



DARRIN
Fresh Water Institute

Lake George, New York
Adirondack Field Station at Bolton Landing

A Proposal for an
Aquatic Plant Assessment of
Saratoga Lake,
New York

Prepared for

Saratoga Lake Protection & Improvement District
c/o Mr. Joseph Finn, Commissioner
157 Neilson Road
Saratoga Springs, NY 12866

Prepared By

Lawrence Eichler
Darrin Fresh Water Institute
5060 Lakeshore Drive
Bolton Landing, New York 12814
(518) 644-3541

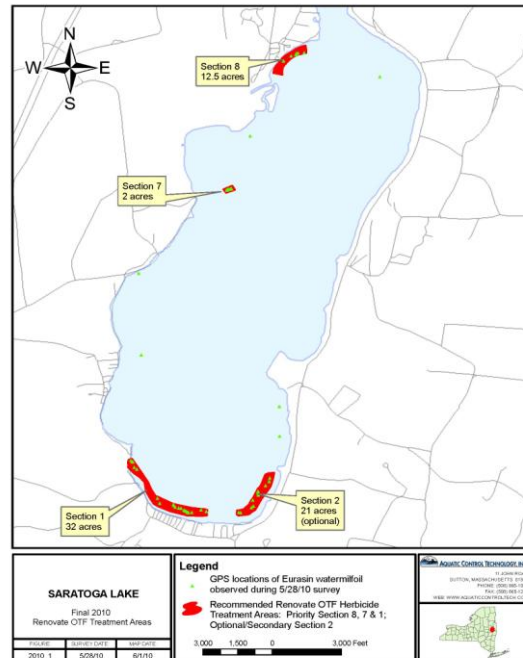
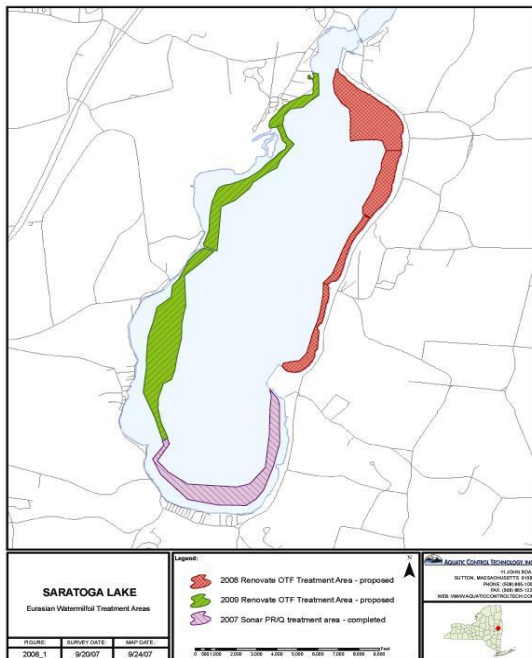
February 22, 2011

Background

At the request of Joseph Finn of the Saratoga Lake Protection and Improvement District (SLPID), we have prepared a proposal for an aquatic plant assessment of Saratoga Lake, New York. The assessment will include a quantitative survey of existing aquatic plant communities and the extent of exotic species infestation. The Point-Intercept Rake Toss method presently required by NYS DEC for Tier III Lakes will be employed. The aquatic plant survey is designed to be comparable to pre-treatment data collected by the author in 2004 (Eichler & Boylen 2004) and 2007 thru 2010 (Eichler & Boylen 2008a; b, 2009, 2010). The 2007 survey was designed to evaluate a treatment program based on application of the herbicide fluridone (SONAR™) in 2007 to control Eurasian watermilfoil (*Myriophyllum spicatum*). The current survey will provide pre-treatment and post-treatment data to evaluate the 2007 fluridone treatment and the 2008 thru 2010 treatments with triclopyr (Renovate OTF™). The sections of this protocol include the work to be done, reporting of results, and a budget and remuneration for services rendered.

The survey area will encompass the entire littoral zone of Saratoga Lake. The three sub-areas marked in the left hand map relate to treatments in 2007, 2008 and 2009. The 2010 treatment areas are presented in the right hand map. The proposed survey will document

***Proposed aquatic plant management program. Maps provided by
Aquatic Control Technologies.***



annual variation in plant composition and changes relative to past treatments. These include areas at the south end, surrounding the sunken islands along the west shore and the area north of Kayaderos Creek treated in 2010, the area from Rileys Cove to Fish Creek treated in 2009, Snake Hill to Franklins Beach treated in 2008 and the south shoreline, which was treated in 2007. The survey will occur in August, a time of maximum plant abundance and species richness. The assessment will generate the information necessary to: 1) review effectiveness of aquatic plant management efforts, 2) meet all permit requirements and 3) provide data for comparison of post-treatment conditions to prior survey information.

Introduction

Nuisance aquatic plant growth has posed problems for Saratoga Lake for the past two decades. Excessive aquatic plant growth is reported to impact water-based recreation, aesthetic quality, environmental issues related to loss of habitat diversity, exclusion of native plant and animal species, and hydrodynamics. Nuisance growth of aquatic plants in Saratoga Lake is mainly attributable to three non-native species:

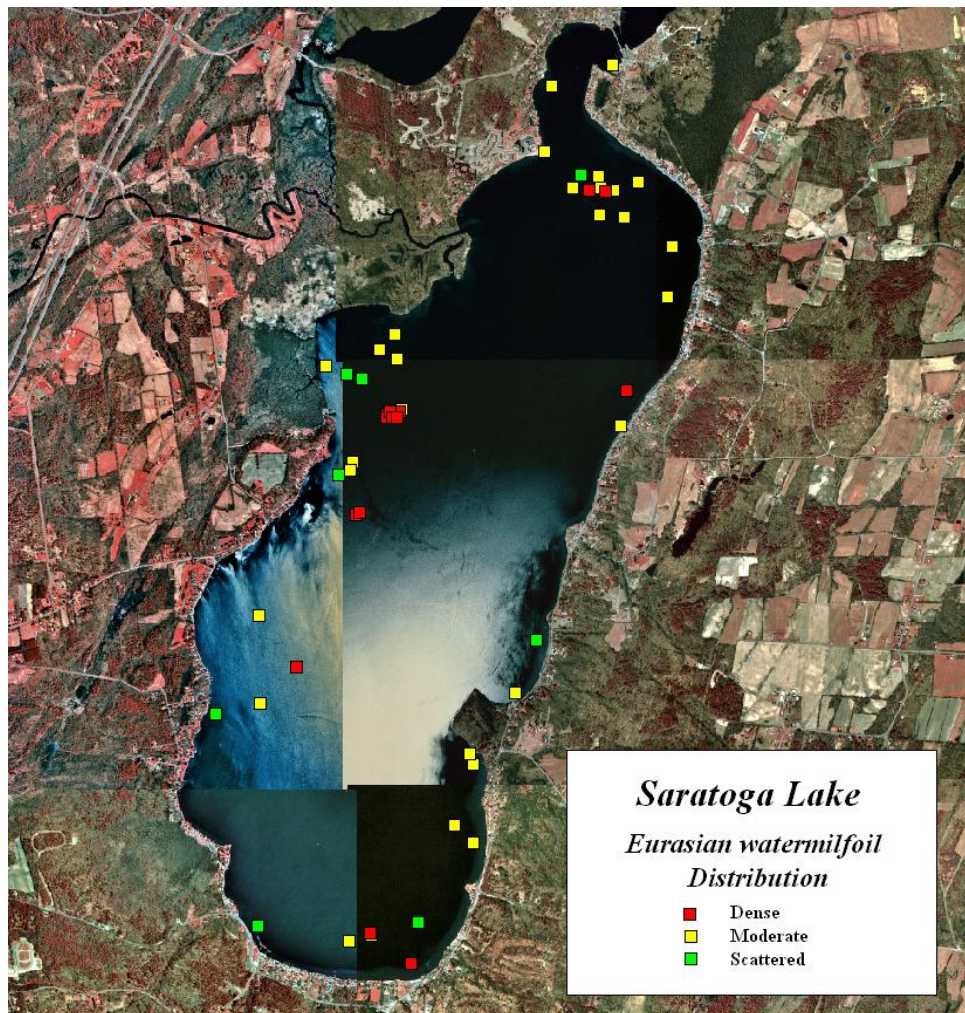
- Eurasian watermilfoil – *Myriophyllum spicatum*
- Curly leaf Pondweed – *Potamogeton crispus*
- Waterchestnut – *Trapa natans*

with the majority of effort devoted to the management of Eurasian watermilfoil.

In 1994, 2004, and 2007 thru 2010, aquatic plant surveys of Saratoga Lake were conducted by the Darrin Fresh Water Institute to evaluate ongoing management efforts, including aquatic plant harvesting, herbicide treatments and lake level drawdown for the control of Eurasian watermilfoil and Curly-leaf Pondweed. Volunteer efforts were also underway to hand harvest an infestation by waterchestnut. Results of these surveys indicated a diverse population of native aquatic plants (Table 1) dominated by the exotic invasive Eurasian watermilfoil. While mechanical harvesting provided access to the open waters of the lake for recreational use, this technology was not having an appreciable long-term effect on the density of growth of Eurasian watermilfoil. Winter drawdown and the resultant ice scour in the shallow waters (depth less than 1 meter) were determined to be negatively affecting the growth of Eurasian watermilfoil. Herbicide treatments with fluridone (Sonar™) were reported to reduce the growth of Eurasian watermilfoil in the Franklin's Beach area, however longer-term, more extensive control was desired. In 2007, herbicide treatments at the south end of the lake with fluridone (Sonar™) in the form of slow and timed release pellets was demonstrated to substantially reduce the abundance of Eurasian watermilfoil. In 2008, triclopyr (Renovate OTF™) was applied in the area from Snake Hill to Franklins Beach, with substantial reductions in the lakewide distribution and density of Eurasian watermilfoil reported in the Fall of the year. In 2009, the final year of the three year cycle, triclopyr (Renovate OTF™) was applied in the area from Rileys Cove to Fish Creek. Lakewide distribution and density of Eurasian watermilfoil was reported at it's lowest level since surveys were initiated.

Eurasian watermilfoil growth at the east side of the lake continued its decline beyond that reported immediately post-treatment in 2008. Some regrowth of Eurasian watermilfoil was reported for the south end of the lake in the second year post-treatment, however Eurasian watermilfoil growth remained well below pre-treatment levels. This decline coupled with what appeared to be sub-lethal effects of the herbicide in the untreated areas, suggest efficacy of the herbicide over a much greater area than anticipated. An increase in Eurasian watermilfoil abundance was observed in 2010, primarily in areas not treated for 2 years. Even with the increase, Eurasian watermilfoil abundance remains at less than half of pre-treatment levels. Moderate levels of Eurasian watermilfoil are currently found around the sunken island in the mouth of Mannings Cove and around the shoal area offshore from Franklins Beach. In order to control Eurasian watermilfoil, a long-term aquatic plant management program, keyed to effective use of all appropriate technologies was determined to be a worthwhile programmatic goal.

Distribution of Eurasian watermilfoil (*Myriophyllum spicatum*) in surveyed areas of Saratoga Lake in 2010.



The proposed survey is designed to duplicate the 2010 survey, providing aquatic plant population data sufficient to evaluate an aquatic plant management strategy based on the use of the aquatic herbicide triclopyr (Renovate OTF™). Results from the 2004 and through 2010 surveys will be employed to provide a baseline of aquatic plant growth to use to evaluate the proposed control efforts.

The following section describes the proposed plan for an aquatic plant survey of Saratoga Lake to verify the presence of Eurasian watermilfoil, quantify the extent of Eurasian watermilfoil infestation and characterize the current status of native aquatic plant species.

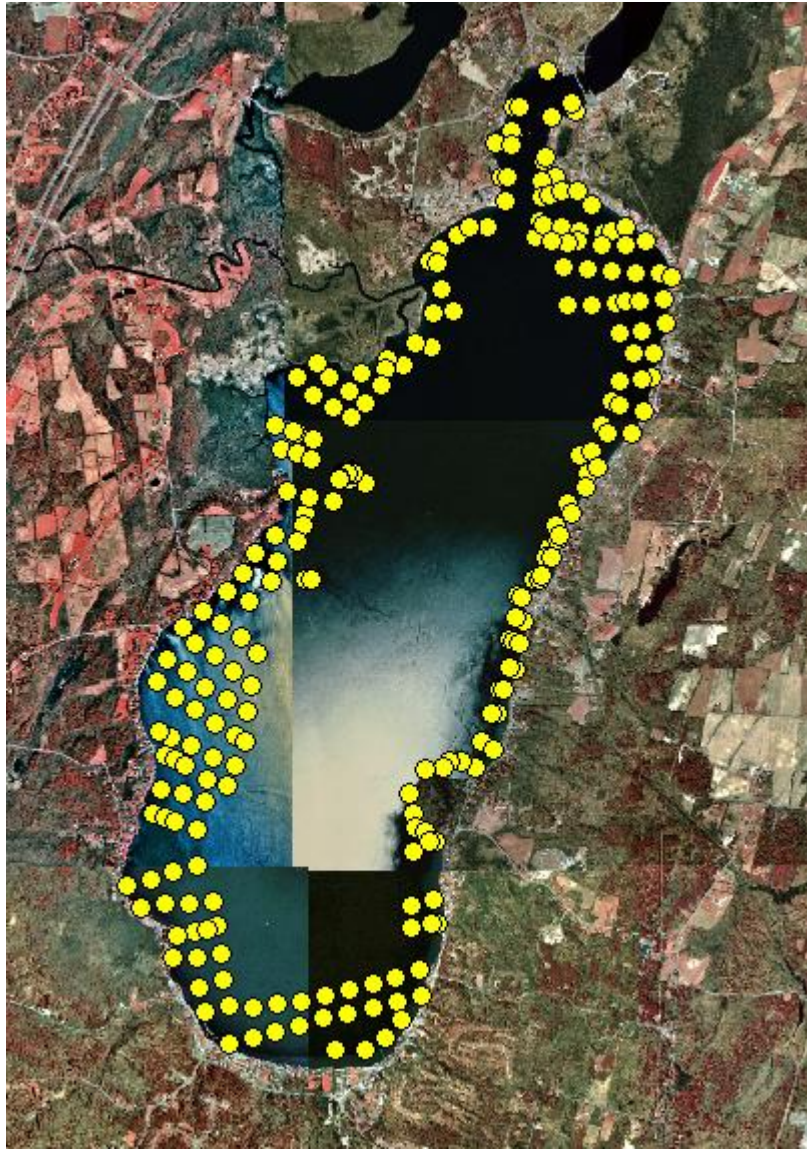
WORK TO BE DONE – Vegetation Survey and Assessment

The proposed vegetation survey is designed to largely duplicate surveys conducted by the author in 2004 and 2008 thru 2010. Two components form the basis for the surveys: herbarium records of all species encountered and point intercept (rake toss) data collections to characterize aquatic plant abundance by frequency of occurrence.

1. Species List and Herbarium Specimens. As the lake is surveyed, the occurrence of each aquatic plant species observed in the lake will be recorded and adequate herbarium specimens collected. The herbarium specimens will be pressed, dried, and mounted (Hellquist 1993) at the Darrin Fresh Water Institute Laboratory in Bolton Landing, NY, where they will become part of the permanent collection. Digital photographic images of each species will be recorded.

2. Point Intercept. The frequency and richness of aquatic plant species will be evaluated using a point intercept (rake toss) method (Madsen 1999). At each grid point intersection, all species located at that point will be recorded, as well as water depth. Species will be located by a visual inspection of the point and by deploying a rake to the bottom, and examining the plants retrieved. A differential global positioning system (DGPS) will be used to navigate to each point for the survey observation. Point intercept plant frequencies will be surveyed in August of 2011, at the time of maximum aquatic plant abundance. Based on an 80 m grid and excluding points outside the littoral zone, a total of 220 survey points will be recorded for Saratoga Lake. The point intercept method allows a large number of discrete observations in a short period of time facilitating statistical analysis and comparisons. Point intercept methods also allow for production of distribution maps for all species listed.

Location of sample points for Saratoga Lake aquatic plant survey.



REPORTING OF RESULTS

A verbal or brief written report of our activities and preliminary results will be available two weeks after the sampling date, at the request of the project sponsors. The final written report will require an additional six to eight weeks to complete. Under no circumstances will the original field notes be available, nor will data be released without the authorization of the investigator. Conversely, no data will be released prior to the final report without the authorization of a representative of the sponsors.

The final report will include all data collected, maps indicated in the work plan, and recommendations for aquatic plant control and other lake management techniques. These recommendations will also evaluate the relative merits of selected options.

BUDGET AND RENUMERATION

A brief budget explanation is attached. The cost of this lake assessment as reimbursement for professional services is as follows.

**Saratoga Lake Aquatic Plant Survey
Tentative Budget for 2011**

Item	
Personnel	\$10,956
Equipment	\$600
Supplies	\$359
Travel	\$295
Report Preparation	\$250
	Indirect (26%) \$3,240
	TOTAL \$15,700

**NOTES:
Off-campus indirect rate applied**

TIME SCHEDULE (MONTH OF 2011)

ITEM	August	September	October	November
Field Work	X ¹			
Interim Report		X ²		
Final Report Preparation		X	X	X
Final Report Released				X

FOOTNOTES:

1. 1. Field work is proposed for August, 2011. Unfavorable weather may occur, affecting the timing of field work.
2. 2. This is a short verbal or written presentation indicating work accomplished and initial impressions, as indicated in the REPORT section.

Table 1. Aquatic Plant Species List for Saratoga Lake Surveys.

<i>Species</i>	Common Name	2007	2008	2009	2010
<i>Ceratophyllum demersum</i> L.	coontail	s	s	s	s
<i>Chara/Nitella</i> sp.	muskgrass, chara	s	s	s	s
<i>Elodea canadensis</i> Michx.	elodea	s	s	s	s
<i>Lemna minor</i> L.	duckweed	f	f	f	f
<i>Lemna trisulca</i> L.	duckweed	f	f	f	f
<i>Megalodonta beckii</i> Torr.	water marigold	s	s	s	s
<i>Myriophyllum spicatum</i> L.	Eurasian watermilfoil	s	s	s	s
<i>Najas flexilis</i> (Willd.) Rostk. & Schmidt.	bushy pondweed	s	s	s	s
<i>Najas guadalupensis</i> (Spreng.) Magnus	Southern naiad	s	s	s	s
<i>Nuphar variegata</i> Engelm. ex Durand	Bullhead Lily	fl	fl	fl	fl
<i>Nymphaea odorata</i> Ait.	white pondlily	fl	fl	fl	fl
<i>Pontederia cordata</i> L.	pickerelweed	e	e	e	e
<i>Potamogeton amplifolius</i> Tuckerm.	largeleaf pondweed	s	s	s	s
<i>Potamogeton crispus</i> L.	curlyleaf pondweed	s	s	s	s
<i>Potamogeton gramineus</i> L.	variable-leaf pondweed	s	s	s	s
<i>Potamogeton illinoensis</i> L.	Illinois pondweed	s	s	s	s
<i>Potamogeton perfoliatus</i> L.	clasping-leaved pondweed	s	s	s	s
<i>Potamogeton praelongus</i> Wulfen	white-stem pondweed	s	s	s	s
<i>Potamogeton pusillus</i> L.	small pondweed	s	s	s	s
<i>Potamogeton robbinsii</i> Oakes	Robbins' pondweed		s	s	s
<i>Potamogeton zosteriformis</i> Fern.	flat-stem pondweed	s	s	s	s
<i>Ranunculus longirostris</i> Godron	white watercrowfoot			s	s
<i>Scirpus</i> sp.	Bulrush			e	
<i>Sparganium</i> sp.	burreed			e	
<i>Stuckenia pectinata</i> L.	sago pondweed	s	s	s	s
<i>Trapa natans</i> L.	waterchestnut	fl			fl
<i>Typha</i> sp.	cattail	e	e	e	e
<i>Utricularia vulgaris</i> L.	great bladderwort			s	s
<i>Vallisneria americana</i> L.	wild celery	s	s	s	s
<i>Zosterella dubia</i> Jacq.	water stargrass	s	s	s	s

s=submersed fl=floating leaved f=floating e=emergent

Literature Cited

- Eichler, L.W. and C.W. Boylen. 2010. Saratoga Lake aquatic plant survey – 2010. Prepared for Saratoga Lake Protection and Improvement District, Saratoga Springs, NY. DFWI Technical Report 2010-14. Darrin Fresh Water Institute, Bolton Landing, NY.
- Eichler, L.W. and C.W. Boylen. 2009. Saratoga Lake aquatic plant survey – 2009. Prepared for Saratoga Lake Protection and Improvement District, Saratoga Springs, NY. DFWI Technical Report 2009-6. Darrin Fresh Water Institute, Bolton Landing, NY.
- Eichler, L.W. and C.W. Boylen. 2008b. Saratoga Lake aquatic plant survey – 2008. Prepared for Saratoga Lake Protection and Improvement District, Saratoga Springs, NY. DFWI Technical Report 2008-8. Darrin Fresh Water Institute, Bolton Landing, NY.
- Eichler, L.W. and C.W. Boylen. 2008a. Saratoga Lake aquatic plant survey – 2007. Prepared for Saratoga Lake Protection and Improvement District, Saratoga Springs, NY. DFWI Technical Report 2008-4. Darrin Fresh Water Institute, Bolton Landing, NY.
- Eichler, L.W. and C.W. Boylen. 2004. Saratoga Lake aquatic plant survey – 2004. Prepared for Saratoga Lake Protection and Improvement District, Saratoga Springs, NY. DFWI Technical Report 2004-6. Darrin Fresh Water Institute, Bolton Landing, NY.
- Eichler, L.W. and C.W. Boylen. 1995. An aquatic plant assessment of Saratoga Lake. Rensselaer Fresh Water Institute Technical Report 95-1. Rensselaer Fresh Water Institute, Bolton Landing, NY.
- NYS DEC, 1992. Saratoga Lake: Clean Lakes Phase II Final Report. New York State Department of Environmental Conservation, Division of Water, 50 Wolf Road, Albany, NY. 38pp + Appendices.