The Aquatic Plants Of the Chateaugay Lakes: Inventory & Management

January 2003

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Acknowledgments

Special thanks to Bill Empsall,
The Chateaugay Lakes Association,
and the crew of The Osprey
• Carrie Hadden, Chuck Hadden, and Kyler Lowell •
for their interest and their assistance.

Aquatic plant illustrations courtesy of the Information Office
of the University of FL Center for Aquatic Plants

Cover Photograph
Ralph's Hotel, Upper Chateaugay Lake, Adirondack Mountains
Photograph taken between 1900 and 1906
Detroit Publishing Co. no. 016793, United States Library of Congress

INTRODUCTION

BACKGROUND

A major threat to the aquatic ecosystems of the Adirondacks are several invasive, non-native species of plants recently discovered in some of our lakes, ponds, wetlands, and riparian habitats. The plants that are of concern include purple loosestrife (*Lythrum salicaria*), Eurasian milfoil (*Myriophyllum spicatum*) and curlyleafpondweed (*Potamogeton crispus*).

Once established, these non-native species can successfully outcompete native plants, severely reducing the biodiversity of the aquatic system. In Lake George, on the outskirts of the Adirondack Park, Eurasian milfoil was first documented in 1985. At that time, it was only found in three bays. By 1991, the milfoil had displaced the natural vegetation in over 90 locations. In 1993, the presence of Eurasian milfoil and purple loosestrife was documented in Franklin County in the north central Adirondacks. Eurasian milfoil was discovered in Upper Saranac Lake in 1996 and has spread from several sites in that lake to numerous locations throughout the 7 mile long lake, and covering large expanses of shoreline in certain areas. In just two years time, Middle Saranac Lake went from containing no known Eurasian to having well-established beds throughout the lake.

RECOMMENDED INVASIVE SPECIES STRATEGY

The best way to avoid the spread of these non-native plants is to find them before they become well established in a body of water. Once introduced, these plants spread quickly, and after becoming established, eradication is generally not possible and management can become expensive. In lakes where Eurasian milfoil has become established, management becomes a top priority.

ECOLOGICAL ROLE OF AQUATIC PLANTS

Not all aquatic plants are bad. Aquatic plants are an important part of a lake ecosystem, providing food, shelter, and breeding sites to a wide variety of aquatic and non-aquatic animals. Aquatic plants also help prevent erosion of banks and near-shore areas due to wind and wave action. When excessively abundant, aquatic plants not only detract from the recreational and aesthetic uses of a waterbody, but may actually reduce the ecological value and negatively impact the fisheries.

TYPES OF AQUATIC PLANTS

There are three general groups of aquatic plants: those that have erect stems and leaves and emerge out of the water, those whose leaves are primarily floating, and those with stems and leaves that are primarily submereged. Emergent plants are typically limited to wet areas and shallow waters along the shore. Cattails are typical emergent aquatic plants. Floatingleaf plants occur from near shore regions to waters that are 3 to 4.5 meters

(10 or 15 feet) deep. Water lilies are typical emergent aquatic plants. Submerged plants are variable in their habit. Some submereged plants, such as elodea, grow along the lake bottom, and may only extended 15 centimeters (6 inches) or less above the sediments. Other submerged plants, such as some milfoils, may gorw in depths of 4.5 meters (15 feet) or more and extend to the lake's surface. Still others, such as the pondweeds, have both submerged leaves and floating leaves.

Factors that Control Aquatic Plant Distribution and Abundance

The distribution and abundance of aquatic plants are generally limited, in order of importance, by light (a function of water clarity and depth), availability of suitable substrate, and nutrients. Therefore, the type and abundance of aquatic plants is a function of the type of lake. Submerged aquatic plants are particularly limited by light, growing out into deeper water in clear lakes and restricted to near-shore regions in less clear waters. Therefore, a long-term change in the mean depth or transparency of a lake would likely lead to a change in submerged plant cover and biomass. Aquatic plants with floating leaves are capable of growing to much greater depths, and are generally not limited by water column light availability.

Excessive external nutrient loading is not a direct cause of aquatic plant problems. In fact, higher external nutrient loading tends to reduce aquatic plant biomass due to shading associated with algal blooms. Sediment nutrient concentrations are important, however. Problematic growth of aquatic plants can be expected in lakes or ponds having shallow, relatively warm water, sediments of rich, fine-textured, moderately organic soils, and transparency greater than or equal to 2 meters (6½ feet). Plants may also be locally more abundant in areas that naturally have a more organic bottom, such as near inlets, outlets, channels, and quiet bays or in areas that receive runoff from shoreline development and septic systems.

Impact of Invasive, Non-Native Species

Invasive non-native species tend to grow in dense stands, crowding out members of the native plant community. The extreme densities these exotic species can reach causes several other negative impacts on the aquatic environment. In lake systems, the fish community can be negatively impacted through loss of spawning and foraging grounds. Also, the decomposition of this extra plant material can cause oxygen stressed conditions, which can result in a fish kill. Furthermore, these plants release nutrients and increase the rate of sediment accumulation, thereby accelerating the eutrophication process. Finally, by impairing boating and swimming, fishing success, and reducing a lake's aesthetic appeal, the presence of these exotic plant species can cause economic hardships to communities which rely heavily on tourism dollars. In wetland systems, this reduction in plant biodiversity is also accompanied by a reduction in wildlife food and shelter value, causing a near total disruption of the ecosystem.

Who to Contact for More Information

If you think that you have discovered an non-native species, or would like more information, contact our office or one of the following organizations:

Adirondack Park Agency
P.O. Box 99, Ray Brook, New York
12977
518 891-4050

New York State Department of
Environmental Conservation
Region 5, Ray Brook, New York 12977
518 897-1200

Additional Reading

Basic Lake and Plant References

The following references are useful resources for anyone interested in aquatic plants or lake ecology:

Diet for a Small Lake: A New Yorker's Guide to Lake Management by New York State Department of Environmental Conservation, Albany and Federation of Lake Associations, Rochester. 1990.

Managing Lakes and Reservoirs, 3rd edition. 2001. Holdren, C, W. Jones, and J. Taggart, Ed. North American Lake Management Society, Terenne Institute and US EPA. NALMS. Madison WI.

Michael R. Martin's (online) Aquatic Plant Image Library. 2002. Cedar Eden Environmental, LLC. Saranac Lake, NY. http://www.cedareden.com/aquaplant.html.

Wetlands by William A. Neiring. An Audubon Society Nature Guide. 1985. Alfred A. Knopf, Inc. Chanticleer Press, Inc. New York.

Advanced Lake and Plant References

The serious student of lakes and aquatic plants may wish to refer to one or more of the following books, which may be available at some libraries (Frank L. Cubley Library at Paul Smith's College or any major city or University Library):

Aquatic and Wetland Plants of Northeastern North America by Garret Crow and C. Barry Hellquiest. 2000. University of Wisconsin Press. Madison.

A Manual of Aquatic Plants by Norman C. Fassett. 1957. University of Wisconsin Press. Madison.

Limnology by Alex Horne and Charles Goldman. 1994. McGraw-Hill. New York.

CHATEAUGAY LAKES AQUATIC PLANT SURVEYS

METHODOLOGY

Cedar Eden Environmental, LLC conducted a survey of the aquatic plant community in the Chateaugay Lakes (Upper, Lower, and the Narrows) on July 31 and August 1, 2002. The survey was conducted by touring the complete shorelines by boat. The purpose of this type of mapping is not to develop a comprehensive list of aquatic plant species present, but to define the general distribution and abundance of the aquatic plant community. An accurate shoreline map was produced for the lakes using a geographic information system (GIS) and recent, high-resolution aerial photographs. Large-scale field maps of sections of the shoreline were produced and used in the field to mark the location of aquatic plant species present in the lake. Specimens of plants that could not be readily identified in the field were collected and placed in a cooler for later study. Aquatic plants were keyed to species wherever possible, using standard reference keys, including Manual of Aquatic Plants Second Edition[1], Manual of Vascular Plants[2], Aquatic and Wetland Plants of Northeastern North America[3], and others.

Cedar Eden Environmental, LLC scanned the field maps into the computer, ortho-rectified the scanned images in the GIS, and digitized the location of each field-marked plant into the GIS. The GIS was used to create large-scale maps of the distribution and general abundance of the aquatic plant communities for each lake. These maps, along with line diagrams of key species, are provided with this report for present and future reference.

RESULTS

The results of the field mapping of the Chateaugay lakes are provided in the three large-scale maps included with this report. Small copies of the map are included on the following pages. These smaller maps are intended as a quick reference, but are too small to adequately display the results of the field work. A key to the plant maps is also provided.

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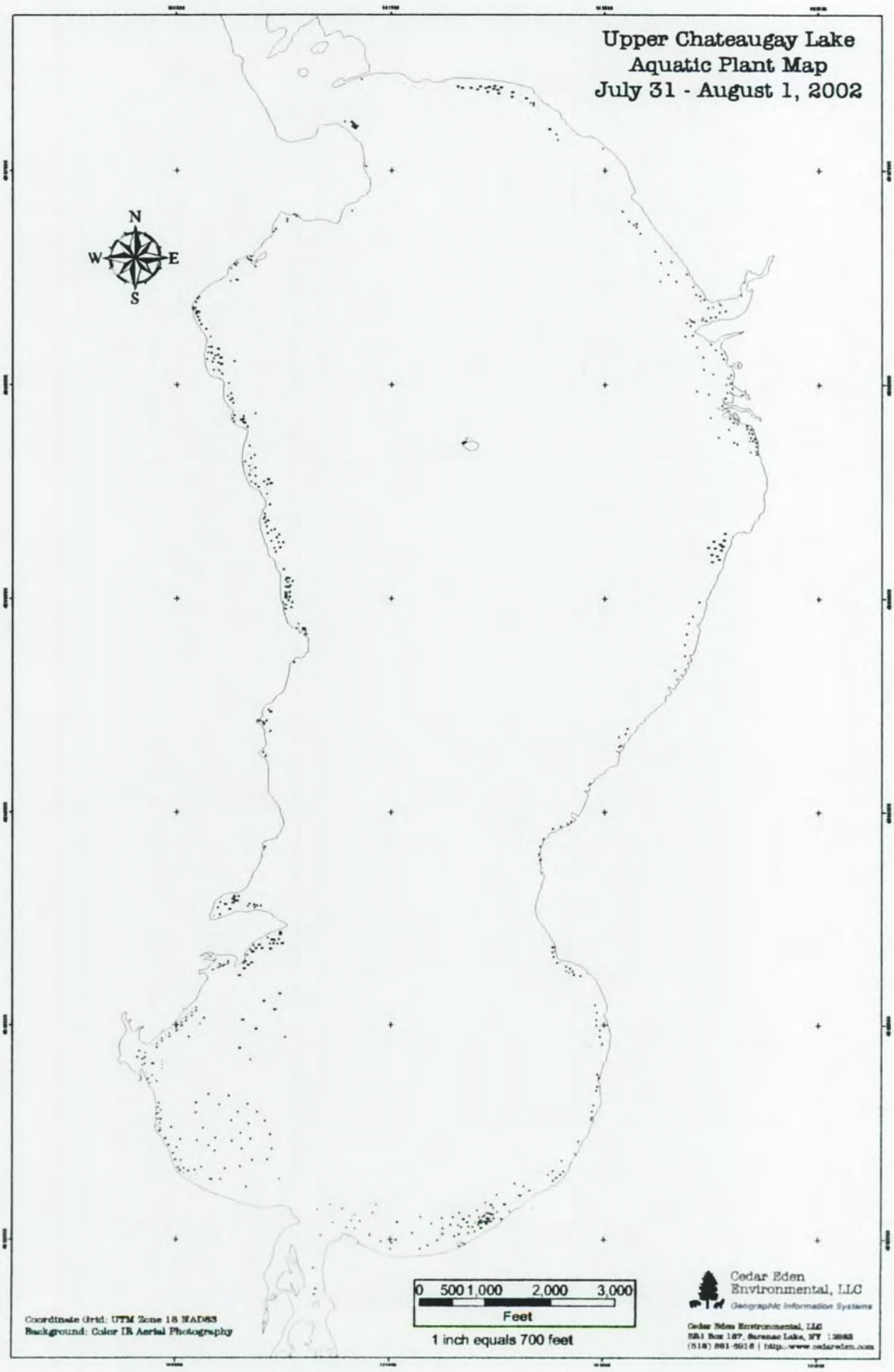
[1]Fassett, N.C. 1957. A Manual of Aquatic Plants. University of Wisconsin Press. Madison

[2]Gleason, H.A. and A. Cronquist. 1963. Manual of Vascular Plants of Northeast United States and Adjacent Canada. D. Van Nostrand Company. New York.

[3]Crow, G.E. and C.B. Hellquiest. Aquatic and Wetland Plants of Northeastern North America. 2000. University of Wisconsin Press. Madison.


Upper Chateaugay Lake
Aquatic Plant Map
July 31 - August 1, 2002
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0 500 1,000 2,000 3,000
Feet
1 inch equals 700 feet
Coordinate Grid: UTM Zone 18 NAD83
Background: Color IR Aerial Photography
Cedar Eden
Environmental, LLC
Geographic Information Systems
Cedar Eden Environmental, LLC
RR1 Box 187, Saranac Lake, NY 12983
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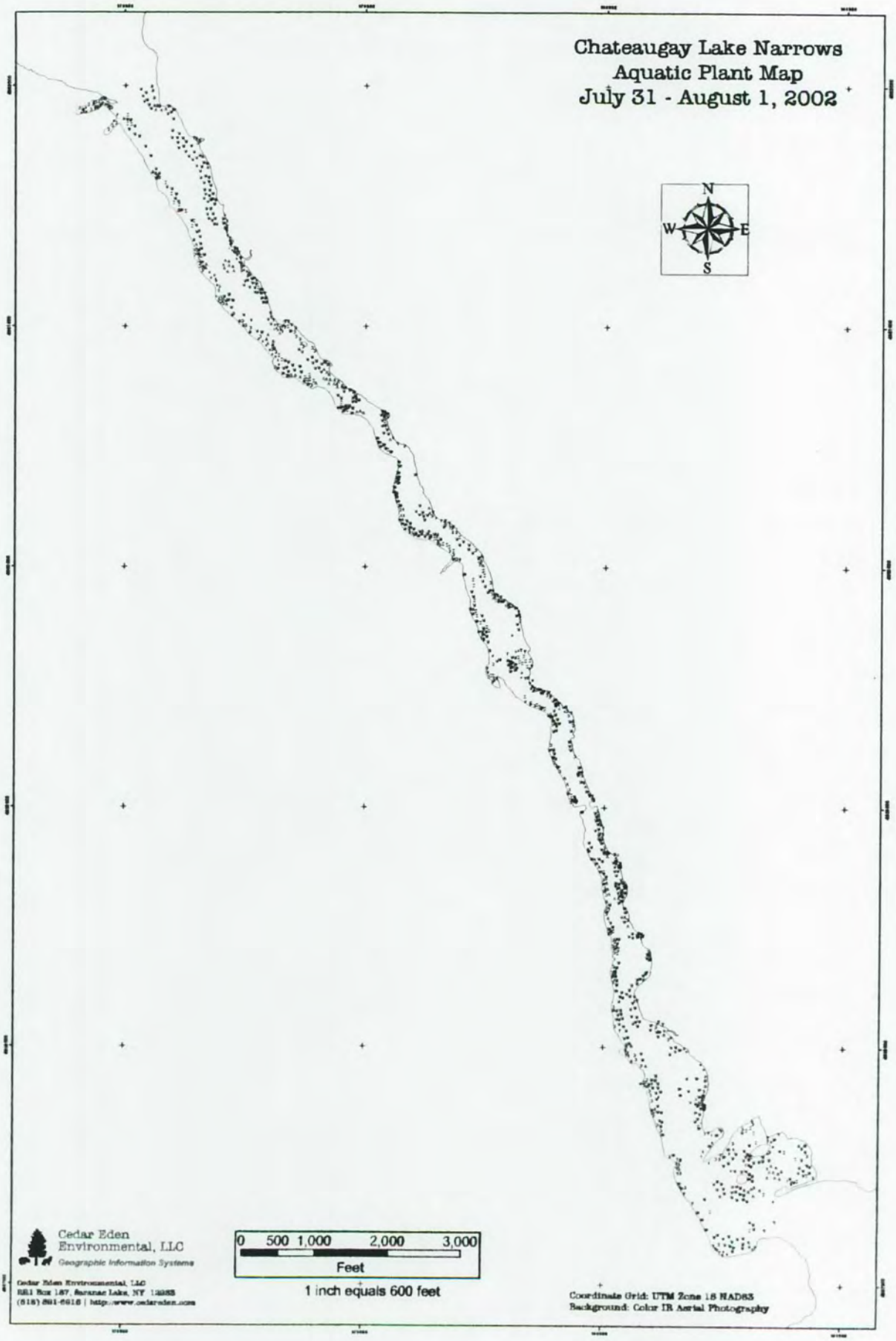
Chateaugay Lake Narrows
Aquatic Plant Map
July 31 - August 1, 2002
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Environmental, LLC
Geographic Information Systems
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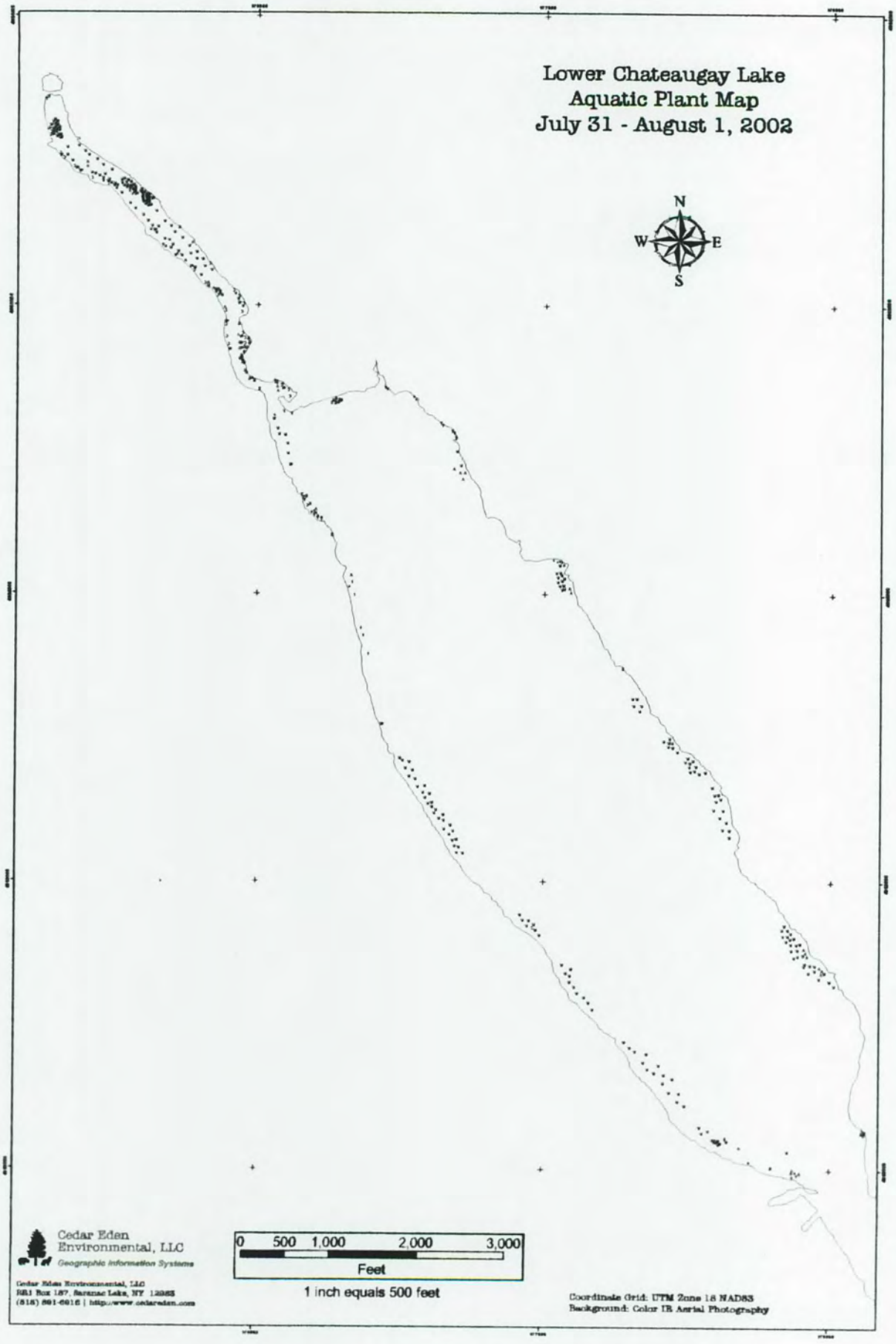
Feet
1 inch equals 600 feet
Coordinate Grid: UTM Zone 18 NAD83
Background: Color IR Aerial Photography


Lower Chateaugay Lake
Aquatic Plant Map
July 31 - August 1, 2002
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Environmental, LLC
Geographic Information Systems
Cedar Eden Environmental, LLC
RR1 Box 187, Saranac Lake, NY 12983
(518) 891-6016 | http://www.cedareden.com
0 500 1,000 2,000 3,000
Feet
1 inch equals 500 feet
Coordinate Grid: UTM Zone 18 NAD83
Background: Color IR Aerial Photography

LEGEND FOR AQUATIC PLANT MAPS		
Code	**Common Name**	**Scientific Name**
1	Leafy Pondweed	*Potamogeton epihydrous*
2	Smartweed	*Polygonum amphibium var. stipulaceum*
4	Variable Pondweed	*Potamogeton gramineus*
5	Clasping-leaved Pondweed	*Potamogeton perfoliatus*
8	Slender Water Nymph	*Najas flexilis*
A	Bassweed	*Potamogeton amplifolius*
b	Bulrush	*Scirpus sp.*
B	Watershield	*Brasenia schreberi*
C	Nitella	*Nitella spp.*
E	Canadian Waterweed	*Elodea canadensis*
G	Sedges	
L	Water Lobelia	*Lobelia dortmanna*
M	Eurasian Milfoil	*Myriophyllum spicatum*
P	Floating-leaved Pondweed	*Potamogeton natans*
R	Spike Rush	*Eleocharis spp.*
S	Bur Reed	*Sparganium angustifolium, S. americanum*
T	Cattail	*Typha spp.*
U	Bladderwort	*Utricularia spp.*
V	Tape Grass	*Vallesneria americana*
W	White Water Lily	*Nypmhaea oderata*
Y	Yellow Water Lily	*Nuphar variegatum*
Z	Purple Loosestrife	*Lythrum salicaria*
n/s	Mare's-tail	*Hippuris vulgaris*
n/s	White Water Crowfoot/buttercup	*Ranunculus longirostris*

n/s = present but not shown on maps

Discussion

Upper Chateaugay Lake

Upper Chateaugay Lake is characterized by having a nearshore zone that is typically shallow, sandy, and slowly sloping. In general, the aquatic plants present were those typically found in relatively clear, slightly acid, sandy Adirondack lakes. These typical plants include pipewort, bur reed, and several pondweed species. The southern end of the lake is contiguous with an extensive wetland system, and the plant community at that end of the lake was more dominated by water lilies, elodea and bur reed.

Colonization of Eurasian milfoil in this lake is probably limited more by wind and wave action than by substrate, however, since Eurasian milfoil can grow in all types of substrates. The eastern shore of the lake received a tremendous amount of wind and wave action, limiting the establishment and spread of all plants, including Eurasian milfoil. In addition, this lake is upstream and upwind of the main source of established Eurasian milfoil in the Narrows and therefore colonization likely occurred several years later in Upper Chateaugay Lake than in the Narrows.

Eurasian milfoil was present at the northern end of the lake, scattered along the eastern shore, and in several large stands at the southern and southwestern ends of the lake, and in bays along the western shore. The largest stand of Eurasian milfoil was located some distance from shore in the western half of the southern bay of the lake.

There was a large stand of slender water nymph in the southwestern corner of the lake. This native plant species can form large, loosely rooted mats of plant material which may break free and float to other parts of the lake. This is the plant that was the source of complaints at the summer meeting of the Chateaugay Lakes Association. The plant was also growing in a small colony in the southeastern corner of the lake, but loose mats were observed in several places along the eastern shore where it had presumably been blown there by the wind.

Chateaugay Narrows

The Chateaugay Lake Narrows is a narrow, riverine channel with a large density of aquatic vegetation established in an organic and peaty sediment. Water clarity and depth helped to maintain open water in the middle of this waterbody, but vegetation is well established along the channel margins and out towards the center in many places. The plant community was dominated by Eurasian milfoil mixed together with water lilies and elodea. This lake had the greatest variety of plant species of the three.

Access to the lake from docks at most private residences, commercial establishments, and the public launch facility is generally not possible without navigating through aquatic vegetation, including Eurasian milfoil.

LOWER CHATEAUGAY LAKE

Lower Chateaugay Lake, like Upper Chateaugay, typically has a sandy, slowly sloping nearshore area. Although long stretches of shoreline are devoid of aquatic plants, there are many long, narrow stands of Eurasian milfoil along the shoreline on both shores of the main lake. Eurasian milfoil was also well established in the outlet channel at the northern tip of the lake. Other plants in the lake included watershield, pondweed species, and bulrush.

AQUATIC PLANT MANAGEMENT

The primary purposes of aquatic plant management are to control the spread of invasive species, restore an ecological balance within the plant community, and/or to restore water-based recreational opportunities including boating and swimming. This section discusses the management alternatives that might be applied to an aquatic plant management program for the Chateaugay Lakes and then presents recommendations for plant management.

POTENTIAL MANAGEMENT ALTERNATIVES

Comparative costs for management alternatives in this section is the cost per acre treated without consideration of the longevity of the treatment effects, based upon Holdren et al (2001)[4].

BENTHIC BARRIERS

A benthic barrier is a material used to cover the lake bottom, smothering and killing rooted aquatic plants. The most commonly used benthic barrier in use today is a heavy synthetic membrane (polyvinyl) which is laid on the lake bottom and anchored using stakes or weighted down with rebar. Benthic barriers do not work well in areas with soft sediments, water current, or stumps and rocks. Gas buildup under the mats can be a problem, causing them to float up and become a navigational hazard. This can be alleviated by cutting slits in the membranes. Benthic barriers can be placed temporarily and removed after several weeks, or left in place permanently. A permit is required to place benthic materials into a lake. Costs associated with benthic barriers include material costs (benthic material and stakes/weights), installation cost, and permitting. The comparative cost per acre is estimated at $20,000 to $50,000 per acre, including installation, removal, and maintenance. However, smaller areas can be managed at a much lower cost.

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[4]Holdren, C, W. Jones, and J. Taggart, Ed. 2001. Managing Lakes and Reservoirs, 3rd edition. 2001. NALMS. Madison WI. These cost estimates are based on prices obtained from cooperating lake management practitioners across the United States. While the cost ranges do not include all possible situations, costs shown for each technique do reflect all directly associated expenses, including design, permitting, capital cost, operating cost, and monitoring. Costs are given in 2001 dollars.

Mechanical Removal - Mechanical Harvesting

Harvesting aquatic vegetation is somewhat like mowing a lawn. A specialized aquatic plant harvester with a cutting bar is used to cut the plants below the water surface and remove the cut fragments from the lake. The equipment is expensive to own and operate. Harvesting can speed the spread of invasive species such as Eurasian milfoil since not all fragments are collected by the machine. A harvester works well in maintaining open boat lanes in areas where aquatic vegetation is dense but the area is free from rocks and stumps and relatively deep. A permit is required for mechanical harvesting, and the procedure may need to be done several times each season. The comparative cost per acre is estimated at $1,000 to $1,500 per acre assuming a machine is available.

A hydrorake can be used for longer control using mechanical harvesting. This machine removes the plants and roots using a barge-mounted articulated rake. The process causes excessive turbidity, resuspension of nutrients, and spread of plant fragments. This can be minimized by using a floating containment boom around the areas to be treated. Unlike mechanical harvesting, this would not need to be repeated several times per year or even on an annual basis. A permit would be required. The comparative cost per acre is estimated at $2,000 to $10,000 per acre depending on the sediment composition and type of vegetation being removed.

Mechanical Removal - Hand-Harvesting

Hand pulling of aquatic vegetation is an effective, though labor-intensive means of controlling aquatic vegetation. Shoreowners are allowed to control plants in a small area of their lakefront under an APA general permit, although they must fill in the simple form to put the permit into effect. Hand-harvesting using SCUBA divers can be effective in controlling Eurasian milfoil in areas where the plant is newly established, the plant beds are mixed with native species, and/or the plant beds are not excessively large. A permit would be required for hand-harvesting large areas of aquatic vegetation. The comparative cost per acre is estimated at $0 for small areas controlled by shore owners and about $1,500 per acre for SCUBA harvesting.

Winter Water Level Drawdown

Winter water level drawdown is an effective and inexpensive means of controlling aquatic vegetation, providing a lake system already has a structure for reliably lowering lake level. A lake is typically lowered by four to six feet in mid-October and allowed to remain drawn down until March, when the lake is refilled. Freezing of the sediments and mechanical disruption of the bottom by ice kills overwintering aquatic vegetation. Negative impacts include drawdown of adjacent wetlands, non-target mortality of hibernating amphibians and reptiles, the potential for fish kills, and drawdown of water levels in adjacent wells. A permit is required for this activity. The comparative cost per acre is estimated at less than $100 per acre if a suitable water level control structure is in place.

Chemical Control

Chemical control using herbicides is an effective means for managing aquatic vegetation. There are several types of chemicals in wide use for this purpose that are either contact herbicides or systemic herbicides. Contact herbicides (such as endothal, diquat, and glyphosphates) destroy plant tissues on contact . They are non selective, meaning they destroy all plants in the treatment area, and they also my leave the plants roots or tubers unaffected. Systemic herbicides (such as 2,4-D, fluridone, and triclopyr) are absorbed into a plant and generally moved throughout the plant, killing both vegetative and root structures within a plant. They are not generally selective, killing all plants within the target area, although some systemic herbicides such as fluridone (Sonar®) can be selective based upon treatment time and dosage rate. Quick acting contact and systemic herbicides, which work quickly, are best for areas with water flow. Herbicides are relatively expensive and require a permit. The comparative cost per acre is estimated at $200 to $2,000 depending on the type of chemical used.

Biological Control using Fish

The use of herbivorous fish, mainly sterile grass carp, has been a sometimes successful alternative. The problem with this method is that it is difficult to determine the proper number fish to stock for adequate control, often resulting in no control or complete elimination of all plants. Also, it has been learned that many nuisance plants including Eurasian milfoil are not the preferred food of these fish. This technique is best used in small ponds. A permit is required to introduce grass carp into a lake or pond. The comparative cost per acre is estimated at $50 to $300 per acre.

Biological Control using Insects

There is some promise in controlling Eurasian milfoil using an aquatic weevil larvae and an aquatic moth caterpillar. However, these treatments are still experimental at best and have not been shown to work in large waterbodies. If these organisms due result in any control, it is not complete control and may take many years for an effect to be observed. The comparative cost per acre is estimated at $1,000 to $3,000 per acre.

Management Recommendations for the Chateaugay Lakes

Taken together, the three Chateaugay Lakes provide a diversity of aquatic habitat for both ecosystem function and recreational opportunities. There are wide sandy beaches for swimming, large deep open spaces for motor boating and waterskiing, extensive wetland areas for nature observation, and abundant aquatic vegetation for food web function, including wildlife habitat, refuge, and food source.

This fact, however, is no consolation to the individual homeowner who is unable to use his or her shorefront due to excessive aquatic vegetation or to the lake association concerned about the spread of an invasive species. Still, aquatic plant management, to a great

degree, has to take into consideration the natural tendencies of a water body to support a certain amount of vegetation. In the Chateaugay Lakes, lake bays and shallow channels will always tend to have more plants than open, sandy portions.

Areas within the three lakes that have high densities of aquatic plants can be expected to have high densities of aquatic plants in the future. Any control effort should be aimed at maintaining lake use and access and perhaps shifting the plant species present to species that are less likely to impact recreational use.

The following techniques should be further investigated for suitability in the Chateaugay Lakes:

- Benthic barriers – for spot control to create access lanes at key public locations and individual residences. This option would primarily be useful in shoreline areas in the Narrows and Lower Chateaugay Lake, although there may some need along the western shore of Upper Chateaugay Lake
- Hand harvesting – for spot control by residences to create an open area around dock or personal swim areas. This option would be useful in all lakes where shoreline use needs to be maintained. Hand removal is also the preferred method for dealing with the large mats of free-floating Najas that may wash up on shore in Upper Chateaugay Lake.
- SCUBA harvesting – for removal of established beds in main traffic areas and in areas where relatively dense, isolated stands of Eurasian milfoil have become established. This would be most useful near the public launch area, at several areas in Upper Chateaugay Lake, and perhaps some of the areas in Lower Chateaugay Lake.
- Mechanical harvesting – for maintaining open lanes for boating in areas where vegetation has impacted this activity. This might be useful in portions of the Narrows, although further spread of Eurasian milfoil fragments into Lower Chateaugay Lake should be a concern. This technique should not be considered in Upper or Lower Chateaugay Lake since it is likely to increase the rate of spread of Eurasian milfoil.
- Winter water level drawdown – This should be investigated as a low-cost, long-term control method for the lakes, even if a reconstruction and reconfiguration of the outlet structures are required.
- Chemical control – This option should be considered for the control of nuisance aquatic vegetation in the lakes. Unfortunately, concerns of the public and agency reluctance to grant permits may rule out any serious consideration, however, even though the technique is widely used throughout the country. It is recommended that the use of faster acting herbicides, rather than slow-acting fluridone, be considered due to the water movement associated with wind and wave action in Upper and Lower Chateaugay Lakes and the water flow in the Narrows.
- Biological control should not be considered for these lakes due to the size of the waterbodies and the experimental nature of some of the techniques.

Sources for Funding

Unfortunately, there are no reliable sources of funding available for the management of aquatic plants in New York lakes and ponds. The best option for funding is to seek local and state moneys through appropriations. The NYS Environmental Protection Fund is another potential source of funding, although aquatic plant management programs do not directly fit into any funding priorities – habitat restoration is the approach that needs to be taken in this case. Some associations have had success in self-funding by establishing a not-for-profit foundation to raise money for lake management.

Sketches of Common Plants

Invasive Plant Species

The following line diagrams can be used to help identify the invasive, non-native plant species in your lakes.

Eurasian milfoil (*Myriophyllum spicatum*): Note whorls of four leaves on nearly pencil thick stems. Stems often reddish, with overall plant color dark to olive-green. Eurasian milfoil forms dense stands that look like miniature forests from a boat, growing typically in depths of 8 to 15 feet, and extending up to surface before branching. Flowering spike sticks up above water. Often confused with native milfoils (natives generally grow in shallower water, are bright green in color, branch profusely and does not extend to lake surface) or coontail (*Ceratophyllum* — does not have whorls of four leaves). *M. spicatum* is well established in a number of area lakes, particularly within the Saranac Lake chain (Upper, Middle, and Lower Saranac, and First and Second Ponds).

Purple Loosestrife (*Lythrum salicaria*): An emergent plant typically found growing in roadside ditches, wetlands, and along shore. Purple loosestrife does not typically grow directly in water. Blooming in mid-August, the plant stands around a meter in height and has numerous purple flowers. This plant can be seen blooming in profusion along the Saranac River from the Pine Street bridge in Saranac Lake and in the downstream wetlands along Route 3 towards Bloomingdale.

insert M. spicatum here

insert purple loosestrife here