Saratoga Lake

Aquatic Vegetation Management Program
2007 – Year One Report

November 2007

Prepared for:

Saratoga Lake Protection & Improvement District
P.O. Box 2551
Ballston Spa, NY 12020

Prepared by:

Aquatic Control Technology, Inc.
11 John Road
Sutton, MA 01590

AQUATIC CONTROL TECHNOLOGY, INC.
POND AND LAKE MANAGEMENT SPECIALISTS

TABLE OF CONTENTS

INTRODUCTION

In 2007 a multiple-year herbicide treatment program was initiated at Saratoga Lake targeting control of the dense beds of Eurasian watermilfoil (EWM). All elements of this multi-faceted program are detailed in the *Environmental Impact Statement (EIS) for Saratoga Lake Invasive Species Long-Term Management Plan* (The LA Group, July 2006).

Sonar herbicide was applied to the southern third of the lake during the first year of the program. The Saratoga Lake Protection and Improvement District (SLPID) is the project applicant/proponent. SLPID served as the Lead Agency for this project and was responsible for coordination of the various entities involved in the treatment program, as well as continuing to operate the sizeable mechanical harvesting operation. The LA Group serves as SLPID's primary lake management consultant and was largely responsible for permitting and project oversight. The herbicide treatment program was performed by Aquatic Control Technology, Inc. The Darrin Fresh Water Institute (DFWI) conducted the comprehensive post-treatment aquatic vegetation survey. SUNY Cobbleskill was retained to perform the fish surveys required by the New York State Department of Environmental Conservation (NYSDEC).

The following report summarizes the results of the 2007 Sonar herbicide treatment. An interim report of the aquatic vegetation survey performed by DFWI is provided, which should fulfill the requirements of the NYSDEC permit. A copy of the full DFWI report will be submitted under separate cover, as will the results of the SUNY Cobbleskill fish survey.

HERBICIDE TREATMENT PROGRAM - 2007

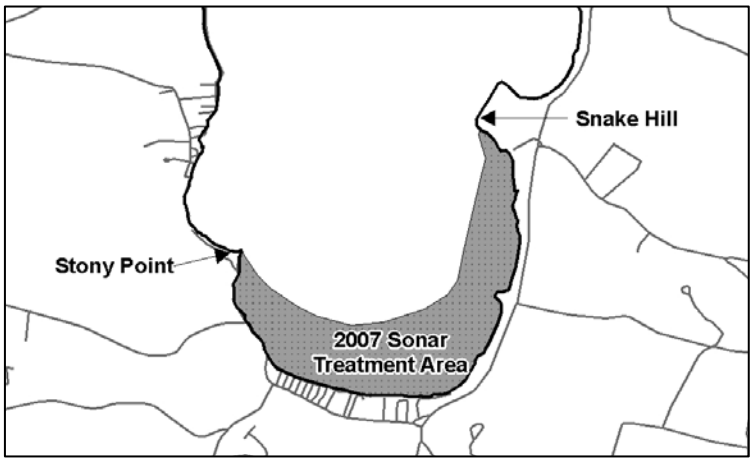
Program Chronology

A chronology of the 2007 treatment program is provided below:

- NYSDEC permit issuance (#5-4199-00002/00007)..... April 23
- Pre-treatment inspection and finalize treatment areas..... April 25
- Sonar PR & Sonar Q applications.....May 14, June 4, July 9
- Inspections and herbicide residue monitoring..... May 24, May 31, June 21, July 9, August 2
- Comprehensive aquatic plant survey (DFWI)..... August

Treatment Areas

The southern end of the lake was selected for the initial year of treatment, since it appeared to be the most favorable location for a large block treatment with Sonar herbicide. The treatment area extended from Stony Point on the southwest shore to Snake Hill on the southeast shore. This location encompassed approximately 158 acres of dense EWM beds located within a littoral area of approximately 292 acres. Factors that favored the southern third of the lake for this treatment included: limited surface water inflow, outlet at opposite end of lake, shallower maximum water depth and lower water volume compared to other sections of the lake, and it is typically not impacted by prevailing winds.



The treatment objective was to maintain sufficient concentrations of Sonar in the EWM beds for a period of 90 or more days. Three applications of time-release Sonar pellets were proposed.

Some slight adjustments of the actual locations of the EWM beds were made with a GPS unit during the pre-treatment survey performed on 4/25/07.

Summary of 2007 Treatment Program

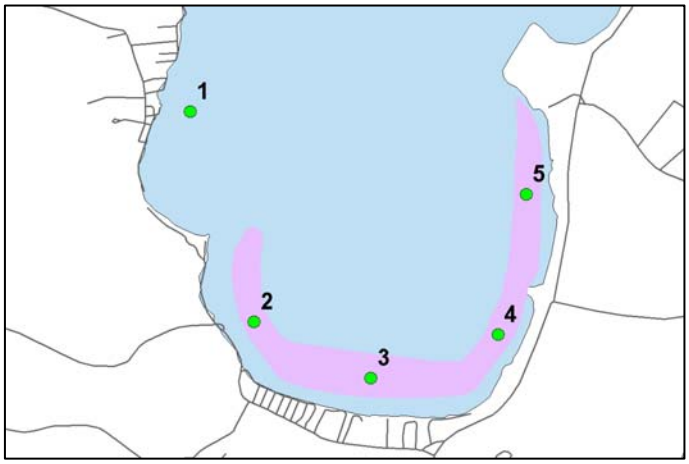
Two formulations of Sonar pellets were applied during all three treatments; Sonar PR (Precision Release – EPA Reg. No. 67690-12) and Sonar Q (Quick Release – EPA Reg. No. 67690-3). The reason for using these two formulations was to utilize the varying release rates in order to maximize the contact time of the active ingredient (fluridone) with the targeted EWM plants. Total quantities of each product applied during the three treatments are provided in the table below.

Date	Description	Sonar PR ppb	Sonar PR lbs	Sonar Q ppb	Sonar Q lbs	Cumulative Total ppb of fluridone applied
05/14/07	**1st Treatment**	30	1920	10	640	40
05/24/07	*FasTEST 1st round*					
05/31/07	*FasTEST 2nd round*					
06/04/07	**2nd Treatment**	20	1290	10	640	70
06/21/07	*FasTEST 3rd round*					
07/09/07	**3rd Treatment**	25	1640	5	320	100
07/09/07	*FasTEST 4th round*					
08/02/07	*FasTEST 5th round*					

Each treatment was completed during one extended workday. The herbicide pellets were evenly applied throughout the designated treatment area using a calibrated Thompson Seeder/Spreader mounted on the bow of a boat. An Airboat was used for the first and third treatment. A conventional jon boat was used for the second treatment due to inclement weather conditions. A Differential GPS system was used to provide real-time navigation with sub-meter accuracy during each treatment. The treatment areas were loaded onto the DGPS unit and the actual passes of the treatment boat were recorded to insure that the herbicide was evenly applied to the designated treatment areas.

Herbicide Residue Testing

Water samples were collected for analysis of fluridone residues from four (4) locations within the treatment area and from one (1) location outside of the treatment area along the southwest shoreline. Five rounds of water samples were collected for the FasTEST immunoassay procedure to determine in-lake fluridone concentrations. Collected samples were shipped via overnight delivery to SePRO's laboratory in Whittakers, North Carolina. Laboratory results are provided in Appendix A.



Even though the calculated concentration of fluridone applied was 40 ppb for the first treatment and 30 ppb for the second and third treatments, the actual concentrations detected in the water column were much lower. While low fluridone concentrations were not unexpected due to the time-release attributes of the Sonar pellet formulations and dilution from untreated water, the reported results were somewhat lower than anticipated.

Date (days since 1st application)	**Average Fluridone Concentration Inside Treatment Area**	**Fluridone Concentration Detected Outside of Treatment Area**
05/24/07 (10)	2.9 ppb	<1.0 ppb
05/31/07 (17)	<1.5 ppb	<1.0 ppb
06/21/07 (38)	3.6 ppb	1.3 ppb
07/09/07 (56)	1.4 ppb	NT
08/02/07 (80)	<1.4 ppb	NT

Most of the water samples were collected approximately 2 feet from the bottom using a Van Dorn collection bottle. The highest reading recorded was 6.1 ppb. This was collected from the bottom within the treatment area.

Post –Treatment Visual Surveys

Despite the low FasTEST results, impact to EWM plants was evident during a 6/21/07 survey conducted by Marc Bellaud of Aquatic Control, Shaun Hyde of SePRO and Joe Finn of SLPID. EWM plants were showing varying levels of chlorosis (plant bleaching and weakening symptomatic of fluridone exposure). Plants from the middle of the treatment area were showing stronger signs of chlorosis than those at the outer edges. There was a visible difference between EWM plants within the treatment area and those outside of the treatment area on the north side of Snake Hill.

Impact to the plants progressed by the time the third treatment was performed on 7/9/07. Another survey was performed approximately one month later on 8/2/07. By that time, the majority of the EWM biomass had collapsed throughout the treatment area. Some highly chlorotic EWM plants were still standing upright in the water column, particularly along the eastern shoreline, but the plants were 2 or more feet below the surface and appeared to be continuing to die-back. The total EWM biomass appeared to be reduced by more than 85% at this point.

During a boat tour of the lake on 9/20/07 with representatives from SLPID, The LA Group, Aquatic Control and SePRO, further collapse of the EWM biomass was observed. There were still some viable EWM plants observed, but the biomass appeared to be reduced by 90% or more. EWM growth outside of the treatment area did not appear to be impacted by the treatment program. Some movement of Sonar outside of the treatment area was noted along the western shoreline based on the FasTEST results, but it was difficult to distinguish whether the treatment or the shale bottom sediment was responsible for the reduced EWM biomass. EWM biomass was considerable on the north side of Snake Hill on the eastern shoreline.

Water Quality

Some basic measures of water quality were collected before and after treatment to see if there was any observable effects in the lake. Temperature and dissolved oxygen profiles and Secchi disk water clarity measurements were recorded towards the center of the southern basin.

The temperature and dissolved oxygen profiles were fairly uniform during both the pre-treatment and post-treatment sampling rounds. Only slight thermal stratification was noted towards the bottom. Previous records provided by SLPID show that the thermocline is typically established in deeper water.

Dissolved oxygen concentrations were at or above saturation levels during both surveys. This is probably attributable to the abundant aquatic plant growth. During the 8/2/07 survey dissolved oxygen did drop off near the bottom.

5/14/2007

Secchi Disk Reading	14.9	feet
	4.54	meters

Depth (m)	Temp (Deg C)	(Deg F)	DO (mg/l)
Surf	16.7	62.1	12.5
1	16.7	62.1	12.6
2	16.7	62.1	12.5
3	16.7	62.1	12.5
4	13.9	57.0	13.0
5	13.2	55.8	13.1

8/2/2007

Secchi Disk Reading	14.5	feet
	4.42	meters

Depth (m)	Temp (Deg C)	(Deg F)	DO (mg/l)
Surf	27.4	81.3	11.7
1	26.6	79.9	12.0
2	25.7	78.3	12.0
3	24.4	75.9	11.6
4	23.6	74.5	9.6
5	23.0	73.4	5.0

Water clarity did not appear to be adversely impacted by the treatment. The Secchi disk readings were almost identical during both sampling rounds. Some filamentous algae did appear to be growing on the decomposing milfoil stalks in the treatment area, but there were no significant mats of floating filamentous algae noted during any of the post-treatment surveys.

Water samples were also collected for microscopic analysis of the plantktonic algae community. Preliminary analysis revealed the following:

5/14/07 – Pre-Treatment	**8/02/07 – Post-Treatment**
Approximate Total Density (by enumeration) 2500 cells/ml	Approximate Total Density (by enumeration) 11,100 cells/ml
Algal Division Breakdown *(dominant taxa observed)*	Algal Division Breakdown *(dominant taxa observed)*
Chlorophyta (Greens) 70% - *Clorella, Scenedesmus*	Cyanophytes (Bluegreens) 66% - *Microcystis*
Bacillariophyta (Diatoms) 17% - *Navicula*	Chlorophyta (Greens) 22% - *Clorella, Micratinium*
Chrysophyta (Yellow-Brown) 9% - *Dinobryon*	Bacillariophyta (Diatoms) 12% - *Tabellaria*
Euglenophytes (Euglenoids) 4% - *Trachleomonas*	

Algal densities were higher during the August sample. Most of the increase appeared to be due to the presence of the bluegreen *Microcystis*. This reading is still below what is typically considered an algal bloom condition, as the Secchi disk clarity of over 4.4 meters would indicate. Greater algal abundance

and diversity is usually seen during the warmer summer months. These samples will be more carefully analyzed by Dr. Kenneth Wagner. The results will be forwarded.

SUMMARY OF LATE SEASON COMPREHENSIVE AQUATIC VEGETATION SURVEY

An interim report of the comprehensive aquatic vegetation survey performed by the DFWI is provided in Appendix B.

The Point-Intercept Rake Toss method utilized was consistent with requirements for NYSDEC Tier III lakes. This approach also replicated the point-intercept survey of Saratoga Lake that was conducted by DFWI in 2004. Two areas were surveyed 1) the Treatment Area plus 20-25% and 2) a Control Area along the northeast shoreline. Eighty (80) locations were sampled at each sight based on an 80-meter grid.

The survey showed good species richness in both the Treatment and Control Areas. The most commonly encountered species aside from *Myriophyllum spicatum* were *Ceratophyllum demersum, Zosterella dubia, Vallisneria americana, Potamogeton zosteriformes* and *Najas guadalupensis.* DFWI reported a higher average number of species per sample point for the Control Area (2.83 ± 0.23) than the Treatment Area (1.77 ± 0.19) but suggested that the loss of EWM accounts for most of this difference.

Pondweed and coontail collected from south end treatment area on 9/20/07

Overall, it did not appear that the Sonar herbicide treatment caused significant off-target impact to native species within and adjacent to the treatment areas. It also did not impact EWM plants located outside of the treatment area. The area and species selectivity achieved was favorable.

RECOMMENDATIONS FOR 2008 MANAGEMENT PROGRAM

The Sonar herbicide treatment of the southern end of the lake in 2007 did provide effective EWM control. Due to the systemic properties of Sonar, carryover control of EWM is anticipated for 1-2 years or longer. Some EWM regrowth is expected, but the overall distribution and biomass should be considerably suppressed from pre-treatment levels.

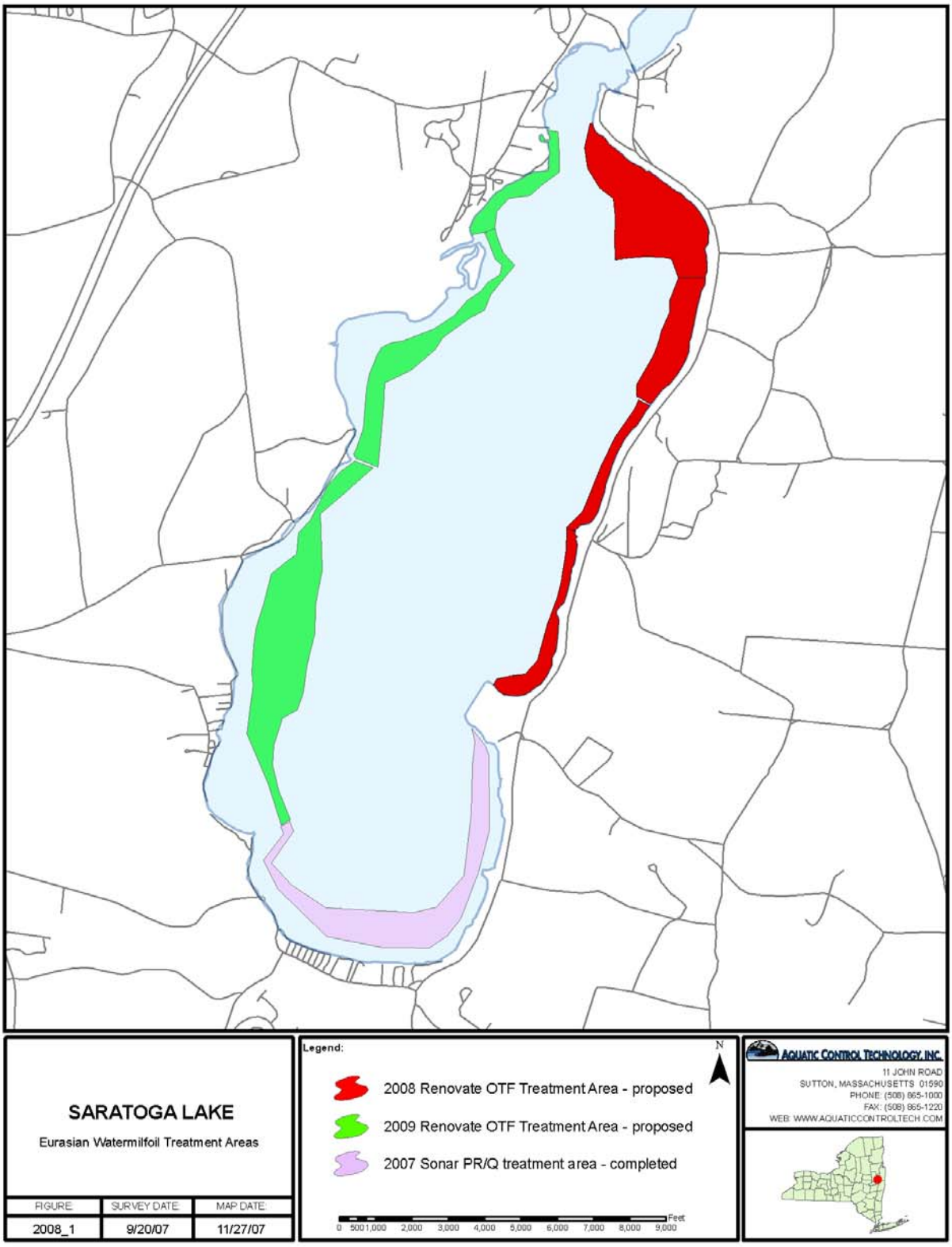
Despite the relative success of the 2007 treatment, Sonar herbicide is not recommended to target the remaining EWM beds in Saratoga Lake. The primary reason is that the remaining beds along the east and west shorelines are more exposed and subject to considerably more dilution than the southern end of the lake. A total of 100 ppb of Sonar pellets were required at the southern end of the lake to achieve control of EWM. It is expected that the maximum permissible label rate of 150 ppb would be needed to treat any other portion of Saratoga Lake, which would carry significantly higher per acre costs. There would also remain a much higher likelihood of dilution from inflow, outflow and the larger volume of adjacent untreated water, which could seriously jeopardize treatment effectiveness.

Renovate OTF herbicide is recommended for treatment of the remaining EWM beds in Saratoga Lake. Renovate (active ingredient Triclopyr) herbicide was included in the EIS as an alternate product for use at Saratoga Lake. Renovate OTF (On Target Flakes) received its EPA registration in the fall of 2006. The OTF formulation was developed to deliver the herbicide to the lake bottom where the active ingredient is released off of the clay carrier over a period of several hours. This reduces dilution and allows for the treatment dose to be calculated based on the lower four feet of the water column. Renovate is a systemic-acting herbicide, so it will kill the roots and should provide multiple-year control/suppression of EWM similar to Sonar. The major difference is that plant uptake is rapid with the majority occurring within the first 1-3 days following treatment. Only one application would be required and the EWM plants should die-back within 4-6 weeks following treatment.

Aquatic Control applied Renovate OTF to three public lakes in Vermont in 2007 for spot-treatment of EWM. Monitoring requirements for these treatments were significant and the post-treatment results were highly favorable. Renovate OTF provided good to excellent control of EWM, with minimal impacts to native species. Compared to previous Sonar treatments performed on two of the lakes, the Renovate OTF yielded noticeably more selective EWM control.

The preliminary treatment plan for 2008 is to treat the EWM beds on the eastern shoreline of the lake that extend from the north side of Snake Hill to the narrows at the Route 9P bridge. This area contains an estimated 292 acres of EWM beds that would be targeted for treatment. Renovate OTF would be applied directly to the EWM beds at application rates ranging from 2.0 – 2.25 ppm. Treatment would be scheduled when EWM plants are actively growing and when the majority of plants are still within 2-4 feet of the bottom. This will likely occur in mid-late May.

Based on results seen in Vermont in 2007 and at other sites from around the country, Renovate OTF is expected to provide excellent EWM control for the large block treatments proposed for the 2008 and 2009 seasons. It should also be an effective tool to control EWM regrowth in subsequent years, since it can be used for smaller-scale spot-treatments.


SARATOGA LAKE
Eurasian Watermilfoil Treatment Areas
FIGURE: 2008_1
SURVEY DATE: 9/20/07
MAP DATE: 11/27/07
Legend:
2008 Renovate OTF Treatment Area - proposed
2009 Renovate OTF Treatment Area - proposed
2007 Sonar PR/Q treatment area - completed
N
0 500 1,000 2,000 3,000 4,000 5,000 6,000 7,000 8,000 9,000 Feet
AQUATIC CONTROL TECHNOLOGY, INC.
11 JOHN ROAD
SUTTON, MASSACHUSETTS 01590
PHONE: (508) 865-1000
FAX: (508) 865-1220
WEB: WWW.AQUATICCONTROLTECH.COM

APPENDIX A

Herbicide Residue Testing Results

- SePRO Laboratory Report – 5/24/07 sampling round
- SePRO Laboratory Report – 5/31/07 sampling round
- SePRO Laboratory Report – 6/21/07 sampling round
- SePRO Laboratory Report – 7/9/07 sampling round
- SePRO Laboratory Report – 8/2/07 sampling round

FasTEST Results Confidential - Not For Distribution

Cooperator:	Aquatic Control Technology, Inc	**Phone:**	**Fax:**
Gerald Smith	11 John Rd	(508) 865-1000	(508) 865-1220
Territory: Shaun Hyde	Sutton MA 01590-		

Sample	Date(s) Treated	Sonar	Date Collected	Rate Applied	Acres Treated	Sample Location Description	Results PPB
1.	05/14/07	PR & Q	5/24/2007	40 ppb	160	Site 1 - Outside	<1.0
2.						Site 2	4.6
3.						Site 3	3.0
4.						Site 4	2.4
5.						Site 5	1.7
6.							
7.							
8.							
9.							
10.							

Depth Sample Collected: 10'

Storage Conditions: Analyzed upon receipt

Date Shipped to SePRO: 5/24/2007

How would you like results sent to you? **Fax** No **Regular Mail** Yes

Date Sample Received: 5/25/2007

Condition of Sample(s) Box/Water Containers: Excellent / Excellent

Date Analysis was Performed: 5/25/2007

Date Results Sent to Cooperator: 5/29/2007

Back of Data Sheet

Name of Waterbody: Saratoga Lake

Average Depth in Feet: 20

Back of Data Sheet

Size of Waterbody in Acres: 4,000

Target Plant(s) to Control: Myriophullum spicatum

FasTEST Results Confidential - Not For Distribution

Cooperator:	Aquatic Control Technology, Inc			**Phone:**	**Fax:**
Gerald Smith	11 John Rd			(508) 865-1000	(508) 865-1220
Territory: Shaun Hyde	Sutton	MA	01590-		

Sample	Date(s) Treated	Sonar	Date Collected	Rate Applied	Acres Treated	Sample Location Description	Results PPB
1.	05/14/07	PR & Q	5/31/2007	40 ppb	158	1-Outside	<1.0
2.						2	<1.0
3.						3	1.9
4.						4	2.1
5.						5	<1.0
6.							
7.							
8.							
9.							
10.							

Depth Sample Collected: 2' from bottom

Date Sample Received: 6/1/2007

Storage Conditions: Analyzed upon receipt

Condition of Sample(s) Box/Water Containers: Excellent | Excellent

Date Shipped to SePRO: 5/31/2007

Date Analysis was Performed: 6/1/2007

How would you like results sent to you? **Fax** No **Regular Mail** Yes

Date Results Sent to Cooperator: 6/4/2007

Back of Data Sheet

Name of Waterbody: Saratoga Lake

Average Depth in Feet:

Back of Data Sheet

Size of Waterbody in Acres: 4000

Target Plant(s) to Control: M. spicatum, P. crispus

FasTEST Results Confidential - Not For Distribution

Cooperator:	Aquatic Control Technology, Inc		**Phone:**	**Fax:**
Gerald Smith	11 John Rd		(508) 865-1000	(508) 865-1220
Territory: Shaun Hyde	Sutton	MA 01590-		

Sample	Date(s) Treated	Sonar	Date Collected	Rate Applied	Acres Treated	Sample Location Description	Results PPB
1.	06/14/07	PR + Q	6/21/2007	70 ppb	158	#1	1.3
2.						#2 surface	1.8
3.						#2 bottom	6.1
4.						#3	3.5
5.						#4 surface	2.4
6.						#4 bottom	2.4
7.						#5	5.24
8.							
9.							
10.							

Depth Sample Collected: 2 feet

Storage Conditions: Analyzed upon receipt

Date Shipped to SePRO: 6/21/2007

How would you like results sent to you? **Fax** No **Regular Mail** Yes

Date Sample Received: 6/22/2007

Condition of Sample(s) Box/Water Containers: Excellent Excellent

Date Analysis was Performed: 6/25/2007

Date Results Sent to Cooperator: 6/25/2007

Back of Data Sheet

Name of Waterbody: Saratoga Lake

Average Depth in Feet: 20

Back of Data Sheet

Size of Waterbody in Acres: 4000

Target Plant(s) to Control: m. spicatom

FasTEST Results Confidential - Not For Distribution

Cooperator:	Aquatic Control Technology, Inc		**Phone:**	**Fax:**
Gerald Smith	11 John Rd		(508) 865-1000	(508) 865-1220
Territory: Shaun Hyde	Sutton	MA 01590-		

Sample	Date(s) Treated	Sonar	Date Collected	Rate Applied	Acres Treated	Sample Location Description	Results PPB
1.	06/04/07	PR, Q	7/9/2007	20PR, 10Q	160	site 2	1.3
2.						site 3	1.2
3.						site 4	1.0
4.						site 4 (surface)	2.2
5.						site 5	1.5
6.							
7.							
8.							
9.							
10.							

Depth Sample Collected: 2'

Storage Conditions: Refrigerated

Date Shipped to SePRO: 7/9/2007

How would you like results sent to you? **Fax** No **Regular Mail** Yes

Date Sample Received: 7/10/2007

Condition of Sample(s) Box/Water Containers: Excellent excellent

Date Analysis was Performed: 7/12/2007

Date Results Sent to Cooperator: 7/12/2007

Back of Data Sheet

Name of Waterbody: Saratoga Lake

Average Depth in Feet: 0

Back of Data Sheet

Size of Waterbody in Acres: 4000

Target Plant(s) to Control: Eurasian watermilfoil

FasTEST Results Confidential - Not For Distribution

Cooperator:	Aquatic Control Technology Inc..			**Phone:**	**Fax:**
Marc Bellaud	11 John Rd			(508) 805-1000	
Territory: Shaun Hyde					
	Sutton	MA	01590-		

Sample	Date(s) Treated	Sonar	Date Collected	Rate Applied	Acres Treated	Sample Location Description	Results PPB
1.	07/09/07	pR, Q	8/2/2007	40/30/30	150	SL 1	<1.0
2.						SL 2	<1.0
3.						SL 3	1.9
4.						SL 4	1.9
5.							
6.							
7.							
8.							
9.							
10.							

Depth Sample Collected: bottom

Date Sample Received: 8/3/2007

Storage Conditions: Analyzed upon receipt

Condition of Sample(s) Box/Water Containers: Excellent / excellent

Date Shipped to SePRO: 8/2/2007

Date Analysis was Performed: 8/3/2007

How would you like results sent to you? **Fax** No **Regular Mail** Yes

Date Results Sent to Cooperator: 8/3/2007

Back of Data Sheet

Name of Waterbody: Saratoga Lake

Average Depth in Feet: 0

Back of Data Sheet

Size of Waterbody in Acres: 4000

Target Plant(s) to Control: Eurasian watermilfoil

APPENDIX B

Interim Report - Comprehensive Aquatic Vegetation Survey

(prepared by Darrin Fresh Water Institute)

Interim Report on Vegetation of Saratoga Lake, New York

Lawrence W. Eichler and Charles W. Boylen
Darrin Fresh Water Institute
Bolton Landing, NY 12814
(518) 644-3541 (voice) (581) 644-3640 (fax)
eichll@rpi.edu boylec@rpi.edu

Background.

Quantitative aquatic plant surveys were undertaken for Saratoga Lake, New York as part of a cooperative effort between Aquatic Control Technologies (ACT) and the Darrin Fresh Water Institute, and supported by the Saratoga Lake Protection and Improvement District (SLPID). The aquatic plant survey was designed to be comparable to pre-treatment data collected by the author in 2004 (Eichler & Boylen 2004) to evaluate a treatment program based on application of the herbicide fluridone (SONAR^{TM}) in 2007 to control Eurasian watermilfoil (*Myriophyllum spicatum*). The Point-Intercept Rake Toss method presently required by NYS DEC for Tier III Lakes was employed.

The survey area encompassed an expanded southern treatment area (treatment area plus 20-25%) plus a control survey area in the northern end of Saratoga Lake. The control (non-treatment) area was surveyed to document annual variation in plant composition. An area with similar plant assemblages to the treatment area, but remote from treatment effects, the Franklin Beach area along the northeast shoreline, was selected as the control.

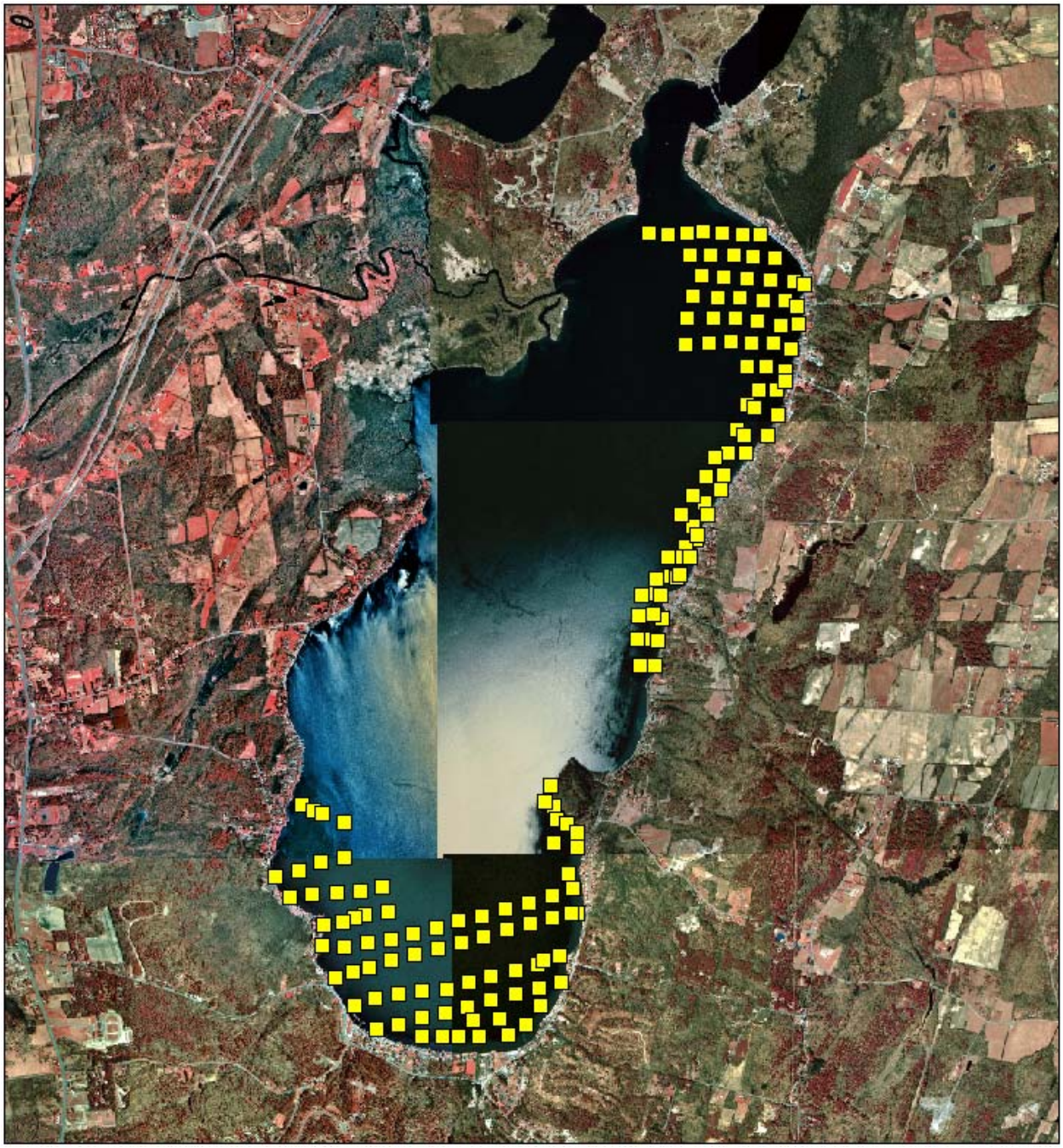
The project was designed to obtain data to evaluate current aquatic plant management efforts and review potential new strategies. The assessment will generate the information necessary to: 1) review effectiveness of aquatic plant management efforts, 2) meet all permit requirements and 3) provide data for comparison of post-treatment conditions to prior survey information.

Methods

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

2. Point Intercept. The frequency and richness of aquatic plant species were evaluated using a point intercept (rake toss) method (Madsen 1999). At each grid point intersection, all species

Figure 1. Sampling points for Saratoga Lake aquatic plant survey. Northern points are the control location. Southern points are the treatment location



located at that point were recorded, as well as water depth. Species were 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) was used to navigate to each point for the survey observation. Point intercept plant frequencies were surveyed in August of 2007, at the time of maximum aquatic plant abundance. Based on an 80 m grid and excluding the majority of points outside the littoral zone, we surveyed a total of 160 points, 80 each for the treatment and control plots on 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.

Results

1. Species List. A preliminary list of species observed for Saratoga Lake is provided in Table 1. A total of 16 species were collected in the two point intercept portions of the survey. Fourteen species were present in the treatment and control areas, respectively.

2. Species Frequency. Species richness in Saratoga Lake was quite high, with a large number of species occurring in more than 5% of survey points (Table 2). In the control portion of the survey, Eurasian watermilfoil was by far the most widely distributed plant (80% of survey points, Figure 2), a number of native species were commonly observed. Common species included *Ceratophyllum demersum* (54%), *Zosterella (Heteranthera) dubia* (44%), *Vallisneria americana* (26%), *Najas guadalupensis* (15%), *Elodea canadensis* (14%), *Potamogeton zosteriformes* (11%), *Potamogeton pusillus* (10%), *Potamogeton perfoliatus* (10%), *Chara* sp. (10%), and *Najas flexilis* (3%). In the treated portion of the survey, Eurasian watermilfoil was no longer the dominant plant (20% of survey points, Figure 2). A number of native species were commonly observed, including *Ceratophyllum demersum* (51%), *Zosterella (Heteranthera) dubia* (25%), *Vallisneria americana* (20%), *Najas guadalupensis* (11%), *Potamogeton zosteriformes* (12%), *Chara* sp. (8%), *Elodea canadensis* (7%), and *Potamogeton perfoliatus* (6%). Average number of species per sample point was greater in the control area (2.83 ± 0.23) than the treated area (1.77 ± 0.19), however Eurasian watermilfoil accounted for the additional species in over 80% of the cases.

Figure 2. Distribution of Eurasian watermilfoil (*Myriophyllum spicatum*) in surveyed areas of Saratoga Lake in 2007.

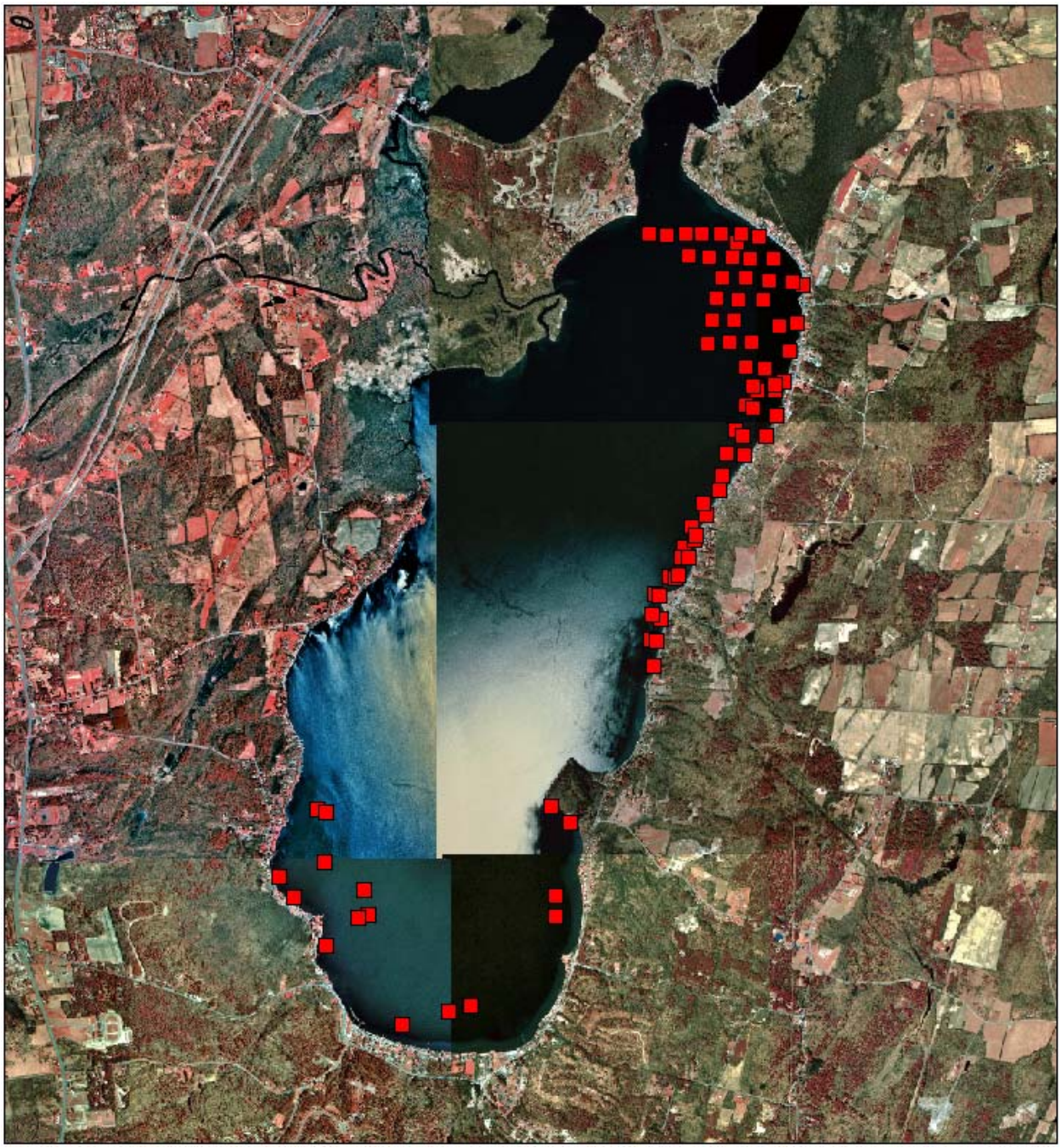


Table 1. Aquatic plant species present in Saratoga Lake in recent surveys.

Species	**Common Name**	**1994**	**2004**	**2007**
Ceratophyllum demersum L.	coontail	**x**	**x**	**x**
Chara/Nitella sp.	muskgrass, chara	**x**	**x**	**x**
Eleocharis acicularis (L.) Roemer & Schultes	needle spike-rush	**x**	**x**	
Elodea canadensis Michx.	elodea	**x**	**x**	**x**
Heteranthera dubia Jacq. (currently Zosterella dubia)	water stargrass	**x**	**x**	**x**
Lemna minor L.	duckweed	**x**	**x**	**x**
Lemna trisulca	duckweed		**x**	**x**
Megalodonta beckii formerly (Bidens beckii Torr.)	water marigold	**x**	**x**	**x**
Myriophyllum spicatum L.	Eurasian watermilfoil	**x**	**x**	**x**
Najas flexilis (Willd.) Rostk. & Schmidt.	bushy pondweed	**x**	**x**	**x**
Najas guadalupensis (Spreng.) Magnus	Southern naiad	**x**	**x**	**x**
Nuphar luteum (Ait.) Ait. f.	yellow pondlily	**x**	**x**	**x**
Nymphaea odorata	fragrant water lily		**x**	**x**
Pontederia cordata	pickerelweed		**x**	**x**
Potamogeton amplifolius Tuckerm.	largeleaf pondweed	**x**	**x**	**x**
Potamogeton crispus L.	curlyleaf pondweed	**x**	**x**	**x**
Potamogeton epihydrus Raf.	ribbon-leaf pondweed	**x**		
Potamogeton gramineus L.	variable-leaf pondweed	**x**	**x**	**x**
Potamogeton illinoensis L.	Illinois pondweed		**x**	**x**
Potamogeton perfoliatus L	Clasping-leaved Pondweed	**x**	**x**	**x**
Potamogeton praelongus Wulfen	white-stem pondweed	**x**	**x**	**x**
Potamogeton pusillus L.	small pondweed	**x**	**x**	**x**
Potamogeton richardsonii (Ar. Benn.) Rydb.	Richardsons' pondweed		**x**	
Potamogeton zosteriformis Fern.	flat-stem pondweed	**x**	**x**	**x**
Ranunculus longirostris Godron	white watercrowfoot	**x**	**x**	
Sagittaria graminea Michx.	arrowhead	**x**	**x**	
Spirodela polyrhiza (L.) Schlieden	great duckweed	**x**		
Stuckenia pectinata L. formerly *Potamogeton pectinatus* L.	sago pondweed	**x**	**x**	**x**
Trapa natans L.	waterchestnut	**x**	**x**	**x**
Typha	cattail	**x**	**x**	**x**
Utricularia vulgaris L.	great bladderwort	**x**		
Vallisneria americana L.	wild celery	**x**	**x**	**x**

Table 2. Percent frequency of occurrence of aquatic plant species in Saratoga Lake in the treated and control areas.

Species	**Treated**	**Control**
Ceratophyllum demersum	51%	54%
Chara sp.	8%	10%
Elodea canadensis	7%	14%
Megalodonta beckii	1%	0%
Myriophyllum spicatum	20%	80%
Najas flexilis	1%	3%
Najas guadalupensis	11%	15%
Potamogeton crispus	8%	4%
Potamogeton gramineus	0.3%	0%
Potamogeton illinoensis	1%	1%
Potamogeton perfoliatus	6%	10%
Potamogeton praelongus	4%	0%
Potamogeton pusillus	0%	10%
Potamogeton zosteriformes	12%	11%
Trapa natans	0%	2%
Vallisneria americana	20%	26%
Zosterella dubia	25%	44%

3. References

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.

Hellquist, C.B. 1993. Taxonomic considerations in aquatic vegetation assessments. Lake and Reserv. Manage. 7:175-183.

Madsen, J.D. 1993. Biomass techniques for monitoring and assessing control of aquatic vegetation. Lake and Reserv. Manage. 7:141-154.

Madsen, J.D. 1999. Point intercept and line intercept methods for aquatic plant management. US Army Engineer Waterways Experiment Station Aquatic Plant Control Research Program Technical Note CC-02, Vicksburg, MS.