ANNUAL VEGETATION MONITORING REPORT
2006 Aquatic Plant Surveys of
Lake St. Catherine, Lily Pond and Little Lake

November 2006

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INTRODUCTION

Aquatic vegetation monitoring continued at Lake St. Catherine, Lily Pond and Little Lake in 2006 in compliance with requirements of the five-year integrated management program that commenced with the 2004 whole-lake Sonar (fluridone) herbicide application. Qualitative surveys were conducted during the late spring and early summer to document the extent of Eurasian watermilfoil growth and to help guide management activities. A more comprehensive aquatic plant survey occurred later in the summer, to provide quantitative data to be compared with results from prior years.

Two strategies were utilized for control of Eurasian watermilfoil re-growth during the 2006 season. Renovate 3 (active ingredient Triclopyr) herbicide was applied to Lily Pond (22 acres) and the northeast portion of Little Lake (10 acres). These areas harbored abundant Eurasian watermilfoil growth by the end of the 2005 season. Spot-treatment with Renovate herbicide was determined to be the most effective strategy to manage the Eurasian watermilfoil re-growth in these areas. These areas were treated on June 21, 2006 in accordance with DEC Permit # 2005-C04. A post-treatment survey of the treatment areas was conducted on August 8, 2006 and a report of the findings was submitted on August 25, 2006 (Appendix B).

Diver hand-pulling was used exclusively to control Eurasian watermilfoil growth on the main basin of Lake St. Catherine. Specific information on the 2006 hand-pulling effort is being provided by the Lake St. Catherine Association (LSCA) under separate cover.

Results of the 2006 comprehensive aquatic plant survey are presented in this report. There are now four similar sets of aquatic vegetation survey data available for the Lake St. Catherine System: pre-treatment (2001), year-of-treatment (2004), year-after-treatment (2005), and two-years-after-treatment (2006). Quantitative comparisons between the four data sets are provided, along with a narrative description of the aquatic plant community and maps of dominant aquatic plant assemblages and Eurasian watermilfoil distribution. Finally, there is an evaluation of management alternatives and recommendations for Eurasian watermilfoil control during the 2007 season.

LATE SUMMER COMPREHENISVE TRANSECT/DATA POINT SURVEY

Aquatic Control replicated the comprehensive transect and data point survey methodology that was used at the lake during the previous surveys associated with this project, which include: 2001 pre-treatment, 2004 year-of-treatment (YOT), 2005 year-after treatment (YAT), and 2006 two-years-after-treatment (2YAT).

The 2YAT survey was completed on September 19 and 20, 2006. Marc Bellaud, Aquatic Control Senior Biologist, and Michael Lennon, Aquatic Control Biologist conducted the survey. This same team has conducted the survey for the past three years.

Survey Methods

All three major lake basins were systematically toured by boat. Transect and data point locations established in 2001, were relocated using a Differential GPS system equipped with sub-meter accuracy. This enabled the practically the same locations to be examined during both surveys (Appendix A – Figure 1). The following information was recorded at each data point: aquatic plants present in decreasing order of abundance, percent total plant cover, plant biomass and percent milfoil cover. Water depths that

were recorded during the pre-treatment survey were checked using a high-resolution depth finder. In most cases, the water depth at the data point was within 1 foot of what was recorded during the pre-treatment inspection. The plant community was assessed through visual inspection, use of a long-handled rake and throw-rake, and with an Aqua-Vu underwater camera system. Plants were identified to genus and species level when possible. Plant cover was given a percentage rank based on the areal coverage of plants within an approximate 400 square foot area assessed at each data point. Generally, in areas with 100% cover, bottom sediments could not be seen through the vegetation. Percentages less than 100% indicated the amount of bottom area covered by plant growth. The percentage of Eurasian watermilfoil was also recorded at each data point. In addition to cover percentage, a plant biomass index was assigned at each data point to document the amount of plant growth vertically through the water column. Plant biomass was estimated on a scale of 0-4, as follows:

0 No biomass; plants generally absent
1 Low biomass; plants growing only as a low layer on the sediment
2 Moderate biomass; plants protruding well into the water column but generally not reaching the water surface
3 High biomass; plants filling enough of the water column and/or covering enough of the water surface to be considered a possible recreational nuisance or habitat impairment
4 Extremely high biomass; water column filled and/or surface completely covered, obvious nuisance conditions and habitat impairment severe

Field data recorded at each transect and data point location is provided in the Table 1 - Field Survey Data found in Appendix A.

Survey Findings

SUMMARY OF SURVEY DATA

	2001	2004	2005	2006
LILY POND	Pre	YOT	YAT	2YAT
Total Number of Data Points	24	24	24	22
Average Percent Cover	90%	80%	98%	88%
Average Viable Milfoil Cover (% of total plant cover)	10%	0%	2%	0%
Average Dead Milfoil Cover (% of total plant cover)		1%		
Total Milfoil Cover (% of milfoil cover only)	9%	6%	2%	0%
Average Plant Biomass Index	3.1	2.5	3.3	2.5
LAKE ST. CATHERINE				
Total Number of Data Points	129	129	129	129
Average Percent Cover	66%	46%	51%	57%
Average Viable Milfoil Cover (% of total plant cover)	65%	0%	1%	4%
Average Dead Milfoil Cover (% of total plant cover)		36%		
Total Milfoil Cover (% of milfoil cover only)	43%	16%	0%	4%
Average Plant Biomass Index	1.9	1.5	1.6	1.80
LITTLE LAKE				
Total Number of Data Points	43	43	43	43
Average Percent Cover	72%	66%	78%	83%
Average Viable Milfoil Cover (% of total plant cover)	21%	0%	0%	2%
Average Dead Milfoil Cover (% of total plant cover)		1%		
Total Milfoil Cover (% of milfoil cover only)	15%	0%	0%	2%
Average Plant Biomass Index	2.3	2.1	2.4	2.9

General observations and quantitative indices of the 2006 (2YAT) survey were quite comparable to the 2005 (YAT) survey. The major difference was the increased distribution of Eurasian watermilfoil (*Myriophyllum spicatum)* seen in the main basin of Lake St. Catherine. Impacts to the native plant community were also noted in Lily Pond following the Renovate herbicide treatment.

Plant cover and biomass continued to trend upwards in Lake St. Catherine and Little Lake. Despite increases in *Myriophyllum spicatum* distribution in both basins, it did not comprise a significant portion of the plant cover (<5%), which suggests that native species have continued to recolonize both basins. Total plant cover and biomass dropped off slightly in Lily Pond, due to impacts to non-target species resulting from the Renovate treatment.

Figure 2 depicts the dominant vegetation assemblages that were encountered during the 2006 survey. Similar to the 2005 survey, the aquatic plant assemblages were separated based on the percent of plant cover. Three different plant assemblages, high density (>70% cover), medium density (40-70% cover) and low density (10-40% cover), were used to depict the plant cover in the lakes. Only slight changes were observed between the 2005 and 2006 surveys. *Potamogeton robbinsii* continues to be the predominant submersed species.

Species Encountered

Aquatic plant species encountered during the 2006 survey were similar to what was seen in prior years (Appendix A - Table 2). Thirty different species were recorded. When separated by plant type there were 22 submersed species, 4 floating-leafed species, 2 floating species, and 2 macro-algae species. Several emergent species were observed in adjacent wetland areas, but were not present at the previously established data point locations.

Macrophyte Species	Common Name	Total			
		2001 pre	2004 YOT	2005 YAT	2006 2YAT
Brasenia schreberi	Watershield	3.6%	7.7%	7.1%	6.7%
Ceratophyllum demersum	Coontail	20.4%	7.7%	10.7%	11.9%
Chara sp. / Nitella sp.	Muskgrass	2.6%	12.2%	40.8%	39.7%
Chlorophyta	Filamentous green algae	1.5%	36.7%	26.0%	6.7%
Eleocharis sp.	Spikerush	1.0%	1.0%	1.0%	0.0%
Elodea canadensis	Waterweed	32.1%	1.0%	1.0%	0.5%
Isoetes sp.	Quillwort	1.5%	6.1%	1.5%	4.6%
Lemna minor	Duckweed	6.6%	1.0%	0.0%	0.5%
Megalodonta beckii	Water marigold	2.6%	0.0%	0.0%	0.0%
Myriophyllum spicatum – dead (YOT only)	Eurasian watermilfoil	0.0%	44.9%	0.0%	0.0%
Myriophyllum spicatum - viable	Eurasian watermilfoil	93.9%	1.0%	17.3%	32.5%
Najas flexilis	Naiad / bushy pondweed	21.9%	0.0%	8.2%	38.7%
Nuphar variegatum	Yellow waterlily	4.6%	5.1%	4.6%	2.1%
Nymphaea odorata	White waterlily	16.3%	5.1%	10.7%	9.8%
Polygonum sp.	Smartweed	0.0%	0.0%	0.0%	0.5%
Potamogeton amplifolius	Large-leaf	32.7%	37.8%	43.4%	48.5%
Potamogeton crispus	Curly-leaf pondweed	1.5%	0.5%	6.6%	4.6%
Potamogeton epihydrus	Ribbon-leaf pondweed	1.5%	6.1%	7.1%	3.1%
Potamogeton gramineus	Variable pondweed	23.0%	1.0%	6.1%	6.2%
Potamogeton illinoensis	Illinois pondweed	4.1%	1.0%	1.5%	8.8%
Potamogeton natans	Floatingleaf pondweed	0.0%	0.0%	0.0%	1.0%
Potamogeton pusillus	Thin-leaf pondweed	0.0%	0.0%	0.0%	4.1%
Potamogeton robbinsii	Pondweed	51.5%	76.0%	87.8%	74.2%
Potamogeton zosteriformis	Flat-stem pondweed	28.1%	3.1%	29.1%	28.9%
Utricularia gibba	Creeping bladderwort	1.5%	0.0%	0.5%	4.6%
Utricularia vulgaris	Common bladderwort	7.7%	9.2%	2.0%	5.7%
Valisneria americana	Wild celery/Tapegrass	29.1%	13.3%	2.0%	4.1%
Wolffia sp.	Watermeal	0.0%	0.0%	0.0%	0.5%
Zosterella (Heteranthera) dubia	Water stargrass	1.0%	1.0%	8.7%	7.7%

Frequency of Occurrence

Throughout the entire Lake St. Catherine system, the frequencies of occurrence for individual species in 2006 were very similar to the 2005 findings (Appendix A – Table 3). Species that were not encountered 2006 included *Megladonta beckii* and submersed *Eloeocharis sp.* Neither of these species was particularly widespread in prior surveys and their absence during the 2006 survey was probably coincidental. The same probably holds true for the two species, *Potamogeton pusillus* and *Potamogeton natans*, which were encountered at a few locations 2006, but were not recorded in prior surveys. Some of the subtle shifts in the overall frequency of occurrence are more notable in each individual basin.

Lily Pond

In 2005, the year-after the whole-lake Sonar (fluridone) treatment, Lily Pond showed the highest level of native plant recolonization. However, *Myriophyllum spicatum* was also fairly widespread and diver hand-pulling efforts during the 2005 season proved to be ineffective.

Macrophyte Species	Lily Pond			
	2001 pre	2004 YOT	2005 YAT	2006 2YAT
Potamogeton robbinsii	95.8%	91.7%	95.8%	95.5%
Potamogeton amplifolius	33.3%	100.0%	91.7%	77.3%
Ceratophyllum demersum	70.8%	4.2%	50.0%	45.5%
Utricularia gibba (or minor)	0.0%	0.0%	0.0%	40.9%
Chlorophyta	0.0%	29.2%	95.8%	31.8%
Utricularia vulgaris	29.2%	37.5%	0.0%	27.3%
Nymphaea odorata	62.5%	16.7%	29.2%	9.1%
Potamogeton illinoensis	0.0%	4.2%	8.3%	9.1%
Potamogeton natans	0.0%	0.0%	0.0%	9.1%
Chara sp. / Nitella sp.	0.0%	0.0%	0.0%	4.5%
Lemna minor	45.8%	8.3%	0.0%	4.5%
Potamogeton crispus	4.2%	4.2%	4.2%	4.5%
Wolffia sp.	0.0%	0.0%	0.0%	4.5%
Brasenia schreberi	4.2%	4.2%	0.0%	0.0%
Elodea canadensis	29.2%	0.0%	8.3%	0.0%
Isoetes sp.	0.0%	4.2%	0.0%	0.0%
Myriophyllum spicatum	79.2%	8.3%	33.3%	0.0%
Najas flexilis	4.2%	0.0%	0.0%	0.0%
Nuphar variegatum	16.7%	16.7%	16.7%	0.0%
Potamogeton epihydrus	0.0%	12.5%	4.2%	0.0%
Potamogeton gramineus	16.7%	0.0%	8.3%	0.0%
Potamogeton zosteriformis	58.3%	8.3%	62.5%	0.0%
Valisneria americana	33.3%	45.8%	0.0%	0.0%
Zosterella (Heteranthera) dubia	4.2%	0.0%	37.5%	0.0%

The entire Lily Pond basin was treated with Renovate herbicide in 2006. There were fairly significant shifts in frequency of occurrence percentages for a number of species. No *Myriophyllum spicatum* was observed post-treatment in 2006. Other species that were not seen in 2006 included *Potamogeton zosteriformis, Zosterella dubia, Elodea canadensis* and *Nuphar variegatum.* A significant reduction in the *Nymphaea odorata* population was also noted.

Lily Pond 9/19/06

Lake St. Catherine (Main Lake)

Frequency of occurrence values were largely unchanged in Lake St. Catherine. Probably the most notable shifts were increases in *Najas flexilis*, *Myriophyllum spicatum*, *Potamogeton zosteriformis*, *Potamogeton amplifolius*, and *Zosterella dubia.* There was a significant drop in the occurrences of *Potamogeton robbinsii*, but this may have been due to increases in other broad-leaved pondweed species.

Macrophyte Species	Main Lake			
	2001 pre	2004 YOT	2005 YAT	2006 2YAT
Potamogeton robbinsii	31.0%	65.1%	82.2%	62.0%
Chara sp. / Nitella sp.	1.6%	17.1%	62.0%	57.4%
Najas flexilis	19.4%	0.0%	12.4%	56.6%
Potamogeton zosteriformis	24.0%	2.3%	31.0%	41.9%
Myriophyllum spicatum - viable	98.4%	0.0%	14.7%	35.7%
Potamogeton amplifolius	28.7%	14.7%	25.6%	34.1%
Zosterella (Heteranthera) dubia	0.0%	0.8%	4.7%	11.6%
Potamogeton illinoensis	6.2%	0.8%	0.8%	8.5%
Ceratophyllum demersum	10.9%	10.9%	6.2%	7.0%
Isoetes sp.	2.3%	8.5%	0.8%	6.2%
Potamogeton crispus	1.6%	0.0%	9.3%	5.4%
Potamogeton pusillus	0.0%	0.0%	0.0%	5.4%
Chlorophyta	0.0%	43.4%	14.7%	3.1%
Nymphaea odorata	3.1%	1.6%	2.3%	3.1%
Valisneria americana	14.0%	3.1%	0.8%	3.1%
Brasenia schreberi	0.0%	0.8%	0.8%	2.3%
Potamogeton epihydrus	2.3%	3.1%	5.4%	2.3%
Potamogeton gramineus	17.8%	0.0%	4.7%	1.6%
Elodea canadensis	27.9%	0.0%	0.0%	0.8%
Nuphar variegatum	0.8%	0.0%	0.0%	0.8%
Lemna minor	1.6%	0.0%	0.0%	0.0%
Megalodonta beckii	1.6%	0.0%	0.0%	0.0%
Utricularia vulgaris	0.8%	0.8%	0.8%	0.0%

Eurasian watermilfoil in Cold Spring Bay 9/20/06

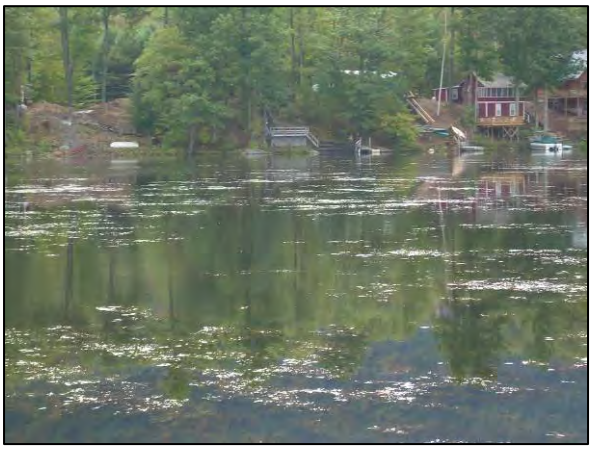
Floating Eurasian watermilfoil fragments with adventitious roots seen at southern end of Lake St. Catherine 9/20/06

Little Lake

Aside from the increase in *Myriophyllum spicatum*, no significant shifts in the frequency of occurrence values were noted in Little Lake between the 2005 and 2006 surveys. Slight increases were noted in several of the less abundant species.

The increased frequency of occurrence of *Myriophyllum spicatum* was significant, but its percent cover at most locations (<2% total) was quite low. It is widely scattered among robust native plant cover.

Macrophyte Species	Little Lake			
	2001 pre	2004 YOT	2005 YAT	2006 2YAT
Potamogeton robbinsii	88.4%	100.0%	100.0%	100.0%
Potamogeton amplifolius	44.2%	72.1%	69.8%	76.7%
Myriophyllum spicatum - viable	88.4%	0.0%	16.3%	39.5%
Nymphaea odorata	30.2%	9.3%	25.6%	30.2%
Brasenia schreberi	14.0%	30.2%	30.2%	23.3%
Potamogeton gramineus	41.9%	4.7%	9.3%	23.3%
Chara sp. / Nitella sp.	7.0%	4.7%	7.0%	11.6%
Utricularia vulgaris	16.3%	18.6%	7.0%	11.6%
Ceratophyllum demersum	20.9%	0.0%	2.3%	9.3%
Potamogeton illinoensis	0.0%	0.0%	0.0%	9.3%
Valisneria americana	72.1%	25.6%	7.0%	9.3%
Nuphar variegatum	9.3%	14.0%	11.6%	7.0%
Potamogeton epihydrus	0.0%	11.6%	14.0%	7.0%
Chlorophyta	7.0%	20.9%	20.9%	4.7%
Najas flexilis	39.5%	0.0%	0.0%	4.7%
Potamogeton zosteriformis	23.3%	2.3%	4.7%	4.7%
Isoetes sp.	0.0%	0.0%	4.7%	2.3%
Polygonum sp.	0.0%	0.0%	0.0%	2.3%
Potamogeton crispus	0.0%	0.0%	0.0%	2.3%
Potamogeton pusillus	0.0%	0.0%	0.0%	2.3%
Eleocharis sp.	4.7%	4.7%	4.7%	0.0%
Elodea canadensis	46.5%	4.7%	0.0%	0.0%
Megalodonta beckii	7.0%	0.0%	0.0%	0.0%
Myriophyllum spicatum - dead	0.0%	11.6%	0.0%	0.0%
Utricularia gibba	7.0%	0.0%	2.3%	0.0%
Zosterella (Heteranthera) dubia	2.3%	2.3%	4.7%	0.0%



Renovate treatment area in northeast corner of Little Lake. Robust growth of largeleaf pondweed and Robbins pondweed reaching the surface. 9/20/06

Species Richness

Species richness or the average number of species encountered at each data point was calculated for each of the three major basins. These results accurately summarize the frequency of occurrence data.

SPECIES RICHNESS

Basin	Pre-Treatment Aug. 2001	YOT Sept. 2004	YAT Sept. 2005	2YAT Sept. 2006
Lily Pond	5.67	3.58	5.17	3.59
Lake St. Catherine	2.96	2.39	2.85	3.50
Little Lake	5.62	3.23	3.30	3.81

Increased species richness was seen in Lake St. Catherine and Little Lake. In Lake St. Catherine, species richness actually exceeded the value that was recorded prior to the whole-lake Sonar treatment. Little Lake is still below pre-treatment values, but is trending upwards. There was a significant reduction in species richness in Lily Pond, which is attributable to the Renovate treatment that was performed in 2006.

Eurasian Watermilfoil Distribution

Eurasian watermilfoil continued to recolonize the littoral areas of Lake St. Catherine and Little Lake in 2006. No Eurasian watermilfoil was found in Lily Pond at the time of the 2006 survey, due to the effectiveness of the Renovate herbicide treatment.

TOTAL MILFOIL COVER

Basin	Pre-Treatment Aug. 2001	YOT Sept. 2004	YAT Sept. 2005	2YAT Sept. 2006
Lily Pond	9.2%	6.4%	2.0%	0.0%
Lake St. Catherine	42.7%	16.3%	0.4%	4.3%
Little Lake	15.4%	0.4%	0.2%	2.0%

Eurasian watermilfoil comprised a fairly low percentage of the total plant cover in Lake St. Catherine and Little Lake, but it was fairly widespread in both basins. Locations where Eurasian watermilfoil was encountered on September 19 and 20, 2006 are depicted in Figure 3 in Appendix A.

EVALUATION OF 2006 RENOVATE TREATMENT

Qualitative observations of the results of the 2006 Renovate treatments in Lily Pond and Little Lake were submitted in a separate report dated August 25, 2006 (Appendix B). This report was prepared by Gerald Smith, Aquatic Control President, who performed both the June 21, 2006 treatment and the qualitative post-treatment inspection on August 8, 2006. Summaries of the Renovate (Triclopyr) and associated metabolite testing were also previously provided under separate cover by Shaun Hyde, the Northeast Aquatic Specialist for SePRO Corporation (Appendix C).

Lily Pond and Little Lake responded differently to the Renovate (Triclopyr) treatment. All open water portions of Lily Pond (20 acres) were treated at a dose targeting 1.5 ppm. The Little Lake treatment was confined to a 10 acre plot in the northeast corner, so the target dose was increased to 1.75 ppm to overcome the effects of dilution. Triclopyr concentrations dropped much more rapidly in Little Lake,

reaching non-detect levels within 21 days of the treatment. Triclopyr concentrations in Lily Pond did not drop to non-detect levels for 49-57 days. The extended Triclopyr exposure time in Lily Pond resulted in more impact to non-target species than was seen in Little Lake or was anticipated based on the lower application rate proposed for the treatment.

Reduced frequency of occurrence was noted on several native species in Lily Pond in 2006. The most notable being: *Potamogeton zosteriformis, Zosterella dubia, Nuphar variegatum,* and *Nymphaea odorata*. Some other species that were absent in 2006, but were not particularly widespread in 2005 (found at <10% of data points) included: *Elodea canadensis*, *Potamogeton gramineus,* and *Potamogeton epihydrus* Species that did not appear to impacted were: *Potamogeton robbinsii, Potamogeton amplifolius, Ceratophyllum demersum, Utricularia gibba* (or *minor*), and *Utricularia vulgaris.*

Qualitative observations of Lily Pond recorded during the 2006 survey included: thinning of the floating-leaved plant population, overall reductions in plant biomass, reductions in plant diversity, and less filamentous algae than was seen in 2005.

Visual observations of the treatment area in Little Lake were quite different. Native plant growth appeared to be robust throughout the treatment area. An absence of a particular plant species was not readily apparent.

There were only four survey data points located within or immediately adjacent to the 10-acre treatment area on Little Lake. Comparing the 2005 and 2006 species richness values from just these four data points on Little Lake to the values for Lily Pond shows that the treatment did impact native species in Lily Pond more significantly.

SPECIES RICHNESS

	2005	2006
Lily Pond	5.17	3.59
Little Lake (treatment area)	3.75	4.25

Eurasian watermilfoil was not found in Lily Pond or within the treatment area on Little Lake. However, Eurasian watermilfoil was immediately adjacent to the treatment area in Little Lake, albeit at low densities. Similarly, Eurasian watermilfoil was found in the North Bay of Lake St. Catherine, despite this area having low but detectable Triclopyr concentrations for several weeks post-treatment.

SUMMARY AND MANAGEMENT RECOMMENDATIONS FOR 2007

The aquatic plant community continued rebounding during the 2006 season, two years after the whole lake Sonar (fluridone) herbicide treatment that was performed in 2004. Overall, the quasi-quantitative indices of plant cover and biomass, along with species richness and frequency of occurrence for many native species trended upwards. Unfortunately, there was also increased distribution and density of Eurasian watermilfoil.

Lily Pond and 10 acres in the northeast corner of Little Lake were spot-treated with Renovate (Triclopyr) herbicide in June 2006. Eurasian watermilfoil was completely controlled in both treatment areas. Triclopyr concentrations persisted at detectable concentrations for more than six weeks post-treatment in Lily Pond. This was more than twice as long as what was seen in Little Lake. The extended contact time did appear to impact some non-target native species. Measurements of plant cover, biomass and species richness in Lily Pond in 2006 were similar to what was documented in 2004 immediately following the Fluridone treatment. Significant recolonization of native species is anticipated at Lily Pond in 2007.

Adverse impacts on native plant species were not evident in Little Lake following the 2006 Triclopyr treatment.

Continued monitoring and implementation of the most appropriate management strategies will be needed to maintain control of Eurasian watermilfoil in the Lake St. Catherine system and to prevent it from returning to levels seen prior to the 2004 Sonar treatment. Preliminary management recommendations for the 2007 season are provided below.

Diver Hand-Pulling

Diver hand-pulling was the primary Eurasian watermilfoil control strategy used in Lake St. Catherine in 2005 and 2006. While these efforts were helpful, expanded distribution and density of Eurasian watermilfoil was observed in several areas during the late season inspections. Diver hand-pulling is still expected to be utilized at the primary Eurasian watermilfoil management strategy for widely scattered

Suction Harvesting

Based on observations made during the August 8, 2006 post-treatment survey and discussions with the diver hand-pulling crew, LSCA filed a permit application to use a suction harvesting machine to control abundant Eurasian watermilfoil growth in several sections of Lake St. Catherine during the 2007 season (Appendix A – Figure 6). DEC issued a permit (# 2006-H07) for the suction harvesting work on October 3, 2006. The dense patch found at the narrows leading into North Bay, directly across from the State Park Beach should be a priority area for suction harvesting. Atwater Bay is another suitable site for suction harvesting.

Chemical Treatment

Prior to issuance of the suction harvesting permit, DEC staff met with representatives from LSCA and Aquatic Control for an inspection of the lake on September 26, 2006 to view different areas of milfoil recolonization. Areas of abundant Eurasian watermilfoil growth identified during Aquatic Control's comprehensive late season survey were inspected. Two areas on Lake St. Catherine, Cold Spring Bay on the eastern shore and Forest House Bay at the southern end, were identified as possible Renovate herbicide spot-treatment sites for the 2007 season. Substantial portions of both bays had abundant Eurasian watermilfoil cover that was estimated to comprise 25-50% of the plant assemblage. Achieving effective Eurasian watermilfoil control in these two areas through suction harvesting and diver hand-pulling will require a considerable effort. Spot-treatment with Renovate herbicide would probably be a more cost-effective strategy and will allow for these other techniques to be used in areas with less extensive Eurasian watermilfoil cover.

Recommended treatment areas are depicted in Figure 6 (Appendix A). The Cold Spring Bay site represents approximately 8 acres and the Forest House Bay site represents 7 acres. Both sites are directly adjacent to the main body of Lake St. Catherine. Dilution and dissipation of Renovate (Triclopyr) following treatment are expected to be similar to what was observed in Little Lake and in Lake Hortonia in 2006. A targeted treatment dose of 1.75 ppm is recommended. A solid or flake formulation of Renovate, named Renovate OTF (On Target Flake), recently received a federal label from the USEPA. Its registration in Vermont is still pending. The flake formulation should improve efficacy for spot-treatments and be more cost-effective when treating deeper water, because the entire water column will not need to be treated and less active ingredient can be used to achieve the necessary contact time with the target plants. Permit applications for treatments in 2007 should list Renovate OTF (flake) as the preferred formulation, with Renovate 3 (liquid) listed as a back-up.

Using the Renovate OTF formulation will provide a savings of approximately 40% on the product cost from a comparative treatment with the liquid formulation. Additional savings in 2007 will need to be realized through a reduction in the required post-treatment monitoring for herbicide residues. Based on

the federal label, the no-treatment setback distance from potable water intakes for treatment of 7 or 8 acres at 1.75 ppm would be 980 feet. Three stations for post-treatment monitoring of Triclopyr residues would be recommended for each treatment site. Recommended sample locations would be: one within the treatment area and two outside of the treatment areas at 980 foot setback point in both directions. The recommended sampling schedule would be: one sampling round 48-72 hours post-treatment, and sampling rounds weekly thereafter. Based on the post-treatment Triclopyr testing results at Little Lake and Lake Hortonia in 2006, four or five sampling rounds are anticipated until concentrations drop below 1 ppb. The 2006 testing results should validate that metabolite testing is unnecessary.

Spot-treatments with Renovate (Triclopyr) herbicide is a critical component of the long-term management plan at Lake St. Catherine. However, it is doubtful that LSCA will pursue additional spot-treatment work in 2007 if the State does not significantly reduce the post-treatment sampling requirements for Triclopyr and associated metabolites. The analytical cost and volunteer time expended for the 2006 Renovate treatments were considerable and burdensome. Reduced sampling requirements are necessary for spot-treatments with Renovate herbicide to be utilized as a selective Eurasian watermilfoil management strategy in the Lake St. Catherine system in the future.

APPENDIX A

- Table 1 – Field Survey Data – September 19 and 20, 2006
- Table 2 – List of Species Encountered – September 19 and 20, 2006
- Table 3 – Complete Frequency of Occurrence by Species and Lake Basin
- Figure 1 – Transect/Data Point Location Map – September 19 and 20, 2006
- Figure 2 – Dominant Aquatic Plant Assemblages – September 19 and 20, 2006
- Figure 3 – Milfoil Distribution – September 19 and 20, 2006
- Figure 4 – Lily Pond 2006 Renovate Treatment Area
- Figure 5 – Little Lake 2006 Renovate Treatment Area
- Figure 6 – 2007 Proposed Management Areas

Transect	Data Point & GPS ID	Distance From Shore (ft.)	Water Depth (ft.)	% Total Plant Cover	% Milfoil (Ms) Cover	Biomass Index	Dominant Vegetation
LILY POND							
1	49	25	4	80	0	2.0	Pr Pa Fa
1	50	100	6	100	0	2.5	Pr Pa Ug
1	51	midpoint	6	90	0	2.0	Pr Up Ug Pa
1	52	150	6	90	0	3.0	Pr Pa Up Ug
1	53	30	4	60	0	3.0	Pa Pn Ny
2	55	25	5	70	0	2.5	Pr Pa Ug
2	58	150	7	80	0	2.0	Pr Pa
2	56	180	7	75	0	2.0	Pr Cd
2	57	60	7	80	0	3.0	Pr Pa Ug Pi Pn
2	54	40	7	70	0	2.0	Pr
3	59	25	4	80	0	2.0	Pr
3	60	120	7	90	0	2.5	Pr Cd Pa Up Pi
3	61	midpoint	7	90	0	2.0	Pr Up Cd
3	62	15	4	100	0	3.0	Ca Pa Pr Ny Up Fa Ug
4	63	20	4	100	0	2.5	Pr Fa Pa Cd
4	64	100	6.5	100	0	2.0	Pr
4	65	100	6	100	0	2.0	Pr Pa Cd Up
4	66	30	3.5	90	0	2.5	Pr Pa Ug
6	67	20	2	100	0	2.5	Pr Fa Pa Cd
5	68	50	3	100	0	3.0	Fa Pr Pa Ug Cd
5	69	60	3.5	100	0	3.0	Fa Pr Pa Ug Cd
6	71	10	1.5	100	0	3.5	Fa Pa Pr Cd Pc L W
5	70	15	4				too shallow
7	48	midpoint	4.5				too shallow
				88.4	**0.0**	**2.5**	

Transect	Data Point & GPS ID	Distance From Shore (ft.)	Water Depth (ft.)	% Total Plant Cover	% Milfoil (Ms) Cover	Biomass Index	Dominant Vegetation
LAKE ST. CATHERINE							
7	47	30	2.5	80	0	2.0	Pa Fa
8	44	50	4	90	0	2.0	Pa Pr
8	45	midpoint	3.5	80	0	2.5	Pa Pr Ni
8	46	25	3.5	80	0	2.5	Pa Pr Pe
9	41	15	5	30	0	1.0	Ni Nf I Zd
9	42	150	11	90	0	2.0	Ni Pz Pr Zd
9	43	40	6.5	100	0	2.0	Pa Pr Pz
10	37	35	8	90	0	2.5	Pa Pr Pz
10	38	40	5	80	0	3.0	Pa Pi Pr
10	39	150	9	60	5	2.0	Pr Cd Ms
10	40	220	12	50	20	2.0	Pr Ms Cd Ni
11	34	20	3	90	0	3.5	Pa Pr B Nu Ny
11	35	100	8	80	0	2.0	Pr Pa
11	36	30	6.5	90	0	2.5	Pr Pa Pz
12	31	25	7.5	70	0	2.0	Pr Nf Ni Pz
12	32	25	3	80	0	2.5	Pr Ni Pa B Ny Pe
12	33	75	7	70	0	2.0	Pr Pa
13	28	35	4	90	0	3.5	Pi Pr Pa Pz Ni
13	29	120	10	80	5	2.0	Ni Pr Ms Nf Pz
13	30	25	10	50	0	2.0	Pr Nf Pz
14	25	20	6	75	0	2.0	Pr Nf Pz Pa
14	26	30	3.5	80	0	2.0	Pr Zd Pa Pi
14	27	60	8	80	5	2.5	Pa Pr Pg Ms
15	22	75	7.5	75	0	2.0	Pa Pr Pz Ec V
15	23	50	5.5	25	0	1.0	Nf I Pp Pz
15	24	125	12	25	50	2.0	Ms Ni
16A	20	100	8.5	80	0	2.0	Pr Nf
16B	21	70	9	20	0	1.0	Pr Ni
17A	17A	25	6.5	40	0	1.5	Nf Pr Ni Pa
17	98	80	8	90	0	2.0	Pr Pa Pz
18	72	15	10	60	10	1.5	Ni Pr Ms
18	73	30	8	80	0	2.0	Pr Pz
19	74	25	8.5	75	0	2.0	Pr Nf Pi Zd
19	75	25	10	5	100	1.0	Ms
20	76	20	6.5	50	0	2.0	Pr Pz Nf
20	77	125	7	20	0	1.0	Nf Ni
21	78	40	6	15	0	1.0	Ni I Pr
21	79	80	12	0	0	0.0	

Transect	Data Point & GPS ID	Distance From Shore (ft.)	Water Depth (ft.)	% Total Plant Cover	% Milfoil (Ms) Cover	Biomass Index	Dominant Vegetation
21	80	15	8	70	0	2.0	Pr Pa Nf Pz
22	81	30	6	90	5	2.5	Pz Pa Ni Nf Pr Ms
22	82	30	7	20	0	1.0	Ni
23	83	25	3	80	10	2.5	Zd Pr Pi Pa Ms
23	84	120	6	90	5	2.0	V Pr Pa Ms
23	85	200	8	50	0	1.0	Nf Ni
23	86	40	8	40	0	2.0	Nf Pz Ni
24	87	40	5	10	0	1.0	Ni I
24	88	25	4	20	0	1.0	Ni Nf
24	90/91	100	8.5	15	0	1.0	Ni Nf
25	92	70	5	40	0	1.0	Ni Nf
25	93	15	3.5	60	0	1.5	Ni Nf Pg
25	94	20	9.5	30	0	2.0	Pr Nf Pz Pc
26	95	50	7	40	0	1.5	Ni Nf Pi Ms Zd
26	96	100	7.5	80	25	2.5	Ni Nf Pi Ms Zd
26	97	175	13	75	0	1.5	Ni Nf Pr Pz Ng
27	100	20	7	60	0	1.5	Nf Ni Zd Pp
27	101	150	8.5	50	0	2.0	Ni Pa Nf Pz
27	102	20	4	80	0	2.5	Nf Pr Ny Zd
27	103	70	8	60	5	2.0	Pp Ni Ms
27	104	225	8	40	0	1.0	Nf Ni Pz
28	127	30	5.5	80	5	2.0	Pz Pr Ni Cd Pa Ms Pp Zd
28	128	40	4	100	5	3.5	Pr Pa B Pz Ny Pe Ms
28	129	midpoint	7	90	0	2.0	Pr Pa Pz Fa
29	105	30	8.5	90	5	2.5	Nf Pa Pr Ms
29	106	30	6	70	0	2.0	Pr Pz Nf
29	107	30	11.5	90	0	2.0	Ni Nf Pr Pz
30	108	25	4	50	0	1.5	Nf V Pr Ni Pz
30	109	100	12	10	0	1.0	Ni
30	110	50	10.5	15	0	1.0	Ni Nf
30	111	150	11	60	15	2.0	Nf Pr Pz Ms
31	124	25	6	50	5	2.0	Ni Pr Nf Pz Ms
31	125	midpoint	10	60	15	2.0	Ni Nf Pr Ms Pz
31	126	30	5	40	0	2.0	Nf Pr Pz
32	112	30	5	75	15	2.5	I Nf Pi Pz Ms
32	113	125	12	60	5	2.0	Nf Ni Pc Ms
32	114	15	7	10	0	1.0	Ni
33	120	50	5	30	0	1.0	Ni Nf I
33	121	125	13	25	0	1.0	Ni Cd

Transect	Data Point & GPS ID	Distance From Shore (ft.)	Water Depth (ft.)	% Total Plant Cover	% Milfoil (Ms) Cover	Biomass Index	Dominant Vegetation
33	122	30	10	60	0	2.0	Nf Pr Pa Pz Ni
33	123	120	13	90	10	2.5	Ni Cd Nf Ms
34	115	40	5	80	5	2.0	Pr Pa Pz Ms
34	116	150	9.5	70	10	2.0	Nf Pr Ni Ms Pa Pz Pc
34	117	250	13	60	0	1.5	Ni Nf Pc
34	118	30	7	60	5	2.5	Nf Pr Pc Ms Cd Pz
34	119	150	10	60	0	2.0	Nf Pr Pz Ni
35	134	50	10.5	50	0	1.0	Ni Pr
35	135	125	8.5	50	5	2.0	Ni Nf Ms
36	130	50	7.5	40	0	2.0	Nf Pa Ni Pz Pc Cd
36	131	250	13	10	0	1.0	Ni
36	132	25	4	10	0	1.0	Nf Pr
36	133	300	13	60	0	1.0	Ni Nf
37	136	100	10	75	0	1.5	Ni Nf
37	137	25	5.5	80	10	2.5	Pr Pa Pz Ms
37	138	15	7.5	10	0	1.0	Ni
38	139	10	6	40	0	1.0	Ni I Pi Nf
38	140	120	7	15	0	1.0	Ni Nf Zd
38	141	200	8	60	5	2.0	Ni Pr Nf Pz Ms
38	142	300	8.5	40	5	2.0	Nf Ni Ms
39	166	50	5.5	100	30	3.5	Pr Pa Ms Pz V Zd
40	143	100	6	15	0	1.0	Ni Pr Nf
40	144	100	12	70	10	2.0	Ni Nf Ms Pz
40	145	20	5	25	0	1.0	Ni Pr
41	168	50	7	60	0	2.0	Nf Zd Pr
42	146	10	6.5	30	0	1.0	Nf Ni I
42	147	35	7.5	0	0	0.0	
43	148	35	6.5	80	0	2.5	Pr Pa Pz
43	149	100	13	50	5	1.5	Ni Ms
43	150	30	5.5	15	0	1.0	Ni Pz Pr
44	151	20	7	20	5	1.0	Ni Pp Ms
44	152	175	13	60	5	2.0	Ni Nf Pz Ms
44	153	75	6.5	90	10	2.5	Pa Pz Pr Ms
45	154	20	6	25	0	1.0	Pp Ni
45	155	25	5	70	5	2.0	Pr Pa Nf Ms
46	156	60	4.5	50	0	2.0	Pa Zd Nf
46	157	200	12	80	10	2.0	Pr Nf Ms Ni Pz
46	158	35	6.5	90	40	2.5	Ms Nf Ni Pz Pr Cd
46	159	175	8	15	0	1.0	Ni Pr Pz

Transect	Data Point & GPS ID	Distance From Shore (ft.)	Water Depth (ft.)	% Total Plant Cover	% Milfoil (Ms) Cover	Biomass Index	Dominant Vegetation
47	160	100	7	20	0	1.0	Nf Pa Pr
47	161	25	5	70	5	2.0	Nf Pr Ms Pz Ni
47	162	125	12	70	5	2.0	Cd Ni Pz Ms
47	169	150	7.5	30	0	1.0	Nf Ni Pr
48	163	45	5	80	5	2.0	Ni Nf Pr Pz Zd Pi Ms
48	164	midpoint	13	80	20	2.0	Ni Nf Ms
48	165	40	4	90	5	2.5	Pr Pa Ms
49	170	25	3.5	50	5	1.5	Nf Pr Pz Ms Pa Pc
49	171	midpoint	9	80	0	2.0	Pr Pa Fa
49	172	15	3.5	70	10	3.0	Pr Pz Pi Ms Nf
50	173	20	2.5	50	5	2.0	Pr Nf Ms
50	174	midpoint	6.5	25	0	1.0	Fa Pr Pa Pp
50	175	20	4.5	80	0	2.0	Pr Pa Nf
				56.5	**4.3**	**1.8**	

Transect	Data Point & GPS ID	Distance From Shore (ft.)	Water Depth (ft.)	% Total Plant Cover	% Milfoil (Ms) Cover	Biomass Index	Dominant Vegetation
LITTLE LAKE							
51	176	midpoint	7	30	0	1.0	Ni Pr
52	177	20	4	100	0	3.5	Pr Pa B Ny Pz
52	178	midpoint	5.5	50	0	2.0	Pr Ni Nf
52	179	30	3.5	100	5	4.0	Pa B Ny Pr Ms
53	180	20	4	100	0	4.0	Ny Pa Pr B Cd Pi Nu Uv Po
53	181	midpoint	6	40	5	2.0	Pr Ni Uv Ms Pa
53	182	20	4	100	5	4.0	B Ny Nu Pr V Pa Ms
54	183	25	5	100	5	3.5	Pr Pa Pi Cd Pz Pp Ms Pc Uv
54	184	40	4.5	50	0	1.5	Pr Uv
54	185	midpoint	5	100	0	4.0	Pr Pa Nu Ny Uv Fa
54	186	100	5	100	0	4.0	Pr Ny Pa
55	187	100	5	100	5	4.0	Pr Pa Pi Ms Cd
55	188	150	4.5	100	0	3.5	Pr Pa Ny Ca
55	189	250	5	100	5	3.5	Pr Pa B Ms
55	190	75	4	100	0	4.0	Pr Pa Ny V Pi
56	191	30	3.5	100	5	3.0	Pr Pa Ms
56	192	400	5.5	100	5	3.0	Pr Pi Ms
56	193	500	5.5	100	5	3.5	Pr Pa Pi Ms Cd
56	194	50	5	80	0	3.0	Pr Pa Ca
57	195	75	6	100	0	4.0	Ny V Pr Pa
57	196	500	5.5	75	5	3.0	Pr Pi Nf Pa Ms
57	197	600	5	100	5	3.0	Pr Pa Pi Ms
57	198	120	4	100	0	2.5	Pr Pa
58	199	40	3.5	90	0	2.5	Pr Pa
58	200	700	5	100	5	3.0	Pr Pa Pi Ms
58	201	600	5	100	0	3.0	Pr Pa Pi
58	202	60	6.5	100	5	2.5	Pr Pa Pe Ms
59	203	35	4	100	5	3.0	Pr Pa Ms
59	204	700	5	90	0	3.0	Pr Pa
59	205	500	5.5	90	0	3.0	Pr Pa Pi
59	206	125	5	80	0	2.0	Pr Pa
60	207	100	4	80	0	2.5	Pr Pa
60	208	500	5	100	0	2.5	Pr
60	209	450	5.5	80	5	2.5	Pr Pi Pa Ms
60	210	75	6	80	5	3.5	Pr Pe Ny V Ms
61	211	75	4.5	60	0	3.0	Pr B Ny
61	212	800	5	30	0	1.5	Pr
61	213	300	5	20	0	1.0	Pr

Transect	Data Point & GPS ID	Distance From Shore (ft.)	Water Depth (ft.)	% Total Plant Cover	% Milfoil (Ms) Cover	Biomass Index	Dominant Vegetation						
61	214	40	5	100	0	3.5	Pr	Pa	Fa	B			
62	215	50	4.5	100	0	4.0	Ny	Pr	B	Pa			
62	216	700	4	80	5	3.0	Pr	B	Pi	Pa	Ms		
62	217	120	4	10	0	1.0	Pr						
62	218	30	3	70	0	3.0	Pr	B	Ny	Pe	Pi	I	Pa
				83.4	**2.0**	**2.9**							

TABLE 2 - PLANTS ENCOUNTERED DURING SURVEYS (2001-2006)

Macrophyte Species	Common Name	Abbreviation
Brasenia schreberi	Watershield	B
Ceratophyllum demersum	Coontail	Cd
Chara sp.	Muskgrass	Ca
Chlorophyta	Filamentous green algae	Fa
Eleocharis sp.	Spikerush	Eo
Elodea canadensis	Waterweed	Ec
Isoetes sp.	Quillwort	I
Lemna minor	Duckweed	L
Megalodonta beckii	Water marigold	Mb
Myriophyllum spicatum - dead	Eurasian watermilfoil	DMs
Myriophyllum spicatum - viable	Eurasian watermilfoil	Ms
Najas flexilis	Naiad	Nf
Najas guadalupensis		Ng
Nitella sp.	Stonewort	Ni
Nuphar variegatum	Yellow waterlily	Nu
Nymphaea odorata	White waterlily	Ny
Polygonum sp.	Smartweed	Po
Potamogeton amplifolius	Large-leaf	Pa
Potamogeton crispus	Curly-leaf pondweed	Pc
Potamogeton epihydrus	Ribbon-leaf pondweed	Pe
Potamogeton gramineus	Variable pondweed	Pg
Potamogeton illinoensis	Illinois pondweed	Pi
Potamogeton natans	Floatingleaf pondweed	Pn
Potamogeton pusillus	Thin-leaf pondweed	Pp
Potamogeton robbinsii	Pondweed	Pr
Potamogeton zosteriformis	Flat-stem pondweed	Pz
Utricularia gibba	Creeping bladderwort	Ug
Utricularia vulgaris	Common bladderwort	Uv
Valisneria americana	Wild celery/Tapegrass	Va
Wolffia sp.	Watermeal	W
Zosterella (Heteranthera) dubia	Water stargrass	Hd / Zd

TABLE 3 - COMPLETE FREQUENCY OF OCCURRENCE BY SPECIES AND LAKE BASIN

Macrophyte Species	Common Name	Abbreviation	Lily Pond				Main Basin				Little Pond			
			2001 pre	2004 YOT	2005 YAT	2006 2YAT	2001 pre	2004 YOT	2005 YAT	2006 2YAT	2001 pre	2004 YOT	2005 YAT	2006 2YAT
Brasenia schreberi	Watershield	B	4.2%	4.2%	0.0%	0.0%	0.0%	0.8%	0.8%	2.3%	14.0%	30.2%	30.2%	23.3%
Ceratophyllum demersum	Coontail	Cd	70.8%	4.2%	50.0%	45.5%	10.9%	10.9%	6.2%	7.0%	20.9%	0.0%	2.3%	9.3%
Chara sp. / Nitella sp.	Muskgrass	Ca	0.0%	0.0%	0.0%	4.5%	1.6%	17.1%	62.0%	57.4%	7.0%	4.7%	0.0%	4.7%
Chlorophyta	Filamentous green algae	Fa	0.0%	29.2%	95.8%	31.8%	0.0%	43.4%	14.7%	3.1%	7.0%	20.9%	20.9%	4.7%
Eleocharis sp.	Spikerush	Eo	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.7%	4.7%	4.7%	0.0%
Elodea canadensis	Waterweed	Ec	29.2%	0.0%	8.3%	0.0%	27.9%	0.0%	0.0%	0.8%	46.5%	4.7%	0.0%	0.0%
Isoetes sp.	Quillwort	I	0.0%	4.2%	0.0%	0.0%	2.3%	8.5%	0.8%	6.2%	0.0%	0.0%	4.7%	2.3%
Lemna minor	Duckweed	L	45.8%	8.3%	0.0%	4.5%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Megalodonta beckii	Water marigold	Mb	0.0%	0.0%	0.0%	0.0%	1.6%	0.0%	0.0%	0.0%	7.0%	0.0%	0.0%	0.0%
Myriophyllum spicatum - dead	Eurasian watermilfoil	DMs	0.0%	0.0%	0.0%	0.0%	0.0%	64.3%	0.0%	0.0%	0.0%	11.6%	0.0%	0.0%
Myriophyllum spicatum - viable	Eurasian watermilfoil	Ms	79.2%	8.3%	33.3%	0.0%	98.4%	0.0%	14.7%	35.7%	88.4%	0.0%	16.3%	39.5%
Najas flexilis	Naiad / bushy pondweed	Nf	4.2%	0.0%	0.0%	0.0%	19.4%	0.0%	12.4%	56.6%	39.5%	0.0%	0.0%	4.7%
Nuphar variegatum	Yellow waterlily	Nu	16.7%	16.7%	16.7%	0.0%	0.8%	0.0%	0.0%	0.8%	9.3%	14.0%	11.6%	7.0%
Nymphaea odorata	White waterlily	Ny	62.5%	16.7%	29.2%	9.1%	3.1%	1.6%	2.3%	3.1%	30.2%	9.3%	25.6%	30.2%
Polygonum sp.	Smartweed	Po	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%
Potamogeton amplifolius	Large-leaf	Pa	33.3%	100.0%	91.7%	77.3%	28.7%	14.7%	25.6%	34.1%	44.2%	72.1%	69.8%	76.7%
Potamogeton crispus	Curly-leaf pondweed	Pc	4.2%	4.2%	4.2%	4.5%	1.6%	0.0%	9.3%	5.4%	0.0%	0.0%	0.0%	2.3%
Potamogeton epihydrus	Ribbon-leaf pondweed	Pe	0.0%	12.5%	4.2%	0.0%	2.3%	3.1%	5.4%	2.3%	0.0%	11.6%	14.0%	7.0%
Potamogeton gramineus	Variable pondweed	Pg	16.7%	0.0%	8.3%	0.0%	17.8%	0.0%	4.7%	1.6%	41.9%	4.7%	9.3%	23.3%
Potamogeton illinoensis	Illinois pondweed	Pi	0.0%	4.2%	8.3%	9.1%	6.2%	0.8%	0.8%	8.5%	0.0%	0.0%	0.0%	9.3%
Potamogeton natans	Floatingleaf pondweed	Pn	0.0%	0.0%	0.0%	9.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Potamogeton pusillus	Thin-leaf pondweed	Pp	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.4%	0.0%	0.0%	0.0%	2.3%
Potamogeton robbinsii	Pondweed	Pr	95.8%	91.7%	95.8%	95.5%	31.0%	65.1%	82.2%	62.0%	88.4%	100.0%	100.0%	100.0%
Potamogeton zosteriformis	Flat-stem pondweed	Pz	58.3%	8.3%	62.5%	0.0%	24.0%	2.3%	31.0%	41.9%	23.3%	2.3%	4.7%	4.7%
Utricularia gibba	Creeping bladderwort	Ug	0.0%	0.0%	0.0%	40.9%	0.0%	0.0%	0.0%	0.0%	7.0%	0.0%	2.3%	0.0%
Utricularia vulgaris	Common bladderwort	Uv	29.2%	37.5%	0.0%	27.3%	0.8%	0.8%	0.8%	0.0%	16.3%	18.6%	7.0%	11.6%
Valisneria americana	Wild celery/Tapegrass	Va	33.3%	45.8%	0.0%	0.0%	14.0%	3.1%	0.8%	3.1%	72.1%	25.6%	7.0%	9.3%
Wolffia sp.	Watermeal	W	0.0%	0.0%	0.0%	4.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Zosterella (Heteranthera) dubia	Water stargrass	Hd / Zd	4.2%	0.0%	37.5%	0.0%	0.0%	0.8%	4.7%	11.6%	2.3%	2.3%	4.7%	0.0%

TABLE 3 - COMPLETE FREQUENCY OF OCCURRENCE BY SPECIES AND LAKE BASIN

Macrophyte Species	Common Name	Abbreviation	Total			
			2001 pre	2004 YOT	2005 YAT	2006 2YAT
Brasenia schreberi	Watershield	B	3.6%	7.7%	7.1%	6.7%
Ceratophyllum demersum	Coontail	Cd	20.4%	7.7%	10.7%	11.9%
Chara sp. / Nitella sp.	Muskgrass	Ca	2.6%	12.2%	40.8%	39.7%
Chlorophyta	Filamentous green algae	Fa	1.5%	36.7%	26.0%	6.7%
Eleocharis sp.	Spikerush	Eo	1.0%	1.0%	1.0%	0.0%
Elodea canadensis	Waterweed	Ec	32.1%	1.0%	1.0%	0.5%
Isoetes sp.	Quillwort	I	1.5%	6.1%	1.5%	4.6%
Lemna minor	Duckweed	L	6.6%	1.0%	0.0%	0.5%
Megalodonta beckii	Water marigold	Mb	2.6%	0.0%	0.0%	0.0%
Myriophyllum spicatum - dead	Eurasian watermilfoil	DMs	0.0%	44.9%	0.0%	0.0%
Myriophyllum spicatum - viable	Eurasian watermilfoil	Ms	93.9%	1.0%	17.3%	32.5%
Najas flexilis	Naiad / bushy pondweed	Nf	21.9%	0.0%	8.2%	38.7%
Nuphar variegatum	Yellow waterlily	Nu	4.6%	5.1%	4.6%	2.1%
Nymphaea odorata	White waterlily	Ny	16.3%	5.1%	10.7%	9.8%
Polygonum sp.	Smartweed	Po	0.0%	0.0%	0.0%	0.5%
Potamogeton amplifolius	Large-leaf	Pa	32.7%	37.8%	43.4%	48.5%
Potamogeton crispus	Curly-leaf pondweed	Pc	1.5%	0.5%	6.6%	4.6%
Potamogeton epihydrus	Ribbon-leaf pondweed	Pe	1.5%	6.1%	7.1%	3.1%
Potamogeton gramineus	Variable pondweed	Pg	23.0%	1.0%	6.1%	6.2%
Potamogeton illinoensis	Illinois pondweed	Pi	4.1%	1.0%	1.5%	8.8%
Potamogeton natans	Floatingleaf pondweed	Pn	0.0%	0.0%	0.0%	1.0%
Potamogeton pusillus	Thin-leaf pondweed	Pp	0.0%	0.0%	0.0%	4.1%
Potamogeton robbinsii	Pondweed	Pr	51.5%	76.0%	87.8%	74.2%
Potamogeton zosteriformis	Flat-stem pondweed	Pz	28.1%	3.1%	29.1%	28.9%
Utricularia gibba	Creeping bladderwort	Ug	1.5%	0.0%	0.5%	4.6%
Utricularia vulgaris	Common bladderwort	Uv	7.7%	9.2%	2.0%	5.7%
Valisneria americana	Wild celery/Tapegrass	Va	29.1%	13.3%	2.0%	4.1%
Wolffia sp.	Watermeal	W	0.0%	0.0%	0.0%	0.5%
Zosterella (Heteranthera) dubia	Water stargrass	Hd / Zd	1.0%	1.0%	8.7%	7.7%

Lake St. Catherine

Poultney & Wells, VT

Transects & Data Point Locations
for Vegetation Survey

FIGURE:	SURVEY DATE:	MAP DATE:
1	9/19 - 9/20/06	11/2/06

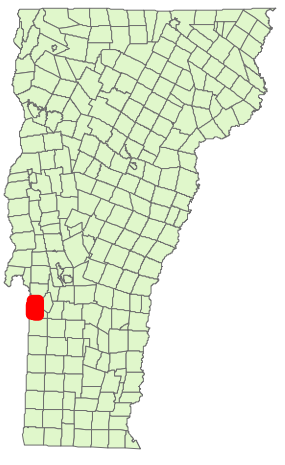
Legend

Data point locations recorded with GPs unit during ACT/ ReMetrix 2001 survey. Sampling replicated during ACT 2006 survey. Data points relocated with DGPS unit with sub-meter accuracy.

Transects recorded during ACT/ ReMetrix 2001 survey using DGPS.

N
W E
S

0 500 1,000 2,000 3,000
Feet



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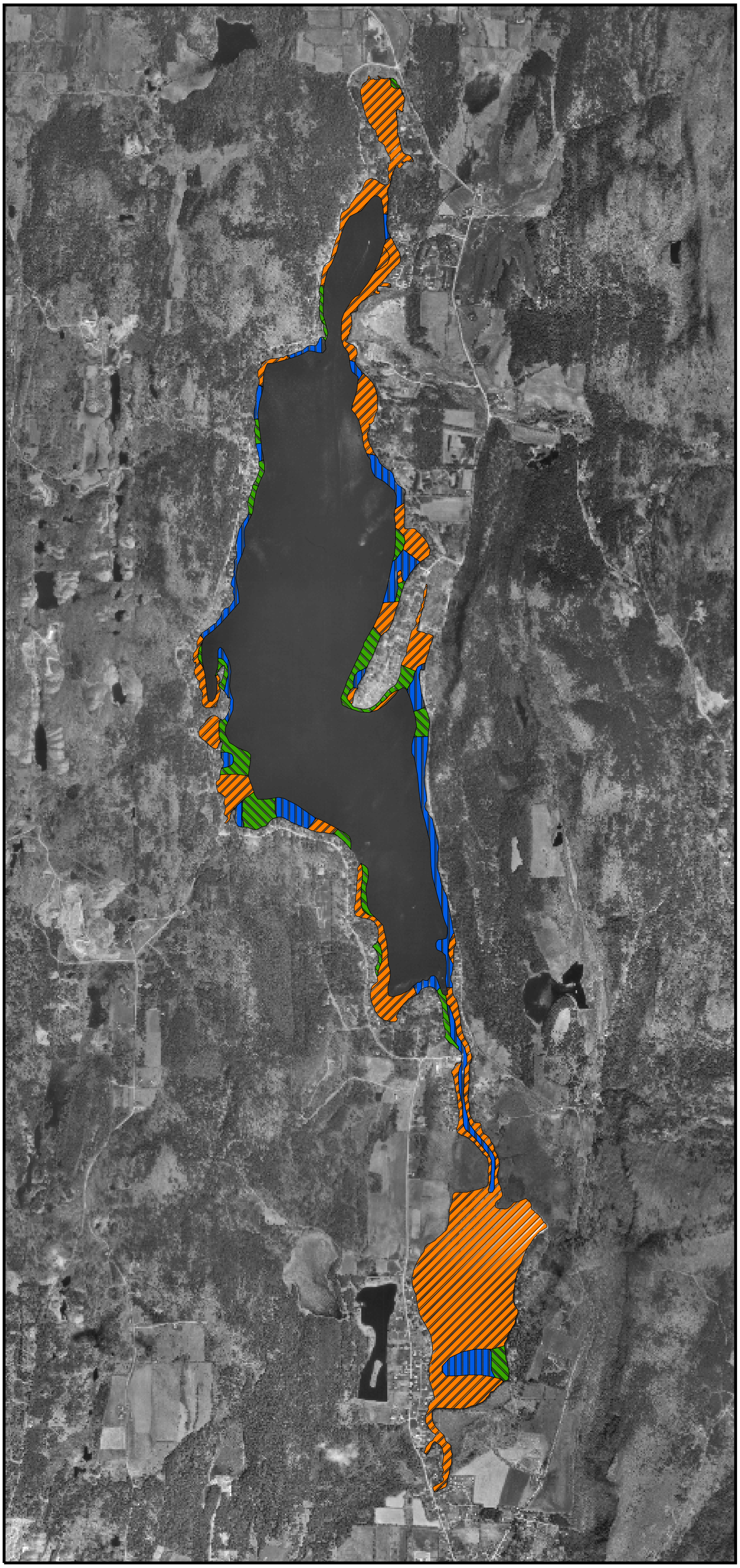


Lake St. Catherine

Poultney & Wells, VT

2006 Vegetation Distribution

FIGURE:	SURVEY DATE:	MAP DATE:
2	9/19 - 9/20/06	11/2/06

Legend

High Density (>70% cover) mixed species - Robbins pondweed, largeleaf pondweed, flat-stem pondweed, Eurasian watermilfoil, coontail, stonewort & muskgrass (with other scattered native species at low density)

Medium Density (40-70% cover) mixed species - Robbins pondweed, largeleaf pondweed, stonewort/ muskgrass flat-stem pondweed, naiad, & filamentous algae (with other scattered native species at low density)

Low Density (5-40% cover) mixed species - Robbins pondweed, large-leaf pondweed, stonewort/ muskgrass, flat-stem pondweed, naiad, & filamentous algae (with other scattered native species at low density)

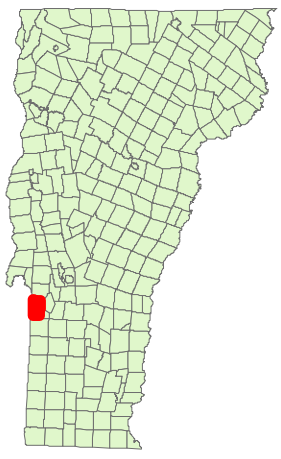
N

W E

S

0 500 1,000 2,000 3,000

Feet



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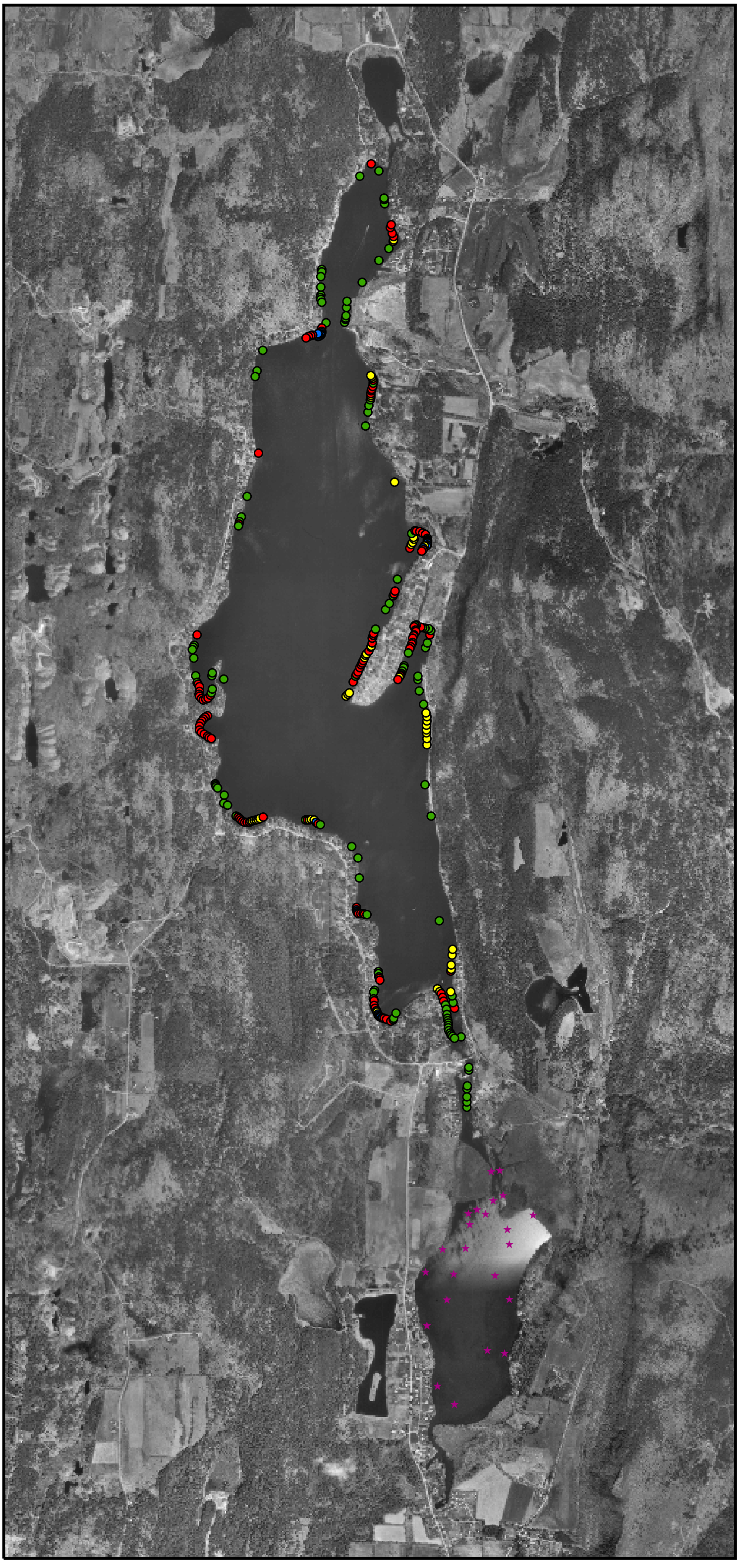


Lake St. Catherine

Poultney & Wells, VT

2006 Eurasian Watermilfoil Cover

FIGURE:	SURVEY DATE:	MAP DATE:
3	9/19 - 9/20/06	11/2/06

Legend

DGPS locations of Eurasian watermilfoil recorded on 9/20/06

- 1-10 plants observed
- 10-25 plants observed
- 25-50 plants observed
- >50 plants observed
- ★ Estimated cover of Eurasian watermilfoil in Little Lake.

NOTES:

No milfoil plants observed in main body of Lily Pond. Widely scattered milfoil plants seen at the southern end of the canal leading to Lake St. Catherine.

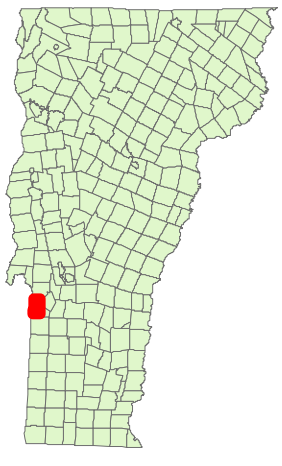
N

W E

S

0 500 1,000 2,000 3,000

Feet



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Lake St. Catherine

Poultney & Wells, VT

2006 Lily Pond Treatment Map

FIGURE:	TREATMENT DATE:	MAP DATE:
4	6/21/06	11/2/06

Legend

2006 Renovate treatment area (approx. 20 acres)

N

0 100 200 400 600 800 1,000 Feet

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Lake St. Catherine

Poultney & Wells, VT

2006 Little Lake Treatment Map

FIGURE:	TREATMENT DATE:	MAP DATE:
5	6/21/06	11/2/06

Legend

2006 Renovate treatment area (approx. 10 acres)

N

0 200 400 800 1,200 1,600 2,000 2,400 Feet

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Lake St. Catherine

Poultney & Wells, VT

2007 Proposed Management Areas

FIGURE:	TREATMENT DATE:	MAP DATE:
6	2007	11/2/06

Legend

N

Proposed 2007 suction harvest areas approved under DEC Permit # 2006-H07

Potential 2007 Renovate treatment areas

0 500 1,000 2,000 3,000 4,000 5,000 Feet

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APPENDIX B

- 2006 Renovate Treatment – Post-Treatment Survey Report, ACT, Inc., 08/25/06

AQUATIC CONTROL TECHNOLOGY, INC.
POND AND LAKE MANAGEMENT SPECIALISTS

August 25, 2006

Mr. Jim Canders, President
Lake St. Catherine Association
Wells, Vt. 05774

Re: Report on Inspection of Milfoil Areas Treated with Renovate 3 Aquatic Herbicide and Overview Inspection/Survey of Milfoil Throughout the Lake St. Catherine System.

Dear Jim:

This report presents the findings of our inspections of the two areas that were chemically treated with Renovate 3 aquatic herbicide on June 21st along with an "overview inspection" of milfoil growth throughout the rest of the Lake St. Catherine system. I performed this inspection/survey on August 8th from our Airboat and was accompanied by Shaun Hyde from SePRO and Martin Greenberg from the Association. We met Susan Jary and Ann Bove from VT DEC (in their boat) to take a look at the Lily Pond area of the lake system.

While the weather was generally pleasant (warm and partly sunny) on the day of our inspection, it was relatively windy and the water surface was "choppy" throughout the main body of St. Catherine. The choppy water surface, impeded visibility into the water in portions of the southern lake but water clarity and visibility from our elevated position in the Airboat was good in Lily Pond, Little Lake and the northern portion and coves of the main lake.

Our inspection was primarily qualitative in scope. Throughout the two treatment areas, we made a number of passes with the Airboat across Lily Pond and Little Lake as well as traveling around the entire shoreline of each waterbody. In Lake St. Catherine itself, we circumvented the entire shoreline in a "zig-zag" pattern, out to maximum water depths in the range of 15-20 feet. Shaun and I visually noted and marked some areas of milfoil and commented on the native plant growth as well. Some of the larger areas of milfoil were recorded with a "hand-held" GPS Unit. A map accompanies this report that shows the locations for some of these milfoil areas, however, there were too many "single" plants or very small groups of milfoil plants to plot with GPS. The GPS coordinates are also provided for your reference and use.

Inspection of Lily Pond Treatment Area:

We found no viable Eurasian watermilfoil in Lily Pond, other than in the "finger-like" cove located in the far southeast portion of the pond. At the very end of this shallow cove, we observed some widely scattered milfoil, along with some scattered water chestnut (*Trapa natans)* and a "patch" of chestnut estimated at roughly 6 feet by 10 feet in area. This was brought to the attention of VT DEC along with Chris Sheldon, whom performs the Diver hand-pulling operation. We understood that Chris was going to hand-pull this water chestnut the very next day. Tim Hunt from VT DEC also recently mentioned to me that he had recently checked out and visited this cove as well, and had hand-pulled a number of additional chestnut plants.

The application of Renovate provided excellent control of invasive milfoil throughout Lily Pond. No viable milfoil was seen anywhere other than in this far southern cove. The milfoil we found there was very sparse and mixed in with so many native plants and in such shallow, murky colored waters, that hand-pulling it would be difficult. We'd give this area a low priority for hand-pulling, since the milfoil is well confined to the far end of this cove and isolated from the rest of Lily Pond. If an attempt was made to hand-pull these plants, the use of a canoe or kayak is recommended to minimize disturbance of the fine silt sediments and allow for precise milfoil removal

The submersed plant population in Lily Pond was observed to be abundant and reasonably diverse throughout most of the pond. Several species or more of pondweed (*Potamogeton* spp.) could be found, along with lesser amounts of coontail, water stargrass, bladderwort, tapegrass and other plants. The waterlilies (*Nymphaea*, *Nupha*r and *Brasenia*) and pickerelweed were impacted by the Renovate treatment and their cover was substantially reduced post-treatment. New growth of lilies was already evident, however, in some areas of Lily Pond and we'd anticipate the lily population and pickerelweed would soon recover.

Inspection of Little Lake Treatment Area:

No viable milfoil was seen throughout the Renovate treatment area in Little Lake. The submersed plant community was even more robust than was observed in Lily Pond. No impact was seen to the emergent plant population found near-shore. While evidence of some "stress" (i.e. yellowing of the leaves and twisting of stems) could be seen on some of the waterlilies, the overall impact of the Renovate treatment on the native plant community appeared to be minor throughout this treatment area.

The scattered milfoil observed several hundred feet southeast of the Little Lake treatment plot on June 21st, was not observed on the Aug. 8th survey. Analysis of the Renovate residue data suggests the movement of triclopyr southeast of the treatment plot appears to have provided enough concentration and exposure (LP02, 0.225ppm and LP03, 0.174ppm, seven days after treatment) to control the milfoil several hundred feet southeast of the 10 acre target area. Along the far western and southern edge (but just outside) of the treatment area, some scattered and more numerous "patches" of invasive milfoil still remained post-treatment. Unlike the enclosed conditions at Lily Pond, the more open and relatively small treatment area in Little Lake resulted in far more rapid dilution of the Renovate that had been anticipated during the pre-treatment project planning. This was also confirmed by the more rapid dissipation of Renovate residues/concentrations as seen in the post-treatment water testing program (LP04 & LP05 non-detectable concentrations 24 and seven days post-treatment). Inflow from St. Catherine's that enters Little Lake via the channel, passes close to the western edge of the treatment area. This pattern of water movement, did result in added dilution of Renovate in these areas and minor injury to milfoil.

Very little milfoil (other than just beyond the bounds of the treatment area) was found throughout the rest of Little Lake. We made at least 8-10 passes across Little Lake, in addition to inspecting the shoreline. Native plant cover and biomass remained high. In fact, we'd say that the northern two-thirds to three-quarters of Little Lake were nearly 100% covered with native plants (*Potamogeton* spp.,dominant), growing either to the water surface or generally within 2-3 feet of the surface. We would not be surprised to learn of resident concerns and complaints over the continuing (or even expanding) abundance of native plants in Little Lake since the 2004 Sonar treatment program. Throughout the southern portion of Little Lake, the percent of plant cover declines somewhat, perhaps due in part to a change in bottom type and other factors.

Overview Inspection of Lake St. Catherine:

Our inspection of the main lake, started at the State Boat Launch in the State Park and continued counter clockwise around the entire lake shoreline. Scattered milfoil was observed in the general area off the State Boat Launch. This milfoil should be hand-pulled soon to prevent fragmentation and spread of milfoil in this area of high boat traffic and to prevent potential infestation to other waterbodies nearby from boats and boat trailers leaving the lake.

Continuing northeast from the Boat Launch, widely scattered single plants or "clumps" of a few milfoil plants could be seen at varying intervals and locations until entering the "narrows" and the North Basin. Along the eastern shoreline of the North Basin, widely scattered and small single or multiple plants of milfoil were observed but this milfoil was typically mixed-in with pondweed or other native submersed or floating-leaved species. The abundance of native plant cover in these areas should help retard the rapid spread of milfoil. We therefore give this area a relatively low priority in terms of Diver hand-pulling, knowing that Diver availability and funds spent on professional Divers needs to be prioritized lake-wide. We naturally encourage careful hand-pulling of invasive milfoil by all property owners, especially along their waterfront areas.

Milfoil was observed to be very sparse along the entire western shoreline of the North Basin. The steep drop-off and rocky shoreline are not conducive to extensive plant growth, which also helps to reduce the amount of milfoil there. Continuing in a counter-clockwise direction and into the main body of the lake, milfoil appeared to be generally sparse. We did note some scattered milfoil in water depths of about 8-12 feet, off a red colored camp with a flag-pole, located several properties to the east of Phil Pope's home.

Continuing along the rocky and steep ledge western shoreline, milfoil continued to be sparse. We fully expect that some milfoil occurs in deeper water and encourage property owners to inspect their areas via mask and snorkel. While the water may be too deep to hand-pull milfoil without SCUBA equipment, the homeowner should be able to see the milfoil from above and alert the Association of the need for Diver's to hand-pull these areas. Several homes to the north of Jeff Crandall, we observed some scattered milfoil in deeper water.

Both Oxbow Bay and Horseshoe Bay, near the Poultney/Wells town line, were found to contain some scattered milfoil. We saw more milfoil in these two bays than along the steep/rocky shoreline to the north, which may have been in-part a function of shallower water depths and calm water that provided better visibility in these coves. None of the milfoil growth that we saw was comprised of more than a handful to a couple dozen or so plants in any one area.

We did not find much milfoil in Atwater Bay, however, this area should be frequently checked, since milfoil was very abundant there prior to the 2004 Sonar treatment program. The milfoil in Atwater Bay in 2004 also extended well out from shore (probably out to 600 feet or more in some areas) prior to treatment. In the southeast portion of the Bay, we took note of a sizable, fairly dense area of milfoil (estimated at 20 by 40 feet or larger) located between a white and yellow cottage and marked by GPS. Along the remaining western, southern and southeast shoreline, milfoil appeared to be fairly sparse. The strong southerly wind and wave action made visibility even more difficult in these locations. Some scattered milfoil was observed in Forest House Bay and the far southern end of the lake, just north of the bridge.

We came across Chris Sheldon and an assistant, hand-pulling milfoil in Hall's Bay, to the east of Cone Point Rd. Chris had indicated they'd worked there already for two or three days.

Considerable milfoil still remained in this bay, estimated at several hundred plants that were widely dispersed and scattered throughout. Native plant growth was abundant and near the surface, making it even more difficult for the Divers to find this milfoil, located in and amongst the native plants. While we're not being critical of Chris what-so-ever, we do question whether time spent hand-pulling at other locations throughout the lake might be more effective in reducing the spread of milfoil lake-wide.

Milfoil appeared to be sparse along the rest of the eastern shoreline except for the large area of milfoil located off the new large home, situated in the cove near Cold Spring Lane. Shaun and I estimated the overall area of the milfoil in this cove at perhaps up to two acres or larger. It had been described to us previously at covering perhaps in the range of just 5,000 sq. ft. While the percent cover of milfoil varies widely over these two acres, milfoil cover probably averages somewhere in the range of 25% or more. This area of milfoil is undoubtedly too large to affordably cover with bottom weed barrier. It has been discussed that perhaps Suction Harvesting would be a good technique to be used in this area. That may be the case; however, we strongly suggest the Association thoroughly explore the anticipated effectiveness, along with the time and cost for suction harvesting. Chris along with VT DEC can provide you with the names of several lakes and contact persons to speak with regarding this management technique. Renovate treatment may possibly be a more suitable management technique for Lake St. Catherine in areas like this cove and perhaps in Hall's Bay as well. Both coves are relatively sheltered; therefore, Renovate should work well.

Recommendations:

In view of the Renovate 3 treatment results discussed above and the findings of our milfoil inspection/survey for the Lake St. Catherine system, we make the following recommendations.

- Professional Diver hand-pulling should aggressively continue through the balance of the summer or until the milfoil begins to "senesce" and the plants begin to break apart. You should consult with Chris Sheldon and staff at VT DEC on how far into the fall would hand-pulling be effective.
- Notwithstanding the Association's need to fairly allocate the financial contributions it receives from residents and groups around the entire lake, professional Diver hand-pulling should be concentrated more-so in lake areas subject to more rapid expansion and spread of milfoil. These "higher priority" areas and /or conditions would specifically include hand-pulling in shallow waters, subject to high recreational use and boat activity. Spending large amounts of time hand-pulling widely scattered milfoil in areas of dense, native plant cover may not be cost/effective seeing how the milfoil is less likely to spread in such areas and considerable cost is incurred for the Divers to just swim and search for the milfoil. To the extent possible, continue to maximize the use of volunteers to inspect the lake system and mark areas of milfoil for the Divers to pull.
- Given the limited financial resources of any lake association to pay for professional Divers, continue to encourage and train lake residents and volunteers to be able to identify and carefully hand-pull invasive milfoil, where and when possible.
- Consult with VT DEC and several other lakes in VT whom have built and operated suction harvesting equipment, before the Association decides to proceed with this technique at St. Catherine and build its own machine. We expect you will hear widely divergent opinions as to the techniques effectiveness, cost, and impacts on non-target plants and animals and so-on.
- Consider the use of bottom weed barrier for control of dense native plant cover along private, small beach front areas in Little Lake and other areas throughout the Lake St.

Catherine system. The Association could purchase Aquascreen in bulk quantities at significant discounts and have it available for purchase by the willing participants. Permitting for bottom weed barriers should also be discussed with DEC.

- Renovate treatment in 2007 of the cove near Cold Spring Lane and in Hall's Bay should be considered and compared with Diver hand-pulling and/or suction harvesting, with respect to effectiveness and cost. We recommend a closer inspection of these two areas of milfoil be made in September and a meeting held that same day with representation from DEC, myself or Marc Bellaud, Chris Sheldon, Shaun Hyde and naturally yourself and others from the Association, in order to openly and candidly discuss these options and reach consensus for next year's milfoil management program. Shaun may be unavailable to meet, in view of the imminent birth of their first child; however, it's very important all the other parties be represented.

Marc has scheduled his annual, comprehensive Transect Plant Survey of the Lake for Sept. 19th and 20th. That survey and year-end report to follow, will provide you with continuing quantitative data and information on the lake's plant community. Thank you.

Sincerely,

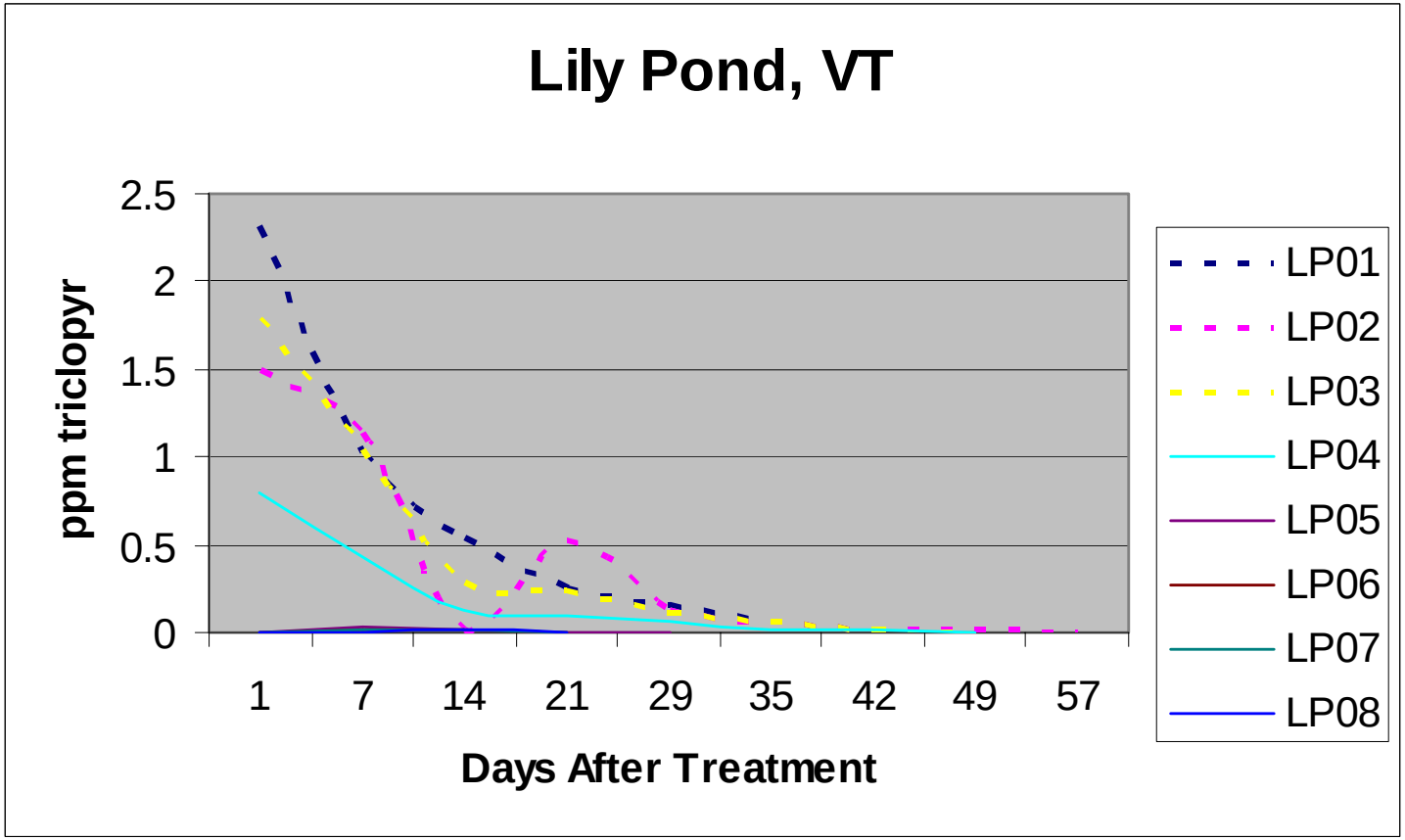
AQUATIC CONTROL TECHNOLOGY, INC.

Gerald N. Smith
President/Aquatic Biologist

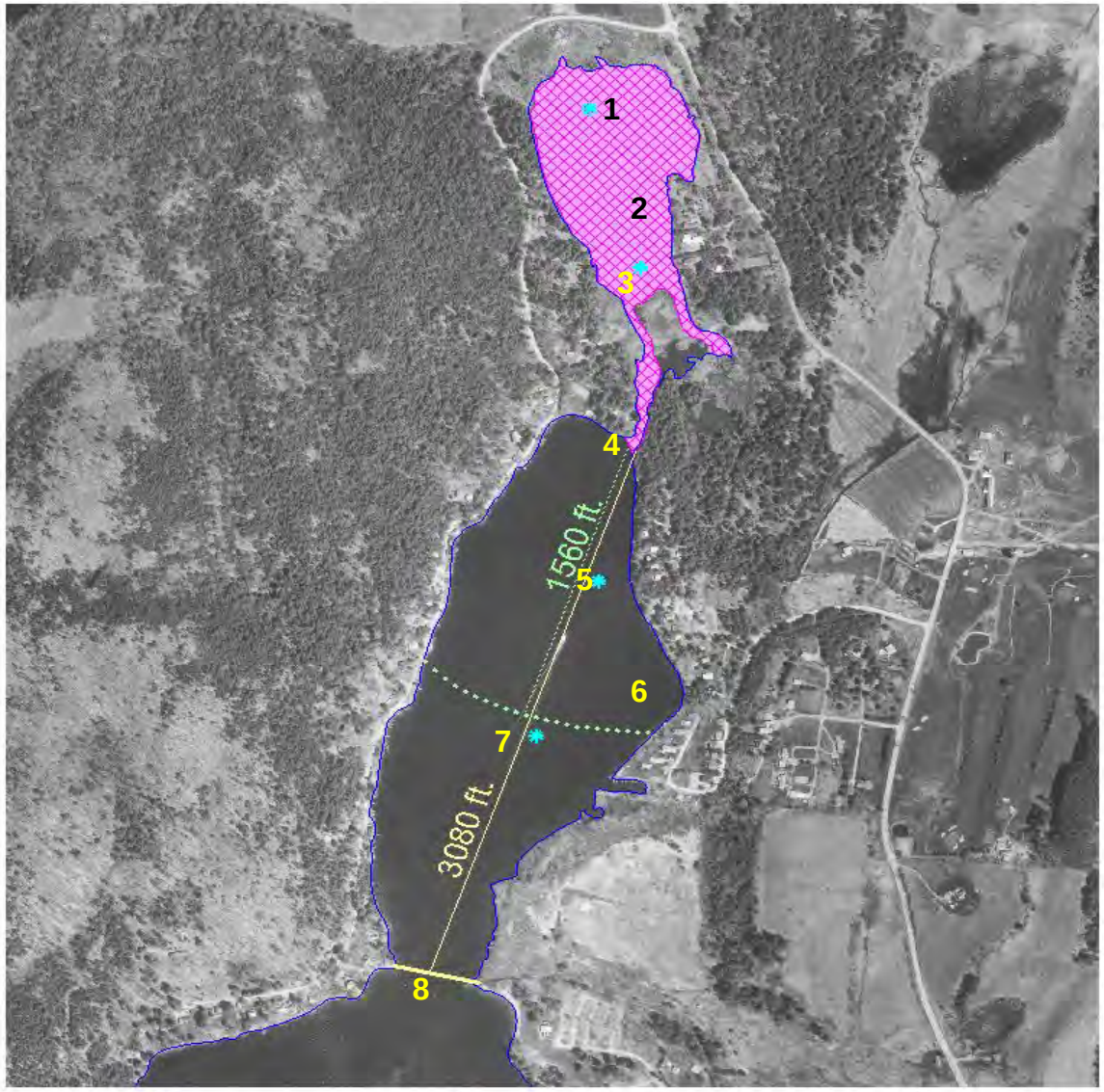
cc: Shaun Hyde, SePRO Corp.

APPENDIX C

- 2006 Renovate Treatment – Triclopyr Analysis Summary, prepared by
  Shaun Hyde, Northeast Aquatic Specialist, SePRO Corporation



- **Target 1.5 ppm**
- **Potable MCL (< 0.4 ppm),** LP05-08 **24hrs**, LP01,03,04 **21 DAT**, LP02 **29 DAT**
- **Non-detect**, LP07, LP08 **21 DAT**
  LP05, 06 **29 DAT**
  LP01-04 **49-57 DAT**



N
W E
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Lake St. Cathrine

Lily Pond Setback Distances for Proposed 2006 Renovate Treatment

FIGURE	MAP DATE
R1	1/18/06

LEGEND

- Lily Pond -- Proposed Renovate Treatment Area (~20 acres)
- Required setback from potable water intakes per EPA label for Renovate 3
- Additional proposed potable water intake and irrigation restriction setback
- Proposed Renovate sampling points

500 0 500 1000 Feet

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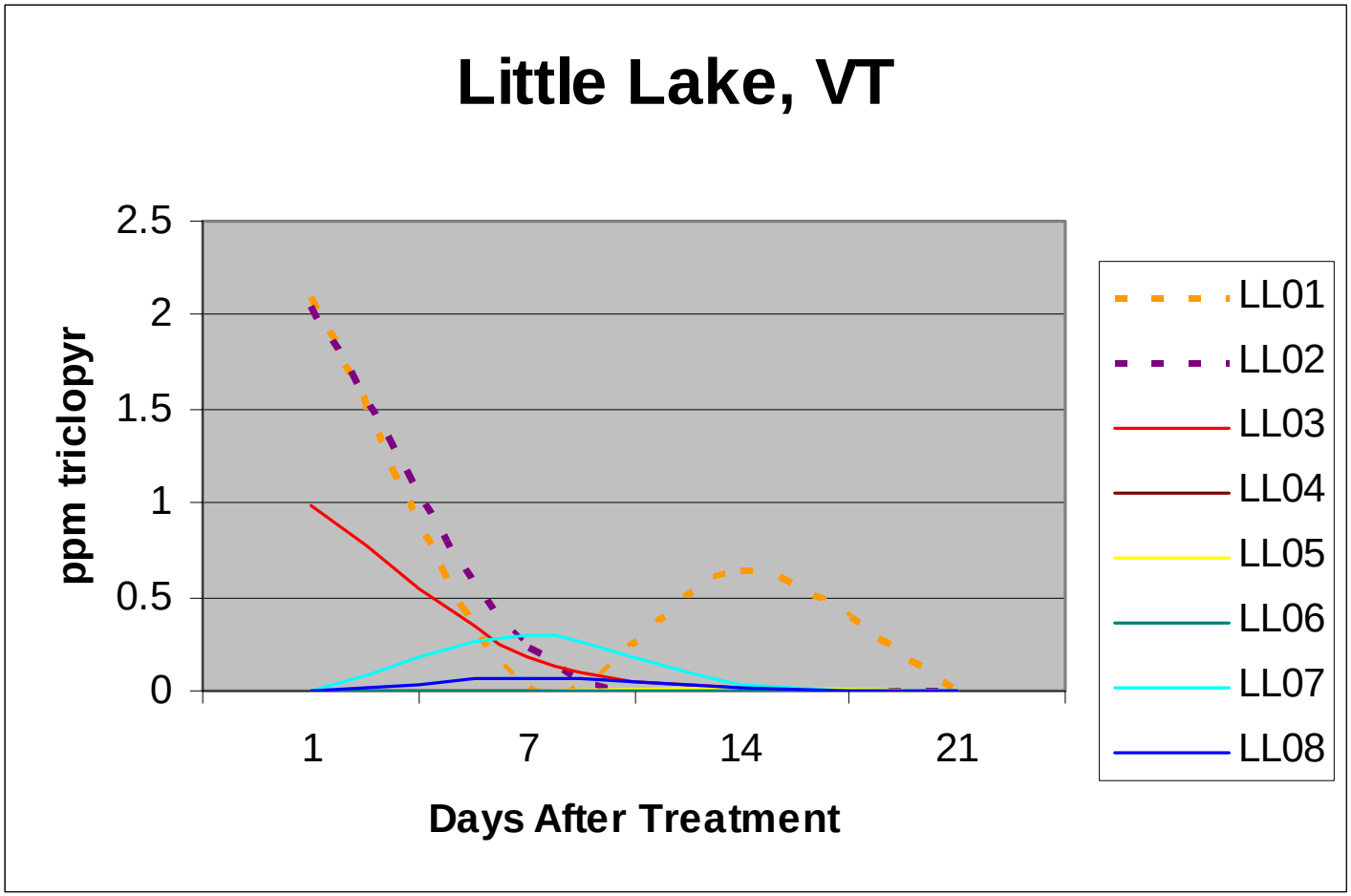
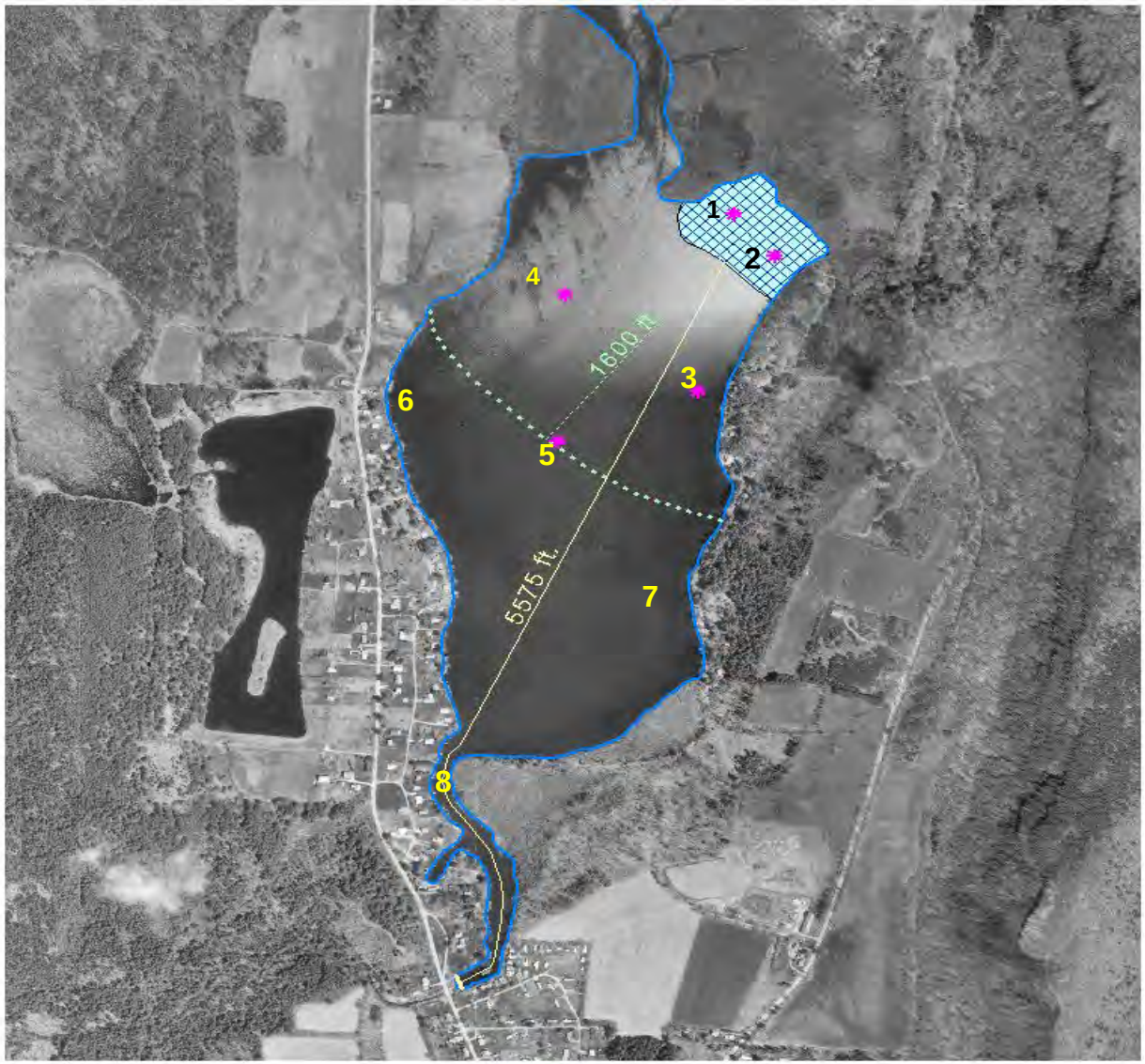


- **Target 1.75 ppm** *(theoretical whole lake 0.091 ppb)*
- **Potable MCL (, 0.4 ppm),** LL03-08 within **24 hrs**
  LL02 within **7 DAT**,
  LL01 reached **21 DAT ***
- **Non-detect**, all sites within 21 DAT



N
W E
S

Lake St. Cathrine

Little Lake Setback Distances for Proposed 2006 Renovate Treatment

FIGURE	MAP DATE
R2	1/18/06

LEGEND

- Little Lake -- Proposed Renovate Treatment Area (~10 acres)
- Required setback from potable water intakes per EPA label for Renovate 3
- Additional proposed potable water intake and irrigation restriction setback
- Proposed Renovate sampling points

500 0 500 1000 1500 Feet

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