LAKE ST CATHERINE
AQUATIC VEGETATION MANAGEMENT PROGRAM
2012 ANNUAL REPORT

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INTRODUCTION

The 2012 season marked the ninth year of Aquatic Control's involvement in the Integrated Management Plan at Lake St. Catherine aimed at the control of non-native Eurasian watermilfoil in the lake. Milfoil management efforts under this plan were initiated in 2004 with a whole-lake Sonar (fluridone) herbicide treatment program. Management efforts following the 2004 Sonar herbicide application have been focused on controlling milfoil in problematic and high-priority areas of the lake using area-specific spot-treatments with Renovate (triclopyr) herbicide and diver assisted suction harvesting and hand-pulling.

Management actions in 2012 included spot-treatment of five areas in the Main Lake and Little Lake that totaled approximately 63 acres, as well as diver hand-pulling and diver assisted suction harvesting. These efforts were consistent with the current five-year Integrated Management Plan (2009-2013). The following report summarizes the results of 2012 Treatment Program and details findings from the late season comprehensive aquatic plant survey. Recommendations for the 2013 season have also been included based on the results of the work performed in 2012. Specific information on the 2012 diver hand-pulling and diver assisted suction harvesting efforts will be provided by the Lake St. Catherine Association (LSCA) under a separate cover.

HERBICIDE TREATMENT PROGRAM - 2012

Program Chronology

A chronology of the 2012 treatment program is provided below:

- DEC permit issuance (ANC 2009-C02)..... May 2009
- Pre-treatment inspection and finalize treatment areas..... May 17
- Treatment of approximately 63.1 acres with Renovate OTF ..... June 13
- Herbicide residue monitoring.....June 16, June 24 & August 18
- Post-treatment inspection..... August 9
- Comprehensive aquatic plant survey .....September 27 & 28

Pre-Treatment Inspection

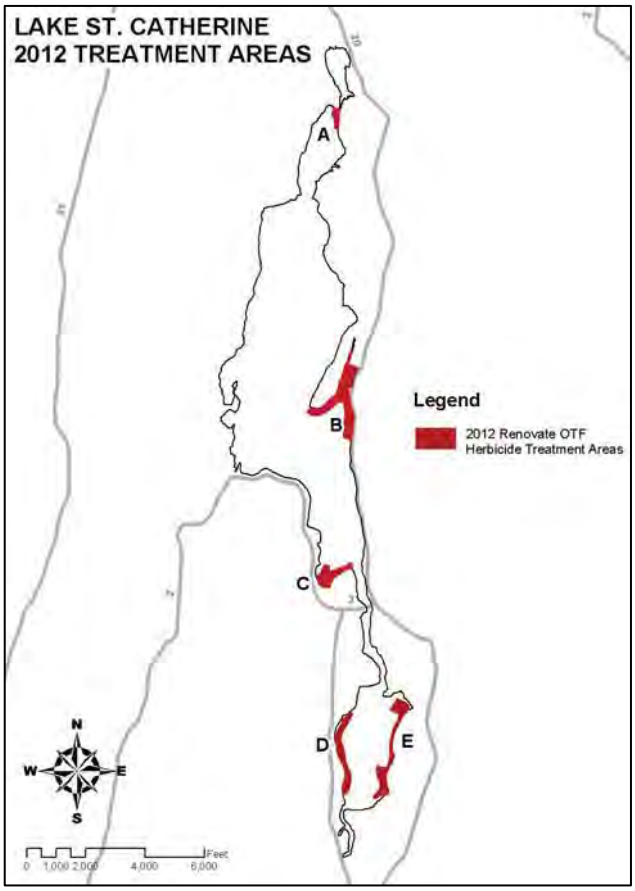
On May 17, 2012 the entire shoreline littoral area of Lake St. Catherine (Lily Pond, Main Lake and Little Lake) was surveyed by Aquatic Control Technology to determine the stage of milfoil growth and to make adjustments to the 2012 treatment scope. Results of the survey were communicated to LSCA for their input and final determination on proposed treatment areas.

Water temperatures ranged from 14.6 °C (58 °F) at the surface to 12.5 °C (54 °F) at a depth of 6 meters. Milfoil growth Little Lake and Main Lake showed was actively growing and was generally within 2-3 feet of the surface.

Ultimately five areas totaling approximately 63.1 acres were targeted for treatment (Figure 1). Consistent with previous years, each treatment area was evaluated with regards to milfoil cover/distribution as well as several other factors including: the potential for increased milfoil spread; the potential for effective treatment; and the overall benefit of milfoil control with respect to the lake, lake residents and other potential users. A final treatment map was provided to DEC for review and approval. Initially, 67.5 acres were proposed for treatment, but the treatment area on the east shore of Little Lake was reduced to maintain a 100-foot no-treatment buffer around the recently installed aeration system.

Summary of 2012 Treatment

The final treatment scope included five treatment areas ranging in size from 2.7 acres to 25.4 acres and totaling 63.1 acres. The largest block of treatment was located in Hall's Bay (Area B) along the eastern shore and the immediate shoreline areas to the southeast and southwest of the cove. This area was targeted to reduce the potential for milfoil fragmentation in this area of high boat traffic.



Partial treatment of Little Lake was performed along the developed east and west shores. The east shore treatment area (Area E) was modified to maintain a 100-foot no-treatment buffer around the diffuser aeration system that had recently been installed in the lake. Area E was reduced by approximately 4.4 acres

The treatment date of Wednesday, June 13, 2012 was selected to allow enough time to comply with the notification requirements of ANC Permit #2009-C02 and so that the two-day swimming restriction (day of treatment and one additional day) would not be imposed over a weekend.

Weather conditions on the day of treatment were overcast in the morning a clearing to sun in the afternoon. The air temperature was roughly 70° F; wind was out of the north estimated at 5 mph. Surface water temperature in the main basin was approximately 22.5°C.

The treatment was conducted with two treatment boats. Main Lake was treated with an aluminum work skiff outfitted with two granular spreaders mounted on the stern of the boat. Little Lake was treated with an 18-foot airboat that with one bow-mounted granular spreader. Each treatment boat was equipped with Differential/WAAS GPS navigation systems to insure that the herbicide was evenly applied to the designated treatment areas. The State Boat Ramp located on the channel between the Main Lake and Little Lake was used as the base of operations.

Treatment in the Main Lake was performed as a split application whereby roughly 70% of the herbicide was applied to each of the designated areas initially and then the remaining 30% was applied several hours later. There was approximately 3-4 hours between each application. This split application approach was used to increase concentration-exposure-time and increase the efficacy of treatment. Due to the dense plant cover and shallow water depths found in Little Lake, a single application approach was utilized. Renovate was applied at a target dose of 2.25 ppm in the bottom 4-feet of the water column in the Main Lake and 1.0 ppm in Little Lake. A total of 11,720 pounds of Renovate OTF (granular) were applied to the five treatment areas. The herbicide application took approximately 8.5 hours to complete.

Post-Treatment Inspection

Aquatic Control Technology performed a post-treatment inspection of the lake on August 9. All of the treatment areas were inspected to evaluate the efficacy of the treatment. Weather conditions were favorable mostly sunny skies and a light breeze. Milfoil control in the treatment was generally favorable with limited milfoil recovery observed in Little Lake and Area B. Milfoil regrowth was typically low density (<5% cover) and low growing (1-2 feet). Dense healthy milfoil was observed immediately outside a number of the treatment areas.

Native plant growth was healthy and abundant in all of the treatment areas. Numerous species were observed including: *Potamogeton illinoensis, Potamogeton gramineus, Potamogeton amplifolius, Potamogeton zosteriformis, Potamogeton robbinsii, Vallisneria americana, Ceratophyllum demersum, Chara sp., Nuphar sp., Nymphaea sp.*

Herbicide Residue Testing

In compliance with conditions of the ANC Permit #2009-C02, water samples were collected from within and immediately downstream of Lake St. Catherine following treatment for analysis of triclopyr concentrations. Sampling was required 24 hours following treatment and then at least monthly until concentrations at all sample locations dropped below 75 ppb, which was the drinking water restriction imposed by DEC. Additional sampling was then conducted to see if in-lake concentrations would drop to <1 ppb, so that the irrigation restriction to be lifted ahead of the 120 day restriction.

A map of the sampling locations is attached to the end of this report (Appendix A). Sampling instructions and sample bottles were provided to LSCA representatives by ACT and SePRO. Collected samples were shipped via overnight delivery to SePRO's laboratory in Whittakers, North Carolina.

Samples were collected on June 16, June 24 and August 18. The highest in-lake concentration detected during the initial sampling round was 0.382 ppm (382 ppb), which was collected at the northern end of the main basin. On June 24, 11 days post-treatment, the average concentrations had dropped significantly to 0.016 ppm or 16 ppb. At the time of the final sampling round on August 18 lake-wide concentrations had dropped below laboratory detection limits (<1.0 ppb).

Table 1: FasTEST Sampling Results (ppb)

Site	16-Jun	24-Jun	18-Aug
1	382.4	8.4	
2	10.3	9.5	
3	80.9	7.4	
4	46	6.9	
5	81.9	13.4	
6	6.6	22.7	<1.0
7	16.7	42.9	
8		16.8	

LATE SEASON COMPREHENSIVE AQUATIC VEGETATION SURVEY

Survey Methods

The late season comprehensive aquatic vegetation survey conducted on September 27 & 28 replicated the methods that were employed in the previous years of this management program.

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 (Appendix B – Figure 1). The following information was recorded at each data point: aquatic plants present, dominant species, 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 in 2001. 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 Field Survey Data Table found in Appendix B.

Survey Findings

The overall distribution and quantitative measures of the aquatic plant community were comparable to prior years and while milfoil cover has fluctuated annually overall vegetative cover and biomass remain relatively static in all three basins.

The composition of the vegetative community has also remained relatively unchanged since 2001 and remains dominated by native pondweed species, most notably: *Potamogeton robbinsii, Potamogeton illinoensii, Potamogeton amplifolius, Potamogeton zosteriformis* & *Certophyllum demersum* Diversity has also been maintained throughout the course of management with 22 different aquatic plant species identified this fall.

Comparative data for all three basins from data collected during late season between 2001 and 2012 is listed below (Table 1).

Table 2: Summary of Survey Data

LILY POND	2001	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total Number of Data Points	24	24	24	22	24	24	24	24	24	24
Total Plant Cover	90%	80%	98%	88%	91%	98%	94%	98%	93%	94%
Milfoil Cover	9%	6%	2%	0%	2%	7%	<1%	<1%	<1%	1%
Plant Biomass Index	3.1	2.5	3.3	2.5	2.8	3.3	2.7	2.3	2.9	3.1

LAKE ST. CATHERINE										
Total Number of Data Points	129	129	129	129	129	129	129	129	129	129
Total Plant Cover	66%	46%	51%	57%	58%	66%	58%	63%	59%	56%
Milfoil Cover	43%	16%	0%	4%	11%	4%	5%	2%	7%	8%
Plant Biomass Index	1.9	1.5	1.6	1.8	2.0	2.0	2.0	1.3	1.8	1.5

LITTLE LAKE										
Total Number of Data Points	43	43	43	43	43	43	43	43	43	43
Total Plant Cover	72%	66%	78%	83%	83%	77%	58%	62%	76%	81%
Milfoil Cover	15%	0%	0%	2%	7%	10%	<1%	5%	9%	14%
Plant Biomass Index	2.3	2.1	2.4	2.9	2.8	2.7	2.2	2.7	3.3	2.5

Table 3: Species List and Frequency of Occurrence (entire lake system)

Macrophyte Species	Common Name	2001	2004	2005	2006	2007	2008	2009	2010	2011	2012
Potamogeton robbinsii	Pondweed	52%	76%	88%	74%	77%	68%	84%	78%	57%	76%
Myriophyllum spicatum	Eurasian watermilfoil	94%	44%	17%	33%	74%	65%	38%	40%	43%	51%
Potamogeton amplifolius	Large-leaf	33%	38%	43%	49%	52%	53%	51%	56%	23%	35%
Najas flexilis	Naiad	22%	0%	8%	39%	34%	22%	15%	16%	14%	8%
Potamogeton illinoensis	Illinois pondweed	4%	1%	2%	9%	23%	39%	29%	36%	35%	53%
Potamogeton zosteriformis	Flat-stem pondweed	28%	3%	29%	29%	23%	19%	16%	26%	22%	20%
Zosterella dubia	Water stargrass	1%	1%	9%	8%	23%	17%	7%	13%	4%	2%
Ceratophyllum demersum	Coontail	20%	8%	11%	12%	21%	18%	17%	22%	10%	21%
Nitella / Chara	Stonewort	17%	6%	36%	40%	14%	14%	13%	2%	2%	1%
Nymphaea odorata	White waterlily	16%	5%	11%	10%	11%	11%	10%	7%	7%	12%
Vallisneria americana	Wild celery/Tapegrass	29%	13%	2%	4%	9%	8%	15%	15%	14%	15%
Brasenia schreberi	Watershield	4%	8%	7%	7%	7%	6%	5%	5%	5%	3%
Utricularia vulgaris	Common bladderwort	8%	9%	2%	6%	7%	7%	11%	8%	2%	4%
Elodea canadensis	Waterweed	32%	1%	1%	1%	5%	43%	60%	30%	10%	14%
Chlorophyta	Filamentous green algae	2%	37%	26%	7%	4%	8%	3%	2%	3%	4%
Potamogeton crispus	Curly-leaf pondweed	2%	1%	7%	5%	3%	1%	0%	0%	1%	1%
Potamogeton epihydrus	Ribbon-leaf pondweed	2%	6%	7%	3%	3%	5%	1%	1%	1%	4%
Nuphar variegatum	Yellow waterlily	5%	5%	5%	2%	2%	1%	2%	1%	2%	1%
Potamogeton gramineus	Variable pondweed	23%	1%	6%	6%	2%	4%	4%	4%	11%	8%
Isoetes sp.	Quillwort	2%	6%	2%	5%	2%	3%	1%	0%	1%	1%
Utricularia gibba	Creeping bladderwort	2%	0%	1%	5%	1%	1%	4%	1%	0%	0%
Eleocharis sp.	Spikerush	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%
Lemna minor	Duckweed	7%	1%	0%	1%	0%	1%	1%	0%	0%	0%
Megalodonta beckii	Water marigold	3%	0%	0%	0%	0%	0%	0%	0%	1%	0%

Lily Pond

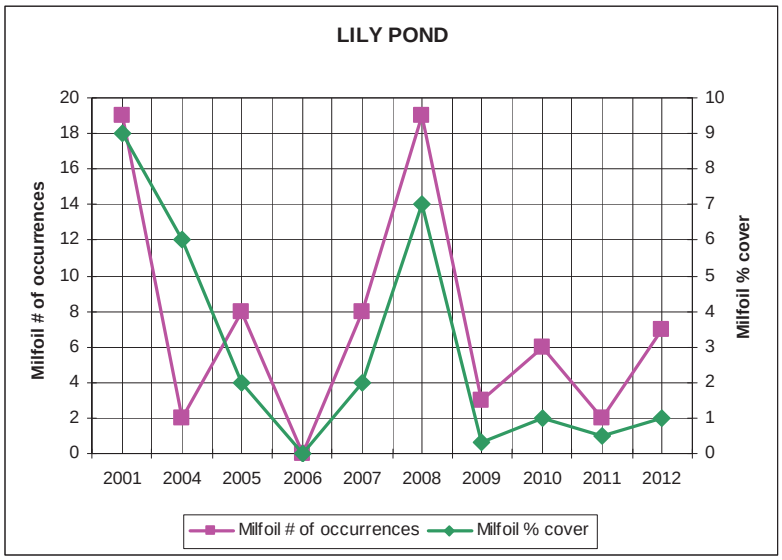
Milfoil frequency in Lilly Pond increased significantly between 2011 and 2012 from just 8.3% to 29.2%; however, milfoil was only found at 7 data point locations. Despite the increase in frequency, milfoil growth remained fairly low density averaging less than 1% cover throughout the basin. Most of the milfoil encountered was found along the southwestern quadrant of the basin nearest the outlet to Lake St. Catherine. Milfoil was also notes in the channel area between Little Lake and the main basin.

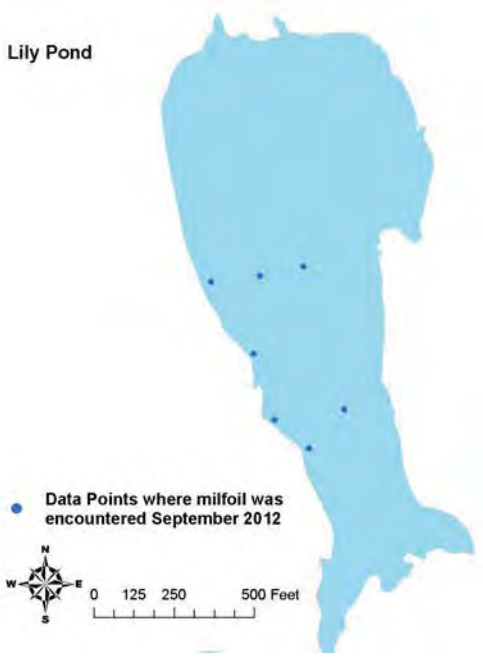
Native species in Lily Pond remained healthy with both cover and distribution similar to what has been recorded in previous years. *Potamogeton robbinsii* (95.8%) remained the most abundant plant in the basin followed by *Ceratophyllum demersum (62.5%). Potamogeton illinoensis and Potamogeton zosteriformis* were also abundant and were encountered 41.7% and 33.3% of the surveyed locations respectively. A significant increase in *Elodea canadensis* was also realized between 2011 and 2012; a notable decrese in *Elodea canadensis* growth was noted between 2010 and 2011.

Table 4: Lily Pond – Species List and Frequency of Occurrence

Macrophyte Species	Lily Pond									
	2001	2004	2005	2006	2007	2008	2009	2010	2011	2012
Potamogeton robbinsii	95.8%	91.7%	95.8%	95.5%	91.7%	87.5%	95.8%	95.8%	87.5%	95.8%
Ceratophyllum demersum	70.8%	4.2%	50.0%	45.5%	83.3%	83.3%	83.3%	79.2%	75.0%	62.5%
Potamogeton amplifolius	33.3%	100.0%	91.7%	77.3%	79.2%	87.5%	91.7%	87.5%	37.5%	45.8%
Potamogeton illinoensis	0.0%	4.2%	8.3%	9.1%	45.8%	41.7%	25.0%	16.7%	45.8%	41.7%
Myriophyllum spicatum	79.2%	8.3%	33.3%	0.0%	33.3%	79.2%	12.5%	25.0%	8.3%	29.2%
Potamogeton zosteriformis	58.3%	8.3%	62.5%	0.0%	25.0%	45.8%	12.5%	66.7%	45.8%	33.3%
Zosterella dubia	4.2%	0.0%	37.5%	0.0%	25.0%	20.8%	8.3%	50.0%	0.0%	0.0%
Nymphaea odorata	62.5%	16.7%	29.2%	9.1%	20.8%	25.0%	33.3%	16.7%	25.0%	29.2%
Potamogeton crispus	4.2%	4.2%	4.2%	4.5%	12.5%	0.0%	0.0%	0.0%	4.2%	0.0%
Chlorophyta	0.0%	29.2%	95.8%	31.8%	8.3%	29.2%	12.5%	4.2%	16.7%	20.8%
Elodea canadensis	29.2%	0.0%	8.3%	0.0%	8.3%	29.2%	45.8%	79.2%	16.7%	29.2%
Utricularia vulgaris	29.2%	37.5%	0.0%	27.3%	4.2%	12.5%	16.7%	4.2%	16.7%	20.8%
Chara sp. / Nitella sp.	0.0%	0.0%	0.0%	4.5%	4.2%	0.0%	0.0%	0.0%	0.0%	0.0%
Wolffia sp.	0.0%	0.0%	0.0%	4.5%	4.2%	0.0%	0.0%	0.0%	0.0%	0.0%
Potamogeton epihydrus	0.0%	12.5%	4.2%	0.0%	4.2%	4.2%	4.2%	0.0%	4.2%	4.2%
Potamogeton gramineus	16.7%	0.0%	8.3%	0.0%	4.2%	0.0%	8.3%	0.0%	8.3%	8.3%
Utricularia gibba	0.0%	0.0%	0.0%	40.9%	0.0%	0.0%	4.2%	0.0%	0.0%	0.0%
Potamogeton natans	0.0%	0.0%	0.0%	9.1%	0.0%	8.3%	8.3%	12.5%	8.3%	0.0%
Lemna minor	45.8%	8.3%	0.0%	4.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brasenia schreberi	4.2%	4.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Isoetes sp.	0.0%	4.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Najas flexilis	4.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Nuphar variegatum	16.7%	16.7%	16.7%	0.0%	0.0%	0.0%	0.0%	4.2%	4.2%	0.0%
Vallisneria americana	33.3%	45.8%	0.0%	0.0%	0.0%	0.0%	8.3%	4.2%	4.2%	0.0%

Chart 1: *Myriophyllum spicatum* Number of Occurrences and Percent Cover





Lake St. Catherine (Main Basin)

The distribution of native plant species in the main basin of Lake St. Catherine was consistent with recent years. *Potamogeton robbinsii* remained the most common plant species in the main lake and was recorded at 66.7% of the surveyed locations. Presence of *Potamogeton illonoensis* increased compared to 2011 making it the second most common plant in the main lake. It was recorded at just over half of the surveyed data points. Frequency of occurrence also increased for cover on *Potamogeton amplifolius* by almost 10%. Cover of other native plants remained relatively consistent with only minor fluctuations between 2011 and 2012.

Table 5: Lake St. Catherine – Species List and Frequency of Occurrence (main basin)

Macrophyte Species	Lake St. Catherine									
	2001	2004	2005	2006	2007	2008	2009	2010	2011	2012
Myriophyllum spicatum	98.4%	65.1%	14.7%	35.7%	76.7%	58.9%	44.2%	27.9%	49.6%	46.5%
Potamogeton robbinsii	31.0%	65.1%	82.2%	62.0%	66.7%	58.1%	78.3%	72.9%	58.1%	66.7%
Najas flexilis	19.4%	0.0%	12.4%	56.6%	50.4%	34.1%	21.7%	24.8%	20.2%	12.4%
Potamogeton amplifolius	28.7%	14.7%	25.6%	34.1%	38.8%	38.0%	41.1%	44.2%	25.6%	34.9%
Potamogeton zosteriformis	24.0%	2.3%	31.0%	41.9%	27.9%	18.6%	19.4%	23.3%	30.2%	20.2%
Zosterella dubia	0.0%	0.8%	4.7%	11.6%	27.9%	21.7%	7.8%	8.5%	5.4%	1.6%
Chara sp. / Nitella sp.	1.6%	17.1%	62.0%	57.4%	20.9%	21.7%	19.4%	2.3%	0.8%	0.0%
Potamogeton illinoensis	6.2%	0.8%	0.8%	8.5%	15.5%	34.1%	23.3%	31.0%	32.6%	53.3%
Potamogeton pusillus	0.0%	0.0%	0.0%	5.4%	12.4%	6.3%	5.4%	11.6%	12.4%	4.7%
Ceratophyllum demersum	10.9%	10.9%	6.2%	7.0%	10.9%	10.1%	7.8%	14.0%	6.2%	10.9%
Vallisneria americana	14.0%	3.1%	0.8%	3.1%	8.5%	9.3%	13.2%	13.2%	10.1%	9.3%
Elodea canadensis	27.9%	0.0%	0.0%	0.8%	4.7%	51.9%	71.3%	14.7%	8.5%	7.0%
Nymphaea odorata	3.1%	1.6%	2.3%	3.1%	3.1%	3.1%	3.1%	1.6%	2.3%	1.6%
Brasenia schreberi	0.0%	0.8%	0.8%	2.3%	2.3%	2.3%	2.3%	1.6%	2.3%	0.8%
Chlorophyta	0.0%	43.4%	14.7%	3.1%	2.3%	3.9%	0.8%	0.8%	3.1%	2.3%

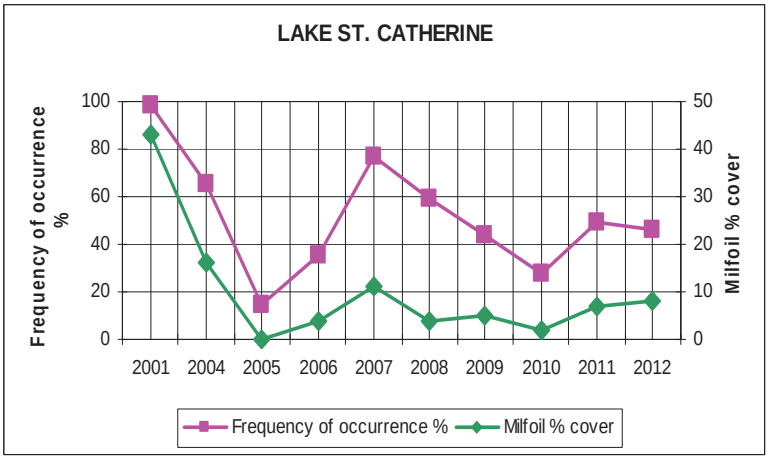
Macrophyte Species	Lake St. Catherine									
	2001	2004	2005	2006	2007	2008	2009	2010	2011	2012
Isoetes sp.	2.3%	8.5%	0.8%	6.2%	2.3%	4.7%	0.0%	0.0%	0.8%	0.8%
Potamogeton gramineus	17.8%	0.0%	4.7%	1.6%	2.3%	6.2%	3.1%	6.2%	14.7%	9.3%
Potamogeton crispus	1.6%	0.0%	9.3%	5.4%	1.6%	0.8%	0.0%	0.0%	0.0%	0.0%
Potamogeton epihydrus	2.3%	3.1%	5.4%	2.3%	0.8%	3.9%	0.8%	0.8%	0.8%	2.3%
Nuphar variegatum	0.8%	0.0%	0.0%	0.8%	0.8%	0.0%	0.0%	0.8%	0.8%	0.0%
Utricularia vulgaris	0.8%	0.8%	0.8%	0.0%	0.0%	1.6%	0.8%	3.1%	0.0%	0.8%
Lemna minor	1.6%	0.0%	0.0%	0.0%	0.0%	0.8%	0.8%	0.0%	0.0%	0.0%
Megalodonta beckii	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Cover of *Myriophyllum spicatum* dropped slightly from 2011 from 49.6% to 46.5%, although average percent cover of milfoil did increase by roughly 1%. Scattered and sometimes moderate-dense growth of milfoil was also recoded outside the pre-established data points. Locations of milfoil were recorded with GPS are depicted in Figure 2. Milfoil was encountered at some of the data points located within 2012 treatment areas, but they were mostly individual stems or surviving plants found at the outer boundary of the treatment areas.

While milfoil remains widespread in the main basin annual treatments and diver suction hand-pulling have helped curb re-growth of milfoil in the lake and have maintained acceptable milfoil control in high-use areas of the lake. Save for a few large patches, most of the milfoil observed in 2012 remained low-density growth, averaging just 7.2% cover throughout the main basin.

Chart 2 (below) represents year-to-year change in milfoil frequency and cover in the main basin.

Chart 2: *Myriophyllum spicatum* Frequency of Occurrence and Percent Cover



Little Lake

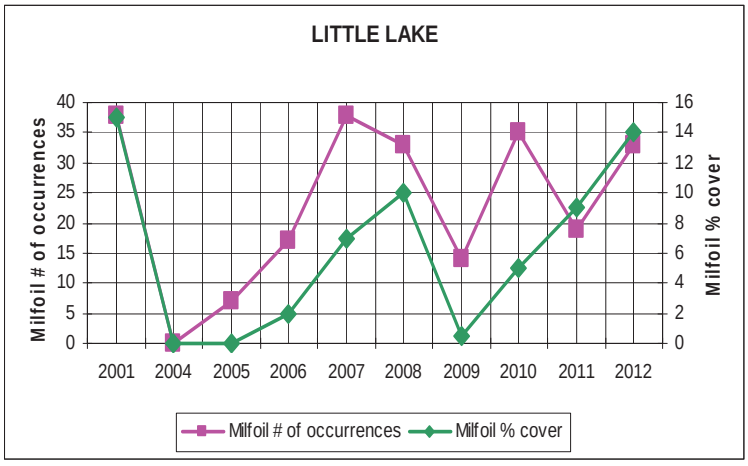
Potamogeton robbinsii and *Potamogeton illinoensis* continued to dominated the aquatic plant community in Little Lake accounting for a large percentage of the plant density recorded during the September 2012 survey. *Vallisneria americana*, *Potamogeton amplifolius*, *Elodea canadensis*, and *Ceratophyllum demersum* were also common, encountered at 40%, 30%, 28% & 28% of the surveyed data points, respectively. The frequency of occurrence for most other native plants recorded in Little Lake remained consistent with previous years.

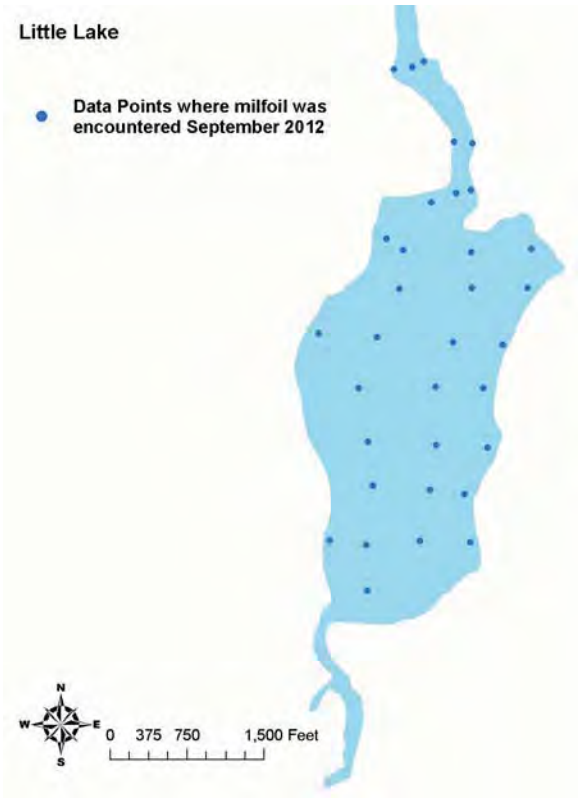
Table 6: Little Lake – Species List and Frequency of Occurrence

Macrophyte Species	Little Lake									
	2001	2004	2005	2006	2007	2008	2009	2010	2011	2012
Potamogeton robbinsii	88.4%	100.0%	100.0%	100.0%	100.0%	88.4%	95.3%	81.4%	86.0%	90.7%
Myriophyllum spicatum	88.4%	0.0%	16.3%	39.5%	88.4%	76.7%	32.6%	81.4%	44.2%	76.6%
Potamogeton amplifolius	44.2%	72.1%	69.8%	76.7%	74.4%	76.7%	55.8%	72.1%	27.9%	30.2%
Potamogeton illinoensis	0.0%	0.0%	0.0%	9.3%	32.6%	46.5%	48.5%	36.2%	62.8%	60.5%
Utricularia vulgaris	16.3%	18.6%	7.0%	11.6%	30.2%	18.6%	34.9%	25.6%	4.7%	2.3%
Nymphaea odorata	30.2%	9.3%	25.6%	30.2%	27.9%	10.1%	18.6%	18.6%	23.3%	32.6%
Brasenia schreberi	14.0%	30.2%	30.2%	23.3%	25.6%	20.9%	14.0%	11.6%	14.0%	11.6%
Ceratophyllum demersum	20.9%	0.0%	2.3%	9.3%	16.3%	7.0%	9.3%	16.3%	27.9%	27.9%
Vallisneria americana	72.1%	25.6%	7.0%	9.3%	14.0%	9.3%	25.6%	25.6%	34.9%	39.5%
Potamogeton zosteriformis	23.3%	2.3%	4.7%	4.7%	7.0%	4.7%	7.0%	9.3%	9.3%	14.0%
Zosterella dubia	2.3%	2.3%	4.7%	0.0%	7.0%	2.3%	4.7%	4.7%	2.3%	4.7%
Potamogeton pusillus	0.0%	0.0%	0.0%	2.3%	7.0%	2.3%	0.0%	0.0%	0.0%	0.0%
Chlorophyta	7.0%	20.9%	20.9%	4.7%	7.0%	9.3%	2.3%	2.3%	2.3%	2.3%
Nuphar variegatum	9.3%	14.0%	11.6%	7.0%	7.0%	2.3%	7.0%	2.3%	4.7%	2.3%
Potamogeton epihydrus	0.0%	11.6%	14.0%	7.0%	7.0%	7.0%	0.0%	0.0%	2.3%	9.3%
Utricularia gibba	7.0%	0.0%	2.3%	0.0%	4.7%	2.3%	14.0%	4.7%	0.0%	0.0%
Najas flexilis	39.5%	0.0%	0.0%	4.7%	2.3%	0.0%	4.7%	0.0%	4.7%	0.0%
Elodea canadensis	46.5%	4.7%	0.0%	0.0%	2.3%	23.3%	34.9%	46.5%	20.9%	27.9%
Chara sp. / Nitella sp.	7.0%	4.7%	7.0%	11.6%	0.0%	0.0%	2.3%	0.0%	4.7%	2.3%
Potamogeton gramineus	41.9%	4.7%	9.3%	23.3%	0.0%	0.0%	4.7%	0.0%	4.7%	4.7%
Isoetes sp.	0.0%	0.0%	4.7%	2.3%	0.0%	0.0%	2.3%	0.0%	0.0%	2.3%
Potamogeton crispus	0.0%	0.0%	0.0%	2.3%	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%
Polygonum sp.	0.0%	0.0%	0.0%	2.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Eleocharis sp.	4.7%	4.7%	4.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Megalodonta beckii	7.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%	0.0%

Despite treatment in this basin the frequency of occurrence of milfoil increased significantly from 2011 (44%) to 2012 (77%); percent cover of milfoil also increased form 9% in 2011 to 14% in 2012. Although some scattered low-density, generally immature growth of milfoil was recorded in some of the treatment areas in Little Lake, milfoil was widespread throughout the remainder of the basin. Large dense patches also persisted to the immediate east and west of the treated areas, which increased the frequency of occurrence and percent cover values.

Chart 3: *Myriophyllum spicatum* Number of Occurrences and Percent Cover

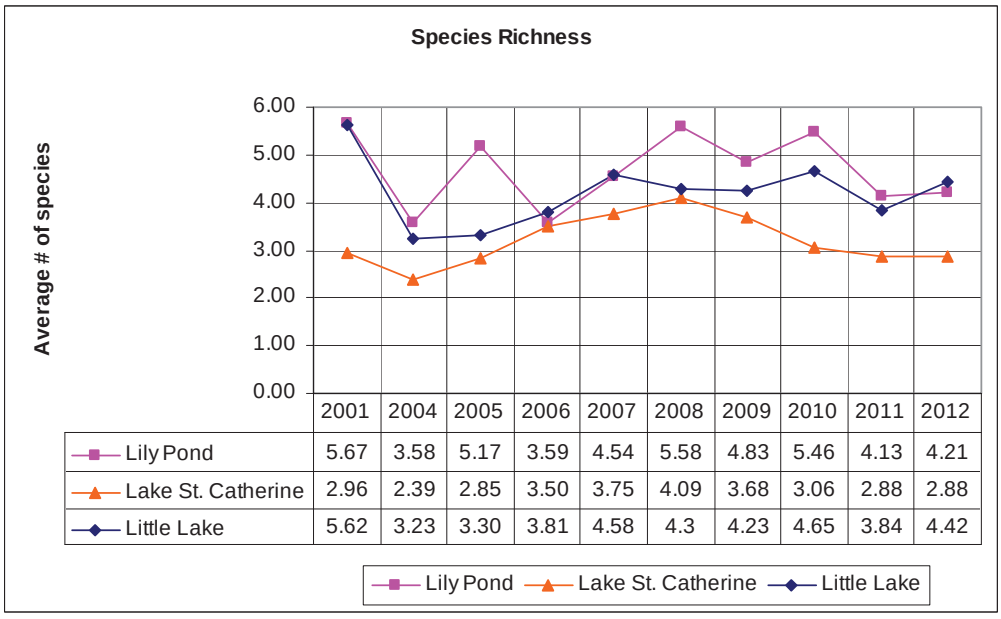




Species Richness

Species richness in all three basins was consistent with findings from the past four years. It does not appear that the triclopyr herbicide treatments have adversely impacted species richness or native plant diversity.

Table 7: Species Richness by Basin

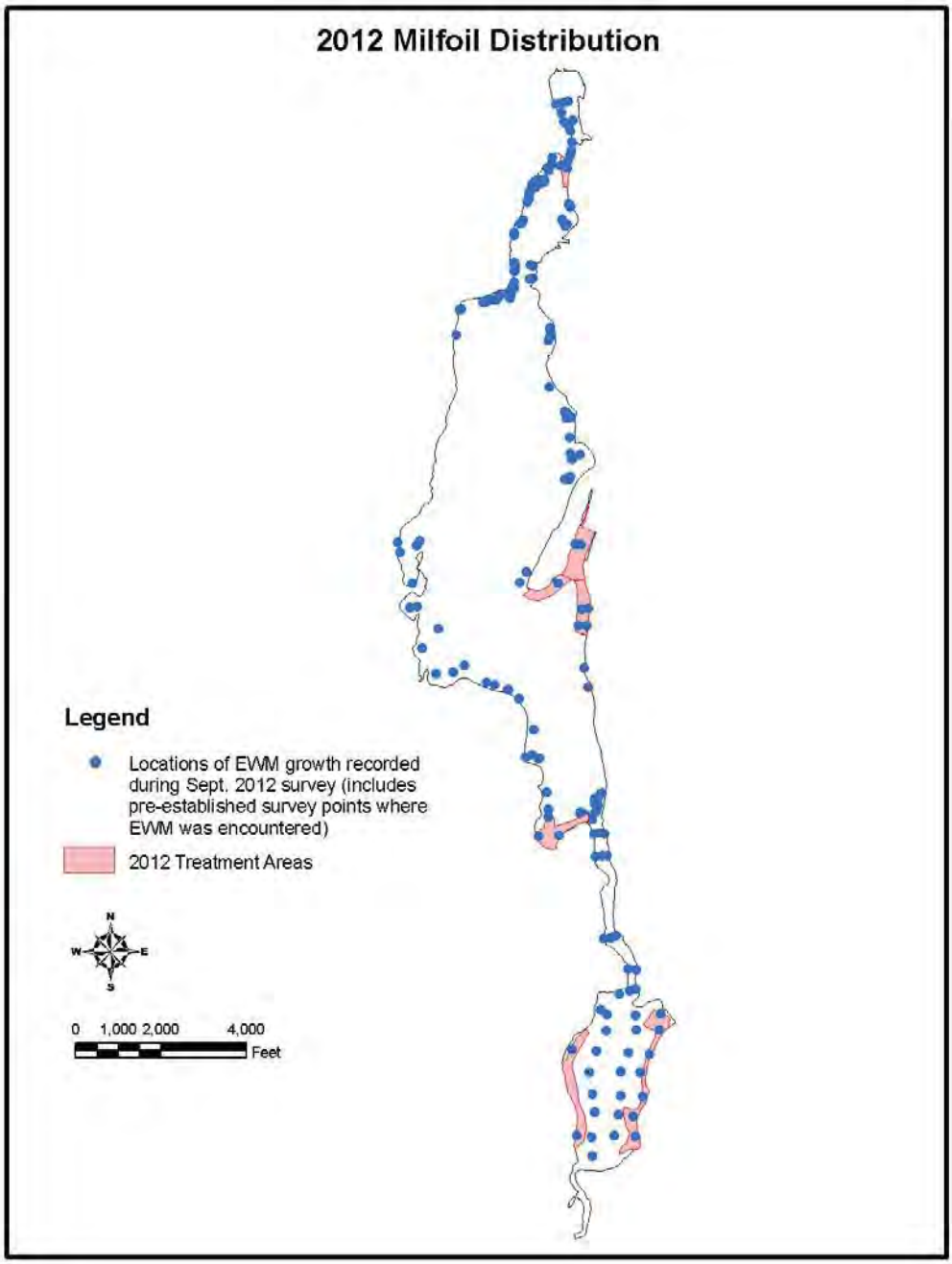


	2001	2004	2005	2006	2007	2008	2009	2010	2011	2012
Lily Pond	5.67	3.58	5.17	3.59	4.54	5.58	4.83	5.46	4.13	4.21
Lake St. Catherine	2.96	2.39	2.85	3.50	3.75	4.09	3.68	3.06	2.88	2.88
Little Lake	5.62	3.23	3.30	3.81	4.58	4.3	4.23	4.65	3.84	4.42

Late Season Milfoil Bed Mapping

Milfoil beds were visually surveyed and mapped during the late season survey. Rain and overcast skies did limit visibility in some areas, but overall survey conditions were fair to good. As with past mapping efforts areas of milfoil growth were visually identified or found using a high-resolution depth finder and an underwater camera. Locations where milfoil was encountered were recorded using a GPS unit. A map of the GPS referenced milfoil locations is shown in Figure 2.

Figure 2: Late season Eurasian watermilfoil distribution



SUMMARY OF 2012 AQUATIC VEGETATION MANAGEMENT PROGRAM

Renovate Herbicide Treatments

Results of the 2012 Renovate OTF herbicide treatment program were consistent with maintenance treatment efforts performed in the Lake St. Catherine system in recent years. Approximately 8-weeks after treatment only scattered low-growing milfoil plants were found in most of the main basin treatment areas. More significant milfoil growth was seen adjacent to the treatment areas in Little Lake. By the time the late season survey was performed in mid-late September (almost 15 weeks post-treatment), additional recovery of low-density milfoil was found in some of the treatment areas, particularly at the edges of the treatment areas where there was a greater potential for herbicide dilution.

In the main basin, North Bay (Area A) appeared to respond favorably, but some small plants were persisting especially near the channel that leads to Lily Pond. Hall's Bay (Area B) was largely free of milfoil except for a few scattered stems; however, more significant recovery was seen at the southernmost point of the treatment area along Route 30 and on the shore heading towards Cone's Point. Forest House Bay (Area C) only supported scattered milfoil plant growth, except just north of the treatment area closer to the west shore and at the easternmost point near the channel.

Positive reduction of milfoil growth was seen in the Little Lake treatment areas (Areas D & E), but milfoil cover and distribution continued to increase outside of the treatment areas. There appeared to be a distinct line between treated and untreated areas.

Renovate remained highly selective for milfoil and measured indices of native plant cover were consistent with previous years. While there continued to be fluctuations in the frequency of occurrence and species richness indices, no major shifts in plant composition were documented following treatment. Based on data collected in the Lake St. Catherine system and from other Vermont lakes, seasonal variability in native plant populations may account for many of the year to year changes.

Spread Prevention and Non-Chemical Control Activities

As required by the DEC Permit, non-chemical milfoil control activities continued at Lake St. Catherine during the 2012 season. Efforts included volunteer monitoring, volunteer and paid hand harvesting and diver assisted suction harvesting. Details of the non-chemical control efforts will be provided by LSCA under separate cover.

DISCUSSION

Recent milfoil management efforts performed on the Lake St. Catherine system have focused on controlling areas of dense milfoil growth and maintaining it at scattered or trace levels. Renovate OTF herbicide treatments continue to be most effective in coves and in larger treatment areas where there is less "edge-effect" (dilution caused by diffusion and mixing with untreated water from adjacent areas). These results were evident again in 2012, where the majority of late season recovery was seen on the edges of treatment areas. It is reasonable to assume that the concentration-exposure-time (CET) of triclopyr was insufficient to provide complete milfoil control in these areas. Strategies were employed to try and improve CET during the 2012 treatment including: delaying treatment until mid-June when more active plant tissue was present to maximize herbicide absorption, treating a contiguous area, and

performing a split-application to extend the time that triclopyr was released off of the biodegradable granule. Despite these efforts, late season milfoil recovery was still evident.

Triclopyr herbicide has demonstrated to be an effective and highly selective tool for control of milfoil at Lake St. Catherine; however, ongoing management efforts will be needed to maintain control of this highly invasive plant. It is apparent that there are still limitations of the Renovate OTF formulation to provide sufficient CET to insure complete milfoil control for partial lake or shoreline applications. Early studies with triclopyr on Eurasian watermilfoil suggested that CET's of 1.5 ppm were needed for 24 hours or 0.5 ppm were needed for 48 hours to insure >85% reduction of milfoil biomass (Netherland and Getsinger 1992). The first round of samples collected from the treatment areas this year showed maximum triclopyr concentrations of 0.382 ppm in North Bay and considerably lower concentrations in all other tested locations. Future treatment efforts should focus on improving the CET. A new formulation of Renovate called Renovate LZR was registered for aquatic use by the EPA in 2012. It has the same active ingredient and percent active ingredient as Renovate OTF, but the biodegradable granule is designed to release the active ingredient more slowly. This may prove to be effective for shoreline applications that are subject to dilution with untreated water. Delaying treatment somewhat later in the growing season when additional active milfoil biomass is present for herbicide absorption may also be worth considering. Milfoil plants that were treated at Indian Brook Reservoir in Essex, Vermont in 2012 were perhaps 2-3 feet taller than the milfoil plants that were treated in the main basin of Lake St. Catherine this year. The triclopyr concentrations remained higher for a longer period of time and the overall control achieved appeared to be better. Longer separation between split applications and possibly higher application rates should also be considered to improve treatment efficacy.

Little Lake continues to be particularly challenging. While the treatment appeared to be effective within treated areas, milfoil densities increased in untreated areas and fragmentation will inevitably result in the rapid recolonization of treated areas. Larger scale treatments with Renovate (triclopyr) herbicide or use of Sonar (fluridone) may be required to improve the efficacy and duration of milfoil control for future herbicide treatments in Little Lake.

RECOMMENDATIONS FOR 2013 SEASON

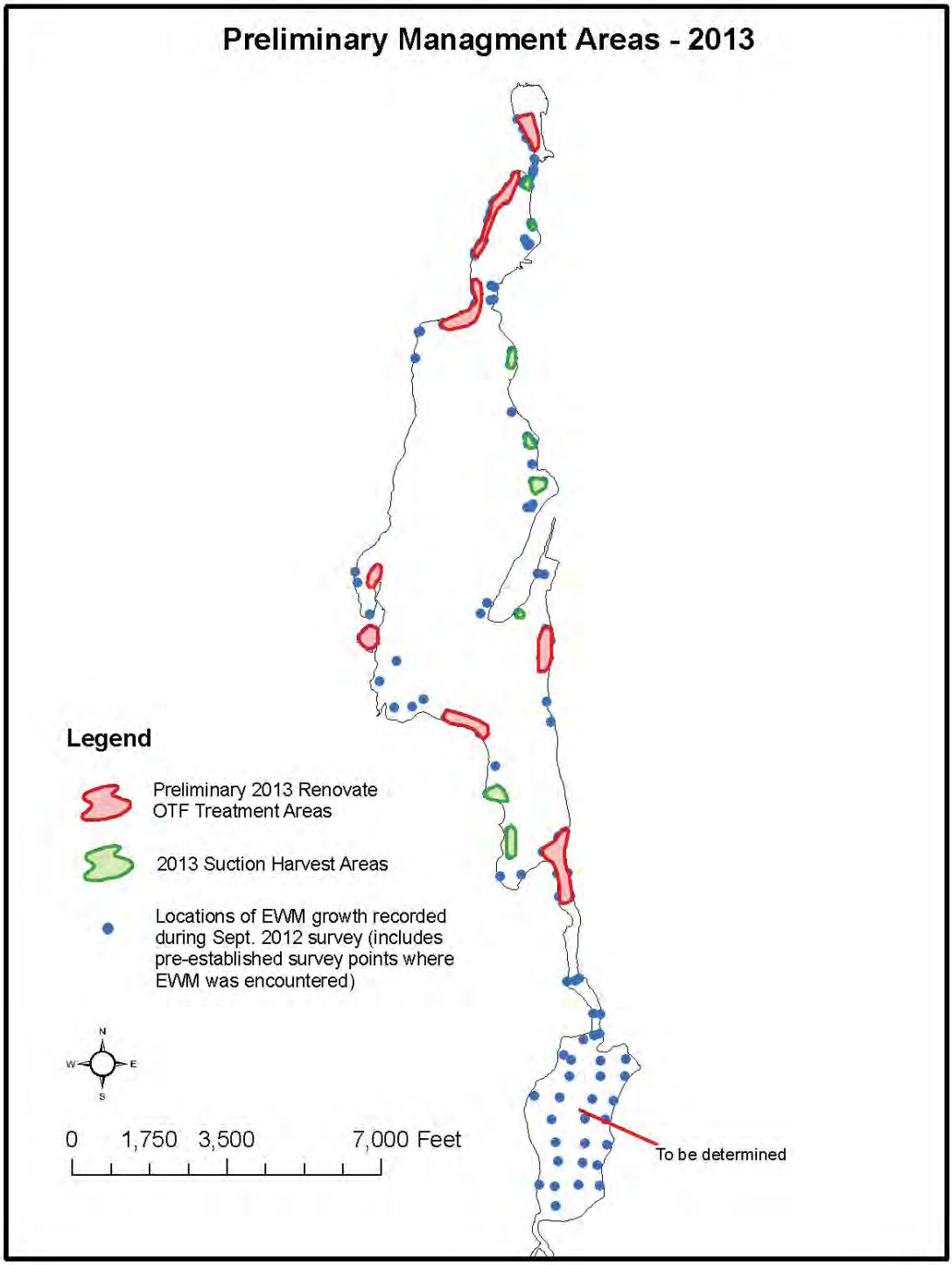
Milfoil management efforts performed at Lake St. Catherine in 2012 were effective at maintaining low levels of milfoil growth. Still, there was late season milfoil recovery seen at the edges of treatment areas and continued recovery in untreated areas. Ongoing management will be required to maintain milfoil control and prevent further recovery. For the 2013 season, we would recommend the following management strategies be considered.

- Renovate OTF herbicide treatments should focus on cove areas and large-block treatment areas where herbicide concentrations can be most effectively maintained.
- A split-application approach should continue to be utilized and modified to increase herbicide concentration-exposure-time.
- The newest granular formulation of triclopyr herbicide, Renovate LZR, should be evaluated and considered for use.
- Non-chemical control strategies, specifically diver hand-pulling and suction harvesting, should be utilized along steeply sloped and exposed areas and for areas with lower density milfoil growth.
- Management efforts should continue to focus on developed shorelines and other high-use areas of the lake. Areas that harbor milfoil growth that prove to be especially challenging (expensive) for

management due to bottom type, location, water depth, etc. and are not prone to excessive fragmentation may warrant being left unmanaged.

- Larger scale Renovate herbicide treatments or Sonar (fluridone) herbicide, specifically the time release pellet formulations, Sonar One and Sonar Q, should continue to be evaluated and considered for use in Little Lake to provide more complete milfoil control and suppression of overabundant native plant growth.

Figure 3: Preliminary 2012 management areas



REFERENCES

Netherland, M.D. and K.D. Getsinger. 1992. Efficacy of Triclopyr on Eurasian Watermilfoil: Concentration and Exposure Time Effects. J. Aquat. Plant Manage. 30: 1-5.

APPENDIX A

Herbicide Residue Testing Results

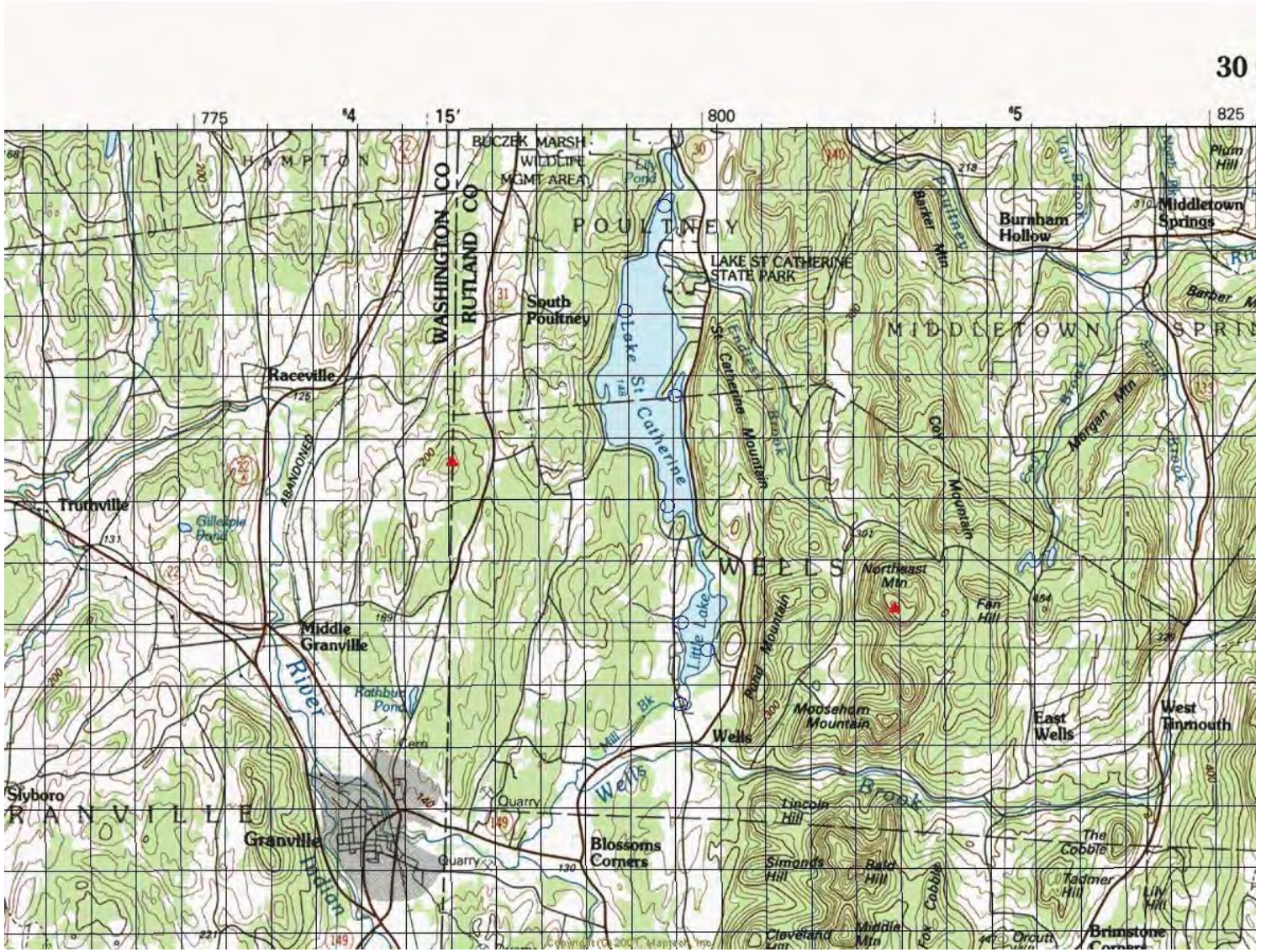
- Sampling Location Map – prepared by DEC
- Sampling Results Summary
- SePRO Laboratory Report – 6/16/12 sampling round
- SePRO Laboratory Report – 6/24/12 sampling round
- SePRO Laboratory Report – 8/18/12 sampling round

Lake St. Catherine 2012 Renovate Assay Results

Treatment Date: 6/13/12

Site	16-Jun	24-Jun	18-Aug
1	382.4	8.4	
2	10.3	9.5	
3	80.9	7.4	
4	46	6.9	
5	81.9	13.4	
6	6.6	22.7	<1.0
7	16.7	42.9	
8		16.8	

FasTEST Sample Location Map (prepared by DEC)



SePRO Research & Technology Campus
16013 Watson Seed Farm Road, Whitakers, NC 27891

FasTEST

LABORATORY REPORT

Chain of Custody: 2012-00981-00

Customer Company

Company Name: Aquatic Control Tech Inc
Address: 11 John Road
Sutton, MA 01590-2509

Customer Contact

Contact Person: Gerald N Smith
E-Mail Address: gnsmith@aquaticcontroltech.com
Phone:
Fax:

Waterbody Information

Waterbody: Lake St. Catherine - MA Waterbody Size (acres): 0.00 Depth Average: 0.0

Sample Information

Lab ID	Sample Location	Test Method	Results	Sampling Date	Sampling Time	Temp at Receipt (C)
17184	1			06/16/2012		
		Renovate/Triclopyr (µg/L)	**382.4**			
17185	2			06/16/2012		
		Renovate/Triclopyr (µg/L)	**10.3**			
17186	3			06/16/2012		
		Renovate/Triclopyr (µg/L)	**80.9**			
17187	4			06/16/2012		
		Renovate/Triclopyr (µg/L)	**46.0**			
17188	5			06/16/2012		
		Renovate/Triclopyr (µg/L)	**81.9**			
17189	6			06/16/2012		
		Renovate/Triclopyr (µg/L)	**6.6**			
17190	7			06/16/2012		
		Renovate/Triclopyr (µg/L)	**16.7**			

Original

SePRO Research & Technology Campus

Chain of Custody: **2012-00981-00**

Waterbody Information

Waterbody: Lake St. Catherine - MA Waterbody Size (acres): 0.00 Depth Average: 0.0

Sample Information

Lab ID	Sample Location	Test Method	**Results**	Sampling Date	Sampling Time	Temp at Receipt (C)

ANALYSIS STATEMENTS:
SAMPLE RECEIPT /HOLDING TIMES: All samples arrived in an acceptable condition and were analyzed within prescribed holding times in accordance with the SRTC Laboratory Sample Receipt Policy unless otherwise noted in the report.
PRESERVATION: Samples requiring preservation were verified prior to sample analysis and any qualifiers will be noted in the report.
QA/QC CRITERIA: All analyses met method criteria, except as noted in the report with data qualifiers.
COMMENTS: No significant observations were made unless noted in the report.

Laboratory Information

Date Received: 06/20/2012
Time Received: 13:00
Date Results Sent: 06/20/2012

Sample Preparation Date: 06/20/2012
Date Analysis Performed: 06/20/2012

This entire report was reviewed and approved for release.

Reviewed By: SRTC Laboratory Manager

Original

SePRO Research & Technology Campus
16013 Watson Seed Farm Road, Whitakers, NC 27891

FasTEST

LABORATORY REPORT

Chain of Custody: 2012-01038-00

Customer Company

Company Name: Aquatic Control Tech Inc
Address: 11 John Road
Sutton, MA 01590-2509

Customer Contact

Contact Person: Gerald N Smith
E-Mail Address: gnsmith@aquaticcontroltech.com
Phone:
Fax:

Waterbody Information

Waterbody: Lake St. Catherine - MA Waterbody Size (acres): 0.00 Depth Average: 0.0

Sample Information

Lab ID	Sample Location	Test Method	Results	Sampling Date	Sampling Time	Temp at Receipt (C)
17412	1			06/24/2012		
		Renovate/Triclopyr (µg/L)	**8.4**			
17413	2			06/24/2012		
		Renovate/Triclopyr (µg/L)	**9.5**			
17414	3			06/24/2012		
		Renovate/Triclopyr (µg/L)	**7.4**			
17415	4			06/24/2012		
		Renovate/Triclopyr (µg/L)	**6.9**			
17416	5			06/24/2012		
		Renovate/Triclopyr (µg/L)	**13.4**			
17417	6			06/24/2012		
		Renovate/Triclopyr (µg/L)	**22.7**			
17418	7			06/24/2012		
		Renovate/Triclopyr (µg/L)	**42.9**			
17419	8			06/24/2012		
		Renovate/Triclopyr (µg/L)	**16.8**			

Original

SePRO Research & Technology Campus

Chain of Custody: **2012-01038-00**

Waterbody Information

Waterbody: Lake St. Catherine - MA Waterbody Size (acres): 0.00 Depth Average: 0.0

Sample Information

Lab ID	Sample Location	Test Method	**Results**	Sampling Date	Sampling Time	Temp at Receipt (C)

ANALYSIS STATEMENTS:
SAMPLE RECEIPT /HOLDING TIMES: All samples arrived in an acceptable condition and were analyzed within prescribed holding times in accordance with the SRTC Laboratory Sample Receipt Policy unless otherwise noted in the report.
PRESERVATION: Samples requiring preservation were verified prior to sample analysis and any qualifiers will be noted in the report.
QA/QC CRITERIA: All analyses met method criteria, except as noted in the report with data qualifiers.
COMMENTS: No significant observations were made unless noted in the report.

Laboratory Information

Date Received: 06/26/2012
Time Received: 10:00
Date Results Sent: 06/27/2012

Sample Preparation Date: 06/26/2012
Date Analysis Performed: 06/27/2012

Disclaimer: The results listed within this Laboratory Report relate only to the samples tested in the laboratory. The analyses contained in this report were performed in accordance with the applicable certifications as noted. All soil samples are reported on a dry weight basis unless otherwise noted in the report. This Laboratory Report is confidential and is intended for the exclusive use of SRTC Laboratory and its client. This report shall not be reproduced, except in full, without written permission from SRTC Laboratory. The Chain of Custody is included and is an essential component of this report.
This entire report was reviewed and approved for release.

Reviewed By: SRTC Laboratory Manager

Original

SePRO Research & Technology Campus
16013 Watson Seed Farm Road, Whitakers, NC 27891

FasTEST

LABORATORY REPORT

Chain of Custody: 2012-01473-00

Customer Company

Company Name: Aquatic Control Tech Inc
Address: 11 John Road
Sutton, MA 01590-2509

Customer Contact

Contact Person: Gerald N Smith
E-Mail Address: gnsmith@aquaticcontroltech.com
Phone:
Fax:

Waterbody Information

Waterbody: Lake St. Catherine - MA Waterbody Size (acres): 0.00 Depth Average: 0.0

Sample Information

Lab ID	Sample Location	Test Method	Results	Sampling Date	Sampling Time	Temp at Receipt (C)
18553	6			08/18/2012		
		Renovate/Triclopyr (µg/L)	**< 1.00.**			

ANALYSIS STATEMENTS:
SAMPLE RECEIPT /HOLDING TIMES: All samples arrived in an acceptable condition and were analyzed within prescribed holding times in accordance with the SRTC Laboratory Sample Receipt Policy unless otherwise noted in the report.
PRESERVATION: Samples requiring preservation were verified prior to sample analysis and any qualifiers will be noted in the report.
QA/QC CRITERIA: All analyses met method criteria, except as noted in the report with data qualifiers.
COMMENTS: No significant observations were made unless noted in the report.

Laboratory Information

Date Received: 08/22/2012
Time Received: 10:00
Date Results Sent: 08/22/2012

Sample Preparation Date: 08/22/2012
Date Analysis Performed: 08/22/2012

This entire report was reviewed and approved for release.

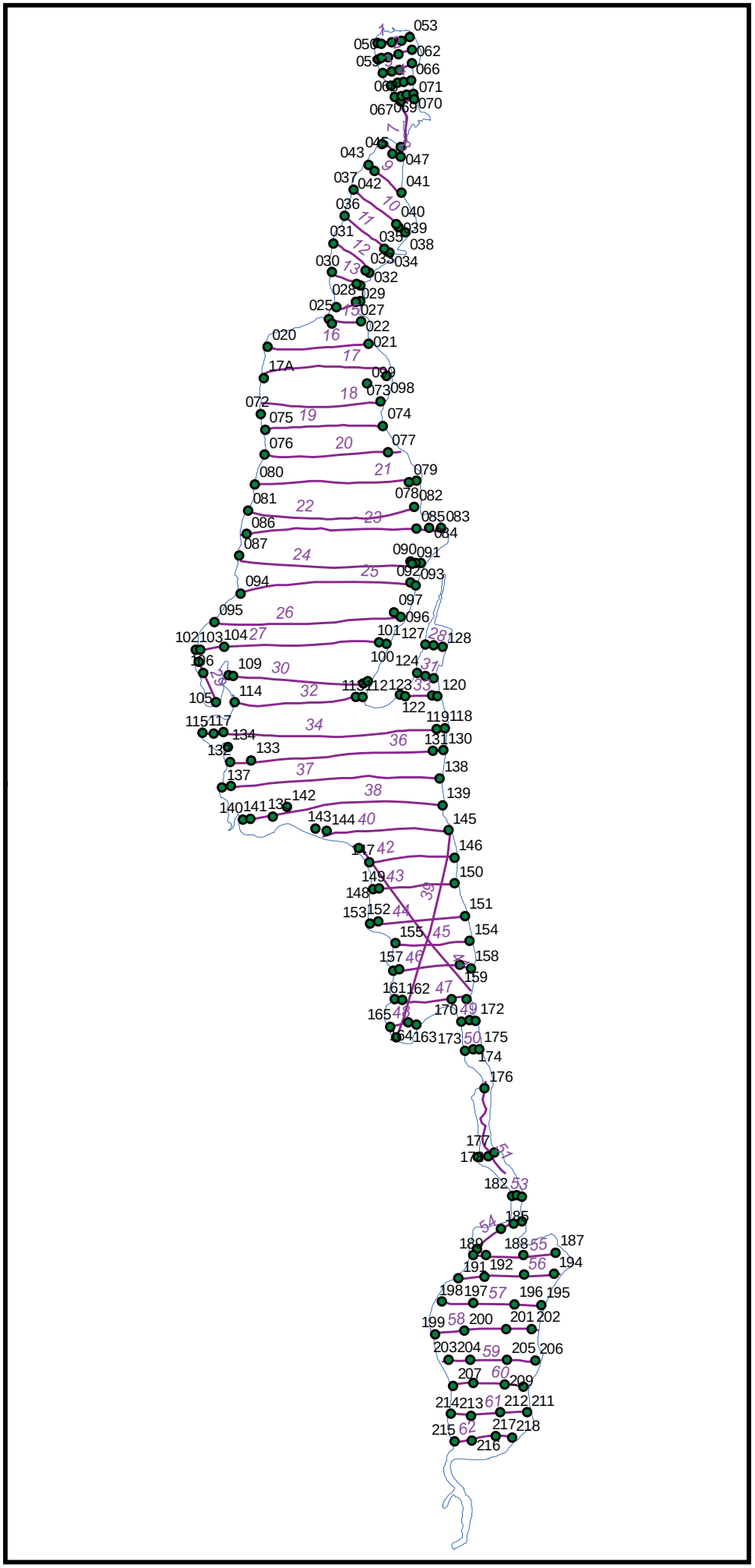
Reviewed By: SRTC Laboratory Manager

Original

APPENDIX B

Comprehensive Aquatic Vegetation Survey Information

- Data Point Sampling Location Map
- Field Data Table
- Overall Vegetation Density Map
- Vegetation Species Distribution Maps
- Late Season Milfoil Distribution - 2012
- Proposed Treatment Areas - 2013



Lake St. Catherine

Poultney & Wells, VT

Transects & Data Point Locations for Vegetation Survey

FIGURE:	SURVEY DATE:	MAP DATE:
B-1	9/27 & 9/28/12	10/17/11

Legend

Data point locations recorded with GPs unit during ACT/ ReMetrix 2001 survey. Sampling replicated during ACT 2007 survey. Data points relocated with DGPS unit with sub-meter accuracy.

Transects recorded during ACT/ ReMetrix 2001 survey using DGPS.

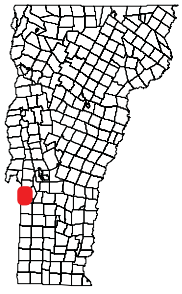
N

W E

S

0 500 1,000 2,000 3,000

Feet



AQUATIC CONTROL TECHNOLOGY, INC.

11 JOHN ROAD
SUTTON, MASSACHUSETTS 01590
PHONE: (508) 865-1000
FAX: (508) 865-1220
WEB: WWW.AQUATICCONTROLTECH.COM

Lily Pond

Transect	Point #	Distance from Shore	Depth (ft)	% Cover	% Ms Cover	Species Richness	Biomass	Pr	Ms	Pa	Ec	Pi	Nf	Pz	Cd	Zd	Ca	Ny	Mu	V	Fa	Pp	Uv	B	Pe	Pg	I	Pn	Ug	Nu	Pc	Lm	Ngram	Mb
1	49	25	3	100	0	2	4	D						X																				
1	50	100	3	100	0	5	4	D		X				X	X			X																
1	51	MID	3	100	0	4	4	D						X	X								X											
1	52	150	3	100	0	5	4	D		X	X	X						X																
1	53	30	3	100	0	3	4	D										X								X								
2	54	40	3	100	0	5	4	D			X	X			X			X																
2	55	25	3	100	0	4	3	X				X		X	D																			
2	56	180	5	90	0	3	3	D		X					X																			
2	57	60	3	90	0	6	3	D			X	X			X										X	X								
2	58	150	6	100	0	4	3	D			X	X			X																			
3	59	25	3	100	1	4	3	D	X	X		X																						
3	60	120	4	100	1	5	3	D	X	X		X			X																			
3	61	MID	4	80	1	5	3	D	X	X	X			X																				
3	62	15	3	90	0	5	4	X		D				X	X			X																
4	63	20	4	100	5	5	4	D	X	X		X			X																			
4	64	100	5	20	0	2	1				X				D																			
4	65	100	4	100	0	4	2	D				X									X		X											
4	66	30	3	100	0	3	2	D							X						X													
5	68	60	3	100	0	4	2	D		X		X									X													
5	69	50	3	100	1	3	2	D	X						X																			
5	71	15	1	100	0	4	4	X							D			X					X											
6	67	10	2	100	5	4	4	D	X	X	X																							
6	70	20	3	100	0	6	2	D		X				X				X			X		X											
7	48	MID	4	80	10	6	3	D	X					X	X						X		X											
				93.75	**1.00**	**4.21**	**3.13**																											

	Pr	Ms	Pa	Ec	Pi	Nf	Pz	Cd	Zd	Ca	Ny	Mu	V	Fa	Pp	Uv	B	Pe	Pg	I	Pn	Ug	Nu	Pc	Lm	Ngram	Mb
Present	3	7	10	7	10	0	8	12	0	0	7	0	0	5	0	5	0	1	2	0	0	0	0	0	0	0	0
Dominant	20	0	1	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	23	7	11	7	10	0	8	15	0	0	7	0	0	5	0	5	0	1	2	0	0	0	0	0	0	0	0
% Frequency	95.8%	29.2%	45.8%	29.2%	41.7%	0.0%	33.3%	62.5%	0.0%	0.0%	29.2%	0.0%	0.0%	20.8%	0.0%	20.8%	0.0%	4.2%	8.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Lake St. Catherine

Transect	Point #	Distance from Shore	Depth (ft)	% Cover	% Ms Cover	Species Richness	Biomass	Pr	Ms	Pa	Ec	Pi	Nf	Pz	Cd	Zd	Ca	Ny	Mu	V	Fa	Pp	Uv	B	Pe	Pg	I	Pn	Ug	Nu	Pc	Lm	Ngram	Mb
7	47	30	3	70	1	6	3	D	X						X						X		X		X								
8	44	50	3	60	5	4	2	D	X	X		X																						
8	45	MID	4	80	10	4	3	D	X	X		X																						
8	46	25	3	100	10	4	2	D	X	X					X																			
9	41	15	3	1	0	1	1													D													
9	42	150	10	80	0	4	2	X				D			X							X											
9	43	40	1	80	0	3	2	D		X		X																						
10	38	40	4	100	0	4	2	X		D	X	X																						
10	39	150	9	90	40	3	2	D	X		X																							
10	40	220	12	30	20	2	1	X	D																									
11	34	20	3	100	0	2	1	X		D																								
11	35	100	7	90	0	3	2	X		D		X																						
11	36	30	5	40	0	3	2			X		D			X																			
11	37	35	6	60	1	4	2	X	X	X		D																						
12	31	25	6	5	0	1	2					D																						
12	32	25	4	100	0	5	0	X		X		X						X						D										
12	33	75	8	90	0	2	0	X		D																								
13	28	35	4	100	5	3	4	X	X			D																						
13	29	120	8	100	5	4	3	D	X	X		X																						
13	30	25	7	40	0	2	1	D				X																						
14	25	20	4	90	70	3	3	X	D	X																								
14	26	30	3	90	10	3	3		X			D								X														
14	27	60	12	40	5	3	1	D	X	X																								
15	22	75	5	10	0	3	1	D			X															X								
15	23	50	4	80	0	3	4	X		X		D																						
15	24	125	10	60	50	2	4		D						X																			
16A	20	100	7	20	0	4	2	X			X	D			X																			
16B	21	70	8	0	0	0	0																											
17A	17A	25	8	50	10	3	2	X	X			D																						
17	98	80	8	100	30	5	3	X	D			X								X						X								
18	72	15	9	10	0	2	2	D				X																						
18	73	30	10	70	0	2	1	D		X																								
19	74	25	5	30	10	5	1	X		X		D		X												X								
19	75	25	13	0	0	0	0																											
20	76	20	7	1	0	1	1					D																						
20	77	125	11	90	0	3	3	X				X								D														
21	78	40	6	90	10	4	2	D	X			X														X								
21	79	80	9	80	10	4	3	X	X			D														X								
21	80	15	6	60	0	2	1	D				X																						
22	81	30	6	80	0	2	1					D		X																				
22	82	30	8	30	1	3	2		X			D								X														
23	83	25	3	70	0	3	3	X				X														D								

Transect	Point #	Distance from Shore	Depth (ft)	% Cover	% Ms Cover	Species Richness	Biomass	Pr	Ms	Pa	Ec	Pi	Nf	Pz	Cd	Zd	Ca	Ny	Mu	V	Fa	Pp	Uv	B	Pe	Pg	I	Pn	Ug	Nu	Pc	Lm	Ngram	Mb
23	84	120	5	70	5	6	2	D	X	X				X						X						X								
23	85	200	6	70	10	4	2		X		X	X				X																		
23	86	40	10	0	0	0	0																											
24	87	40	8	0	0	0	0																											
24	88	25	3	20	0	3	1				D	X	X																					
24	90	100	10	100	20	5	3	D	X			X		X								X												
25	92	70	11	10	0	2	0												D							X								
25	93	15	4	5	0	3	1												X	X	X													
25	94	20	11	0	0	0	0																											
26	95	50	5	0	0	0	0																											
26	96	100	4	0	0	0	0																											
26	97	175	12	5	0	3	1	X				D	X																					
27	102	20	4	100	20	5	1	X	X			X						X		X														
27	103	70	10	5	0	1	1	D																										
27	104	225	10	90	80	3	3		D			X			X																			
27	100	20	5	5	0	1	1					D																						
27	101	150	8	70	0	3	3					D		X	X																			
28	127	30	4	100	1	4	1	D	X	X				X																				
28	129	MID	6	100	1	4	1	D	X	X		X																						
28	128	40	4	100	0	4	3	D		X		X		X																				
29	107	30	5	100	5	5	2	D	X	X		X		X																				
29	106	30	13	100	0	2	1	D						X																				
29	105	30	6	90	10	4	2	D	X			X	X																					
30	108	25	5	5	0	1	1																			D								
30	109	100	12	0	0	0	0																											
30	111	150	10	80	20	5	2	D	X			X		X	X																			
30	110	50	4	10	0	3	0	D					X	X																				
31	124	25	5	30	0	5	1	X		D		X	X	X																				
31	125	MID	8	90	0	4	0	D				X	X	X																				
31	126	30	5	70	0	4	3	X				D	X	X																				
32	114	15	6	0	0	0	0																											
32	113	125	8	90	10	6	2	X	X			D		X		X						X												
32	112	30	4	90	0	3	2	D				X		X																				
33	122	30	4	0	0	0	0																											
33	123	120	10	100	40	4	2	D	X			X			X																			
33	121	125	13	60	0	4	2	D				X	X	X																				
33	120	50	6	20	0	4	0			X		D		X						X														
34	115	40	5	100	0	3	2	D		X		X																						
34	116	150	10	60	50	3	2	X	D			X																						
34	117	250	12	100	1	3	1	D	X					X																				
34	119	150	6	80	20	5	3	X	X			X	D									X												
34	118	30	3	60	50	2	2	X	D																									
35	134	50	7	0	0	0	0																											
35	135	125	14	100	5	4	1	D	X			X		X																				
36	132	25	8	0	0	0	0																											
36	133	300	10	15	10	3	1	X	D	X																								
36	131	250	12	100	0	7	0	X	X			D	X		X							X				X								
36	130	50	7	80	20	6	3	X	X	X		D	X	X																				
37	138	15	10	0	0	0	0																											
37	136	100	13	70	5	3	1	D	X																	X								
37	137	25	6	70	0	3	1	D		X		X																						
38	140	120	5	0	0	0	0																											
38	141	300	6	20	10	3	1		D		X			X																				
38	142	300	6	10	5	2	2		X			D																						
38	139	10	7	30	0	1	3		D																									
39	166	50	3	90	0	4	1	X		D		X								X														
40	143	100	6	90	60	4	2	X	D	X		X																						
40	144	100	10	90	50	3	2	X	D			X																						
40	145	20	10	60	40	4	3	X	D		X		X																					
41	168	50	6	90	1	5	1	X	X	D		X		X																				
42	147	35	9	100	0	2	0	D		X																								
42	146	10	12	5	0	1	1	D																										
43	148	35	7	100	0	2	0	X		D																								
43	149	100	13	50	1	3	1	D	X					X																				
43	150	30	7	5	0	2	1						D						X															

Transect	Point #	Distance from Shore	Depth (ft)	% Cover	% Ms Cover	Species Richness	Biomass	Pr	Ms	Pa	Ec	Pi	Nf	Pz	Cd	Zd	Ca	Ny	Mu	V	Fa	Pp	Uv	B	Pe	Pg	I	Pn	Ug	Nu	Pc	Lm	Ngram	Mb
44	153	75	5	90	1	4	2	X	X	X		D																						
44	152	175	10	80	5	4	1	D	X				X	X																				
44	151	20	7	0	0	0	0																											
45	155	25	8	70	0	3	2	D		X		X																						
45	154	20	6	0	0	0	0																											
46	156	60	4	10	0	1	1			D																								
46	157	200	9	90	1	6	1	X	X	X			D		X										X									
46	159	175	13	5	0	2	1					X			D																			
46	158	35	7	90	30	3	3	X	X			D																						
47	161	25	4	100	0	2	1	X		D																								
47	162	125	10	90	5	4	0	D	X			X													X									
47	169	150	7	90	30	3	2					D		X	X																			
47	160	100	3	5	0	1	1						D																					
48	165	40	5	90	1	3	1	D	X	X																								
48	164	MID	11	80	0	2	1	D			X																							
48	163	45	5	90	1	5	3		X	X		X								D					X									
49	170	25	5	80	10	4	2	X	X	X										D														
49	171	MID	8	30	20	3	2		X	D																	X							
49	172	15	4	40	10	4	2	X	X	D		X																						
50	173	20	3	40	1	2	1	D	X																									
50	174	MID	7	80	5	3	1	X	X	D																								
50	175	20	6	90	5	5	1	D	X	X											X	X												
				56.33	**7.58**	**2.88**	**1.46**																											

	Pr	Ms	Pa	Ec	Pi	Nf	Pz	Cd	Zd	Ca	Ny	Mu	V	Fa	Pp	Uv	B	Pe	Pg	I	Pn	Ug	Nu	Pc	Lm	Ngram	Mb
Present	42	47	32	8	43	12	26	13	2	0	2	2	8	3	6	1	0	3	10	1	0	0	0	0	0	0	0
Dominant	44	13	13	1	26	4	0	1	0	0	0	1	4	0	0	0	1	0	2	0	0	0	0	0	0	0	0
Total	86	60	45	9	69	16	26	14	2	0	2	3	12	3	6	1	1	3	12	1	0	0	0	0	0	0	0
% Frequency	66.7%	46.5%	34.9%	7.0%	53.5%	12.4%	20.2%	10.9%	1.6%	0.0%	1.6%	2.3%	9.3%	2.3%	4.7%	0.8%	0.8%	2.3%	9.3%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Transect	Point #	Distance from Shore	Depth (ft)	% Cover	% Ms Cover	Species Richness	Biomass	Pr	Ms	Pa	Ec	Pi	Nf	Pz	Cd	Zd	Ca	Ny	Mu	V	Fa	Pp	Uv	B	Pe	Pg	I	Pn	Ug	Nu	Pc	Lm	Ngram	Mb
51	176	MID	6	30	0	1	1	D																										
52	179	30	3	90	20	8	3	D	X	X	X							X						X	X		X							
52	178	MID	5	90	5	3	1	D	X																X									
52	177	20	4	80	20	7	3	D	X	X		X						X						X	X									
53	182	20	3	90	5	6	4	X	X		X				X			D						X										
53	181	MID	5	60	0	4	1	D			X												X		X									
53	180	20	3	100	10	6	4	X	X	D	X				X			X																
54	183	25	3	100	5	8	0	D	X		X			X	X			X		X										X				
54	184	40	5	100	10	6	3	D	X	X					X			X								X								
54	185	MID	4	100	30	10	4	X	X	X	X	X		X	D			X		X						X								
54	186	100	3	100	0	7	0	X	X	X	D				X			X		X														
55	190	75	3	100	0	4	4	D			X	X						X																
55	189	250	3	100	30	4	4	D	X	X		X																						
55	188	150	3	100	30	5	4	D	X			X			X	X																		
55	187	100	3	100	1	5	3	X	X		X						D	X																
56	194	50	3	100	30	6	3	X	X		X	D				X				X														
56	193	500	3	100	10	5	4	D	X	X		X								X														
56	192	400	3	100	5	4	4	D	X			X								X														
56	191	30	3	100	0	2	1	D		X																								
57	198	120	3	100	1	7	3	X	X	X	X	D						X		X														
57	197	600	3	40	1	4	3	X	X			D								X														
57	196	500	3	100	5	4	4	D	X			X								X														
57	195	75	4	100	20	2	0	D	X																									
58	202	60	6	100	1	3	1	D	X						X																			
58	201	600	3	100	80	4	4	X	D			X								X														
58	200	700	3	100	10	4	3	X	X			X								D														
58	199	40	3	90	0	2	1	D				X																						
59	203	35	3	100	0	4	2	D				X		X				X																
59	204	700	3	100	10	5	3	D	X	X		X								X														
59	205	500	4	100	80	4	4	X	D			X								X														
59	206	125	5	100	70	5	4	X	D		X			X	X																			
60	210	75	5	80	20	4	1	D	X					X	X																			
60	209	450	4	100	70	5	4	X	D			X						X		X														
60	208	500	4	100	10	5	3	D	X	X				X						X														
60	207	100	4	30	0	3	0	D							X					X														
61	214	40	3	10	5	4	1	D	X			X																				X		

Transect	Point #	Distance from Shore	Depth (ft)	% Cover	% Ms Cover	Species Richness	Biomass	Pr	Ms	Pa	Ec	Pi	Nf	Pz	Cd	Zd	Ca	Ny	Mu	V	Fa	Pp	Uv	B	Pe	Pg	I	Pn	Ug	Nu	Pc	Lm	Ngram	Mb
61	213	300	4	20	5	3	4	D	X			X																						
61	212	800	5	15	10	2	3		D			X																						
61	211	75	3	100	5	5	2	D	X	X		X			X																			
62	215	50	3	30	0	1	0					D																						
62	216	700	5	20	1	2	2		X			D																						
62	217	120	4	20	0	2	2					D												X										
62	218	30	3	100	0	5	4	X				X						D		X				X										
				81.28	**14.30**	**4.42**	**2.53**																												

	Pr	Ms	Pa	Ec	Pi	Nf	Pz	Cd	Zd	Ca	Ny	Mu	V	Fa	Pp	Uv	B	Pe	Pg	I	Pn	Ug	Nu	Pc	Lm	Ngram	Mb
Present	14	28	12	11	20	0	6	11	2	0	12	0	16	0	0	1	5	4	2	1	0	0	1	1	0	0	0
Dominant	25	5	1	1	6	0	0	1	0	1	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	39	33	13	12	26	0	6	12	2	1	14	0	17	0	0	1	5	4	2	1	0	0	1	1	0	0	0
% Frequency	90.7%	76.7%	30.2%	27.9%	60.5%	0.0%	14.0%	27.9%	4.7%	2.3%	32.6%	0.0%	39.5%	0.0%	0.0%	2.3%	11.6%	9.3%	4.7%	2.3%	0.0%	0.0%	2.3%	2.3%	0.0%	0.0%	0.0%

Entire Lake

	Pr	Ms	Pa	Ec	Pi	Nf	Pz	Cd	Zd	Ca	Ny	Mu	V	Fa	Pp	Uv	B	Pe	Pg	I	Pn	Ug	Nu	Pc	Lm	Ngram	Mb
Present	59	82	54	26	73	12	40	36	4	0	21	2	24	8	6	7	5	8	14	2	0	0	1	1	0	0	0
Dominant	89	18	15	2	32	4	0	5	0	1	2	1	5	0	0	0	1	0	2	0	0	0	0	0	0	0	0
Total	148	100	69	28	105	16	40	41	4	1	23	3	29	8	6	7	6	8	16	2	0	0	1	1	0	0	0
8.25 **% Frequency**	75.5%	51.0%	35.2%	14.3%	53.6%	8.2%	20.4%	20.9%	2.0%	0.5%	11.7%	1.5%	14.8%	4.1%	3.1%	3.6%	3.1%	4.1%	8.2%	1.0%	0.0%	0.0%	0.5%	0.5%	0.0%	0.0%	0.0%

2012 TOTAL VEGETATION BIOMASS

Legend

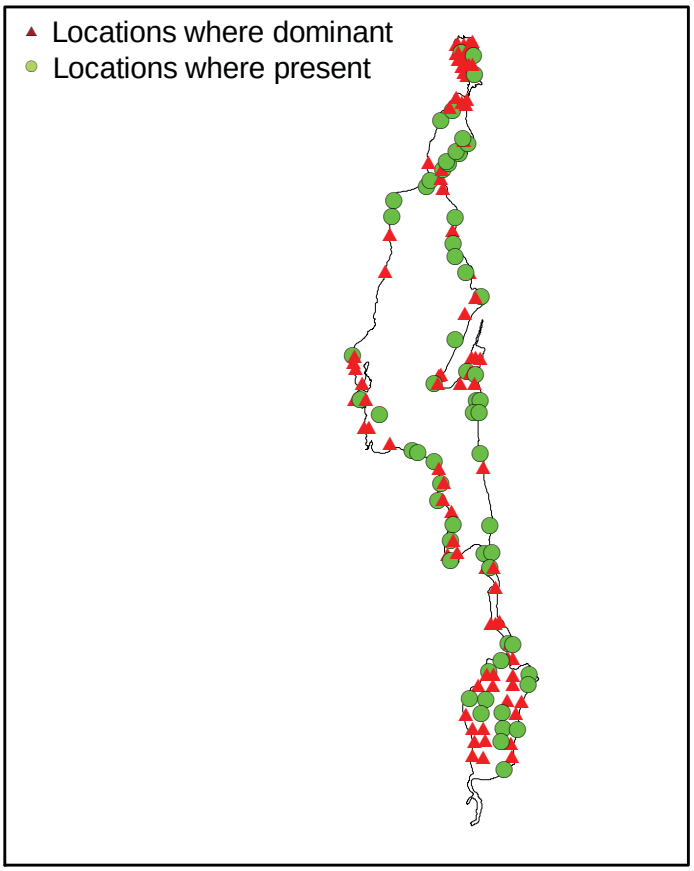
Biomass indices reported
during 9/27 & 9/28/12 survey

- 1 - low biomass (along bottom)
- 2 - moderate biomass (in water column)
- 3 - high biomass (approaching surface)
- 4 - extremely high biomass (topped out)

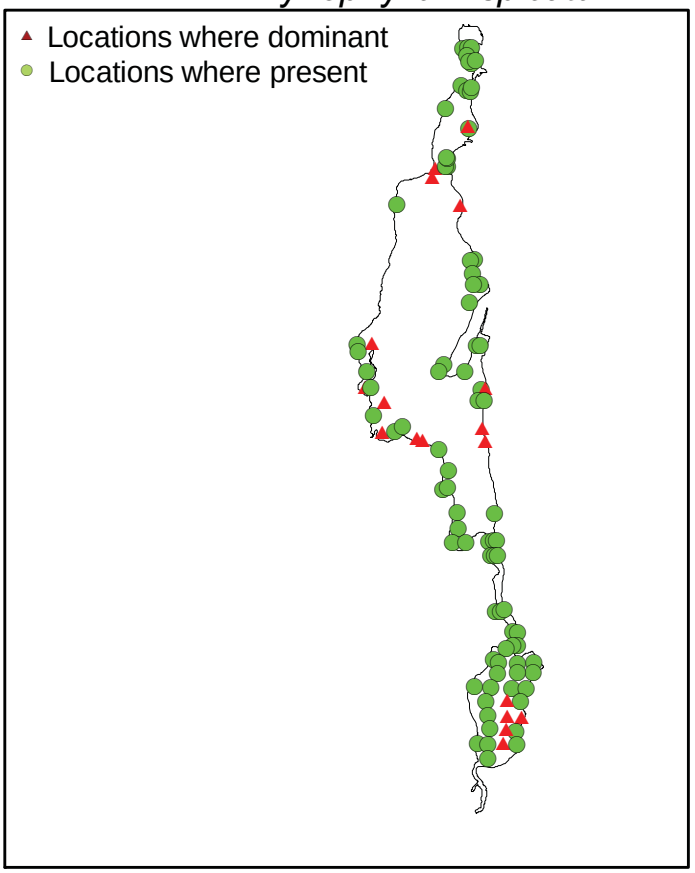
N
W E
S

0 1,000 2,000 4,000 6,000 8,000
Feet

Distribution of *Potamogeton robbinsii*

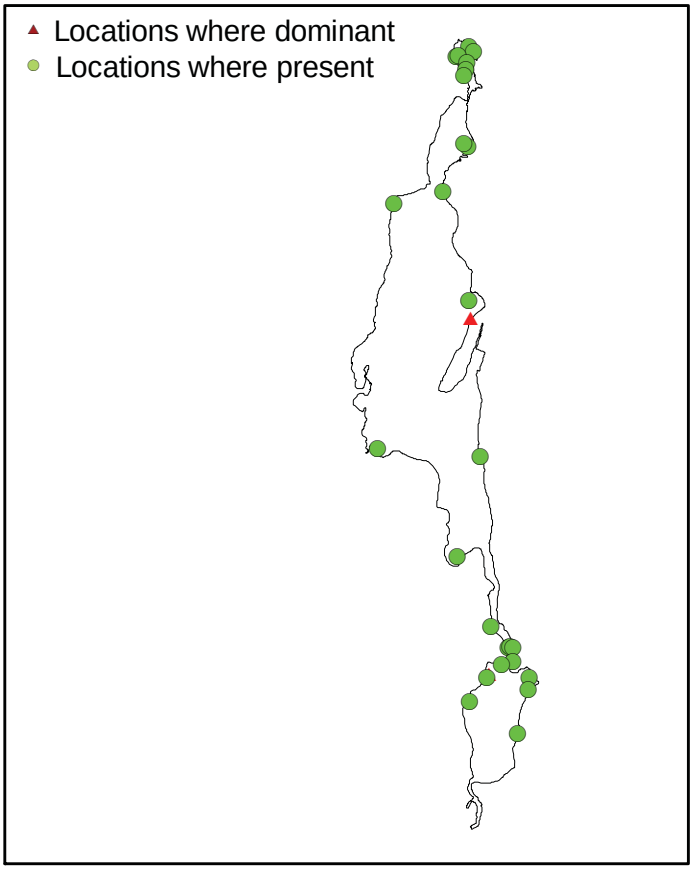


Distribution of *Myriophyllum spicatum*

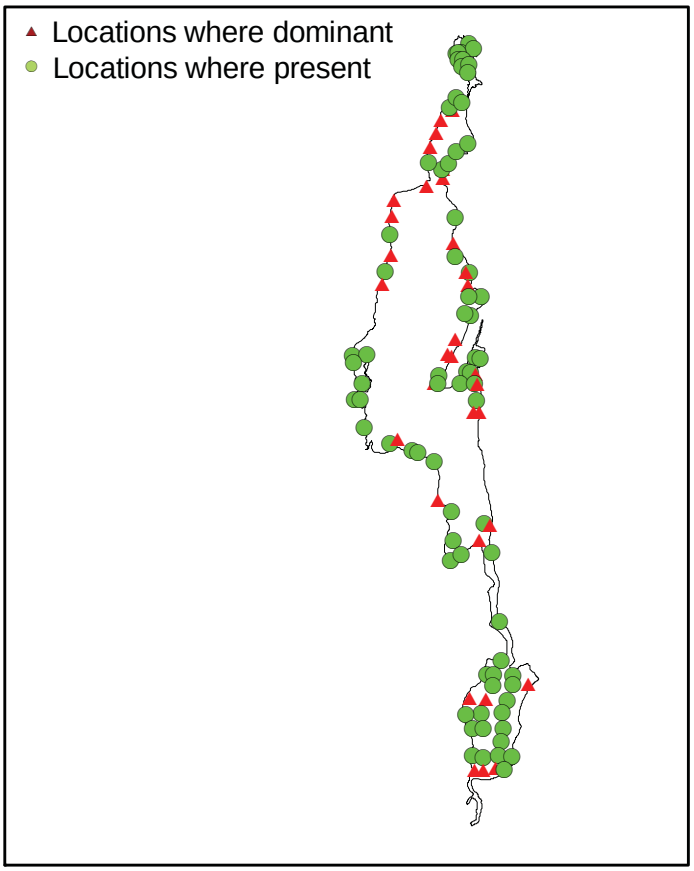


Distribution of *Potamogeton amplifolius*

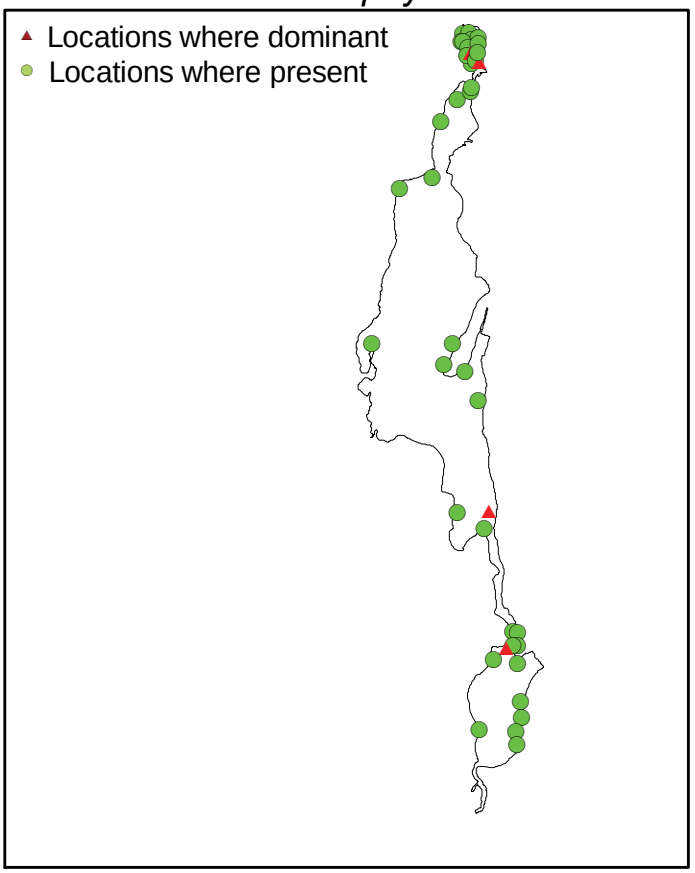
Distribution of *Elodea canadensis*



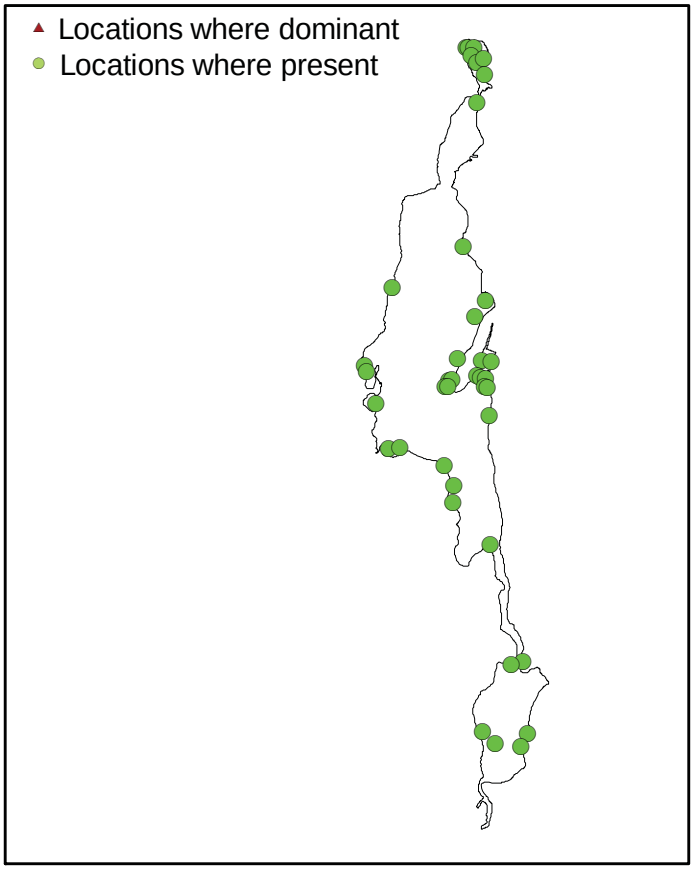
Distribution of *Potamogeton illionensis*



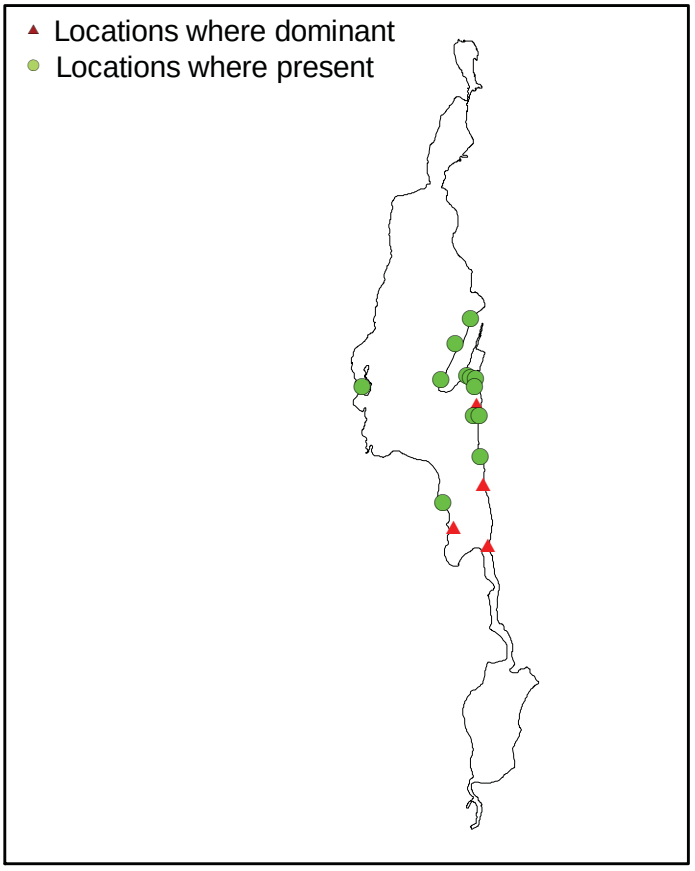
Distribution of *Ceratophyllum demersum*



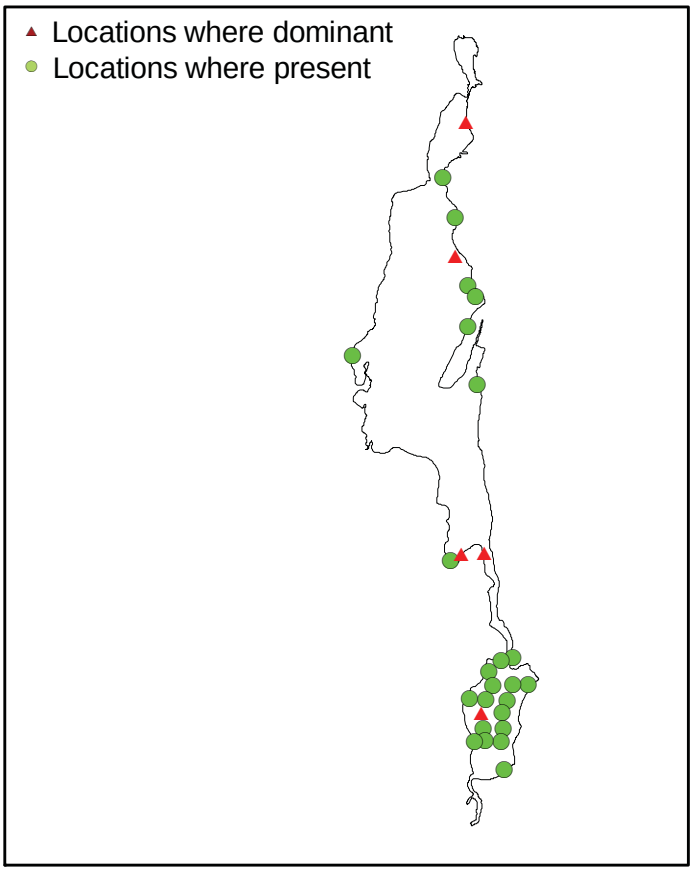
Distribution of *Potamogeton zosterformis*



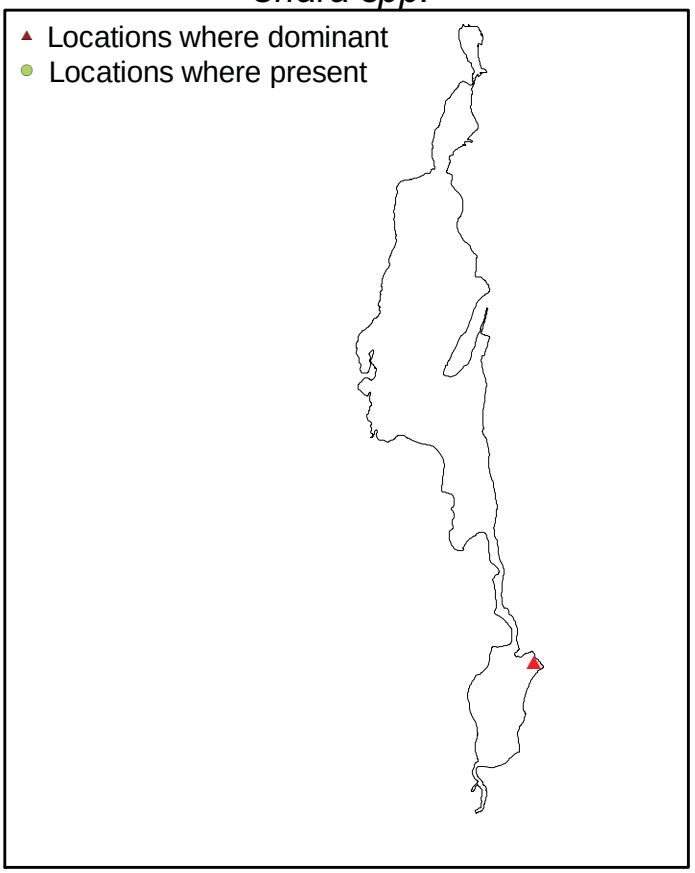
Distribution of *Najas flexilis*



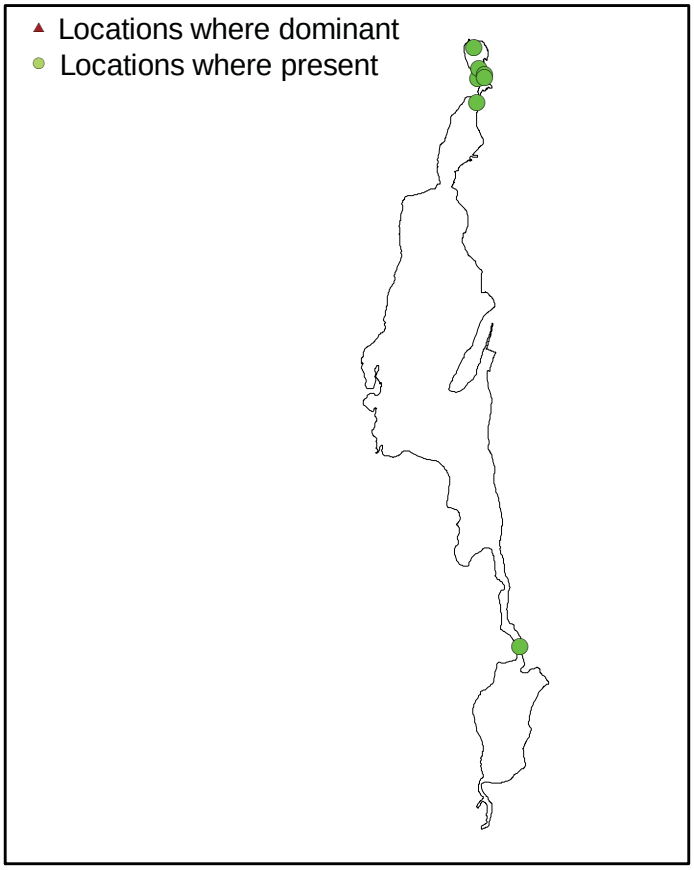
Distribution of *Vallisneria americana*



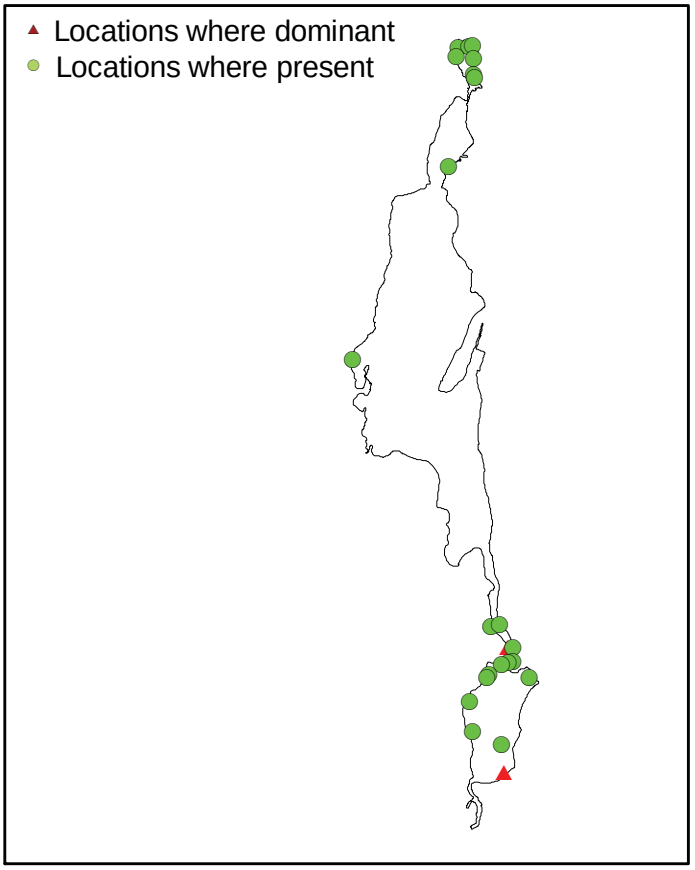
Distribution of *Chara spp.*



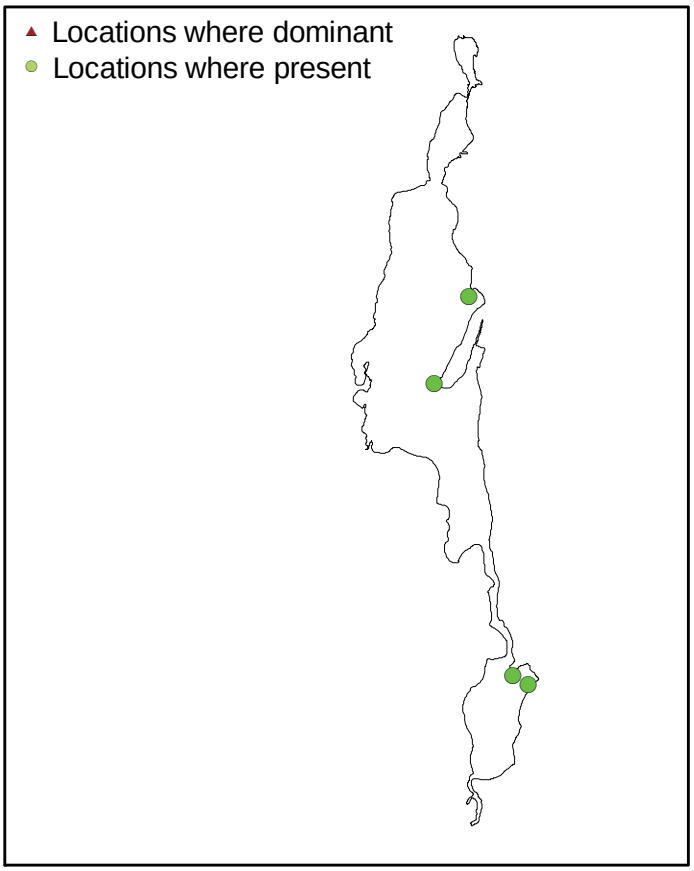
Distribution of *Utricularia vulgaris*



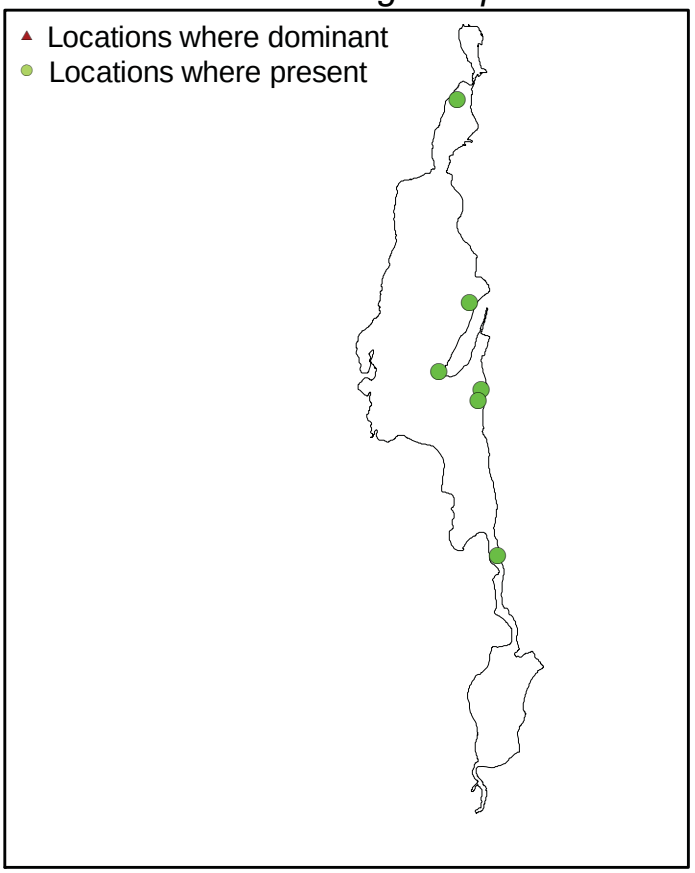
Distribution of *Nymphaea odorata*



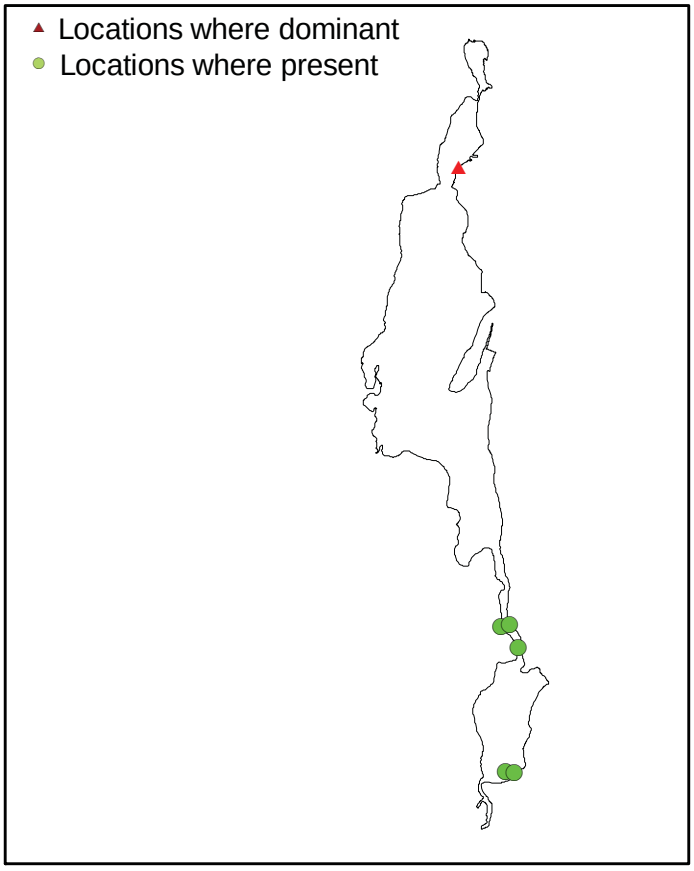
Distribution of *Zosterella dubia*



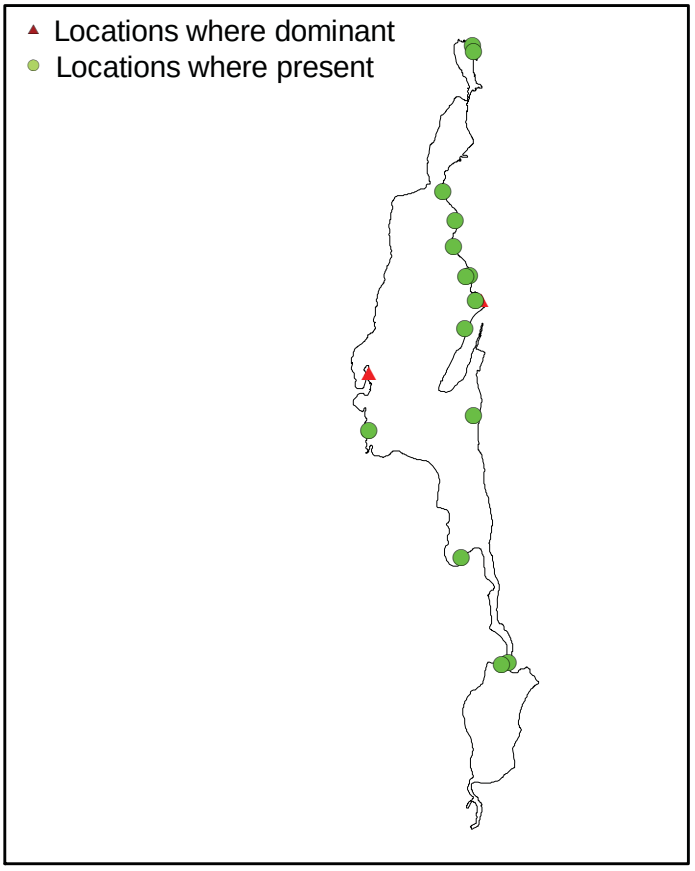
Distribution of *Potamogeton pusillus*



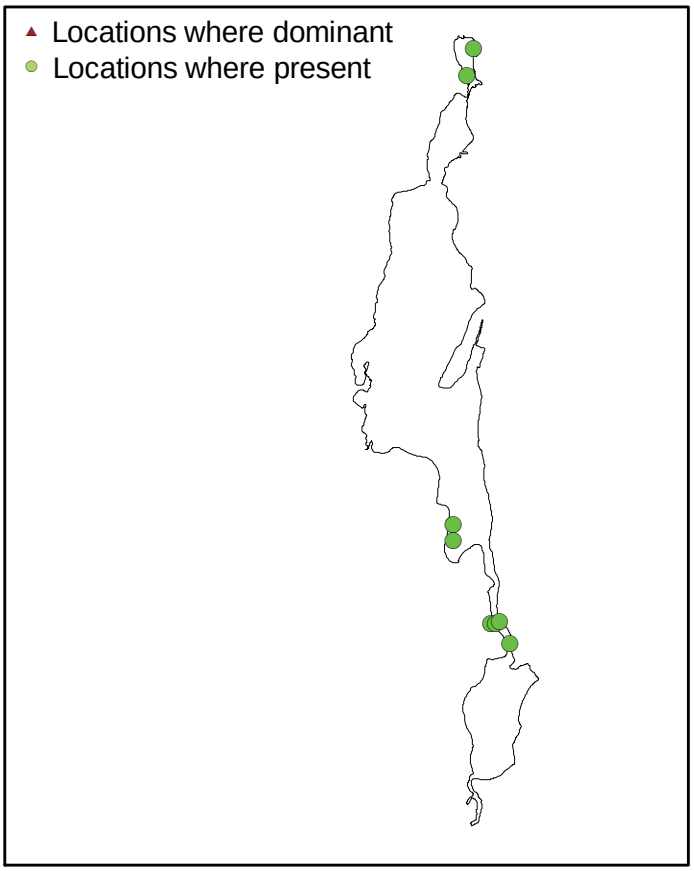
Distribution of *Brasenia schreberi*



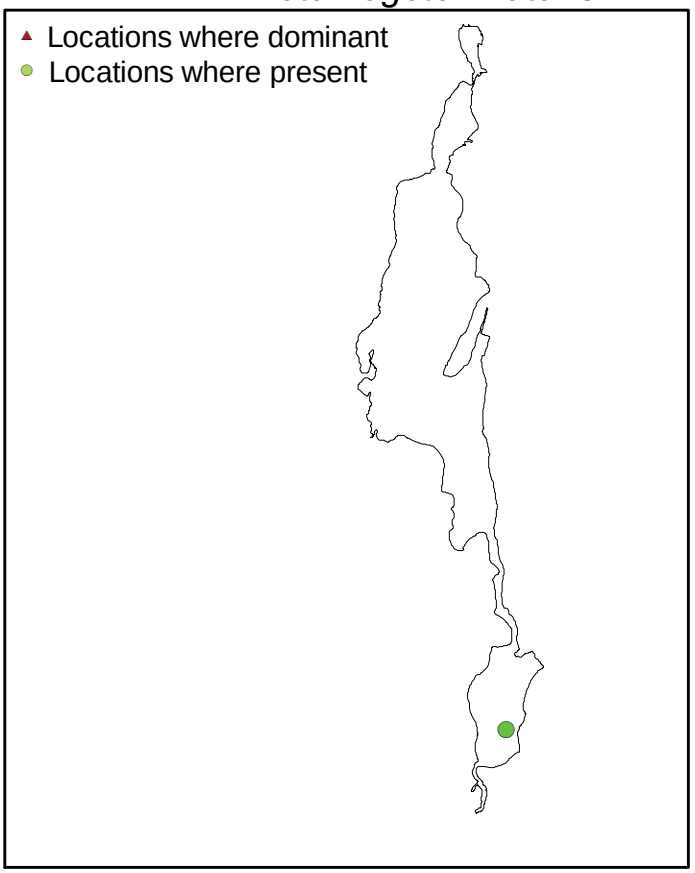
Distribution of *Potamogeton gramineus*



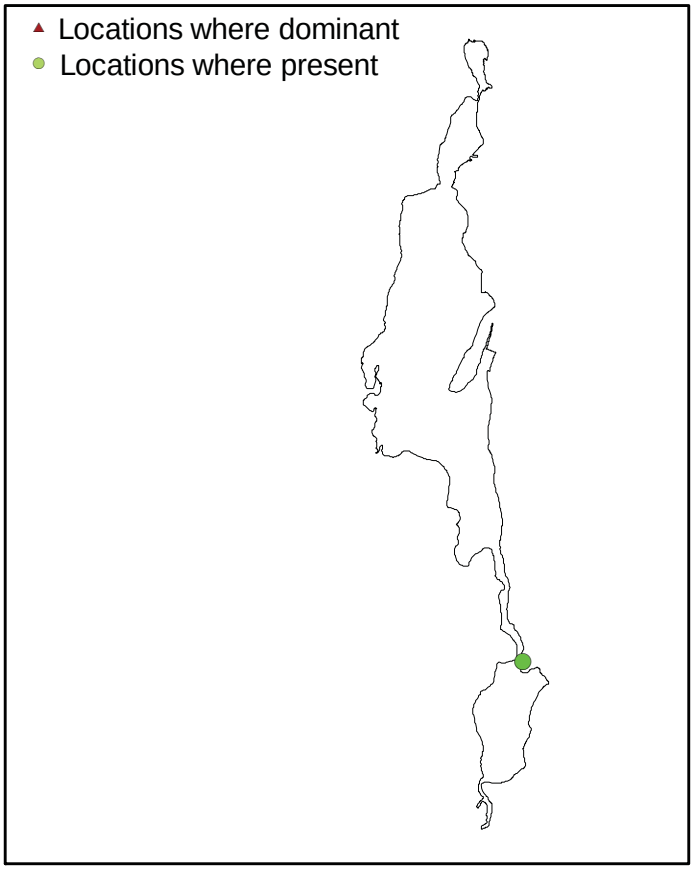
Distribution of *Potamogeton epihydrus*



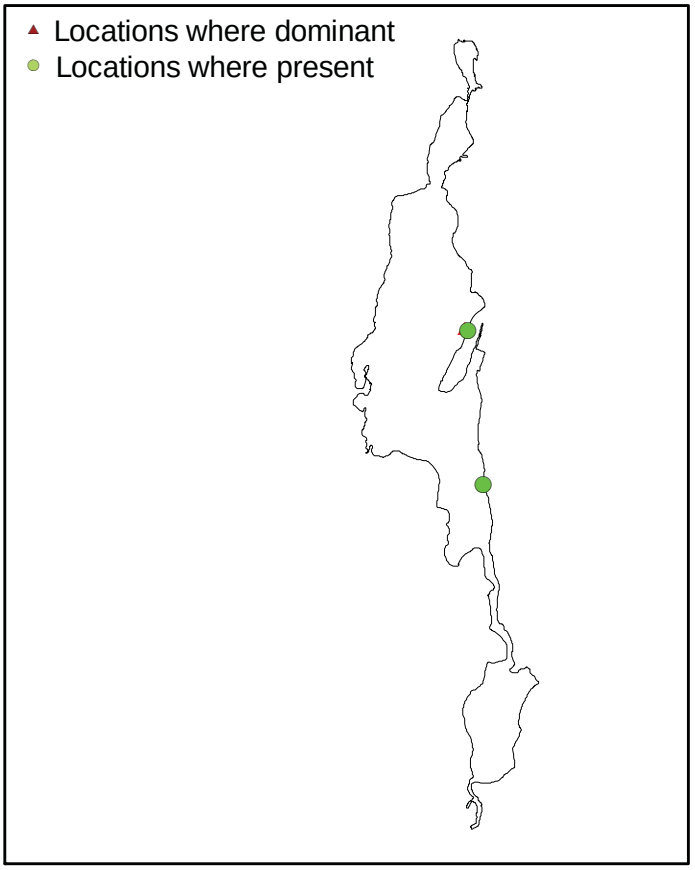
Distribution of *Potamogeton natans*



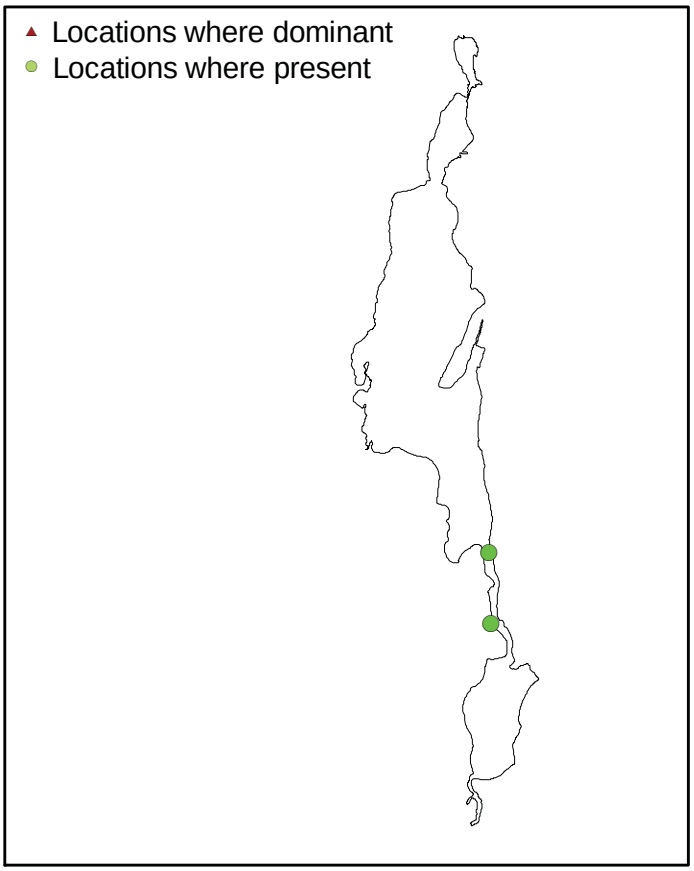
Distribution of *Nuphar variegatum*



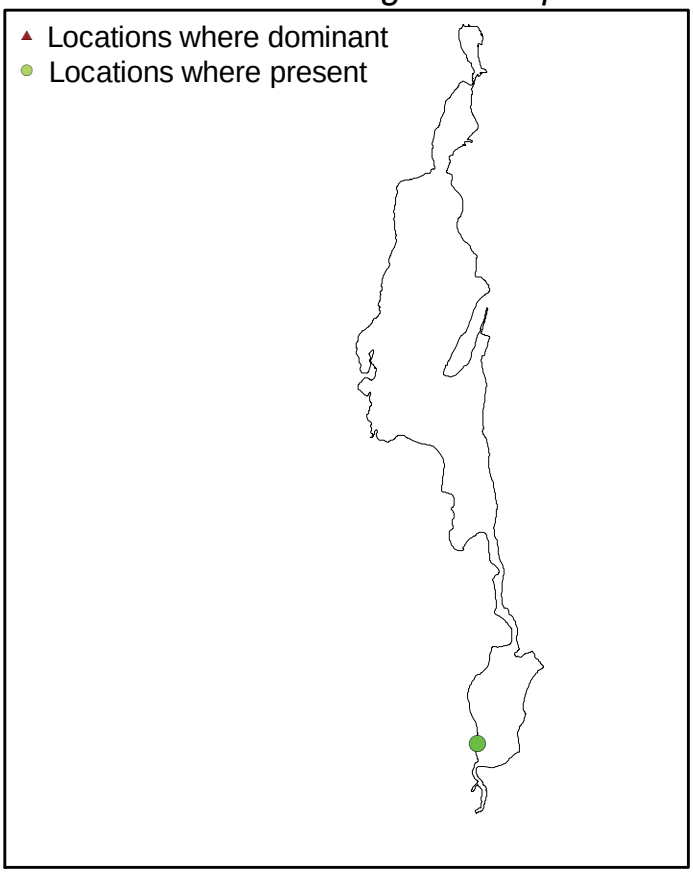
Distribution of *Musci spp.*



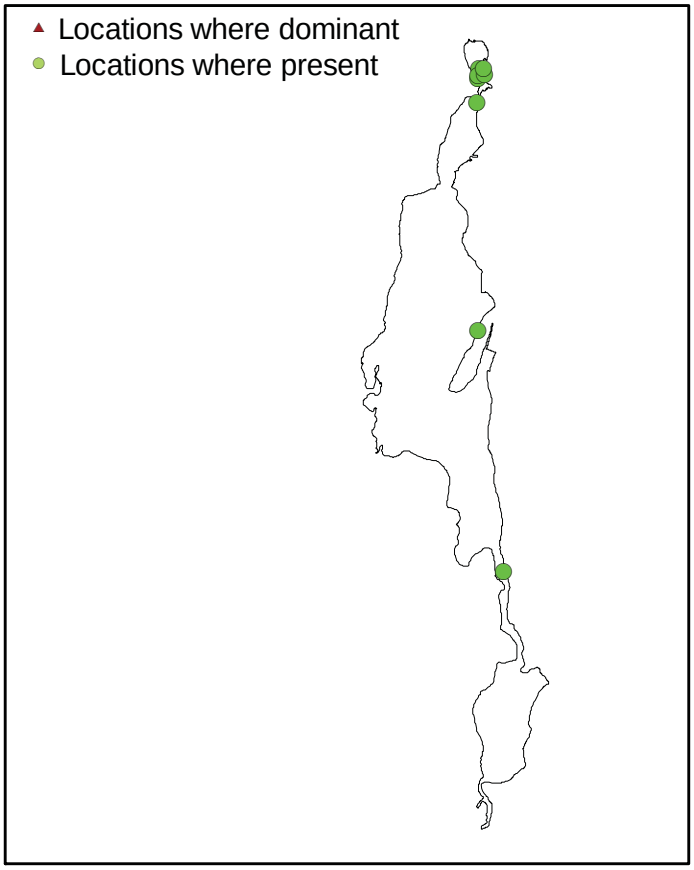
Distribution of *Isoetes spp.*



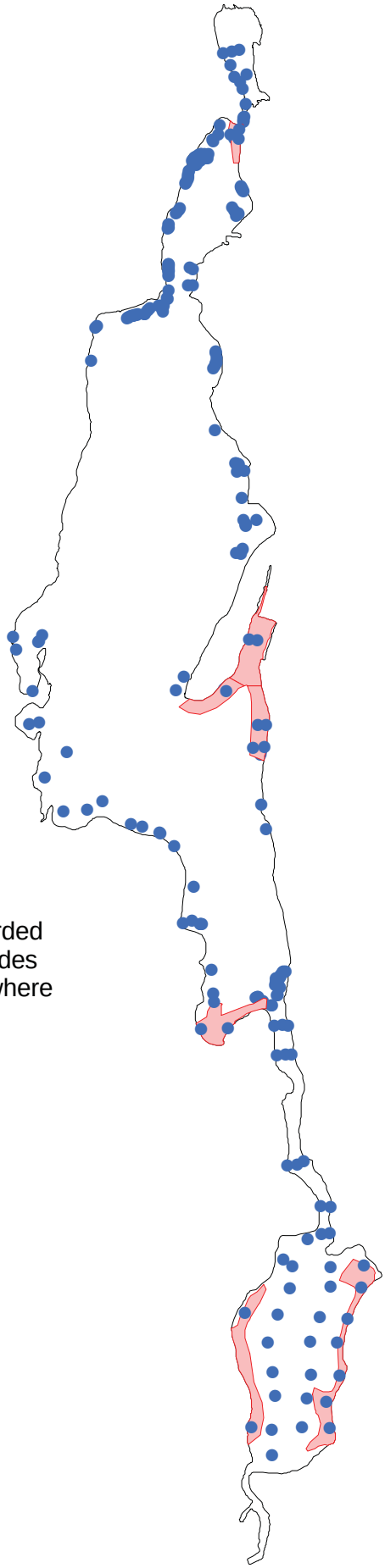
Distribution of *Potamogeton crispus*



Distribution of Filamentous algae



2012 Milfoil Distribution



Legend

- Locations of EWM growth recorded during Sept. 2012 survey (includes pre-established survey points where EWM was encountered)
- 2012 Treatment Areas

N
W E
S

0 1,000 2,000 4,000
Feet

Preliminary Managment Areas - 2013