AN ASSESSMENT OF THE WATER QUALITY OF
FRIENDS LAKE
WARREN COUNTY, NEW YORK

Completed by

Eichler, L. W.
Rensselaer Fresh Water Institute

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FWI #88-4

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Background

Friends Lake is located in the central portion of Warren County in the Town of Chester. The lake's watershed is located wholly within the Adirondack Park. Friends Lake is classified by New York State as Class AA - Special, which means that no waste materials of any kind, treated or untreated, may be discharged to the water body, and that the best usages include potable water with appropriate treatment and recreation, both contact and otherwise.

The lake has a surface area of 450 acres and a sloping watershed of 3558 acres. Elevations within the watershed range from 1400 feet to 913 feet above sea level at the lake surface. The lake has a maximum depth of 9.1 meters (30 ft.) and exhibits thermal stratification. The only outlet is located on the northeastern margin of the lake. Two inlets are located on the west shore of the lake. The lake can best be classified as oligotrophic to mesotrophic. These classifications indicate that nutrients necessary for the growth of algae in the waters of the pond are low to moderate.

The surficial geology is primarily granitic gneiss (exposed bedrock) with scattered glacial till (a sand and gravel soil without exposed bedrock).

Friends Lake is a residential/recreational lake with boating, fishing and swimming the primary uses. New York State lists Friends Lake as having no public access due to the lack of a state

Table 1. Physical Features of Friends Lake.

FRIENDS LAKE - Chestertown, Warren County, New York		
Latitude	43 degrees 38 minutes 20 seconds	
Longitude	73 degrees 50 minutes 25 seconds	
Maximum Depth	9.1 meters	(30 feet)
Mean Depth	4.2 meters	(14 feet)
Surface Area	1.8 km^2	(450 acres)
Watershed Area	14.4 km^2	(3558 acres)
Volume	7774200 m^3	(6300 acre-feet)
Hydraulic Retention Time	0.9 years	
Elevation	278 meters	(913 feet)
Shoreline Length	9.8 km	(6.1 miles)

operated park or launch ramp. The lack of public access limits the availability of state and federal funding for lake maintenance or restoration projects.

The watershed is sparsely populated, and areas of undeveloped shoreline with potential for residential use remain. The population in 1969 was estimated as 150 year round residents with a summer peak of 1350. Commercial land use on the shore of the lake exists in the form of seasonal resorts.

Sewage treatment is on an individual septic system basis. Bacterial water quality of Friends Lake has been sampled on a number of occasions. Most samples were collected to be indicative of background levels of bacteria in the lake. Results range from 3 to 8 total coliform bacteria per 100 milliliters from midlake samples. A single sample reported for 1980 contained higher levels of both total coliform bacteria (56 colonies/100ml) and fecal coliform bacteria (38 colonies/100ml). The bacterial levels in this sample, although higher than previous records, were within acceptable limits for contact recreation (swimmming) as set by New York State Department of Health. The relationship of coliform bacterial testing to water quality goals will be explained in detail in a later section.

Sampling Locations

In order to characterize the chemistry of Friends Lake water, three sampling sites were selected (Figure 1). Sites were selected to provide samples representative of the lake as a whole. Selection criteria, which were discussed with association members prior to sample collection, included: water depth, degree of shoreline development, density of aquatic weed growth, and proximity to inlets or outlets.

In order to characterize the bacterial levels of Friends Lake, six samples were obtained for bacterial analysis. Five of the samples were collected near shore in areas where bacterial contamination would appear likely. These areas included: 1) the inlets, where drainage from extensive land areas enters the lake, 2) areas of high human population density, 3) areas with little water circulation adjacent to developed shorelines, and 4) areas showing moderate to high densities of aquatic plants and/or algae. A single sample was collected in the center of the lake to characterize background bacterial levels.

Sampling Methods

At each lake site a surface grab sample for chemical analysis was collected. Samples were collected by submerging a 500 milliliter bottle below the surface of the water and then inverting it to fill in such a manner that the mouth of the bottle was as far as possible from human skin. Care was taken to avoid collecting portions of the surface film in the sample. Samples for coliform bacterial analysis were also collected in this manner using sterile sample containers. All bacterial samples were analysed within 6 hours of collection. A large volume sample was collected at each site for later analysis of chlorophyll a concentration.

All samples were stored on ice until return to the laboratory. Immediately upon returning to the laboratory a portion of each chemistry sample was analysed for pH, specific conductance and alkalinity. A separate portion to be used for total phosphorus determination was frozen until analysed. A third portion was preserved with nitric acid for determination of metals. The remainder of each sample was filtered (0.4 um Nuclepore filter) and stored at 4°C until analysed for nitrate, ammonia, chloride and soluble silica concentrations. The sample for chlorophyll a analysis was filtered through a glass fiber filter and the filter frozen in a dessicator for later analysis. The analytical methods used for all determinations are listed in Appendix A.

Results

Samples were collected from Friends Lake on July 14, 1987 by members of the lake association. In addition, they began planning for a program to measure water temperature and transparency throughout the summer season. Although they were unable to start data collection in 1987, sampling is planned for 1988. A brief discussion of some of the factors related to water temperature and transparency is included here.

Thermal stratification, when used to describe a lake, refers to an increase or decrease, sometimes abrupt, in water temperature from the surface to the bottom of the lake. Since most of the heating of the lake occurs at the surface, temperature in the surface waters during the summer months is highest and decreases with depth. There is however, a zone of rapid temperature change over a small increase in depth. This zone is referred to as the thermocline. This thermocline acts as a barrier, effectively preventing mixing of the waters above it with the waters below it. The part of the lake above the thermocline is referred to as the epilimnion and the portion below the thermocline is known as the hypolimnion.

Depth profiles of dissolved oxygen and temperature in nutrient rich lakes generally show oxygen levels near zero in the deeper parts of the lake during the summer months. These low levels of oxygen in the hypolimnion control the type of organisms capable of utilizing this portion of the lake. This lack of oxygen is due to decomposition going on in the deep waters and sediments. Bacterial activity in the sediments of the lake bottom consumes oxygen and once the lake is stratified, the deep waters are effectively cut off from the primary source of oxygen to a lake, the atmosphere. A by-product of some of the bacteria capable of living in the absence of dissolved oxygen is hydrogen sulfide which gives the water a "rotten egg" odor.

Secchi depth is a simple measure of water transparency. Water transparency is controlled by the density of plankton (floating microscopic plants) and the amount of fine grained silts and clays present in the water. Nutrient rich lakes, for example Saratoga Lake listed in Table 4 for comparison, generally have large numbers of plankton in the water which result in low transparency. Shallow lakes in areas where the soils are mainly fine clays and silts also have generally low Secchi depth readings due to constant resuspension of the fine sediments via wave activity. Water transparency in Friends Lake as measured with a Secchi disk has been reported to be 4.8 to 5.0 meters (16 feet). This transparency is comparable to other lakes in the area (Table 4).

The chemical constituents of primary concern for Friends Lake residents would be those which promote the growth of algae and aquatic weeds. These materials, notably phosphorus and nitrogenous compounds, are fertilizers in that they are present in the shortest supply relative to the amounts needed to sustain algal growth. Addition of one or both of these nutrients generally results in a reduction of water quality since the concentrations of these nutrients control the amount of plant, and thus animal, material capable of growing in the lake. Sources of nitrogen and phosphorus to the lake include: 1) the atmosphere through rain, snow, etc.; 2) surface runoff of soils; 3) septic system leachate; 4) resuspension from the sediments of the lake; 5) runoff of fertilizers from farm fields or lawns and gardens; and 6) fecal material from domestic animals.

Phosphorus is generally considered to be the primary limiting nutrient to plant growth. Total phosphorus concentrations listed in Table 2 indicate that the amount of phosphorus in the surface waters of Friends Lake is low. At any one time, most of the phosphorus is probably tied up in the cellular material of the organisms in the lake. Previous reports found much higher concentrations of phosphorus in Friends Lake water, however the units may not be directly comparable. A check of the way phosphorus concentrations were reported in the previous study is necessary.

The methods used to determine the amount of nitrogenous compounds in the lake water only measure materials not contained in living tissue or particulate material. From Table 2, it is apparent that there are little or no nitrogenous compounds (ammonia and nitrates) available in the surface waters of Friends Lake. Most of the nitrogenous material is probably bound up in living tissue (i.e. algae, plants, fish, etc.). The lack of available ammonia and nitrates indicates that nitrogenous material may be limiting to algal productivity in Friends Lake.

Alkalinity and pH records for Friends Lake are listed in Table 2. The pH at all sites was approximately neutral (pH near 7.0). The ability of a lake to neutralize additions of acid via acid rain or surface runoff is measured by alkalinity or the buffering capacity present in the lake water. The alkalinity of Friends Lake ranged from 10.0 to 30.0 mg/L as $CaCO_3$ in the surface waters (epilimnion). This alkalinity value is low but as evidenced by the neutral pH of the lake water, it presently has an adequate capacity to buffer whatever acids come into the lake. The greatest amount of acid enters the lake during the spring when rapid melting of snow occurs. This is generally the time when the most acidic (less than 7) pH values are observed in lakes and streams. Since spring water samples were not included in this study, the effects of spring snowmelt on the pH of Friends Lake remains to be determined.

Specific conductance is a measure of the total dissolved ions present in the water. Conductivity values in the surface waters ranged from 47 to 48 umhos. These conductivities are low and in line with other chemical constituents reported for Friends Lake.

The chloride concentrations for all samples from Friends Lake ranged from 1.30 to 1.58 milligrams per liter. Concentrations of chloride in this range are quite low for a lake with a moderate amount of development (compare Tables 3 & 4) and present little or no hazard. The lack of major highways within the watershed and the limited amount of road salt drainage into the lake may account for the low chloride concentration observed. Since spring samples were not collected specific statements on input of chlorides to the lake via road salt cannot be made at this time.

Chlorophyll _a_ is the primary photosynthetic pigment found in algae and is generally used to estimate the amount of algae present in lake water. Most naturally mesotrophic waters have chlorophyll _a_ concentrations of between 2 and 8 micrograms per liter. Chlorophyll _a_ concentrations for Friends Lake are at the lower end of this range indicating that the lake is mesotrophic to oligotrophic. This classification indicates that Friends Lake is low to intermediate in algal productivity.

The coliform group of bacteria are used as the principal indicator of suitability of water for domestic and recreational use. These bacteria are found in the digestive tract of warm blooded animals and excreted with fecal material. Coliform bacteria though not generally pathogenic (disease causing) in humans indicate the presence of sewage which frequently carries other potentially pathogenic bacteria and viruses. Ratios of the different groups of coliform organisms are used to determine whether the sewage source was human or from other warm blooded animals, e.g. cattle, poultry, etc. Assays of total coliform, fecal coliform and fecal streptococcus bacteria in Friends Lake were made at various locations to determine potential locations of sewage input and to provide assurance that Friends Lake remains within New York State Department of Health guidelines for contact recreation (i.e. swimming). Levels of coliform bacteria in the lake (Table 3) are well below the allowable limits set by New York State for contact recreation (Table 5, Class B).

A bathymetric map of Friends Lake (Figure 2) is provided courtesy of the New York State Department of Conservation, New York State Lakes, Vol. 1, 1985.

Aquatic weeds do not presently appear to be a problem for boating or other recreational activities. A certain number of aquatic plants are beneficial since the weed beds provide habitats for numerous fish and other organisms allowing for a good warm water sports fishery. Non-native aquatic plants such as Eurasian Watermilfoil have begun turning up in more remote lakes and have the potential for causing a variety of problems and an overall degradation in water quality. If the suspicion exists that

Eurasian Watermilfoil is present in Friends Lake, the Fresh Water Institute would be glad to identify, free of charge, any plants suspected to be Eurasian Watermilfoil. Procedures for plant collection and identification are included as Appendix D. A drawing of Eurasian watermilfoil is included as Figure 3.

A list of the fish species reported for Friends Lake (Table 6) is included courtesy of the New York State Department of Environmental Conservation.

SUMMARY AND SUGGESTIONS

At present, the water quality of Friends Lake is quite adequate for the primary use of its' residents, namely recreation. The chemical and bacteriological results are well within guidelines set by New York State for these uses (Class B, Table 5). Use of Friends Lake water for drinking or food preparation without prior treatment (chlorination) is probably not advisable. If it is necessary to use lake water for these purposes, chlorination is desirable to kill any potential pathogenic organisms and filtration to remove particulates is well worth the small additional cost. Location of intakes for lake water systems should be given careful consideration. The intake should be no deeper than 5 meters (15 feet) to assure well oxygenated water and should be no shallower than 2 meters (6 feet) to avoid sediments mixed by wave action and recreational activity. Without active concern the good water quality presently enjoyed by residents is not guaranteed.

Since the lake serves public and private users as a bathing area, elimination of all inputs from septic systems should be of primary concern. Initiation of a new Septic Survey by the Warren County Sanitary Inspector, Mr. Daniel Olsen, should be pursued. The survey will determine any severe problems and it then becomes the Department of Health's responsibility to oversee correction of any problems encountered. If the county, as a result of a lack of manpower, is unable to complete the survey, the association members may wish to do their own survey. A sample septic survey form is included for your information (Appendix B). The only shortcoming of doing your own survey is the lack of any legal right to force residents to correct failing systems. DOH or Warren County may be willing on a case by case basis to help you with this. After completion of the survey, lake residents should still police themselves since systems that were operational during the survey may fail shortly afterward.

As previously discussed, nitrogen and phosphorus compounds entering the lake are likely to cause the greatest problems for recreational users. There are a number of ways that the amount of these nutrients entering the lake can be reduced. Methods for reduction will be discussed in relation to the source of input.

Nutrient additions from the atmosphere through rain, snow, etc., are a large part of the total nutrients added to a lake each year. The ability to reduce inputs from this source is limited. Reduction of the amount of impermeable surfaces adjacent to the lake (paved roads and driveways, sidewalks, etc.) will slow the flow of rainwater to the lake by forcing it to percolate through soils prior to entering the lake. Soils act as a natural filter removing much of the nitrogen and phosphorus compounds before the water reaches the lake. Eliminating stormwater drains emptying directly into the lake is also helpful. The drains may be redirected to small gravelled areas for slow dispersal of the water.

Sewage from failing or improperly located septic systems can be a major source of nutrients to a lake. In a properly maintained and located septic system, solid material is allowed to settle in the septic tank where microorganisms can decompose it into water soluble material. The water soluble components (leachate) are allowed to pass into lateral drainage fields where the liquid slowly percolates into adjacent soils. In the soil, chemical reactions and bacteria remove the nitrogen and phosphorus compounds from the water and convert it to insoluble material, cellular material and gaseous material. Thus, in a properly operating system nitrogen and phosphorus are removed before the water finally percolates back to the lake. In a system which is not operating properly, insufficient time is available for complete removal of nitrogen and phosphorus compounds before the leachate reaches the lake. Septic system failure is likely to occur when the systems are:

1) built in fill, over an old wetland or natural drainage area whose water table is near the surface of the soil.

2) not of sufficient size to handle normal and peak loading rates.

3) located where the depth of soil present over bedrock is less than six feet.

4) located less than 50 feet from the shore of a lake or a stream.

5) located in soils with extremely high permeability or steeply sloping ground resulting in too rapid a movement of liquid through the system.

6) receiving excessive amounts of undigestable or slowly digested materials (i.e. plastics, bone or eggshells) without frequent pumpout.

7) older than 30 years and have never been upgraded.

Extreme septic system failures may be observed as clogged toilets and drains or puddling of water on the surface of the ground near the location of the septic leaching device of the system. Puddling is most likely to occur when the soils are quite wet primarily during the spring of the year and after periods of heavy rain in the summer. Surface pooling of water is also most common at high water usage times of day, generally in the morning. Septic inputs directly into the lake generally result in excessive growth of dense filamentous mats of algae near the point where the sewage enters the lake.

Eroding soils carry considerable amounts of nutrients into the lake. Soils generally contain much greater amounts of nitrogen and phosphorus compounds than lake water. If soils are stabilized by good vegetation cover, only small amounts of nutrients are washed into the lake. If large areas of timber are logged or if roads and developments are improperly designed, large scale erosion of soils frequently results. Soil erosion may be controlled in several ways by: 1) maintaining or planting effective ground cover vegetation (e.g. Crown Vetch) in erosion prone areas, 2) restricting the amount of acreage that may be logged at any one time and the time of year when logging operations occur, 3) providing guidelines on road construction within the basin and methods that contractors use to develop property, and 4) maintenance of a vegetated area along the shoreline. Considerable amounts of soils are deposited in the lake by streams. Some of the soils may be removed by minimum adjustments to the stream bed to reduce the water velocity in the stream prior to entry into the lake. Reduced water velocity in the stream will cause the bulk of the suspended soils to be deposited in the low velocity area and with occasional cleanout this area can be maintained fairly easily. Your local Soil Conservation Service representative can provide valuable assistance in determining the extent of erosion problems and suggesting methods for soil conservation.

The runoff of fertilizers applied to lawns and gardens can frequently add nitrogen and phosphorus to a lake. There are a number of "common sense" methods for reducing the inputs from these sources. Don't fertilize early in the spring or at other times when soils are saturated from recent rainstorms. Try to apply small amounts of fertilizer more frequently (i.e. twice per year add one-half the amount usually applied once per year). Don't locate vegetable gardens or other gardens that you plan to fertilize heavily close to the lake. Don't fertilize immediately before a rainstorm is forecast.

Continued monitoring of Friends Lake water quality by your association is desirable. A chemical assay program is probably not necessary on an annual basis. Lake Association members in conjunction with their water quality committee can make certain measurements that will prove useful in observing any long-term trends in water quality. The Fresh Water Institute currently assists the Lake George Association in operating a Lay Monitoring

Program on Lake George. A similar program was organized on Friends Lake during the summer of 1987. Association members are acquiring Secchi disks and thermometers to record the transparency and temperature of the lake once per week during the summer months. At the end of the year, the data is gathered and compared to results from previous years to provide a measure of any significant changes in water transparency. On a three or five year basis, more complete chemical assays and observations of the lake may be advisable. These lake observations and chemical assays may be conducted by such groups as RPI Freshwater Institute, RPI Department of Environmental Engineering, or a host of consulting companies. If the association feels that they want to collect samples and make their own assessments, laboratories such as Bender Labs in Albany, C.T. Male in Latham, or the Fresh Water Institute are certainly capable of sample analysis on a fee per sample basis.

An informed community is also an asset. An important first step, forming a lake association, has already been done. Joining the statewide federation of lake associations, or the North American Lake Management Society, both of which put out a number of interesting publications, may also be worthwhile. The FWI currently provides a lecture series at our Bolton Landing facility, one evening each week during the summer months, covering environmental and other topics of general interest. Your association could sponsor a similar program at little cost. A list of 1987 summer lecturers is enclosed to give you an idea of the agencies willing to provide lecturers (Appendix C). In addition, certain universities, state and local agencies offer summer programs and courses for children and adults at nominal costs. Also enclosed is the course brochure for summer courses provided by the Fresh Water Institute. Other organizations such as Pack Demonstration Forest, Blue Mountain Lake Museum, and Warren County Cooperative Extension may also have similar offerings and may even be willing to conduct one or two day field activities at Friends Lake.

Table 2. Results of Chemical Analysis of Friends Lake Samples.

Analyte	Sampling Site		
	A	B	C
pH	7.08	7.13	7.21
Specific Conductance (umhos)	47.0	48.0	47.0
Alkalinity (mg/l as $CaCO_3$)	10.0	30.0	25.0
Chloride (mg/l)	1.33	1.58	1.30
Nitrate (mg N/l)	0.01	<0.01	<0.01
Ammonia (mg N/l)	<0.01	<0.01	<0.01
Total Phosphorus (ug P/l)	2	LA	5
Soluble Silica (mg Si/l)	0.92	0.96	0.92
Calcium (mg/l)	5.6	7.2	6.2
Chlorophyll a (ug/l)	1.8	2.8	2.8

Table 3. Results of Bacterial Analysis of Friends Lake Samples.

Site Number	Total Coliform	Fecal Coliform	Fecal Streptococcus
1	23	4	14
2	44	11	73
3	46	17	730
4	30	24	167
5	77	14	91
6	72	14	63

Table 4. Surface Water Chemistry for Selected Lakes.

Lake	Secchi Depth (meters)	Total Phosphorus (ppb as P)	Chloride (ppm)	Trophic Status
Lake George Warren Co., NY	8	5	6.5	oligotrophic
Friends Lake Warren Co., NY	4.9	5	1.3	mesotrophic
Glass Lake Rensselaer Co., NY	3.3	13	8.2	mesotrophic
Saratoga Lake Saratoga Co., NY	2.2	100		eutrophic

TABLE 5. Classifications and Standards for Fresh Surface Waters.

			Dissolved Oxygen Standards				Coliform Standards*					
			Trout Waters		Non Trout Waters							
Class	Best Usage	Limits	Minimum Daily Average	Minimum	Minimum Daily Average	Minimum	Monthly Median Value	20% of Sample	Monthly Geometric Mean	pH	Total Dissolved solids	Phenolic Compounds
AA	Water Supply for Drinking or Food Processing	Waters will meet Health Department Standards	6 mg/l	5 mg/l	5 mg/l	4 mg/l	Less than 50/100 ml coliforms	Less than 240/100 m coliforms	---	6.5-8.5	As low as practicable, less than 500mg/l	Less than 0.001mg/l (phenol)
A	Water Supply for Drinking or Food Processing	Waters will meet Health Department Standards for Drinking Water with Approved Treatment	6 mg/l	5 mg/l	5 mg/l	4 mg/l	Less than 5000/100 ml coliforms	Less than 20,000/100 ml coliforms	Less than 200/100 ml fecal coliforms	6.5-8.5	As low as practicable, less than 500mg/l	Less than 0.005mg/l (phenol)
B	Contact recreation and other uses except water supply and food processing	------	6 mg/l	5 mg/l	5 mg/l	4 mg/l	** Less than 2,400/100 ml coliforms	** Less than 5,000/100 ml coliforms	** Less than 200/100ml fecal coliforms	6.5-8.5	None detrimental to aquatic life. Waters currently less than 500mg/l shall remain below this limit.	------
C	Fishing and other uses except water supply, food processing and contact recreation	------	6 mg/l	5 mg/l	5 mg/l	4 mg/l	------	------	** Less than 10,000/100ml coliforms and 2,000/100ml fecal coliforms	6.5-8.5	None detrimental to aquatic life. Waters currently less than 500mg/l shall remain below this limit.	------

D	Secondary contact recreation. Waters are not suitable for propagation of fish	Waters must be suitable for fish survival	------	------	-----	3 mg/l	------	------	------	6.0-9.5	------	------
N	Employment of water in its natural condition for whatever compatible purposes	No waste discharges without approved filtration through 200' of unconsolidated earth	Natural	Natural	Natural	Natural	Natural	Natural	Natural	Natural	Natural	------

Notes: Additional Standards applicable to the above classifications: Turbidity - no increase that will cause a substantial visible contrast to natural conditions; Color - None from man-made sources that will be detrimental to the specified best usage of waters; Suspended, colloidal or other solids - None from any waste discharge which will cause deposition to the best usage of water; Oil and floating substances - No residue attributable to a waste discharge nor visible oil films nor globules of grease; Taste and Odor producing substances, toxic wastes and deleterious substances - None that will be injurious to fish life or to make the waters unsafe or unsuitable for any classified use.

With reference to certain toxic substances affecting fish life, the establishment of any single numerical standard for waters of New York State would be too restrictive. There are many waters, which because of poor buffering capacity and composition will require special study to determine safe concentrations of toxic substances. However, most of the non-trout waters near industrial areas in this state will have an alkalinity of 80 mg/l or above. Without considering increased or decreased toxicity from possible combinations, the following may be considered as safe stream concentrations for certain substances to comply with the above standard for this type of water. Water of lower alkalinity must be considered since the toxic effect of most pollutants will be greatly increased. Ammonia or Ammonium Compounds - Not greater than 2.0 mg/l expressed as NH_3 at pH 8 or above: Cyanide - Not greater than 0.1 mg/l expressed as CN: Ferro or Ferricyanide - Not greater than 0.4 mg/l expressed as $Fe[CN]_6$: Copper - Not greater than 0.2 mg/l expressed as Cu: Zinc - Not greater than 0.3 mg/l expressed as Zn: Cadmuim - Not greater than 0.3 mg/l expressed as Cd.

Table 6. Fish Indigenous to Friends Lake.

Common Name	Classification
Largemouth Bass	Micropterus salmoides
Smallmouth Bass	Micropterus dolomieu
Chain Pickerel	Esox niger
Northern Pike	Esox lucius
Brown Bullhead	Ictalurus nebulosus
Pumpkinseed Sunfish	Lepomis gibbosus
Rock Bass	Ambloplites rupestris
Yellow Perch	Perca flavescens

Friends Lake

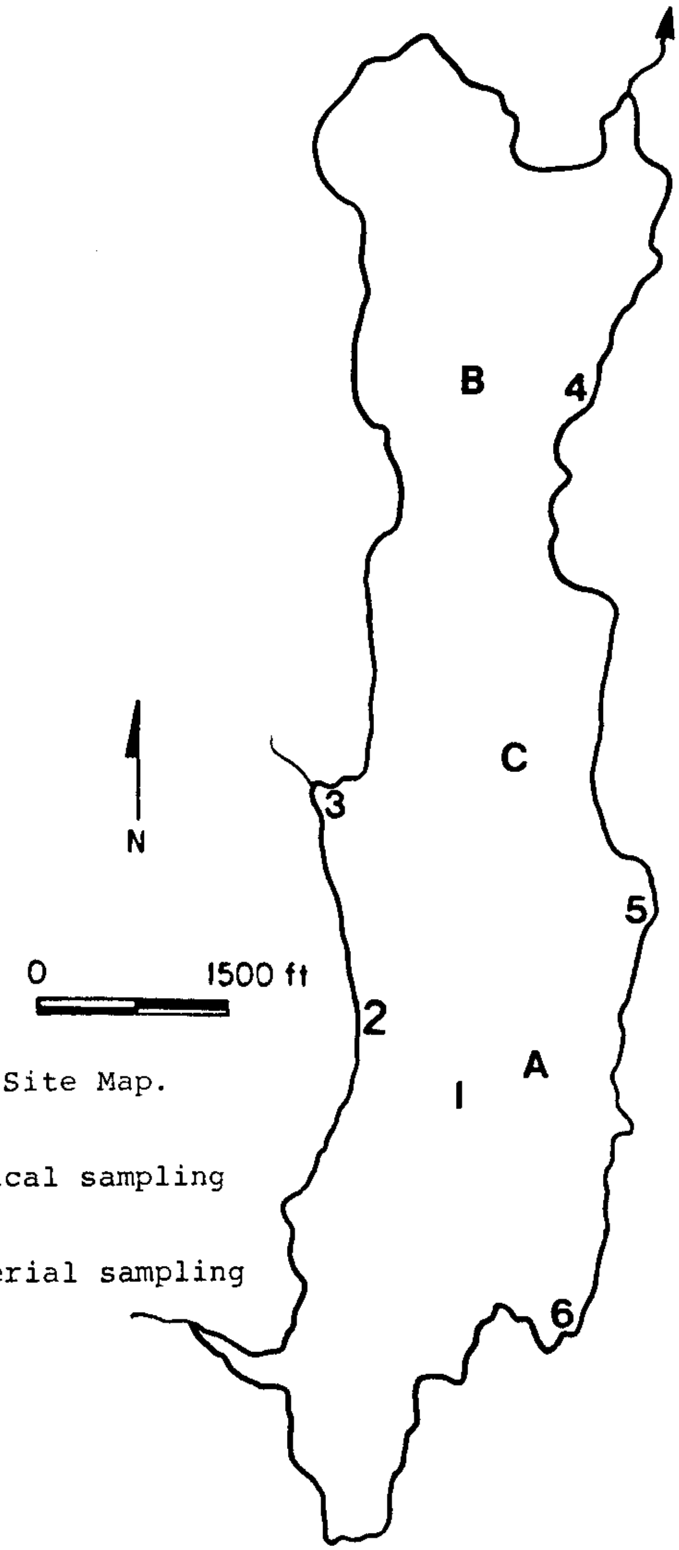

Figure 1. Sampling Site Map.

Letters denote chemical sampling sites

Numbers denote bacterial sampling sites

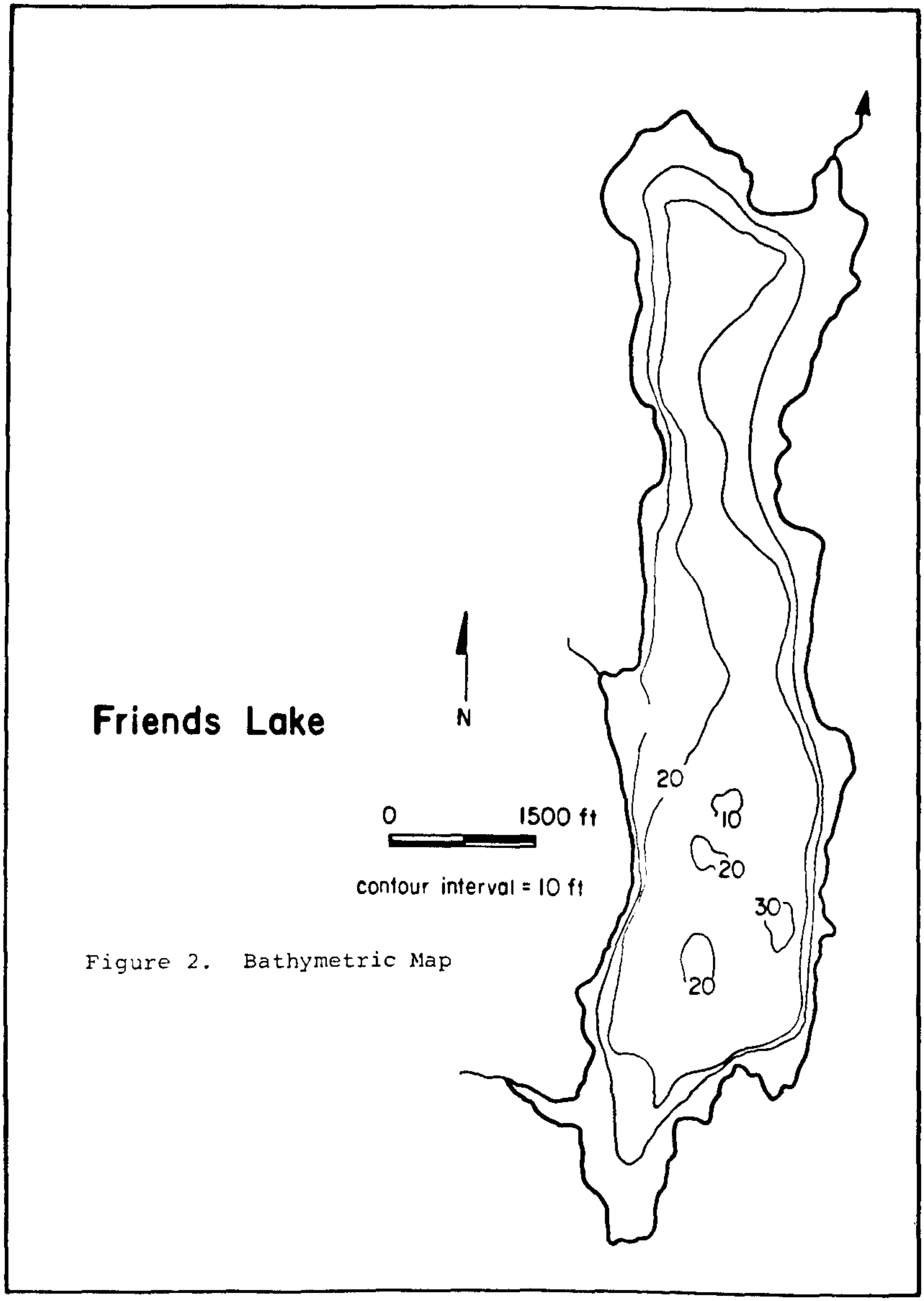

Figure 2. Bathymetric Map

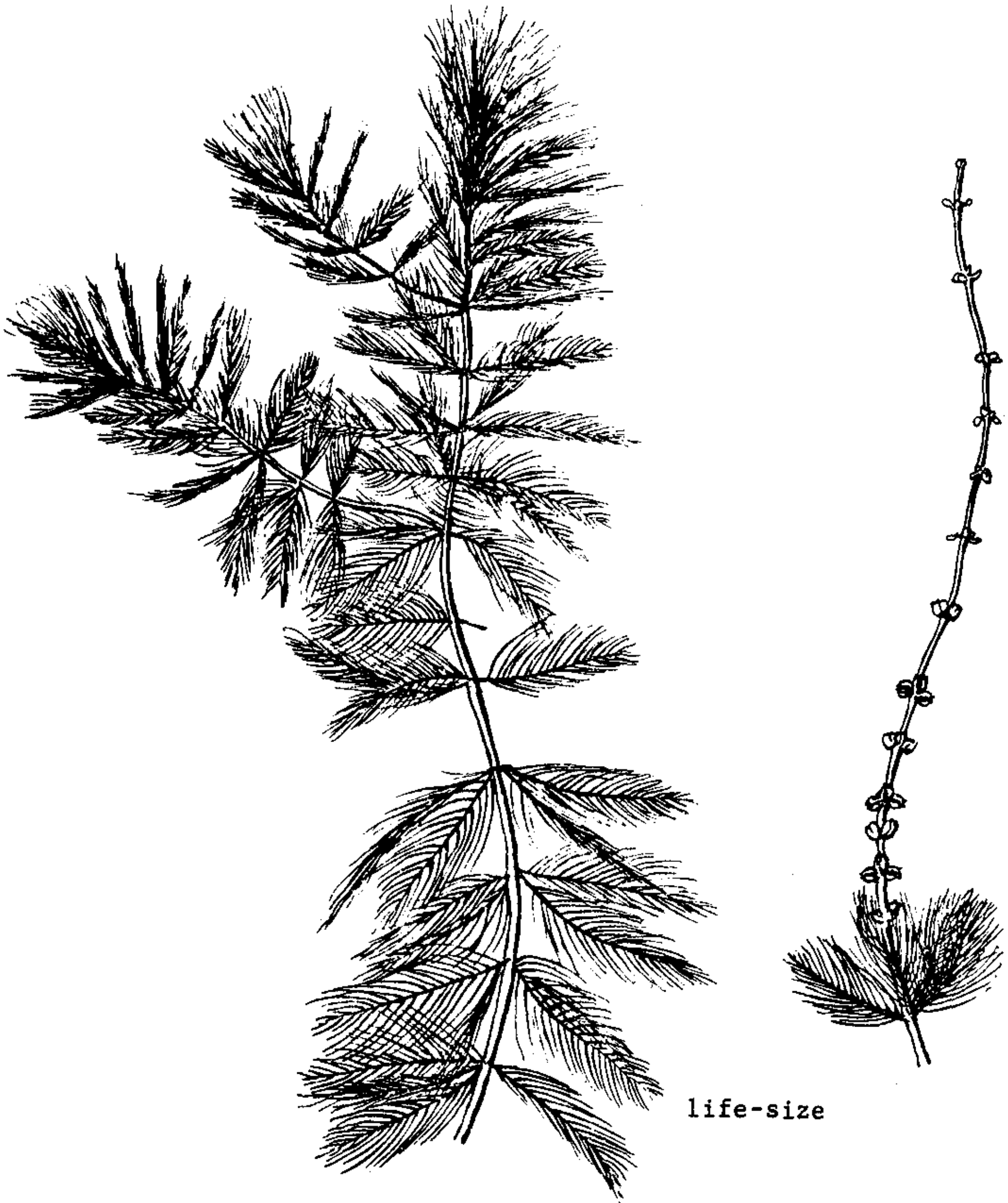

Figure 3. EURASIAN WATERMILFOIL, *Myriophyllum spicatum*

Fresh inland water and fresh to brackish coastal water; California; and Wisconsin to Vermont, Texas, and Florida.

This plant has been in the United States for at least seventy years. Since 1955 it has become very abundant in Upper Chesapeake Bay, the tidal Potomac River, and several Tennessee Valley reservoirs.

Leaves look like weatherbeaten feathers because of their 12-16 pairs of close-together leaflets.

Resembles Northern (page 32) and Whorled (page 34) Watermilfoils, with which it sometimes grows; but can be told from them by its more featherlike leaves.

APPENDICES

Appendix A. Analytical Methods and Equipment.

Analysis	Method	Instrument
pH	Expanded Scale pH/millivolt meter	Orion, Model 811
Alkalinity	Gran Plot Titration	Orion, Model 811
Specific Conductance	Wheatstone Bridge type meter	YSI, Model 31
Chloride	Ion Chromatography	Dionex, QIC
Nitrate	Automated Cadmium Reduction	Dionex, QIC
Ammonia	Automated Phenate	Technicon Autoanalyser II
Total Phosphorus	Single Reagent Ascorbic Acid	Bausch and Lomb Spectronics 70
Soluble Silica	Automated Molybdate	Technicon Autoanalyser II
Total Coliform	Membrane Filtration	
Fecal Coliform	Membrane Filtration	
Fecal Strep.	Membrane Filtration	
Chlorophyll a	Spectrophotometric Methanol Extraction	Bausch and Lomb Spectronics 710

Appendix B. Sanitary Survey Form.

FORM NO.__________

SANITARY SURVEY

1. SITE DESCRIPTION

A. NAME OF OCCUPANT____

B. MAILING ADDRESS____
Street Address, Box Number

____
City, Town, Zip Code

____
Telephone

C. NAME OF OWNER____

D. PROPERTY LOCATION______________________________________

E. TAX MAP NUMBER____

2. TYPE OF BUILDING

A. PRIVATE RESIDENCE
B. APARTMENT BUILDING
C. HOTEL OR MOTEL NUMBER OF UNITS____________
D. RESTAURANT
E. OTHER DESCRIPTION________________

____

F. YEAR BUILDING CONSTRUCTED________________________________

G. LENGTH OF OCCUPANCY:
SEASONAL FROM________TO_______
YEAR ROUND
VACANT

H. AVERAGE NUMBER OF OCCUPANTS OR PATRONS_________
I. COLOR AND CONSTRUCTION TYPE_____________________________
____

J. APPROXIMATE SIZE (FT^2) OF LAWN AND GARDEN_________________
K. USE LAWN OR GARDEN FERTILIZER
YES_____ ANNUAL AMT (IF KNOWN)_____LBS.

3. <u>WATER SUPPLY</u>

A. TYPE
PUBLIC MAINS
PRIVATE WELL — APPROXIMATE DEPTH (FEET)_____

B. CHLORINATED
YES
NO

C. WATER USAGE

SHOWERS	______
BATH TUBS	______
DISHWASHERS	______
GARBAGE DISPOSAL	______
SINKS	______
TOILETS	______
WASHING MACHINE	______

4. <u>WASTEWATER DISPOSAL FACILITIES</u>

A. TYPE OF SYSTEM

CESSPOOL__
SEPTIC TANK-SEEPAGE PIT__
SEPTIC TANK-TILE FIELD__
HOLDING TANK__
OTHER DESCRIPTION__________________________________
____

B. TANK CONSTRUCTION

SIZE (gallons)_________________________
AGE (years) __________________________
TYPE OF CONSTRUCTION:
CONCRETE___
METAL___
OTHER___ DESCRIPTION________________________
____

HOW MANY YEARS SINCE PUMPED?___________________

APPROXIMATE DISTANCE FROM LAKE (feet)__________

C. TILE FIELD

APPROXIMATE LENGTH (feet)____________
AGE (years)
APPROXIMATE DISTANCE FROM LAKE (feet)________________

D. SEEPAGE PITS

NUMBER OF PITS________
SIZE________
AGE(years)__________
APPROXIMATE DISTANCE FROM LAKE (feet)__________

E. SKETCH OF BUILDING AND SYSTEM

5. PROBLEMS

A. WHAT PROBLEMS HAS YOUR SYSTEM CAUSED?

ODORS____
SLOW DRAINING OF PLUMBING____
SURFACING OF SEWAGE________
BACKUP OF SEWAGE INTO HOUSE____
NONE _____
OTHER___ DESCRIPTION___________________________________
____

B. HOW OFTEN DO PROBLEMS OCCUR?___________________________
____

C. IF YOU LIVE ALONG THE LAKESHORE, DO YOU NOTICE ANY OF THE FOLLOWING, ADJACENT TO YOUR PROPERTY?

ALGAE OR SCUM ON ROCKS ________
AQUATIC VEGETATION ("WEEDS") ________

6. OTHER INFORMATION

A. WHAT TYPE OF SOIL DO YOU HAVE:

SANDY LOAM	SILTY LOAM
CLAY	DON'T KNOW

B. SOIL COLOR

BLACK-DARK BROWN
LIGHT BROWN
GRAY
REDDISH-BROWN

C. HOW WELL DRAINED IS YOUR SOIL?

WELL DRAINED_________
DRAINS SLOWLY________
DON'T KNOW___________

D. ARE THERE ROCK OUTCROPS ON YOUR PROPERTY?

YES _____
NO _____

E. WOULD YOU BE WILLING TO ALLOW AN ONSITE TEST OF YOUR WASTEWATER DISPOSAL SYSTEM: YES____ NO____

7. SIGNATURE OF PERSON (S) WHO FILLED OUT FORM

_______________________________________ DATE______________

8. COMMENTS OR REMARKS

____

____

____

____

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Appendix C.

FRESH WATER INSTITUTE

1987

Summer Lecture Series

Concerning the Lake George Region and The World Around Us

Rensselaer's Fresh Water Institute, located on route 9N in Bolton Landing, is pleased to host a weekly series of presentations to the general public by distinguished professionals.

Monday July 6	J. P. Sweet: Publisher of Lake George's First Tourist Guide *Betty Buckell,* Regional Author, Lake George
Monday July 13	Light and Color in the Open Air *Charles Bean,* Institute Professor, Rensselaer Polytechnic Institute, Troy
Monday July 20	The Stories of Lake George — Facts and Fancy *Thomas Lord,* Regional Historian, Silver Bay Association
Monday July 27	Winter in New York: Weather Patterns over Land and Water *Ray Falconer,* Senior Research Associate, Atmospheric Sciences Research Center, SUNY, Albany
Monday August 3	Rambling the Byways: Birds, Wildflowers and Fungi *Pat Santora,* Journalist & Naturalist, Chestertown
Monday August 10	The Garden of Eden *Steven Clemants,* Botanist, New York Natural Heritage Program, Delmar
Monday August 17	Champ: Beyond the Legend *Joe Zarzynski,* Founder and Director, The Lake Champlain Phenomena Investigation, Wilton
Monday August 24	ET: Are You There? Discussion of Life in the Universe *Alan Meltzer,* Professor of Physics, Rensselaer Polytechnic Institute, Troy
Monday August 31	Lake George: Immediate Concerns — Long Range Prognosis *Charles Boylen,* Director, The Rensselaer Fresh Water Institute, Bolton Landing

Programs begin at 7:30 PM. The public is cordially invited free of charge. Programs are nature-oriented slide talks lasting approximately 1 hour.

Funding for this series has been provided by generous gifts from numerous individuals and foundations.

Appendix D.

MILFOIL IDENTIFICATION PROGRAM

Rensselaer Fresh Water Institute has an ongoing program of identifying new sites with Eurasian Watermilfoil both in Lake George, and in nearby lakes. If you have a plant that you think may be Eurasian Watermilfoil, we will gladly identify it for you free of charge.

To have plants identified, bring at least three intact plants to the RFWI laboratory facility in Bolton Landing on Lakeshore Drive (Route 9N). The plants should be in a plastic bag or container with water. In addition, we would like the following information: name of collector, lake name, site of collection, depth at which the plant was growing, date of collection, the name and phone number of a person to contact with the results. Three specimens will be mounted, with one available to the person or group submitting the specimen.

Plants for identification should be directed to John Madsen. For more information, contact the RFWI site at ph. 644-3541 or in Troy at 276-6757.