk transparency is useful in assessing the trophic status, or the degree of eutrophication of lakes. The trophic status is often an accurate gauge of productivity and overall water quality. Cossayuna Lake is considered a highly productive, eutrophic lake. It is classified as a Class "A" lake, suggesting it should support contact recreation and potable water usage, with filtration and chlorination. CSLAP does not consistently collect any data related directly to the drinking water quality or the health of the lake for swimming (bacteriological data). The Association has, however, instituted a volunteer septic system dye testing program. No failing systems were detected by this method during the period of testing.

Five years of sampling did not indicate any apparent trends in water quality. In other words, the water quality does not appear to be getting either better or worse. Even volunteer monitors' opinions of the lake's water quality fluctuated from year to year. This observation was noted by both the CSLAP volunteers and the respondents to the 1998 Watershed Survey. Approximately 46 percent thought the water quality has

Table 5 CSLAP Parameters

PARAMETER	SIGNIFICANCE
Water Temperature (°C)	Water temperature affects many lake activities, including the rate of biological growth and the amount of dissolved oxygen. It also affects the length of the recreational season
Secchi Disk Transparency (m)	Determined by measuring the depth at which a black and white disk disappears from sight, the Secchi disk transparency estimates the clarity of the water. In lakes with low color and rooted macrophyte ("weed") levels, it is related to algal productivity
Conductivity (µmho/cm)	Specific conductance measures the electrical current that passes through water, and is used to estimate the number of ions (charged particles). It is somewhat related to both the hardness and alkalinity (acid-buffering capacity) of the water, and may influence the degree to which nutrients remain in the water. Generally, lakes with conductivity less than 100 µmho/cm are considered softwater, while conductivity readings above 300 µmho/cm are found in hardwater lakes.
pH	pH is a measure of the (free) hydrogen ion concentration in solution. Most clearwater lakes must maintain a pH between 6 and 9 to support most types of plant and animal life. Low pH waters (<7) are acidic, while high pH waters (>7) are basic
Color (true) (platinum color units)	The color of dissolved materials in water usually consists of organic matter, such as decaying macrophytes or other vegetation. It is not necessarily indicative of water quality, but may significantly influence water transparency or algae growth. Color in excess of 30 ptu indicate sufficient quantities of dissolved organic matter to affect clarity by imparting a tannic color to the water.
Phosphorus (total, mg/l)	Phosphorus is one of the major nutrients needed for plant growth. It is often considered the "limiting" nutrient in NYS lakes, for biological productivity is often limited if phosphorus inputs are limited. Many lake management plans are centered around phosphorus controls.
Nitrogen (nitrate, mg/l)	Nitrogen is another nutrient necessary for plant growth, and can act as a limiting nutrient in some lakes, particularly in the spring and early summer. For much of the sampling season, many CSLAP lakes have very low or undetectable (<0.02 mg/l) levels.
Chlorophyll *a* (µg/l)	The measurement of chlorophyll *a*, the primary photosynthetic pigment found in green plants, provides an estimate of phytoplankton (algal) productivity, which may be strongly influenced by phosphorus

deteriorated in the last 5-25 years, 9 percent believe there has been no perceptible change in water quality, 9 percent believe water quality has improved, and 26 percent are simply not sure whether there has been any change at all. The following, Table 6, displays the results of the CSLAP program for1992-1996:

Table 6- CSLAP Results 1992-1996

	Minimum	Average	Maximum	
secchi disk transparency	0.52	1.48	2.85	meters
total phosphorus	0.010	0.034	0.065	mg/l
nitrate nitrogen	0.01	0.01	0.01	mg/l
true color	3	7	13	platinum color units
pH	7.36	8.34	9.13	
conductivity	181	194	206	
chlorophyll *a*	2.76	30.66	81.60	ug/l

Based on data from other lakes in the CSLAP program, the following comparisons and conclusions can be made. Using water clarity, chlorophyll *a* and total phosphorus concentrations as indicators, Cossayuna Lake is more productive than other lakes with the same water quality classification, other lakes in the Upper Hudson River basin, and the rest of the state. Cossayuna Lake has less color and, correspondingly, less dissolved organic matter. The lake has slightly higher levels of phosphorus and chlorophyll a and lower transparency. Public perception of the water quality of Cossayuna Lake is less favorable than perceptions at other less productive lakes in the region. As the summer progresses, there is an increase in algae growth, as measured by chlorophyll *a*, and an increase in phosphorus, with slightly decreased clarity. This increase in productivity is likely due to the mixing of nutrient-rich bottom waters with the lake surface waters when the lake de-stratifies in the fall. This enrichment of lake bottom waters, in turn, is likely due to the release of phosphorus from bottom sediments when oxygen levels fall to near zero in the lake bottom.

The perceptional data that is collected from volunteers, indicates the lake is reliably supportive of recreational uses over much of the summer. However, water chemistry data suggests that contact recreation may not be supported in the lake at all times during the summer, and the water quality is more characteristic of a lake with some recreational usage problems.

The Association re-enrolled in the CSLAP program in 1998 so that important data collection can continue indefinitely. The complete CSLAP report can be found in Appendix G.

2.1.6 Internal Phosphorus Loading Estimates For Cossayuna Lake (1998)

The most recent report is the Darrin Freshwater Institute (DFWI) 1998 report on Phosphorus Concentrations Associated with Sediments in Cossayuna Lake. The report was commissioned by the Cossayuna Lake Watershed Management Team to find out what the rates of internal phosphorus loading were for Cossayuna Lake. Internal phosphorus loading is commonly associated with the release of phosphate bearing compounds from sediments underlying the lower, cooler layer of water during summertime thermal stratification (hypolimnion). When thermal stratification breaks up in the fall of the year, soluble phosphates in the hypolimnion are mixed through the water column, frequently spawning algal blooms. On February 17, 1998, staff of the DFWI and the Lakes Services Section of the DEC collected sediment cores through the ice which were used to determine internal phosphorus loading rates for Cossayuna Lake. Samples were taken from five sites in the lake. The following discussion represents conclusions from the report.

Oxygen concentrations were observed to fall below 20 percent saturation below a depth of 7 meters. The sediments in the lake show a classical phosphorus release pattern relative to declining oxygen concentration. As oxygen concentrations declined to near zero, total phosphorus concentrations climbed from 22.5 ug P/l to a maximum of 67 ug P/l. Actual release rates for total phosphorus were calculated and found to range from 3.5 to 8.8 mg P/m2/day. Sediment phosphorus concentrations are similar for most locations with the exception of Southeast Cove which had concentrations 3-5 times higher. This area is reported to receive farm field runoff which may account for the elevated levels of phosphorus present.

The complete report, "Internal Phosphorus Loading Estimates for Cossayuna Lake," can be found in the Appendix H.

2.1.7 Temperature and Dissolved Oxygen Report (1999)

A study of the temperature and dissolved oxygen levels throughout the lake was conducted by DFWI during 1998 with the assistance of volunteer monitors from the CLIA. The purchase of a dissolved oxygen meter necessary to undertake this study was made possible with funding available through this the WMPP and the WCSWCD. The study can be found in Appendix I and a summary of the findings can be found in the discussion below.

Profiles of dissolved oxygen collected during the period of summer stratification are necessary to develop the extent of the lake bottom which will be exposed to anaerobic conditions, and the depth at which anaerobic conditions occur in order to develop a loading rate for the entire lake. Without current lake data, the phosphorus loading rate can be estimated for the preparation of the phosphorus budget, with a certain loss of accuracy. Dissolved oxygen was indeed collected and measured by volunteers from

June through October of 1998 with equipment and staff provided through the Watershed Management Planning Project.

Dissolved oxygen is both a chemical and biological indicator of lake health. On an annual basis, dissolved oxygen concentrations in the surface waters of the lake remain at or near saturation. Oxygen is utilized by all organisms to support respiratory needs. While phytoplankton produce oxygen as a consequence of photosynthesis, excessive algal growth and the die off of plants and animals will deplete oxygen in the water. Cossayuna Lake exhibits physical characteristics typical of a dimictic northern temperate lake. The term dimictic refers to two periods of complete lake mixing, one in the spring and the other in the fall of the year. The period of ice cover extends from late December through early April. Ice thickness in mid-winter can reach a depth of one (1) meter. Inverted temperature profiles are observed under ice cover, with a range of from 0 degrees C (32 degrees F) at the surface to 6 degrees C (43 degrees F) in the deepest portions of the lake. Isothermal conditions (equal temperatures) generally exist throughout the lake immediately following ice-off.

Sunlight gradually warms the lake from the surface downward that by mid-June summer thermal stratification is established. Thermal stratification is a gradient in temperature from the lake surface to the bottom. It affects chemical and biological processes within the lake, primarily by separating the lake horizontally into surface water (epilimnion) and deep water (hypolimnion). Vertical mixing of water is interrupted by the thermocline, creating two discrete masses of water. The depth of the thermocline is largely controlled by water mixing forces such as climate, wind speed and direction, fetch, lake topography, proximity to inlets and outlets, and water chemistry. By mid-summer the maximum depth of the thermocline is approximately 5 meters (16 feet), where the warmer surface waters of the epilimnion are physically and chemically separated from the deeper colder waters of the hypolimnion. The period of summer stratification persists through late September when autumn overturn occurs. During the period of summer stratification, hypolimnetic (deep) waters show reductions in dissolved oxygen concentrations, with levels dropping to near zero just above the lake bottom as early as June 17.

Severe dissolved oxygen reductions (concentrations less than 2 ppm) occur throughout the summer months below a depth of 5 meters. Such conditions are stressful to fish and promote the dissolution of nutrients from bottom sediments. Nutrients, primarily nitrogen and phosphorus, which are normally tied up in the sediments under aerobic (oxygenated) conditions, are available to promote greater algal growth (productivity) when oxygen levels are depleted. After Fall overturn (October), the dissolved oxygen concentrations in the hypolimnion are near saturation and comparable to levels in the epilimnion, as a result of complete mixing with the overlying oxygenated waters of the epilimnion.

In general, dissolved oxygen depletion in the hypolimnion is considered an indicator of a mesotrophic or eutrophic lake. Current conditions in the hypolimnion of Cossayuna

Lake indicate a eutrophic condition. Once oxygen is completely depleted in the lower hypolimnion, the underlying sediments release a major amount of nitrogen and phosphorus, a process known as nutrient regeneration. In eurtrophic lakes such as Cossayuna, regeneration can account for the majority of the annual phosphorus budget.

2.1.8 Phosphorus Budget

The Eutromod model was used to estimate the phosphorus budget for Cossayuna Lake. All computer simulations for phosphorus loading are based on a mathematical relationship of phosphorus movement in lakes. These relationships were determined as part of the Vollenweider Phosphorus Equation. The major factors of the Vollenweider model that control the results are the size of the lake, lake depth, retention time, all of which control sedimentation rates of phosphorus. The Vollenweider Equation can accurately predict phosphorus levels in most lakes even when the lake does not qualify as a well mix reactor. Most lakes become seasonally thermally stratified which prevents mixing which, in turn, disqualifies the lake as a well mix reactor. Other circumstances that are involved in lake mixing include position of the inlet and outlets, and dams or high volume water withdrawals. The last two factors are water losses and, therefore, phosphorus losses. These factors also change the lake's retention time which then effects sedimentation rates. The following sections describe the process of setting up the Eutromod model for Cossayuna Lake.

Past work on Cossayuna Lake was relied upon as the source of information for water quality data. This primarily included CSLAP data and work by David Smith.
The second data source was the North American Morphometric Atlas of Selected Lakes (1985) and Lake Gazetteer to collect information on size of watershed lake retention time and lake depth. This information was independently verified since lake volume is one of the most critical data set for phosphorus modeling. The next data set required for the lake model is to assemble the characteristics of the watershed. The characteristic of the watershed was determined by examining and measuring various land use areas on color-enhanced infrared aerial photography. The photograph (Figure 11 in the text) belongs to a set from a U.S. Environmental Protection Agency project.

Table 7 Lake Modeling Data Summary

Total Phosphorus (CSLAP)Average 34 ppb
Range 15-65 ppb

Lake Characteristics
Average
Lake Depth 10 ft., 3.1 m
Lake Max. Depth 26 ft., 7.9 m
Detention Time .8 years
Watershed Area 7,467 acres
Lake Size 776 acres

Watershed Characteristics	Computer Simulation Estimated Phosphorus Loading
Residential 500 acres	0.4
Farmsteads 14 acres	2.4
Forested Wetland 393 acres	
Pastures 1,674 acres	0.14
Other Agricultural Fields 1,037 acres	0.0006
Forest 3,799 acres	
Summit Lake 125 acres	

Rainfall 35.3 inches
Septic tanks within 200' of water bodies -400 houses
120 year-round estimated population- 420
280 seasonal estimated equivalent pop. -323

Results

The analysis was completed in two segments with the first segment calibrating the model and second examining the hypothesis of past nutrient location. The model does not allow a convenient method of input the internal phosphorus load. As part of the work of the watershed committee, the Darrin Freshwater Institute undertook a series of experiments to determine internal phosphorus loading. Internal phosphors loading occurs when the dissolved oxygen levels approach 0 ppb. During periods of anoxic conditions, phosphorus is released from the sediments (Eichler et al 1998).

Three estimates of the amount of phosphorus release were prepared based on a low, high and average phosphorus yields for lake and the estimates are listed below:

Low- 196 kg/yr.; Maximum- 493 kg/yr.; Average- 319 kg/yr.

Figure 9, "Cossayuna Lake Phosphorus Loading," illustrates the potential levels of phosphorus that enter Cossayuna Lake annually. The first six columns are derived by

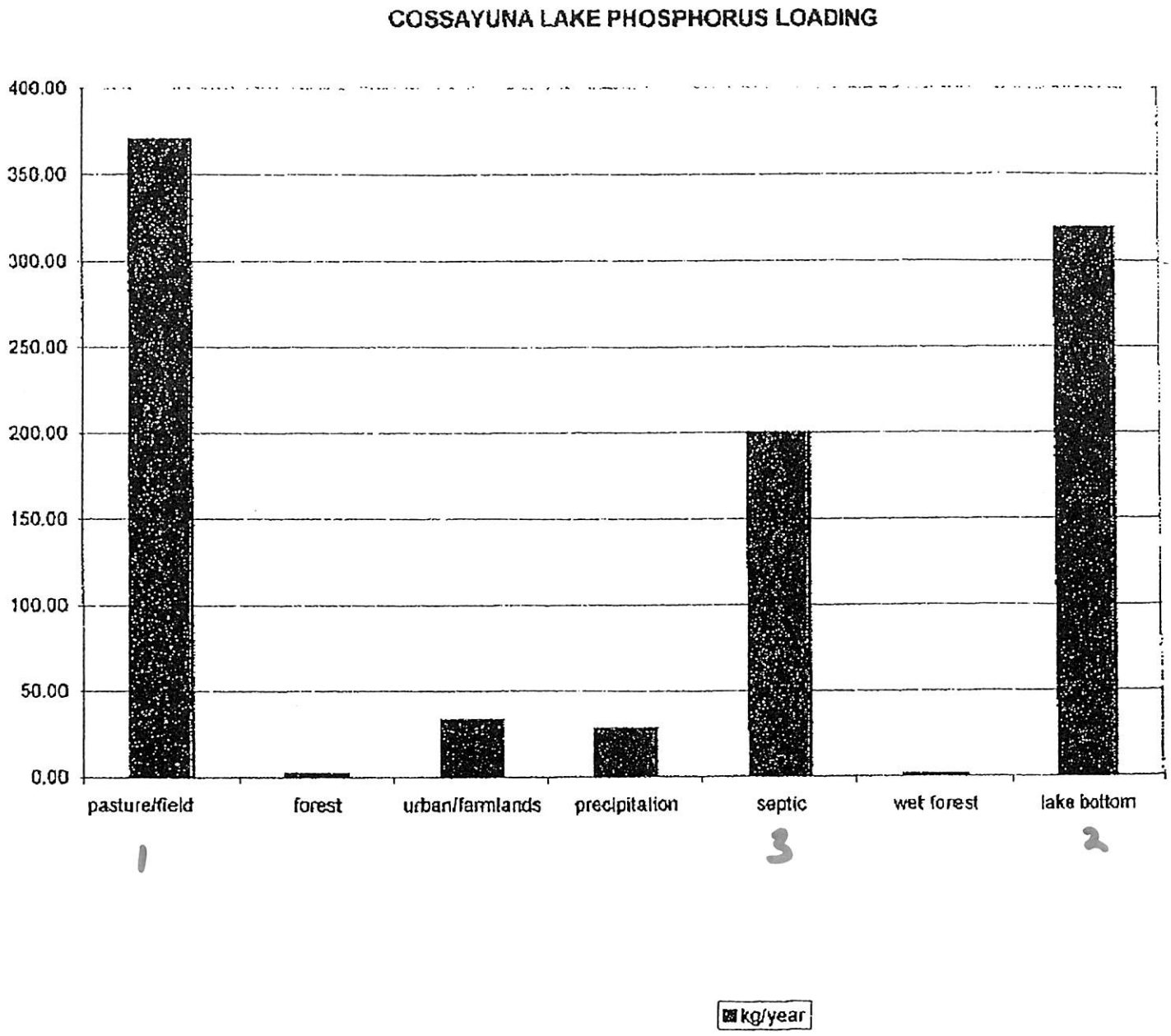


Figure 9
Phosphorus Loading
Cossayuna Lake
Washington County, NY

the computer simulation described above and last column (lake bottom) is from the Darrin Freshwater Institute. The largest contribution of phosphorus comes from pasture and fields which is the second largest land use category. The kg/acre loading for this category is 0.14 kg/acre. The forest land use category has the lowest annual loading rate of 2.1 kg and, correspondingly, the lowest per unit area loading rate of 0.0006 kg/acre. The septic tank loading is based on 400 homes with the phosphorus removal rate of 50 percent. The residential area is estimated at 500 acres which converts to 0.4 kg/acre. The urban/farmstead category covers only 14 acres in the basin and includes the area most intensive animal husbandry activities. It is estimated that 400 cows are now found in the basin. The per unit area loading is 2.4 kg/acre.

Analysis and Management Options

The phosphorus modeling for Cossayuna Lake should be used to develop management options for the lake. The modeling results can assist in setting priority for future management actions in the lake basin. Certain categories of phosphorus are not controllable such as precipitation. Two categories of land use could benefit from implementation of best management practices. The agricultural areas (pastures, fields and farmsteads) could implement of typical best management practices including, but limited to the following:

* Manure Management
* Stream Buffer Zones
* Whole Farm Plans
* Barnyard Stabilization

Septic systems are among the most difficult facilities to manage due to the need to involve individual homeowners, widely varying construction methods and many site specific unknowns. The internal loading of phosphorus is either the major or the second highest phosphorus source occurring in the lake watershed annually. Management of this phosphorus source will lower phosphorus content of the water which in turn, will lower the algae content of the water. The water-borne phosphorus does not have a significant impact on aquatic macrophyte production. Reduction of algae productivity will eventually lead to lower sediment deposition which will eventually have an impact on aquatic macrophytes.

Management options for internal phosphorus loading are aeration and alum introduction. Aeration provides air to the bottom of the lake which prevent anoxic condition and, therefore, the phosphorus is not released. This method requires constant input of energy in order to run the compressor system. The second means of reducing internal loading is to add alum to the lake. The alum binds the phosphorus and prevents the phosphorus from entering the water column.

2.2 Biological Limnology

The biological limnology of Cossayuna Lake is primarily limited to the lake's warm water fishery. DEC conducted fishery surveys in 1932, 1948, 1967 and 1974. Since 24 years have passed since the last fishery assessment was done, there is presently a great deal of discussion among fishermen, association members and other residents about how to manage Cossayuna Lake's fish population. DEC plans to conduct a fishery survey of the Cossayuna Lake in the year 2000. DEC continues to stock the lake with about 3,200 Tiger Muskies annually in the fall since they are an important control of the Blue Gill population and do not reproduce. DEC's position is that the Cossayuna Lake fishery is in fairly good condition. Since most fishing in New York State takes place on cold water lakes, Cossayuna Lake's status as a warm water fishery limits the amount of state resources that will be spent locally.

2.2.1 Biological Survey of the Upper Hudson Watershed (1932)

DEC conducted a biological survey of Cossayuna Lake in 1932 as part of a wide study of certain waters in the Upper Hudson watershed. The report found that the large beds of macrophytes served to promote healthy populations of Large-Mouthed Bass, Northern Pike, Bullheads and Perch. Pike and Perch were being maintained through stocking since the inlet streams were not well suited to their spawning. Only a small area of Cossayuna Lake was found to be able to support Small-Mouthed Bass and high temperatures on the lake bottom made it also unsuitable for Ciscoes, which were introduced in 1929 and never really established themselves. All catches of Northern Pike were less than 14 inches likely indicating that they were over-fished during the winter of the previous year.

2.2.2 Cossayuna Lake Technical Report (1975)

A 1975 report on the state of the Cossayuna Lake fishery was written by DEC staff and released as part of the Cossayuna Lake Technical Report published by the GARC&D. The entire report is presented in Appendix C. A summary of its contents can be found below.

The Report found that Cossayuna Lake remains a warm water fishery in good condition, particularly when considering the condition of the habitat caused by the increasing abundance of aquatic vegetation. Lower angler success could be due to difficult fishing conditions and increasing angler pressure, rather than fewer fish. Cossayuna Lake was intensively sampled in the spring of 1974 using electrofishing and trap netting. For the purposes of comparison, the report gives a species list for 1932, 1948, 1967, and 1974. The results from a 1974 trap net survey can be found in Table 8, "1974 Fish Survey Results."

Table 8 1974 Fish Survey Results

Species	Number Captured	Average Length
Largemouth Bass	1	10.2"
Smallmouth Bass	3	13.6"
Northern Pike	4	28.9"
Yellow Perch	29	7.4"
Black Crappie	128	9.0"
Pumpkinseed Sunfish	70	6.6"
Bluegill Sunfish	171	6.6"
Bullhead	32	11.9"
Golden Shiner	134	8.0"

Any improvements in the Cossayuna fishery will first be dependent upon addressing the problem of eutrophication. Spawning habitat for gamefish species should be protected by minimizing any future disruption of rocky, rubble/gravel and gravel/rubble areas since they are a critical habitat for fish spawning and comprise only 15 percent of the existing shoreline (1974). Further destruction of this habitat will impact the spawning of small-mouth bass. Protective cover must also be preserved including all remaining areas of emergent aquatic vegetation. Rocks, fallen trees, stumps and logs should be left in place to provide cover. The seasonal wetlands also serve as protective cover in addition to their role as spawning areas and nutrient or silt traps.

Chapter 3 Land Use

Land use in the watershed today is directly related to the natural beauty of Cossayuna Lake and the surrounding landscape. The recreational opportunities are numerous and have caused there to be a demand for seasonal and, increasingly, year-round residences. Residential land use development is the most intensive use but not the predominant use in the watershed. Aerial photographs of the region indicate the majority of the land in the watershed is now forested. Aerials are the most reliable source of comparison regarding how the watershed landscape has changed in recent years. There are aerial photographs available of the Cossayuna watershed for the years 1968 and 1995. They indicate a significant loss of agricultural lands to forests in areas in the watershed away from the shoreline and a significant loss of tree cover along the shoreline. Another source of information that helps tell the story of how development has occurred over the years are photographs of the shoreline and outlying region during the first part of the century. Photographs 1-4 are provided to give perspective to the changes that have taken place in land use over the last 80 years.

Figure 10, "Land Use Map," is based on tax parcel information for 1997. A further review of land uses using infra red aerial photographs from May of 1994. Figure 11,

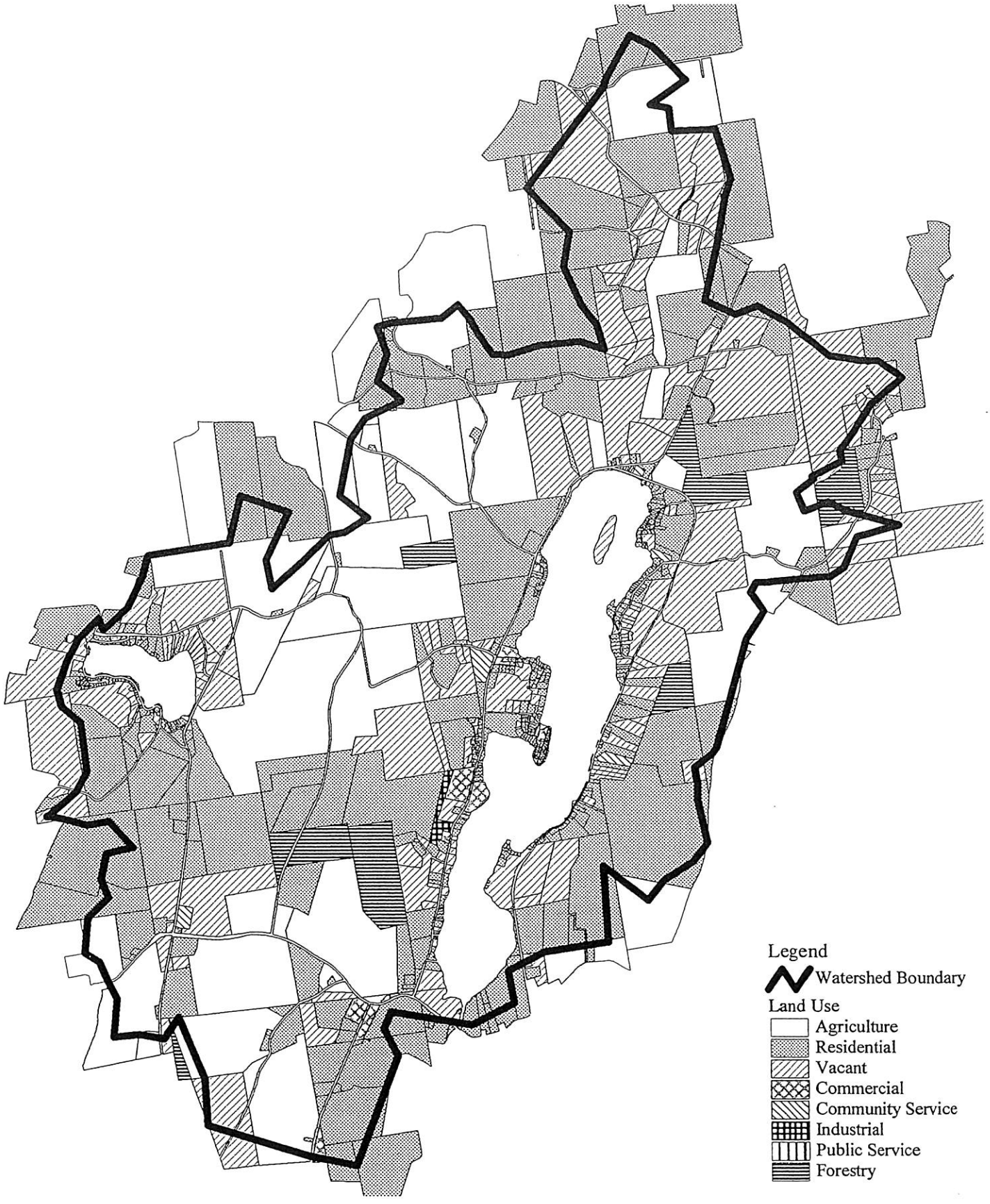


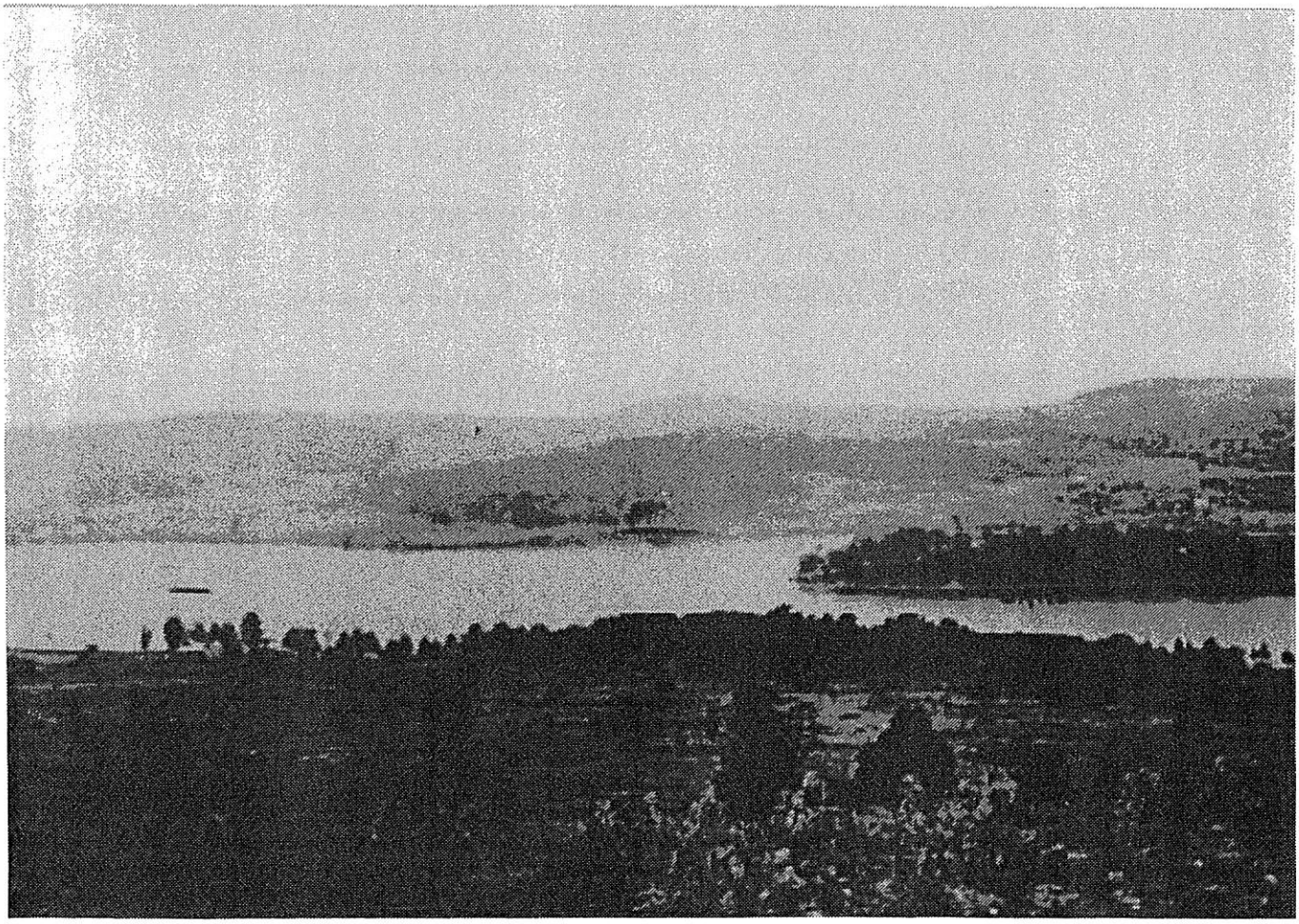
Figure 10

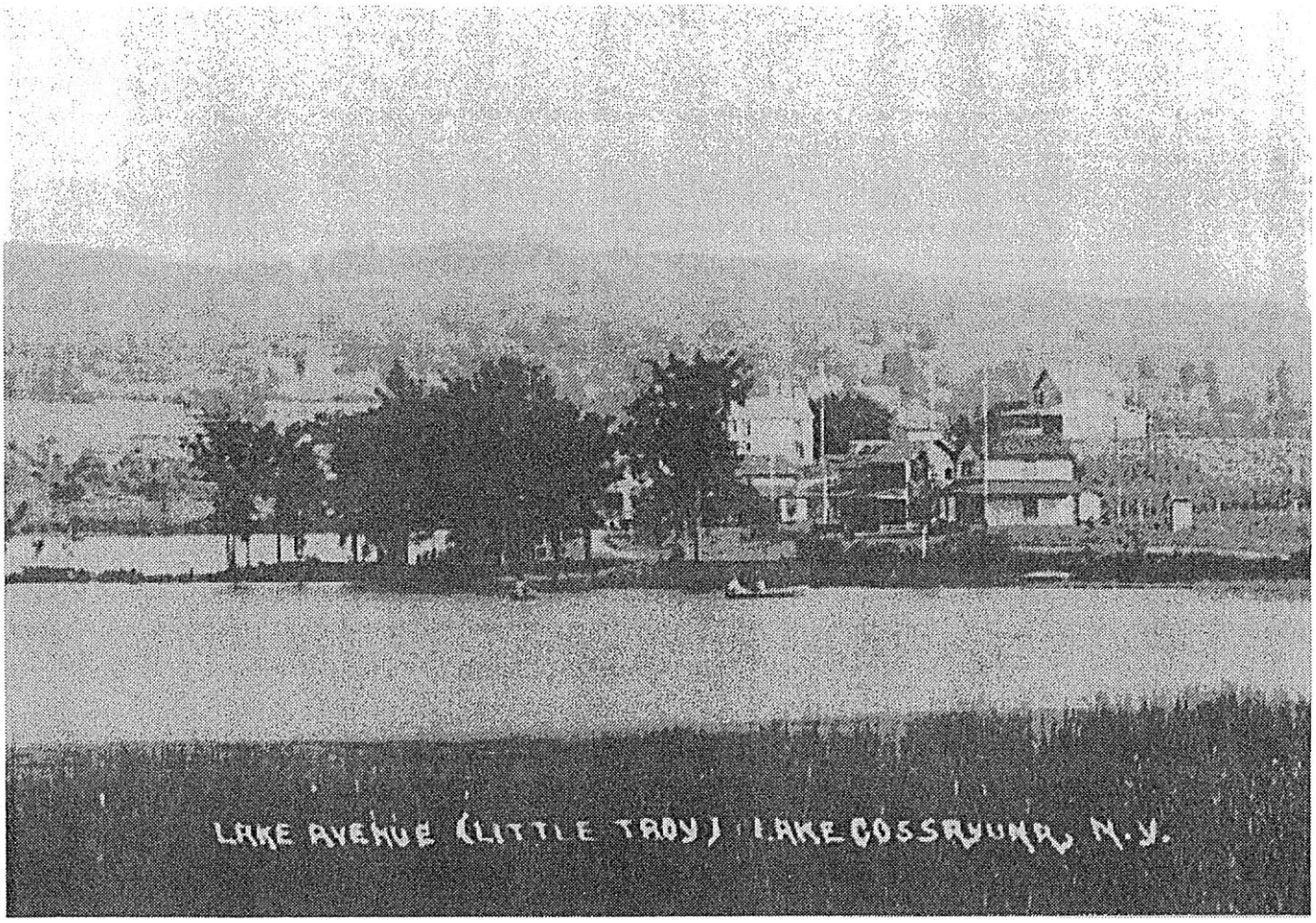
Land Use Map

Cossayuna Lake
Washington County, NY

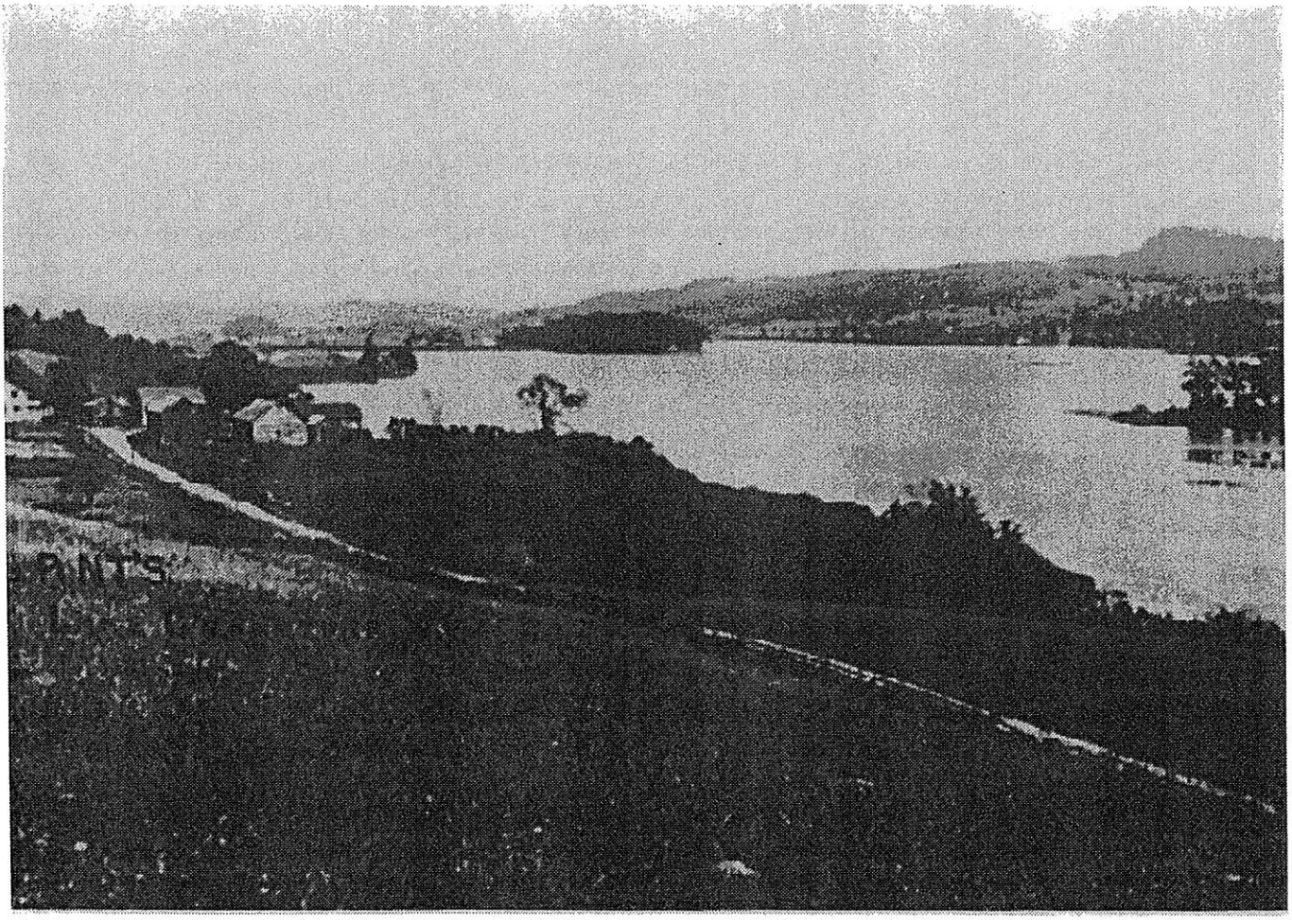
Prepared By:
Highland Geographic, Inc.
55 Bay St., Suite 314
Glens Falls, NY 12801
518/798-6741
September, 1999

Photograph1-South View of Cossayuna Lake
Photograph 2-East View of Cossayuna Lake





Photograph 3- West View of Cossayuna Lake



Photograph 4- North View of Cossayuna Lake

"Aerial Photograph," estimates land use distributions in the watershed in the following acreages:

Residential- 500 acres
Farmsteads- 14 acres
Forested Wetlands- 393 acres
Pastures- 1674 acres
Other Ag. Fields- 1037 acres
Forests- 3799 acres
Open Water- 901 acres

Neither Greenwich and Argyle have adopted zoning laws, however, both communities have individual planning boards who hold review power over minor and major subdivisions. Their review is limited to site plan issues. Both communities also have regulations governing the placement of mobile homes. The New York State Building Code governing new construction is administered by Washington County. Washington County also administers the county wide Sanitary Code governing the disposal, design and installation of all systems except those that come under the jurisdiction of the NYS Department of Health or NYS Department of Environmental Conservation. The CLIA is in the process of trying to get this law updated.

3.0 Undeveloped Lands

Undeveloped lands include forests, abandoned farm fields, open fields and wetlands. The predominant land use in the watershed continues to be forest land. Forests account for over one-half of the total land area in the watershed. Aerial photographs indicate that although there are more areas forested today than fifty years ago when agriculture was more prevalent in the watershed, there is still a net loss in tree cover. This is primarily due to the development of homes both along the lakeshore and along the east side of East Lake Road and County Route 48. All of the forest land in the watershed is privately owned and consists primarily of hardwood deciduous forest. The filling-in or alteration of wetlands continues to be regulated by DEC and the Army Corps of Engineers.

3.1 Residential Uses

A land use survey was conducted as part of the Cossayuna Lake Technical Report (1932). The survey indicated that approximately 80 percent of the shoreline was developed at that time. Approximately 92 percent of the shoreline residences were seasonally used in 1975, whereas the recent watershed survey indicated that only 60 percent are seasonal today. This change has meant more additions, garages and outbuildings have been constructed. Also, more driveways have been paved, more trees removed and septic systems, meant for use over a few months, are now being utilized full-time. More new development and more intensive use of the land usually

Figure 11
Aerial Photo
Cossayuna Lake
Washington County, NY

equates to more nonpoint source pollution from stormwater runoff, erosion and failing septic systems.

3.2 Agricultural Uses

In the1950's, there were more than 20 farms in the watershed. Since then, all but 6 farms have been either bought for development, abandoned or consolidated into other farms. In 1990, the Maplewood Farm, located above the northeast corner of Cossayuna Lake, was identified by the Washington County Water Quality Coordinating Committee (WCWQCC) as a potential nonpoint source for phosphorus pollution. The barnyard and manure loading area drained directly into a significant tributary of the lake. This was resulting in farmstead wastes, milking center waste and trench silo leachate flushing quickly into the tributary during periods of heavy rainfall and snowmelt. Maplewood owners worked with the Washington County Soil and Water Conservation District (WCSWCD) and the Natural Resources Conservation Service (NRCS) to develop a cost-effective conservation control plan which focused on farmstead runoff and water quality impacts. This successful project utilized a grant from the NYS Environmental Protection Fund and was completed in November of 1996.

Presently, there is insufficient sampling data from other tributaries around the lake to determine whether there are any other sources of significant agricultural runoff impact. One report (Smith, 1988) measuring the major inflows around the lake, found that the concentration of nutrients flowing into Cossayuna Lake from the watershed were highly correlated with stream discharges following significant storm events. This is an ongoing issue of significant importance which should be resolved by future tributary sampling.

3.3 Industrial and Public Uses

New York State owns and operates the boat launch facility on East Lake Road at the northeast end of the lake. This is an unattended launch site with a single lane, a single dock, rest rooms and a parking lot large enough to accommodate approximately 30 cars with trailers. There is a site register where launch users are given the opportunity to sign-in the number of people in their party, address, auto and boat license and type of planned activity. A recent check of the register of sign-ins revealed 21 entries for the month of May. A total of 52 people utilized the launch, nearly all of which planned to go fishing on Cossayuna Lake. In June, the number of persons registered dropped to 23. The average number of people in each party was 2.5. DEC recognizes that roughly one-third of all launch users actually register on the sign-in sheets. If this assumption is applied to the situation at the Cossayuna launch, more than 150 people, or 5 people per day, actually utilized the site in May alone.

The Watershed Survey indicated that there is a great deal of concern about activities at the boat launch. Issues included the possibility of installing a boat wash, better

signage, charging fees and monitoring the site. 62 percent of the survey respondents suggested that the issues at the boat launch were "not important."

There are other public use areas including the Cossayuna Post Office, the Cossayuna Firehouse and a cemetery located at the north end of the lake. There is a single industrial land use in the watershed today. Fronhoffer Tool Company is located on the west side of County Route 48. There are unsubstantiated reports that in the early 1900's there was a limestone mining operation in the watershed.

3.4 Commercial Uses

According to local residents, the number of commercial businesses has declined dramatically over the last 50 years. Once a thriving tourist destination with numerous hotels, cottage colonies and inns, there is only one open cottage colony on Cossayuna Lake today. Other commercial businesses that continue to operate in the near-lake area are a bait shop, restaurant, and combined grocery and marina. The land use survey done in 1975 reported approximately 11 commercial land uses including boat rentals and launches, general stores and luncheonettes, most of which were open on a seasonal basis.

Chapter 4 Development Trends

4.0 Past Trends

There are no condominium and townhouse complexes, multiple lot subdivisions, motels and commercial recreational development on Cossayuna Lake. Development has been generally limited to mixed single-family residential. New construction is occurring at a rate of about one or two homes per year and, in most cases, takes place on lots where existing camps have been torn down or removed. The conversion of seasonal cottages to year round use continues to be a serious issue since septic systems are not ordinarily upgraded at the time of the conversion. This oversight often results in failing septic systems since they have a greater opportunity to reach or exceed capacity.

Building data was compiled for the watershed from 1990 through 1998. There were approximately 9 new houses constructed and 19 additions or alternations made to existing houses.

4.1 Potential for Future Development

There is a significant potential for future development in the watershed. The lack of zoning and the abundance of good land is an incentive for developers who seek such opportunities. The potential is relatively high for residential seasonal home subdivision consisting of many lots on a large property. The limiting factor at this point appears to be the condition of Cossayuna Lake and the opportunity for lake access. Future

development in the watershed has the potential to create the following impacts on Cossayuna Lake:

1. Decline in water quality. New development and the conversion of camps to year-round use could cause additional stormwater runoff from driveways, roadways, and lawns, especially where steep slopes are found. The improper siting or installation of private septic systems in new development could result in discharges reaching the lake. Either excess stormwater or wastewater entering the lake would likely increase nutrient levels and contribute to a decline in water quality while accelerating eutrophication.

2. Increased boating pressure. According to the results of the watershed survey and interviews with the Sheriff's patrol personnel, recreational boating is occasionally a problem in Cossayuna Lake. About 72 percent of survey respondents who answered individual questions relating to unsafe boat operation and excessive speed indicated that these activities were creating minor to serious problems on Cossayuna Lake. Any new development in the area will contribute new boaters and may lead to greater user conflicts.

3. Loss of rural and natural character. New development means loss of open space and changes to the rolling natural landscape. The survey indicated that the vast majority of watershed residents enjoy the area primarily for this reason plus the scenic beauty of the lake itself. Significant changes could lead to the eventual net loss in property values.

Chapter 5 Social and Economic Setting

5.0 Regional Demographics

The US Census Bureau reports the following population counts for Washington County and the towns of Argyle and Greenwich.

Table 9 Historical Population

	1930	1950	1970	1990	2000 *
Washington County	46,482	47,144	52,725	59,330	61,263
Argyle	1,452	1,801	2,415	3,031	3,185
Greenwich	3,872	3,811	4,177	4,557	4,686

* As projected by the Lake Champlain-Lake George Regional Planning Board (1997)

During the 20 year period that followed the 1970 Census, Washington County gained just over 6,600 new residents. Approximately nine percent of these residents moved into Argyle and nearly six percent into Greenwich. Statistics indicate that Argyle grew

slowly by 100-200 persons per decade between 1930 and 1960, rose dramatically between 1960 and 1970 (517 people) and between 1970 and 1980 (432), and then grew much more slowly between 1980 and 1990 (184). Population growth is projected to continue to grow well into the next century.

Greenwich's rate of growth has been more even and considerably slower over this same period. Greenwich actually lost residents between 1930 and 1940, and then made gains of 100-250 people per decade through 1990. This trend is expected to continue well beyond the year 2000.

5.1 Watershed Population Characteristics

There are no actual statistics for each portion of the Argyle and Greenwich population's who live in the watershed. However, the Washington County Geographical Information System Cooperative prepared the watershed mailing list of 650 from tax maps after omitting any duplicate ownership of property. Assuming that an average of 2.5 persons occupy each household, there are an estimated 1,625 persons residing in the watershed either part-time or year-round. Figure 12, "Cossayuna Lake Property Map," indicates the boundary for determining watershed population.

According to the results of the 1998 Watershed Survey, about 60 percent of the residents are seasonal and 38 percent are year-round residents. Approximately 45 percent are seasonal residents from another location in New York and 12 percent live out of the state. Nearly 40 Percent of the survey respondents indicated that they either lived or had been coming to Cossayuna Lake for over 30 years.

5.2 Cultural and Historic Setting

The earliest known residents of Cossayuna Lake are believed to be the Horicon Indians who had ancestral ties to the Mohican and Hoosac Indian tribes. The Horicons abandoned the region long before the first white settlers and named the lake Quabba-yuna or "Lake of the Pines." Later, the Massachusetts Indians became transient residents utilizing the region for its rich fishing and hunting opportunities. They apparently accessed the lake from a trail up the Owl Kill, around Jackson Ponds and up Cossayuna Creek.

The hamlet of "Lakeville", also known as Cossayuna Village, was settled in the1780's. It quickly became a small manufacturing hub featuring mostly saw mills and a flax mill centered around several small dams created on two small ponds below Cossayuna Lake. Saw mills also dotted the outlet of Argyle Lake (now Summit Lake) and a woolen mill graced the head of the lake. During this era the lake was known as McEachron's Lake, then Cowan's Lake and later Big Lake. The name was changed to Cossayuna Lake in the late 1800's. Before the early 1800's the entire lake was located in the town of Argyle which then was part of Albany County.

Figure 12

Property Map

Cossayuna Lake
Washington County, NY

N

0.5 0 0.5 1 Kilometers

0.5 0 0.5 Miles

Prepared By:
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55 Bay St., Suite 314
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September, 1999

The earliest settlers were English and Scotch-Irish from New England and Palatine Dutch from the Hudson Valley region. Residents opened the first general store in 1800 and five tiny schoolhouses were constructed around the lake in 1808. The first postal services were offered in 1830 in the parsonage of the South Argyle Church. Ten years later the official Cossayuna Lake Post Office opened at the south end of the lake.

"The History and Directory of Cossayuna and the Vicinity," published by the Cossayuna Volunteer Fire Department in 1957, describes the region in the late 1800's as isolated, yet bucolic and extremely self-sufficient. There were an estimated 62 working farms plus numerous small factories and mills in the watershed at that time employing all who wanted or needed employment. Shortly after the turn of the century, outsiders discovered Cossayuna as a recreational resource and many large farmhouses were converted to inns in order to accommodate guests. The first hotel, "The Oaks", was constructed in 1889 on Macklin's Point. Apparently one of its most important functions before it burned in 1915 was to transport thirsty hotel guests by a small steamboat from "dry" Argyle to "wet" Greenwich. Cottages were furiously built on the lakeshore between 1910 and 1920. These changes forever transformed Cossayuna from a thriving, independent, mostly agricultural community to an essentially seasonally-driven, highly dependent and tourism-based community.

5.3 Economic Characteristics

The lands around Cossayuna Lake have undergone many substantial changes over the last fifty years or more. Along with changes in land use has come the demand for year-round residences and the consequential conversion of seasonal camps to year round homes. This transition has resulted in a significant increase in the real property tax base. The total 1997 assessed value on properties on the lakeshore and fronting the west side of County Route 48 and the east side of East Lake Road was $22.31 million. Approximately 83 percent of the total properties calculated, or $18.43 million in real property value, representing 12.76 percent of the total town value, is located in the town of Argyle. The additional $3.88 million in assessed value, or 1.75 percent of total town value, is located in the town of Greenwich.

Real property along the shore and near-shore area annually generates approximately $311,000 in revenues for the Argyle Central School, $210,000 in town and county taxes within the town of Argyle, and $38,000 in town and county taxes within the town of Greenwich. The small amount of area included in the Greenwich School District was not calculated for the purposes of this study. Figure 12, "Cossayuna Lake Property Map," illustrates the property boundaries represented by the figures above.

5.4 Municipal Cooperation

Roughly one-third of the Cossayuna Lake shoreline lies in the town of Greenwich. Greenwich has consistently been financially supportive of the CLIA's annual aquatic vegetation management program, contributing a total of $19,500 towards the aquatic

weed harvesting management program over the last 8 years (average annual contribution, $2,438). The town of Argyle has also generously supported the program by contributing $20,500 over the same period (average annual contribution, $2,563). Argyle elected not to grant any funds towards the harvesting program during the last several years. In 1996, however, Argyle contributed $5,000 towards the herbicide weed control program. Argyle has recently adopted a resolution of support for future grants for water quality improvements of Cossayuna Lake.

Washington County made contributions totaling $8,000 in 1990 and 1991. Support in the way of in-kind services has generously continued through the present time. Table 10, "Funding History for the Control of Aquatic Vegetation," summarizes how the CLIA has been able to fund water quality improvement projects since 1990. CLIA purchased an aquatic weed harvesting machine, shore conveyor and dump truck, maintained an aquatic vegetation control program and initiated a voluntary septic system testing program. Primary funds for these purchases came from the individual private contributions of Cossayuna Lake shoreowner's.

Chapter 6 Infrastructure

6.0 Roads

County Route 48 on the west side and town-owned East Lake Road on the east side are the principle roads providing access to Cossayuna Lake. US Route 4 and NYS Route 40 on the west and NYS Routes 22 and 29 to the south tie-in with the county highway system to make access to the lake relatively easy. East Lake Road is a dirt surface that was graded and covered with oil and crushed stone in 1998. It receives a high traffic load during the summer due to the location of the public boat launch. Numerous complaints about the condition of this road are received by the town highway superintendents each year.

6.1 Water Supply

The vast majority of watershed residents rely on individual on-site wells for their drinking water. The survey revealed that a number of residents do use the lake as a water supply for non-potable uses such as lawn watering and washing vehicles. The village of Argyle utilizes Summit Lake as a backup municipal water supply.

6.2 Sanitary Waste Disposal

Sanitary waste disposal in the watershed is limited to individual on-site septic systems. Use and operation of these systems are regulated by the Washington County Sanitary Code. In the near future, the CLIA will propose to amend the Sanitary Code to require inspections and mandatory upgrades to the system should they be deemed necessary. This is an important issue which stems from new construction and the conversion of camps to year-round residences.

Table 10 Funding History for the Control of Aquatic Vegetation

January 20, 1998

This summary shows how the Cossayuna Lake Improvemment Association has been able to fund water quality improvement activities for the eight years from 1990 through 1997. During this period, an aquatic weed harvesting machine, shore conveyor, and dump truck were purchased and operated by the association, chemical treatment programs were implemented, and a septic system testing program was initiated. Assistance from New York State, Washington County, and the townships of Argyle and Greenwich was provided as shown.

DONOR	1990	1991	1992	1993	1994	1995	1996	1997	Total
HARVESTING				(dollars)					
NY State	4750	250							5000
Washington County	4000	4000							8000
Town of Argyle	3000	3500	3500	3500	3500	3500			20500
Town of Greenwich	2000	2500	2500	2500	2500	2500	2500	2500	19500
CLIA Treasury	2500	2500	2500	3000			2500	2500	15500
Member Donations	10295	5075	5700	7150	6215	6765	4850+	6005#	52055*
HERBICIDES									
Member Donations	6631	No trmt.	6133	6273	7034	6043	15494+	9163#	56744*
CLIA Treasury					500	500			1000
Town of Argyle							5000		5000
MEMBER DUES	2085	3525	5625	4575	4825	4475	5010	5460#	35580*

In 1997, members contributed $20,628. to the lake association and its programs.

* Members contributed a total of $144,379. over eight years ,including dues,which, for the most part, are used for lake improvement.

+ The lake was treated with Sonar in 1996. That year, it appears that some donations were diverted from the harvesting program to the chemical treatment program.

6.3 Cossayuna Dam

Lake levels are controlled by a steel and concrete dam located at the south end of the lake. This "Upper Dam" was constructed in roughly 1840 for the purposes of operating a grist mill. It has the capacity to hold lake levels back a maximum of 16 inches, 6 inches of which is controlled by a wooden board. The CLIA has ownership of the dam and maintains it with the primary purpose of drawing the lake down in the late fall. Drawdown is practiced in the wide belief that it aids in the control of aquatic vegetation along the shoreline zone and it reduces the potential for erosion caused by ice pressure. The "Middle Dam" is located on the County Route 49 Bridge and is maintained by the local fire department who own the rights to the pond. This particular dam has no appreciable effect on the lake level on Cossayuna Lake.

Chapter 7 Recreational Resources

Bicycling and walking are the most popular land-based recreational activities. There is a formal nature walking trail, volleyball court, picnic pavilion, fishing area and swimming beach located at the Cossayuna Lake Improvement Association property on the east side of the lake. The lake itself serves as the main recreational destination in the region. Cossayuna Lake supports all types of pleasure boating, fishing, and water-skiing.

Activities on the lake are subject to New York State navigation laws. These include equipment, registration of boats, trailering, and rules of the nautical road. Regulations pertaining to speed, accidents, boating while intoxicated, mufflers, marine sanitary devices, water-skiing, diving, and the operation of personal watercraft (jet skiis) are presently in effect on Cossayuna lake. In New York, speed is limited to 5 mph when within 100 feet of shore, dock, pier, raft, float or anchored boat.

Cossayuna Lake is patrolled by the Washington County Sheriff's Department on a regular basis throughout the summer. Two patrolman continually patrol the lake a minimum of one day per week between the hours of 8AM and 4PM. About 60 percent of their job is related to boarding boats and checking registrations and certificates, safety devices and sanitary systems. They also tow stranded boats, address complaints and educate jet skiers about the new regulations regarding their operation. Their concentration continues to focus on the education and safety of all lake users rather than on handing out tickets. No boating accidents have been reported in recent years. According to the Sheriff's report, the activity having the highest use on Cossayuna Lake is fishing.

Chapter 8 Cossayuna Lake Improvement Association

8.0 Membership, General Purpose and Activities

The Cossayuna Lake Improvement Association was founded in 1940's. The Association was organized primarily to address property values, the quality of fishing and the control of aquatic vegetation. Beginning with about 10 members, the Association membership now stands at about 151 families, representing 65 percent of shoreline property owners. CLIA is a not for profit organization with the following purposes:

- ✓ To maintain and improve the waters of Cossayuna Lake.
- ✓ To promote the advancement of the Cossayuna Lake community.
- ✓ To provide education for the community related to lake ecology.
- ✓ To promote sports, social activities, and good fellowship.
- ✓ To maintain a place to meet.
- ✓ To serve as the voice of membership in matters under consideration by federal, state, and local governing bodies which have direct impact on the lake.
- ✓ To seek enforcement of laws which effect the lake and its watershed

CLIA has been consistently successful in carrying out its objectives. In recent years, the organization's focus has been on the control of Eurasian watermilfoil, updating the Washington County Sanitary Code, and developing the framework and support for a Cossayuna Lake Water Protection and Improvement District. The CLIA is planning to conduct a public boating access survey to begin to ascertain who utilizes the boat launch and what kinds of activities they engage in once out on the lake.

8.1 History of Aquatic Vegetation Management Efforts

Since 1970, the primary focus of the CLIA has been the development of an annual aquatic vegetation management plan and securing the funding to carry out its initiatives. The plan involves a combination of winter drawdown, harvesting and herbicide applications. The harvesting program costs $10,000-15,000 every year. Approximately $2,500 is contributed by the Town of Greenwich and the remainder CLIA and its members. This harvesting is conducted to keep boat lanes open in the main areas of the lake. The other 60 percent comes from donations of property owners and most of this funding is used to keep individual docks and boat lanes free from vegetation. Table 11, "Aquatic Pesticide Permits," lists the various DEC permits obtained for the application of aquatic pesticide treatments since 1973.

The herbicide program is solely dependent on member donations which totaled $9,163 in 1997. Volunteers contribute an average of 700 hours per year, equivalent to nearly $8,000, in the operation of harvesting equipment. Table 12, "Aquatic Weed Harvesting Summary," reports the man hours, harvester loads, truck loads and estimated tons of harvested materials removed from the lake between 1990-1997. Landmarks in the

Waste of money!

Table 11 Aquatic Pesticide Permits

The following retrospect represents the history of aquatic pesticide permits applied for by the Cossayuna Lake Improvement Association and granted by the NYS Department of Environmental Conservation.

1998 & 1999: 3500 lbs of Aquakleen (active ingredient 2,4D) to 35 acres of the lake at the rate of 100 lbs per acre for milfoil control.

1997: 3500 lbs of Aquakleen to 35 acres of the lake at the rate of100 lbs per acre.

1996: 900 lbs of Sonar SRP (solid pellets) to 29 acres of the lake at the rate of 30 lbs per acre for milfoil control.

1994 & 1995: 3500 lbs Aquakleen for 35 acres at the rate of100 lbs per acre.

1992 & 1993: 3000lbs of Aquakleen for 30 acres at the rate of 100 lbs per acre.

1991: No permits issued.

1989 & 1990: 3,000 lbs of Aquacide Pellets for 30 acres at the rate of 30 lbs per acre.

1988: 2500 lbs of the same for 25 acres at the rate of 220 lbs active per acre.

1987: No permits issued.

1986: 2,350 lbs of Aquacide Pellets for 23.5 acres at the rate of 20 lbs active per acre.

1985: 3,525 lbs of the same for 23.5 acres at the rate of 30 lbs active per acre.

1984: 205 lbs of the same for 5 small treatment areas at the rate of 20 lbs active per acre.

1976-1981: Six permits were issued for the use of 600 lbs of Copper Sulfate for algae control of 126 acres at a rate of 0.3 ppm per application. Three treatments per year were authorized but actual treatment was only once in 1980 and no treatment was made in 1977.

1974 & 1975: 600 lbs of Copper Sulfate to 126 acres at the rate of 0.3 ppm per application and 35 gallons of Diquat to 35 acres at the rate of1 gallon per acre for watermilfoil and pondweed control.

1973: 464 lbs of Copper Sulfate to 116 acres at the rate of 0.3 ppm per application and 25 gallons of Diquat to 25 acres at the rate of 1 gallon per acre.

Table 12 Aquatic Weed Harvesting Summary

Cossayuna Lake Improvement Association

January 20, 1998

The following summary will provide some perspective on the accomplishments of the eight-year-old aquatic weed harvesting program initiated and implemented by the Cossayuna Lake Improvement Association.

CATEGORY	1990	1991	1992	1993	1994	1995	1996	1997	Total
Man hours	1415	1545	1408	1187	918	1306	799	623	9201*
Harvester loads	325	518	549	517	272	472	272	181	3106
Truckloads	161	269	283	233	126	243	134	95	1544
Estimated tons	450	673	708	672	354	614	335	238	4044+

* About 5550 of these man hours were provided by volunteers who operated the harvesting equipment. Many hundred more volunteer hours were expended in the maintenance and repair of the harvesting equipment and in administration of the overall project. These 5550 hours, provided by association members, have a value of more than $62,000.

+ The 4044 tons of aquatic weed mass which was removed, if put into more familiar terms, would be the equivalent of 161,760 bales of hay...a quantity of bales which, if put end-to-end would stretch 92 miles...a distance equal to thirteen times the road distance around Cossayuna Lake. This significant quantity of weed mass was donated to two different commercial gravel-mining operations as a top-dressing compost for areas that had previously been mined and were being reclaimed.

management program include the purchase of a $37,000 Aquamarine H 5-200 weed harvester in 1990, participation in the CSLAP water quality monitoring program from 1991-1996, and the experimental application of Sonar in 1996. The Watershed Committee made it possible to continue CSLAP testing in 1999.

The following represents the Lake Management Plan ratified by the CLIA for the 1999 season.

To maintain the water level 6 inches above the bottom of the dam spillway:

1. Begin winter drawdown the day after Columbus Day by removing the board from the spillway and slowly drawing the lake down through October and completely opening the gates on the dam on November 1.
2. Begin monitoring the lake level at ice-out.
3. Establish and maintain the summer level at 6 inches above the bottom of the spillway as soon as possible.
4. Maintain the summer level at 6 inches above the bottom of the spillway, weather permitting.

To maintain the water quality at a level which supports such activities as fishing, swimming and boating by the use of aquatic herbicides and mechanical controls.

Chemical Control

1. Provide residents the option of spot treating out to 200 feet with 2-4-D.
2. Use 2-4-D in the boat channels on both sides of the little island and spot treat other areas if financially feasible.
3. The specific plan to meet the chemical objectives will be approved by the BOD at the March meeting and submitted to DEC for approval.

Harvesting Control

1. Run harvesting program June-September using one day per week for maintenance.
2. Seek funding from the towns, county, state and other sources to support the harvesting program.
3. Offer harvesting as an "Every Time" option to those who gave a donation to the program and at a higher rate to other lake residents and businesses.
4. The specific plan to meeting the harvesting objectives will be approved by the BOD and submitted to DEC for approval.

Biological Control

1. Continue to investigate the possibility of introducing Triploid Carp into Cossayuna Lake and present a report to the membership with cost estimates and recommendations.

To minimize the introduction of nutrients and sediment into the lake by careful monitoring and education.

1. Continue to work with various highway departments, WCSWCD and DEC to

encourage best management practices in culvert replacement and road repairs.
2. Continue to monitor the environment to ensure that building and sanitary codes are observed.
3. Continue to explore the development of a lake protection and improvement district.

To monitor the water quality through research activities designed to assess such factors as lake usage, water clarity, oxygen saturation, and bacterial contamination.

1. Test areas of concern for nitrates, phosphates and bacterial contamination.
2. Offer voluntary septic testing program.
3. Continue the CSLAP membership.

To educate individuals within the lake's watershed in effective management techniques.

1. Provide homeowners education on bank erosion.
2. Provide information on permits needed for bank stabilization projects.
3. Provide education on lake management for town boards.
4. Provide homeowners education on septic systems.

8.2 Status of Water Quality Improvement District

The Cossayuna Lake Improvement Association is currently making its second attempt to create a lake protection and improvement district. The district would be used to create a permanent and legal supply of funds to put towards managing the aquatic vegetation in the lake and to create a permanent water quality monitoring program. The proposed district would also give the lake a municipal, rather than not-for-profit status and provide owners the right to vote on projects proposed by the district. Efforts to create a district began in 1975. The most recent effort was launched in 1997. A survey was sent out to 385 land owners around Cossayuna Lake to find out whether there was support for the district plan at the grass-roots level.

Approximately 58 percent of the surveys were returned with a 70 percent approval rating. The CLIA sought home rule resolutions from the towns of Greenwich and Argyle so that residents around the lake can decide whether they want a special district. In 1998 the towns of Greenwich and Argyle voted to approve the home rule provision. In December of the same year the Argyle Town Board reversed its position and turned down the request for home rule. The Board voted instead to act as lead agency in the formal application of all future government loans and grants. On December 28, 1998 the Board passed a resolution requesting funding for the purpose of improvements to Cossayuna Lake to the Association of Towns, Assemblyman D'Andrea, Senator Stafford, Governor Pataki and the Cossayuna Lake Improvement Association. Should CLIA receive support for a district from both towns at some point in the future, there appears to be strong support from local legislative representatives to introduce the necessary legislation in the New York State Assembly.

special watershed management district as a very important or significantly important objective.

Goals and objectives of a watershed management plan ranked the following:

1. To protect and enhance water quality
2. To maintain or increase property values
3. To increase public education and awareness concerning the watershed

Chapter 10 THE SUMMIT LAKE REPORT

The watershed survey was also sent to residents around Summit Lake since it is located inside the watershed of Cossayuna Lake. Respondents were specifically asked whether they were responding for Cossayuna Lake or Summit Lake. The findings were collected and reported by the Summit Lake Association. The survey showed that the majority of respondents have owned property on the lake for 20 years or more. About 84 percent of those who responded own shoreline property and 75 percent consider themselves as seasonal residents. Roughly half are from outside Washington County. About 55 percent are convinced that water quality has declined, 15 percent believe it has improved and 30 percent answered "not sure" to this question. Approximately 50 percent support active weed control in any form, 30 percent say no to any chemical controls, and 20 percent do not support treatment of any kind.

The number one goal for Summit Lake was identified as protecting and enhancing water quality. There also consensus that the lake is presently overdeveloped and there should be some type of limitation to future development. Those who are boat owner's generally responded that there is not a problem with boats in Summit Lake and those not owning a boat believe that boating is a significant problem that needs to be addressed.