

MOON LAKE
PRESERVATION COUNCIL

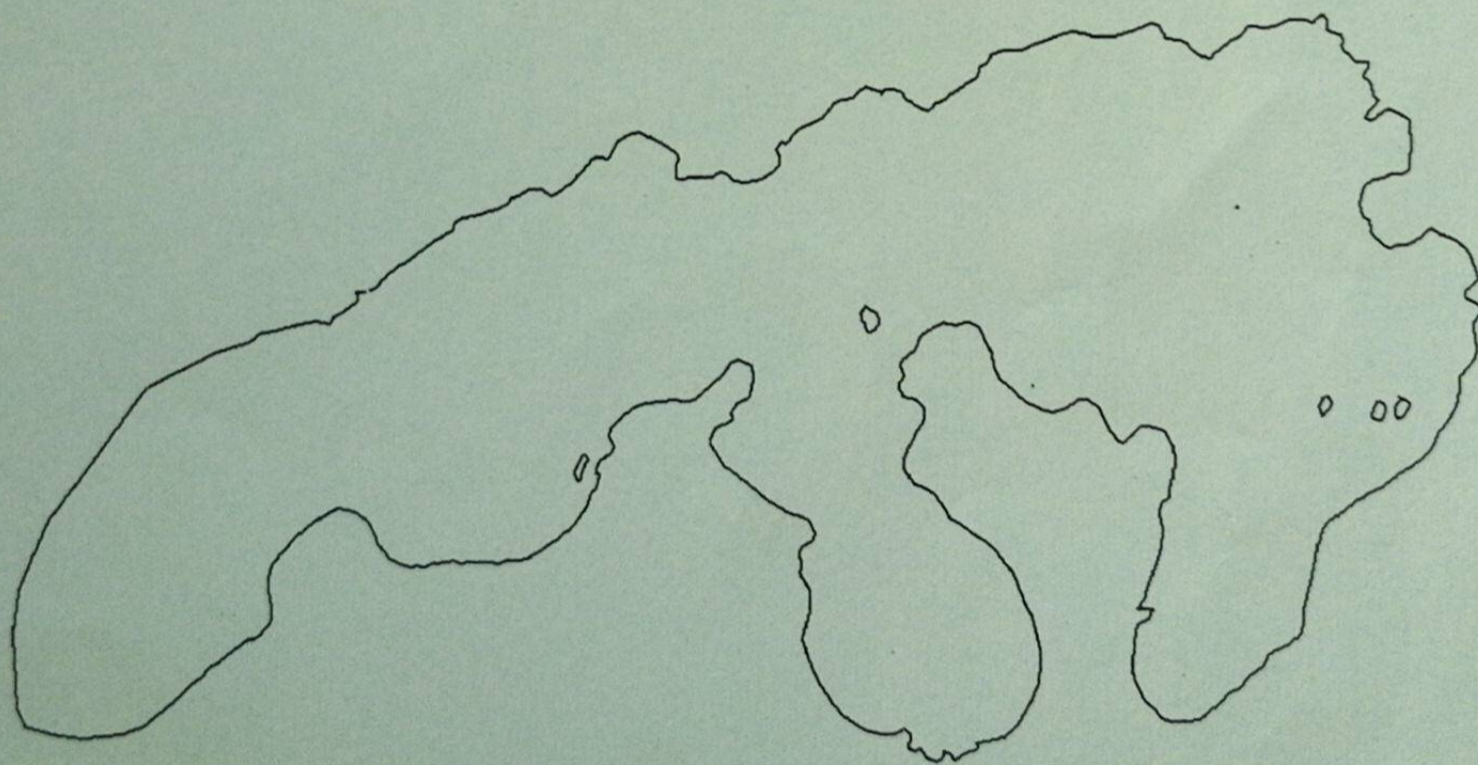


Lake Management Plan
1999

MOON LAKE

LAKE MANAGEMENT PLAN

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1999



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PREFACE

This report was prepared for the Moon Lake Preservation Council by Dr. Richard Lamb, Center for Earth and Environmental Science, at SUNY Plattsburgh.

Funding for the lake management planning effort was provided by the Jefferson County Water Quality Coordinating Committee.

A meeting was held with the membership of the Moon Lake Preservation Council during the summer of 1998 to discuss lake management planning issues, determine goals and objectives of the planning process, and formulate a preliminary action plan to guide future management efforts. Members of the association who participated in the meeting included:

Suzanne Clarke
Harold Crego
Wallace Freeland
Marge Kearney
Craig MacFarland
Chris Maslona
John Smith
Winifred Smith
Katharine Tufo

INTRODUCTION

This report is intended to be the first phase of an on-going lake management planning effort undertaken by property owners in the Moon Lake area. Its purpose is to set forth a plan of action that will preserve, protect and enhance water quality and the lake area environment in order to provide for a desirable residential setting and for maximum enjoyment of water based recreational activities. It deals with three general types of issues: (1) water quality, (2) land use and development, and (3) recreational use of the lake.

The action plan presented herein identifies follow up activities that should be taken to achieve the goals and objectives of the lake management planning effort. The Moon Lake Preservation Council itself without additional funding support or assistance may undertake some of these activities. In other cases, funding through grants and/or assistance provided by colleges or universities should be sought.

Factual and descriptive information contained in this report pertaining to Moon Lake and its watershed was obtained from a variety of sources, including government agencies, discussions with agency officials, discussions with lakeshore property owners, and existing documents and publications. Goals and objectives were formulated by members of the Moon Lake Preservation Council, with the assistance of the author, at a meeting during the summer of 1998. Results of a citizen questionnaire survey were an important input during the planning process.

The Moon Lake Preservation Council represents the 91 residential properties around the lake. The residential areas are divided into three tracts: Smith Tract with 23 cottages, Webster Tract with 34 cottages, and the Wicks Tract with 34 cottages.

LAKE AND WATERSHED CHARACTERISTICS

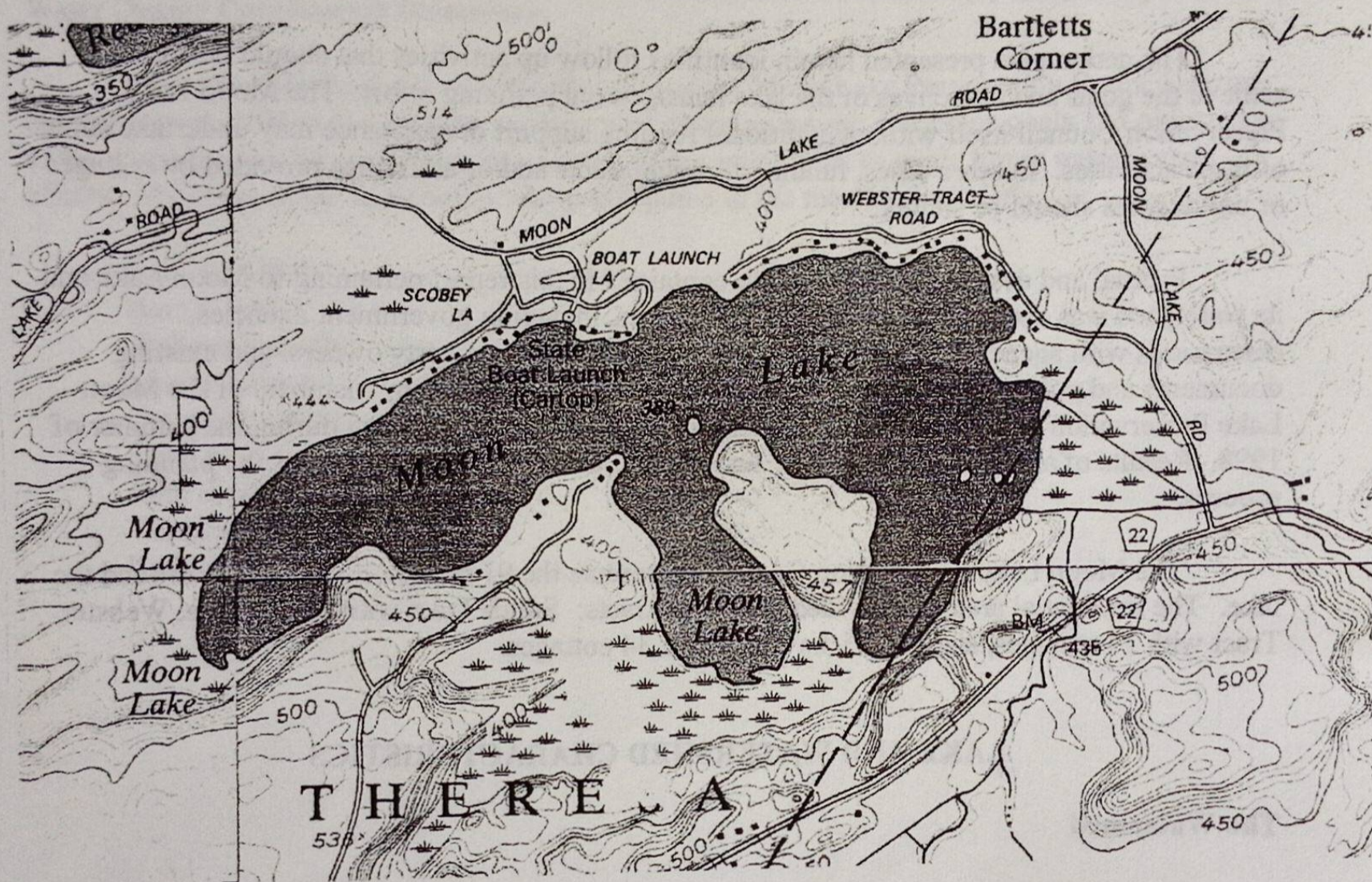
The Watershed

Moon Lake is one of the "Indian River Lakes," so named because they lie in the vicinity of the Indian River that flows northward to the St. Lawrence. The outlet is Vrooman Creek which flows through a wetland located on the east end of the lake. There are no named tributary streams feeding into the lake.

The watershed area of Moon Lake has been estimated to be about 1.4 square miles.¹ This is a relatively small watershed, encompassing the shoreline area and some surrounding lands.

¹ NYS Department of Environmental Conservation, "A Morphometric Atlas of Selected Lakes, Volume 3, Region 6, undated.

Map 1 MOON LAKE AND VICINITY



Land Use

Most of the area within the watershed is hilly, rocky and forested, or is wetland. The only developed sections are portions of the Moon Lake shoreline. There are no commercial uses within the watershed. Much of the buildable land along the shoreline has already been developed, but some potentially developable lands remain within proximity of the lake.

Limnology

Moon Lake is a shallow water, eutrophic lake. Eutrophic lakes are characterized by high nutrient levels, an abundance of aquatic vegetation, and low water clarity due to algae growth. It is a natural condition occurring as a result of the lake's shallow depth and its mud bottom. Man induced pollutants from septic systems, storm water runoff from developed areas, and sewer treatment plant effluent can contribute to the nutrient load, and accelerate weed and algae growth. It is unknown how much of the nutrient load of Moon Lake is man induced.

Because it is a shallow lake, it does not stratify into temperature layers during summer months, as do deeper lakes. Nutrients such as phosphates and nitrates tend to be available for organic growth at all depths, and water temperature and oxygen levels are likely to remain relatively constant throughout the lake. Shallow, eutrophic lakes do not support cold water fisheries (i.e. trout species) that require deeper water with sufficient dissolved oxygen.

The "Morphometric Atlas"² of New York State Lakes published by the New York State Department of Environmental Conservation gives the maximum depth of Moon Lake as 20 feet, with mean water depth of only 12.1 feet. Water depth contours shown in the atlas, although generally reflective of actual depths, are not believed to be accurate in their detail.

Hydraulic retention time, or flushing time, is listed at about 3.18 years, longer than some other lakes in the region, but shorter than others. Deep lakes with long flushing times tend to be less sensitive to phosphorus loadings than do shallow lakes with short retention times.

Water Quality

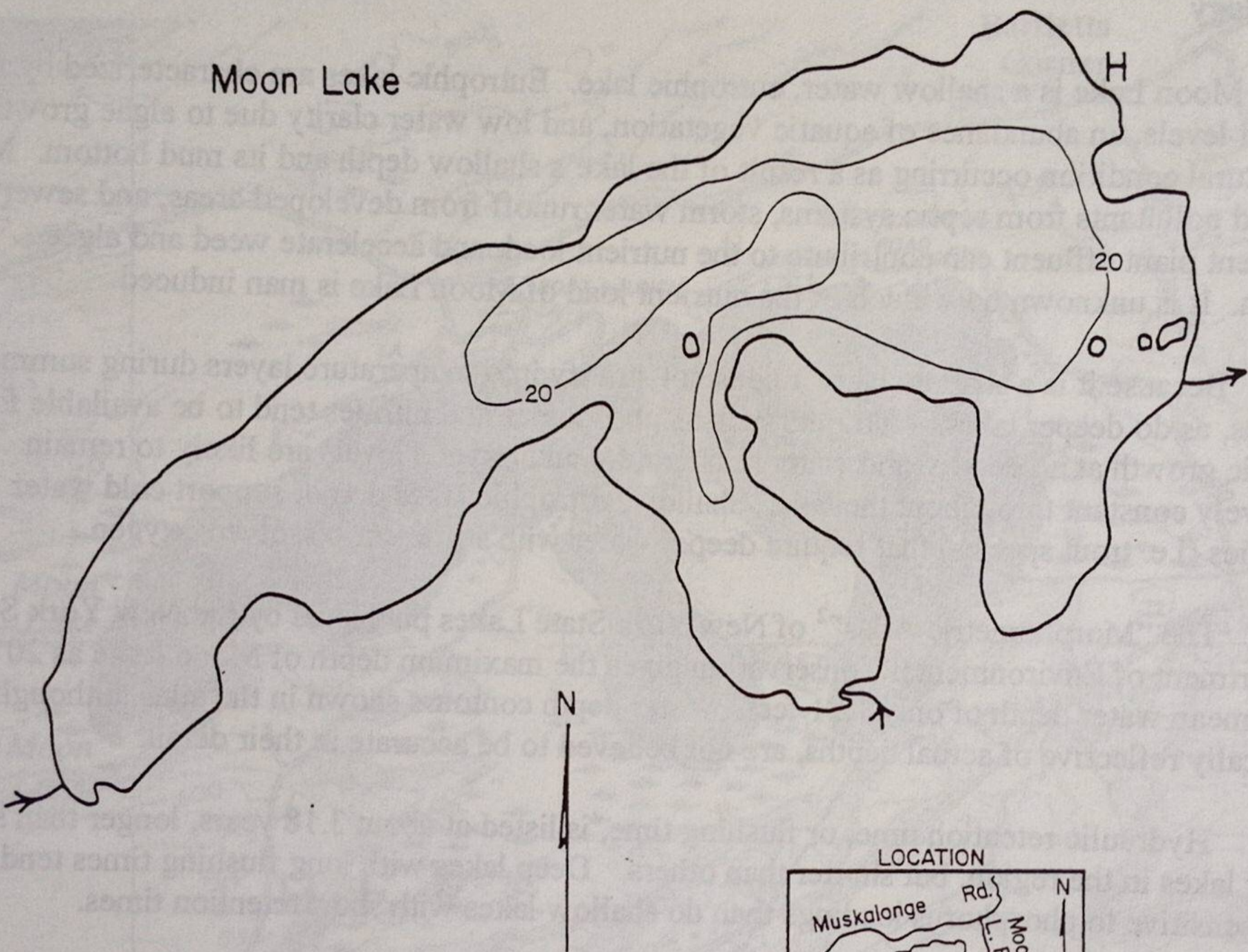
Moon Lake has been designated as a Class C body of water by the New York State Department of Environmental Conservation, meaning that water quality should be maintained at a level suitable for fishing and for primary and secondary contact recreation.

Water Quality Test Data

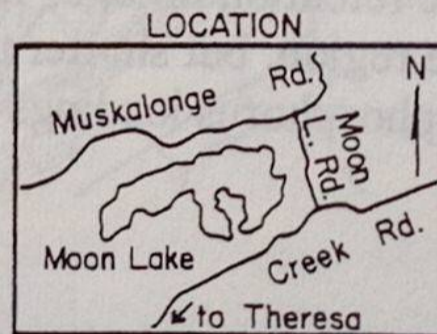
Moon Lake participated in the state sponsored CSLAP (Citizens Statewide Lake Assessment Program) water quality testing program from 1992 through 1996. This program enables water samples taken by association members to be tested and analyzed. Among the parameters measured were Secchi disk transparency, Chlorophyll *a*, and Total phosphorus. Results indicated that Moon Lake contained high levels of Total phosphorus and Chlorophyll *a*, and low water transparency as measured by Secchi disk transparency, consistent with the

² Ibid.

Moon Lake



0 500 1000 ft
contour interval = 20 ft



LOCATION

Pond Number: 71
Latitude: 441505
Longitude: 754338
Watershed: Oswegatchie-Black
County: Jefferson
Topographic Quadrangle: Muskellunge Lake

MORPHOMETRY

Mean Depth:	12.1 feet	3.7 m
Maximum Depth:	20.0 feet	6.1 m
Volume:	4355 ac-ft	54 $10^5 m^3$
Watershed Area:	1.4 acres	3.7 Km^2
Hydraulic Retention Time:	3.18 yr	
Shoreline Length:	3.79 mi	6.12 Km
Elevation:	390 ft	119 m
Outlet Dam:	Yes	
Water Quality Classification:	C	
Access Type:	PvH	

SPORT FISH

LMB,NP,BC,BG,BB,YP

characteristics of highly productive, eutrophic lakes. The high Chlorophyll *a* readings indicate an abundance of algae.

Table 1: CSLAP Water Quality Test Results (1992 – 1996 average)

Parameter	Moon Lake	Eutrophic Lakes	Mesotrophic Lakes	Oligotrophic Lakes
Secchi Disk Transparency	1.7 m	< 2.0 m	2-5 m	> 5.0 m
Chlorophyll <i>a</i>	21.1 (ug/l)	> 8 (ug/l)	2-8 (ug/l)	< 2 (ug/l)
Total Phosphorus	.027 (mg/l)	> .020 (mg/l)	.010-.020 (mg/l)	< .010 (mg/l)

Some previous water quality testing was conducted in conjunction with a study undertaken by NYS DEC personnel during the summers of 1979 and 1980.³ The results of this testing for the same three water quality parameters showed even more pronounced eutrophic conditions than the more recent data, with very high chlorophyll *a* and total phosphorus readings. However, no conclusions can be made concerning change in water quality from these two sets of data because of different sampling locations and times. The 1979-80 data were obtained in August when algae growth and phosphorus tend to be high, while the 1992-1996 data were obtained throughout the summer season including the earlier months when algae and phosphorus tend to be lower.

Table 2: 1979-80 Test Results

Secchi Disk Transparency	1.0 m
Chlorophyll <i>a</i>	55.5 (ug/l)
Total Phosphorus	.063 (mg/l)

The 1997 CSLAP report for Moon Lake⁴ makes the following conclusions from seasonal variations in water quality test results:

- Water quality shows a decrease over the course of a typical summer, while total phosphorus and chlorophyll *a* show an increase.
- "There does not appear to be any strong seasonal correlation between nutrients and algae at Moon Lake, although it is likely that algae growth is most frequently controlled by phosphorus concentrations."
- "There does not appear to be any strong seasonal correlation between algae and water clarity at Moon Lake, although it is likely that water clarity is most frequently controlled by algae levels."

It can be concluded from the water quality test data that Moon Lake has low water clarity during the latter summer months due to the presence of algae, and that the amount of algae is controlled by the phosphorus concentration in the water as well as other factors. It is unknown how much of the phosphorus content can be attributed to man-induced sources such as septic

³ Mills, Edward. and Shiavone, Albert Jr., "Evaluation of Fish communities Through Assessment of Zooplankton Populations and Measures of Lake Productivity," North American Journal of Fisheries Management, 2:14-27, 1982.

⁴ NYS Department of Environmental Conservation, "1996 Interpretive Summary, New York Citizens Statewide Lake Assessment Program, Moon Lake," April 1997, 23 pp.

systems and storm water runoff from developed areas and roadways, and how much is a natural occurrence for which there is no control.

Because there is no available data for coliform, no conclusions can be made in regard to the presence or absence of bacteriological contaminants in the water. The suitability of the water for drinking, swimming or other forms of contact recreation cannot be assessed.

Public Perceptions

The general observation of shoreline residents is that there is an alga problem. There are no suspected sources of man-induced nutrients into the lake other than the possibility of failing septic systems.

Weed Growth

Excessive weed growth is considered to be a problem by Moon Lake residents, especially the spread of Eurasian Milfoil. It has been observed that the amount of rooted aquatic vegetation, and its location, varies considerably from year to year. However, no maps or studies have been conducted that document the type, extent, or spread of aquatic vegetation, or that identify the various species that exist in the lake, and their location.

Fisheries

Moon Lake supports a warm water fishery. The "Fishing Indian River Lakes" guide published by NYS DEC states that the following species are present.

- Walleye
- Northern Pike
- Largemouth Bass
- Yellow Perch
- Black Crappie
- Panfish (Pumpkinseed, Rock Bass, Bluegill, and Brown Bullhead)

Data from a gill net fish count taken circa 1980 showed that Black Crappie far outnumbered any other above listed specie.⁵

The NYS Department of Environmental Conservation has stocked Moon Lake with tiger muskellunge and Walleye. DEC staff has provided the following explanation of fishery management in Moon Lake.

"Walleye fry and fingerling stockings from 1980 to 1986 were done to evaluate comparative survival. Survival was poor due to black crappie predation. The 1993 stocking of 5" fingerlings was to evaluate survival of larger fingerlings. Evaluation by Cornell indicated poor survival likely due to predation by abundant largemouth bass population. Tiger muskellunge stocking was initiated in 1996 at

⁵ Mills, Edward. and Shiavone, Albert Jr., p. 21.

a rate of 2 fall fingerlings per acre to provide additional angling opportunity at the request of local sportsmen."

Table 2: Fish Stocking History

1997	400	Tiger Muskellunge	9.0"		
1996	400	Tiger Muskellunge	9.0"		
1995	none				
1994	none				
1993	4000	Walleye Pike	5.0"		
1992	none				
1991	none				
1990	none				
1989	none				
1988	none				
1987	none				
1986	1,000,000	Walleye Pike	Fry		
1985	2500	Walleye Pike	3.5"	880	Walleye Pike 3.0"
1984	1,000,000	Walleye Pike	Fry	4000	Walleye Pike 3.5"
1983	4600	Walleye Pike	3.75"		
1982	1,000,000	Walleye Pike	Fry		
1981	none				
1980	1,000,000	Walleye Pike	Fry		

Source: NYS DEC files

Wildlife Habitats

The wetlands and forested areas contiguous to Moon Lake provide valuable habitat for both fish and wildlife. It can be assumed that mammals and birds commonly found in such habitat are also present in the Moon Lake area. Loons are also frequently found in the Indian River Lakes, with nesting sites generally along shorelines a few inches above the water level. Destruction of shoreline habitat can cause the disappearance of Loons.

NYS DEC records show no deer wintering areas or endangered species habitat as being located within the Moon Lake area.

Soils

Much of the developable portion of the Moon Lake shoreline is underlain by shallow to bedrock Quetico soils that pose severe limitations to septic systems. (The source of this and the following soils information is the "Soil Survey of Jefferson County, New York," prepared by the U.S. Department of Agriculture and the Soil Conservation Service.⁶) Smaller areas of other soils

⁶ U.S. Department of Agriculture and the Soil Conservation Service, "Soil Survey of Jefferson County, New York," 1989.

exist, all of which have significant limitations for development. Descriptions of soils found around the perimeter of Moon Lake, and their suitability ratings for septic systems and homesites without basements as determined by the Soil Conservation Service, follow.

QeB – Quetico-Rock outcrop complex, 2 to 8 percent slopes: Nearly level to gently sloping, very shallow, somewhat excessively drained Quetico soil, and areas of rock outcrop.

MuE - Millsite-Rock outcrop complex, steep: Moderately deep, well drained and somewhat excessively well drained Millsite soil, mixed with areas of rock outcrop, found on steep slopes.

Sa – Sapristis and Aquentis, ponded: Level, very deep, organic and mineral soil found in marsh areas adjacent to open bodies of water.

HmB – Heuvelton-Millsite-Rock outcrop complex: A mixture of very deep, moderately well drained Heuvelton soil; moderately deep, well drained, and somewhat excessively drained Millsite soil, and areas of rock outcrop.

InB – Insula-Quetico complex, rocky, 0 to 8 percent slopes: Nearly level to gently sloping, shallow to very shallow, will drained to excessively well drained soils found on broad undulating areas of uplands.

Lc – Livingston mucky silty clay: A nearly level, very deep, and very poorly drained soil found on smooth broad flat, or depressional areas on plains.

Table 3: Soil Suitability Ratings

Map Symbol	Name	Limitations for Septic Tank Absorption Fields		Limitations for Dwellings without Basements	
HmB	Heuvelton	Severe	wetness, percs slowly	Moderate	wetness, shrink-swell, slope
InB	Insula	Severe	depth to bedrock	Severe	depth to bedrock
Lc	Livingston	Severe	wetness, percs slowly	Severe	flooding, wetness, shrink-swell
MuE	Millsite	Severe	slope, depth to rock	Severe	slope, depth to rock
QeB	Quetico	Severe	depth to rock	Severe	depth to rock
Sa	Saprints	Severe	ponding	Severe	ponding, low strength

Most of the developed areas are underlain by Quetico soils that are very shallow, with less than 10 inches of soil on top of bedrock. These soils are unsatisfactory for septic systems unless a suitable fill material is imported and placed to a sufficient depth below the leach field.

Another soil found around the perimeter of the lake is the Millsite soil series. It is classified as having severe limitations for septic systems and for dwellings because of excessive slopes and shallow depth to bedrock. Because it is a loam soil with moderate to rapid percolation rates, it would be satisfactory for septic systems in those locations where the bedrock is deeper and the slope is not steep, provided that leach fields are placed a satisfactory distance from the lakeshore. (New York State standards require a minimum 100 feet setback from water

Map 3
SOILS



courses.) In steeper areas, and in particular where bedrock is close to the ground surface, septic systems are prone to malfunction.

There are also sizable areas of Saprints along the shore of Moon Lake. Saprints are wetland and muck soils, unsuitable for development.

In the soil conditions found around the perimeter of Moon Lake sewerage effluent from conventionally constructed leach fields could be adding to the nutrient load of the lake. Effluent could flow through the thin soil layer, not be adequately treated before reaching bedrock, and thence flow along the top of the bedrock into the lake.

Topography

Much of the developed portion of Moon Lake lies on moderate sloping (2 to 8 percent) land. Moderate slopes are considered good for residential development because they provide enough drainage without creating excessive erosion problems.

There are also areas with steep slopes, exceeding 25 percent. Development on steep slope typically creates erosion and leads to excessive surface runoff carrying sediment and nutrients into the lake. Good design practices could minimize such problems.

Wetlands

Three New York State regulated wetlands, identified as R-23, M-9 and P-1, exist around the perimeter of Moon Lake. The area of regulation by NYS DEC includes a 100 feet buffer surrounding the delineated wetland areas.

Septic Systems

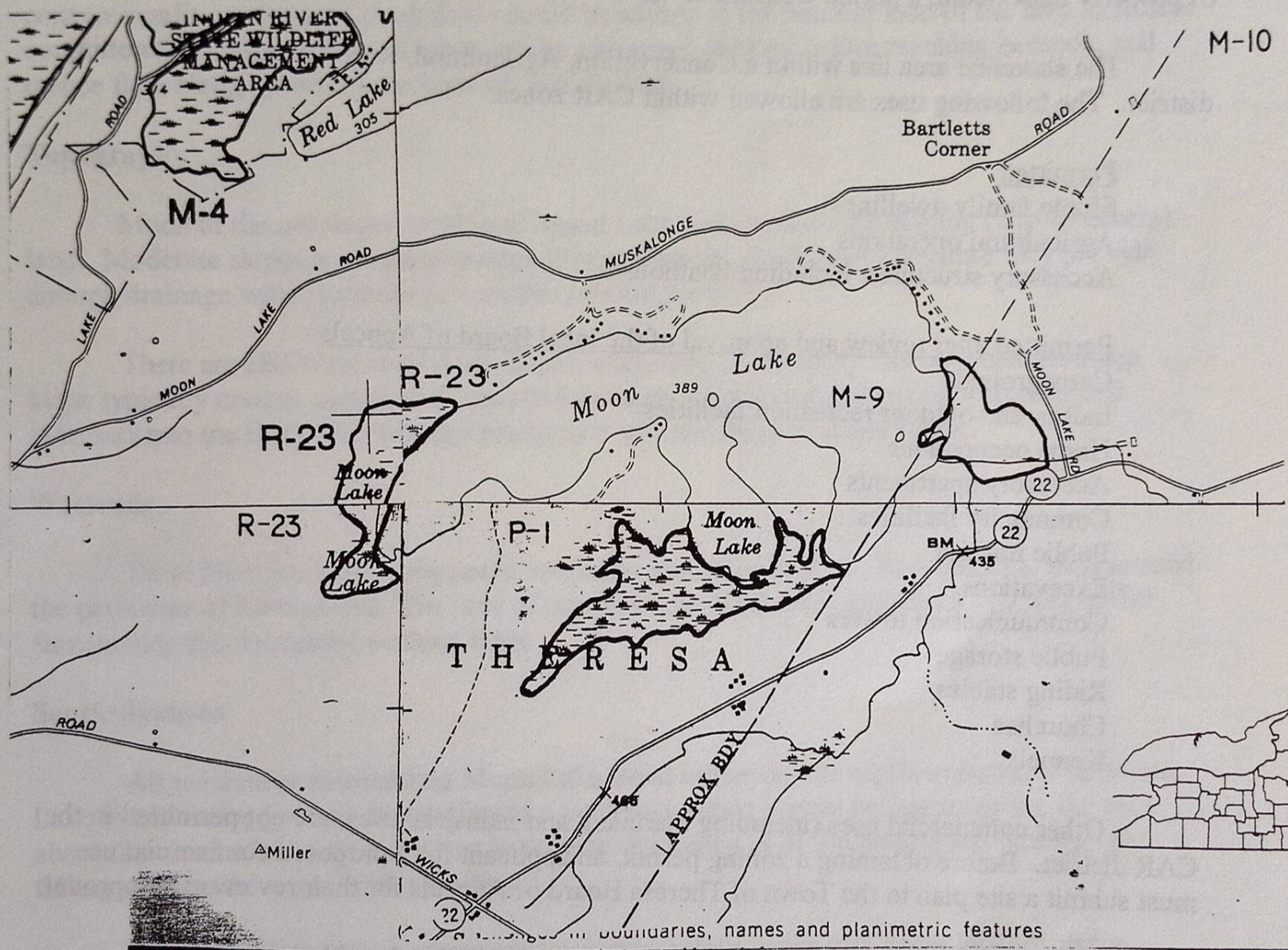
All residences surrounding Moon Lake Road utilize on-site septic systems. The Moon Lake Preservation Council has instigated a voluntary septic system testing program, but only about one-third of the septic systems have been dye tested as of the date of this writing. No failing systems have yet been identified.

Because aging septic systems are subject to failure, especially when located on the shallow soils found around Moon Lake, or when camps are expanded or converted to year around residency, it is recommended that septic systems be dye tested periodically. The New York State sponsored Citizens Statewide Lake Assessment Program (CSLAP) recommends testing every two years.

Public Access

There is a state boat launch located on the north shore off Moon Lake Road. Access is limited to watercraft with motors of 10 h.p. or less, including jet skis.

Map 4 NEW YORK STATE REGULATED WETLANDS



The Regulatory Environment

Local Zoning:

Most of the Moon Lake lakeshore area lies within the Town of Theresa. Land use and development is regulated by the town zoning ordinance. Any new buildings or change in the use of property must obtain a permit from the town.

The shoreline area lies within a Conservation, Agricultural, Recreational (CAR) zoning district. The following uses are allowed within CAR zones:

Permitted

- Single family dwellings
- Agricultural operations
- Accessory structures, including boathouses

Permitted after review and approval of the local Board of Appeals

- Campgrounds
- Indoor and outdoor recreation facilities
- Home occupations
- Accessory apartments
- Community facilities
- Public utilities
- Excavations
- Communication towers
- Public storage
- Riding stables
- Churches
- Kennels

Other commercial uses (including marinas), and industrial uses, are not permitted in the CAR district. Before obtaining a zoning permit, an applicant for a proposed commercial use must submit a site plan to the Town of Theresa Board of Appeals for their review and approval.

All new development within the shoreline area must comply with the following dimensional and building setback requirements.

- Minimum lot size: 30,000 square feet
- Minimum lot width: 150 feet
- Minimum building setback from shoreline: 30 feet for all structures except boathouses
- Boathouses may be placed at the waters edge
- Minimum side yard setback for boathouses: 15 feet

Recent amendments to the Town of Theresa Zoning Regulations (February 1999) contain the following provisions of significance to lakeshores:

Recreational vehicles may be placed on a property for a maximum of two weeks unless located in a town approved campground or when stored at an owners primary residence.

New commercial campgrounds are limited to one powered watercraft for each 100 feet of shoreline on the lake.

"Funnel" type development and contractual access to the lake are limited by a requirement that each dwelling unit having access to the lake is supported by 150 feet of shoreline frontage. (Funnel development is characterized by a number of inland lots having access to the lake via a short length of shoreline, i.e. the spout of the funnel. This, or contractual access granting a right-of-way easements across a shoreline lot, were it not controlled, could enable large developments to locate near the lake even where there is little vacant shoreline frontage remaining.)

Septic systems:

Enforcement of septic system regulations is at the town level. The New York State Fire Prevention and Building Code requires that new on-lot septic systems meet state standards, and be inspected and approved by the town Code Enforcement Officer. This applies to new construction as well as to the replacement of existing systems.

There is no provision in the law for the inspection of existing septic systems to test their adequacy or compliance with state standards. However, most banks require that home septic systems be certified as meeting state standards before granting a mortgage. Suspected problems may be reported to the Town Health Officer, who has the authority to require that faulty systems be replaced.

Docks

Any dock or boathouse constructed using fill material is required to obtain a permit from the NYS DEC and the U.S. Army Corps of Engineers. (A joint application is available from NYS DEC.) Floating docks, or docks set on piers do not require any permit.

Speed Limits

State law limits the speed of watercraft to 5 mph within 100 feet of lakeshores, enforceable by NYS DEC.

Other Activities Requiring a Permit from NYS DEC

- Any alteration of a NYS regulated wetland, including a surrounding 100 foot buffer.
- The use of chemicals for weed control.
- The construction or modification of any dam.
- Any disturbance of the bed or banks of protected streams.

PROPERTY OWNER QUESTIONNAIRE SURVEY

A property owner questionnaire survey was distributed to lakeshore property owners during the summer of 1998. A total of 29 questionnaires were completed and returned, representing 31% of the 95 surveys mailed. Tabulated results are included as Appendix 1. Among the significant findings of the survey are:

- a. Moon Lake was rated as good for boating activities and for aesthetic appeal; fair to good for fishing; and fair for swimming and water supply.
- b. A majority of respondents noticed changes in water quality and weed growth during the past few years. Most often mentioned was an increase in weed and algae growth, and loss of clarity.
- c. The most serious problems, in order of importance, were thought to be: (1) milfoil and rooted aquatic plants, (2) algae, (3) turbid, unclear water, (4) poor bottom conditions for swimming, and (5) excessive boat speed.
- d. Suspected causes of water quality problems include failing household septic systems, beaver dams, gasoline or oil from boats, and stormwater runoff.
- e. The best way to deal with water quality and weed growth problems was thought to be upgrading failing septic systems.
- f. The best way to deal with Eurasian Milfoil was thought to be biological controls, if demonstrated to be effective. A number of respondents thought that individuals should be responsible clearing weeds in front of their own property. There was not much support for the use of weed killing chemicals, and very little support for purchasing a mechanical cutter and harvester.
- g. There was strong support for: (1) both a voluntary septic system testing and compliance program, and (2) publishing and distributing a booklet that encourages good water quality maintenance practices by property owners, and (3) adopting stricter controls on land development. There was less support for spending money, as a group, for weed or algae control programs, and for a mandatory septic system testing program.

LAKE MANAGEMENT ISSUES

Water Quality

The five year CSLAP program provided valuable data on water quality, but there are unanswered questions remaining to be addressed. First, the possibility that inadequate septic systems or other sources are creating bacteriological contamination needs to be examined.

Second, the cause of the abundance of algae during the late summer months should be investigated, and any controllable man-induced sources of the nutrient load entering the lake should be identified. And third, there is a need for continuous testing of water quality and septic systems in order to help prevent the future deterioration of lake water.

Because all household septic systems have not been tested, priority should be given to completing this program for all residences, especially considering the shallow and rocky soils that surround much of the lake.

In addition, it is recommended that the Moon Lake Preservation Council institute a water quality maintenance program that includes annual water quality testing, and the periodic evaluation of septic systems. Water quality testing should include coliform testing for bacteriological contamination as well as other standard parameters. Septic systems should be evaluated on a periodic cycle, perhaps every 2 to 5 years. The New York State Federation of Lake Associations (FOLA) is sponsoring a program known as the "Citizen's Pollution Control Program" to assist lake associations in such an endeavor, but it is unknown how many lakes will be supported.

There is a need for study of the alga problem to identify whether man-induced sources of nutrients are contributing to excessive alga growth. For instance, it is unknown whether untreated or insufficiently treated greywater is entering the lake.

In addition, measures could be taken to minimize the impact of storm water runoff. In some lakes, storm water runoff is the major contributor of nutrients. Controlling storm water runoff could be done by regulation, or less effectively, through voluntary compliance with recommended land development practices. For Moon Lake, future development on steeper slopes should incorporate erosion control measures in order to keep silt, sediment, and other pollutants from flowing into the lake. Sediment catch basins and vegetative filter strips along shorelines are examples. New commercial facilities and other developments requiring submission of a site plan under local zoning should be reviewed for their impact upon water quality, and appropriate mitigation measures should be required.

Weed Control

Excessive growth of aquatic vegetation during some years is a major concern of lake residents. Eurasian milfoil has been identified as the cause of the excessive weed growth. It has been observed that weeds are more prolific than in some years than in others, in cyclical fashion.

Although it may be speculated that excessive nutrients have accelerated weed growth, this is not necessarily true. Eurasian Milfoil is a bottom feeder that might thrive in Moon Lake despite the best phosphorus control measures. It has thrived in neighboring Millsite Lake (before chemical and mechanical control measures were taken), despite that lake being nutrient poor. Therefore, measures designed to reduce nutrient levels may not necessarily have a noticeable impact upon weed growth.

There appears to be little support among property owners for purchasing a weed cutter/harvester, or to use weed killing chemicals, to control milfoil. The use of biological control in the form of aquatic weevils that eat Eurasian Milfoil is a possible weed control method that awaits the results of further experimentation and research. Such weevils have played a role in controlling milfoil growth in some lakes, but have not had the same level of success in all lakes where they have been found. A second biological control, in the experimental stage, is a species of moth. Early research suggests that the moth could be a more effective control than the weevil. Future research may indicate whether or not the introduction of weevils or moths could be an effective control in Moon Lake. Biological controls tend to be almost universally acceptable by lakeshore residents, and represent a desired form of milfoil control should they prove feasible and affordable in the future. Weevils are commercially available at present, but their price is high. It is unknown whether weevils are currently present in Moon Lake, in what numbers, and whether they play a significant role in milfoil control. A starting point in weed control, therefore, would be to determine the presence or absence of weevils in the lake at the present time.

Mapping the extent and type of aquatic vegetation on a periodic basis should be an element of a weed control program. There are a number of reasons why such mapping is desirable. First, it would identify those areas where milfoil growth is most prolific, and where control efforts could be concentrated. Second, it would identify beds of aquatic vegetation that are a valuable part of the lake's ecosystem and that should not be reduced or eliminated. And third, it would serve to monitor progress of any milfoil control programs that were to be undertaken.

At the present time the most feasible means of weed control is for property owners to clear weeds within small areas in front of their own properties -- by hand pulling or cutting, or by the use of bottom barriers. Chemical treatment is not legal without a permit from NYS DEC. It would be beneficial to distribute information to property owners explaining how to employ such methods.

Fish Stocking

Lakeshore property owners wish to be informed of fish stocking plans. It is recommended that a contact person from the Moon Lake Preservation Council be appointed to keep abreast of DEC's plans.

Land Use and Development

Preserving the natural character and scenic beauty of the Moon Lake area is a concern of residents. The most permanent and effective method of preserving open space character and valuable habitats is the voluntary donation of a conservation easements to a local land trust or land conservancy. A conservation easement on a property permanently preserves it as open space, and makes the donor (the landowner) eligible for certain tax breaks. In order for a landowner to donate a scenic easement, a local not-for-profit land trust/conservancy must be established to accept it. Accordingly, supporting the creation of an "Indian River Lakes Land

Conservancy" is a component of this lake management plan. Such a land conservancy would accept conservation easements from any of the Indian River lakes, including Moon Lake.

Another concern is the possibility of commercial development interfering with residential use, and adding watercraft traffic to the lake. Campgrounds are an allowed use within the zoning district surrounding Moon Lake. A commercial campground may detract from the residential tranquility of surrounding individual summer homes and camps. Recently enacted amendments to the Town of Theresa Zoning Regulations contain provisions to lessen the adverse impact of new campgrounds on lakeshore residential properties, including a limit of one motorized watercraft per each 100 feet of shoreline. However, should campers choose to launch their jet skis from a campsite launch, this provision could be difficult to enforce.

There are no provisions in the Town of Theresa zoning ordinance to prevent development at the edge of a cliff face. Such development could result in erosion of the rock face, changing the natural appearance of the shoreline, failing septic systems, and destruction of raven habitat. Green space buffers should be required along all rock cliff faces.

Still another issue is improperly designed development increasing storm water runoff into the lake, thereby increasing the nutrient load. Proposed commercial developments and larger residential subdivisions should be reviewed to assure that runoff is diverted into shallow depressions and vegetative filter strips rather than drain directly into the lake. Erosion control measures should be taken during the construction phase of projects, and accompanying any land clearance.

In order to deal with the above issues, and to preserve and protect the environment of the Moon Lake area, it is recommended that a lake shore area land use plan be prepared to guide future land conservation and development. The plan should be based upon an environmental inventory that includes maps of the unique characteristics of the Moon Lake area, including its sensitive environments such as wetlands, shallow soils, and rocky slopes at the waters edge. It should include recommendations for the preservation of open space, and for land use regulation designed to preserve rural character.

Recreational Use of the Lake

The Moon Lake Preservation Council favors the continuation of the 10 hp limit for watercraft at the state boat launch.

As reflected by the results of the questionnaire survey, there are concerns with boat traffic and jet skis. Such concerns are common among many lakeshore property owners, and include excessive speeds, inconsiderate boaters, the presence of jet skis, and hazardous or inconsiderate operation of watercraft.

On some of the Indian River Lakes there has been confusion as to whether jet skis are allowed to use the state launch. Because jet skis are rated in cc's instead of horsepower, it is not clear to some users whether they are permitted. In fact, such watercraft exceed the 10 h.p. limit. It has been suggested that the signs be revised to include wording that relates cc's to horsepower.

GOALS AND OBJECTIVES

The following goals and objectives were adopted by the Moon Lake management plan committee members at a July 1998 meeting.

Water Quality Goals

- a. Milfoil growth should be controlled.
- b. Water quality should not be allowed to deteriorate.

Water Quality Objectives

- a. Monitor water quality annually.
- b. Determine the cause of excessive weed growth (milfoil), and why it is cyclical in nature.
- c. Map the extent and type of aquatic vegetation.
- d. Complete the septic system testing program, and re-test periodically.
- e. Stay abreast of the latest information regarding biological controls, such as weevils, and if found to be effective, determine property owner opinions and seek funds to institute a biological control program for milfoil.
- f. Encourage good water quality practices by shoreline residents, such as not disposing toxic substances (paint thinner, motor oil, etc.) in the ground or not washing with soap in the lake.
- g. Continue to prohibit, by local zoning, potentially polluting businesses from locating within the lakeshore area.

Land Use and Development Goals

- a. The rural character of the lake area should be maintained.
- b. The natural character of the shoreline should be maintained.

Land Use and Development Objectives

- a. Limit and strictly regulate "Funnel" or "Keyhole" development (whereby a number of inland building lots share a narrow width of lakeshore frontage).
- b. Limit commercial development within the lakeshore area to campgrounds only.
- c. Identify critical habitats, environmentally sensitive lands, and key open spaces in the lakeshore area.
- d. Discourage the removal of natural vegetation along shorelines, and the clear-cutting of large tracts of land.

Recreational Use of the Lake Goals

- a. Conflicts between various user groups should be minimized to the extent practicable.
- b. Limit the number and size of water craft on the lake.

Recreational Use of the Lake Objectives

- a. Encourage compliance with existing boating regulations, including the no wake zone.
- b. Encourage boater and watercraft user courtesy.
- c. Do not expand the boat launch. Maintain as a hand launch.

Organizational Goals

- a. Maintain an active Moon Lake organization.
- b. Maintain active participation in the Jefferson County lakes organization.
- c. Maintain active participation in the NYS Federation of Lake Associations (FOLA).

Organizational Objectives

- a. Increase membership in the Lake Association.
- b. Keep members informed of items of interest.
- c. Obtain adequate funding through dues, fund-raisers, and grants.
- d. Keep abreast of the latest information and programs available from FOLA.

ACTION PLAN

The following actions should be taken to achieve the goals and objectives of the lake management plan.

- a. Continue to distribute a bi-annual newsletter.
- b. Maintain active participation in the Jefferson County lakes organization.
- c. Send representatives to the annual FOLA meetings and other appropriate conferences.
- d. Continue the septic system testing program.
- e. Continue to apply to FOLA for inclusion in the CSLAP program. Meanwhile, do annual water quality testing using funds from the local organization.
- f. Have a study done to determine the causes of excessive weed growth in some years.
- g. Prepare a map of aquatic vegetation.
- h. Determine the presence and density of mifoil controlling weevils in Moon Lake?
- i. At an annual meeting, test the willingness of property owners to pay for weed or algae control.
- j. Stay abreast of the latest information regarding biological controls, such as weevils, and if found to be effective and affordable, initiate a trial program of biological control.
- k. Prepare a map identifying wildlife habitats, sensitive environmental areas, and key open spaces within the shoreline area.
- l. Prepare proposed amendments to local zoning regulations for the Town of Theresa in order to implement land use and development goals and objectives.
- m. Prepare a booklet for distribution to lake area property owners that outlines existing regulations, describes voluntary actions that could be taken to preserve water quality and the lakeshore environment, encourages water craft courtesy, and lists agencies to contact with enforcement concerns.

APPENDIX 1: TABULATED RESULTS OF PROPERTY OWNERS SURVEY

1. Does your property have a drainage plan?			
a. Yes	12	10	10
b. No	18	15	15
2. Approx how many years since you last had a drainage plan?			
a. 0-5 years	10	10	10
b. 6-10 years	10	10	10
c. 11-15 years	10	10	10
d. 16-20 years	10	10	10
e. 21+ years	10	10	10
3. How would you rate the condition of your drainage system?			
a. Excellent	10	10	10
b. Good	10	10	10
c. Fair	10	10	10
d. Poor	10	10	10
e. Very Poor	10	10	10
4. Have you noticed any change in water quality?			
a. Yes	10	10	10
b. No	10	10	10
5. Please describe any other drainage issues you have noticed (e.g., flooding, erosion, etc.)			
a. Flooding	10	10	10
b. Erosion	10	10	10
c. Other	10	10	10
6. Do you believe the drainage system is adequate for your property?			
a. Yes	10	10	10
b. No	10	10	10
7. How likely are you to invest in a drainage system?			
a. Very Likely	10	10	10
b. Likely	10	10	10
c. Not Likely	10	10	10
d. Not at All Likely	10	10	10
8. What is your primary reason for not investing in a drainage system?			
a. Cost	10	10	10
b. Lack of knowledge	10	10	10
c. Other	10	10	10

APPENDIX
TABULATED RESULTS OF LAKE AREA PROPERTY OWNER SURVEY
Moon Lake

(95 surveys mailed, 29 returned, rate of return = 31%)

1. Does your property have lake frontage? 27 yes 1 no
2. About how many days per year do you spend on your lake area property? 3 year around, 2 one-half year
The rest = 45 day average

3. How would you rate the condition of your lake for the following?

	1	2	3	4	
	<u>Poor</u>	<u>Fair</u>	<u>Good</u>	<u>Excellent</u>	<u>No Opinion</u>
a. Swimming	9	23	9		
b. Non-motorized boating		3	18	7	1
c. Motorized boating		12	20		
d. Fishing	1	9	11	5	3
e. Household water supply	5	10	7	1	3
f. Aesthetic appeal	1	8	17	4	2

4. Have you noticed any change in water quality:
 - a. since last year? 8 yes 18 no
 - b. in the past few years? 17 yes 11 no

5. Please describe any change in water quality or in lake levels. (For example, excessive weed or algae growth, loss of clarity, odor or taste of water, fish kills, abnormally high or low water, etc.)

1. More algae
2. Increase in weed growth (milfoil)
3. Loss of clarity

6. Do you believe the following conditions are a problem in your lake?

	1	2	3	
	<u>No Problem</u>	<u>Minor Problem</u>	<u>Serious Problem</u>	<u>No Opinion</u>
a. Rooted aquatic plants in general		11	19	
b. Milfoil in particular		5	20	2
c. Algae (green scum)	2	15	11	1
d. Turbid water (not clear)	8	16	4	2
e. Undesirable taste or odor	11	10	1	4
f. Zebra mussels	18	1	1	5
g. Lake level too high or too low	16	10	0	2
h. Poor bottom conditions for swimming	6	12	10	1
i. Swimmers itch or bacteria problems	16	3	2	7
j. Toxic chemicals in the water	16	4	1	6
k. Poor fishing	16	8	1	2
l. Fish kills	18	4	2	5
m. Too many boaters	15	11	1	2
n. Excessive boat speed	10	12	6	1
o. Intoxicated boaters	13	6	2	4
p. Other? Describe:				

7. What do you suspect may be a cause of the most significant water quality problems in your lake? (Check all that apply.)

- a. 11 Failing household septic systems.
- b. 2 Effluent from municipal sewer treatment plants.
- c. 5 Stormwater runoff from developed areas and roadways.
- d. 0 Runoff from lawn fertilizers.
- e. 6 Gasoline or oil from boats.
- f. 12 Beaver dams.
- g. 5 Other. Describe: weeds, algae

8. Control of Eurasian Milfoil is a common concern on many lakes. What do you believe is/are the best ways to deal with this problem? (Check all that apply.)

- a. 4 Lakeshore owners, as a group, should purchase a mechanical weed harvester.
- b. 9 Use weed killing chemicals.
- c. 12 Individuals should be responsible for clearance of weeds in front of their property either by hand cutting or pulling, or by the placement of weed blankets (bottom barriers).
- d. 22 Use biological controls such as weevils or grass carp, if demonstrated to be effective.
- e. ____ Other. Describe:

9. Excessive algae growth due to elevated phosphorus levels is also a common concern. . What do you believe is/are the best ways to deal with this problem? (Check all that apply.)

- a. 8 Use chemical controls such as copper sulfate.
- b. 17 Upgrade failing septic systems.
- c. 7 Reduce stormwater runoff by providing vegetative filter strips and stormwater settling basins for new development, driveways and roadways.
- d. 2 Other. Describe: regulations

10. Would you favor or oppose the following:

	1	2	3	4	5	
	<u>Strongly</u>				<u>Strongly</u>	<u>No</u>
	<u>Oppose</u>	<u>Oppose</u>	<u>Neutral</u>	<u>Favor</u>	<u>Favor</u>	<u>Opinion</u>
a. A <u>voluntary</u> septic system testing and compliance program.	1		3	8	14	1
b. A <u>mandatory</u> septic system testing and compliance program.	3	7	5	4	8	
c. Spending your own money, as a group, for weed or algae control programs, if other sources of funds are not available.	3	4	3	11	4	2
d. Encouraging practices that preserve water quality and shoreline aesthetics by preparing a booklet of suggestions for lakeshore property owners.	1		2	12	11	1
e. Adopting stricter local controls on future land development in lakeshore areas.	1		6	9	9	2

11. Would you favor or oppose the following specific land use controls that would apply to future use of the land. (Existing land uses would be grand-fathered.)

	1 Strongly Oppose	2 Oppose	3 Neutral	4 Favor	5 Strongly Favor	No Opinion
a. Regulations designed to reduce the density of new development on critical habitats, environmentally sensitive lands, and valuable open spaces.	1	1	1	17	6	
b. Regulations designed to preserve the natural character of the shoreline, such as limiting vegetative cutting.	1	4	4	11	5	1
c. Regulations designed to reduce stormwater runoff (carrying algae inducing nutrients) entering the lake.	3		5	9	4	3
d. Regulations limiting "funnel development," whereby an unlimited number of inland building lots share a relatively small amount of lakeshore frontage.	1		3	10	10	

COMMENTS:

Most common response: excessive boat speed, jet skis, large motorboats (safety and erosion concerns)

Other: septic system testing needed

Mr. Dennis R. Juno