

# LAKE ST. CATHERINE

Aquatic Vegetation Management Program

2018 Annual Report

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Appendix A: Herbicide Residue Testing Results

Appendix B: Comprehensive Aquatic Vegetation Survey Information

## 1 INTRODUCTION

The 2018 season was SÖLitude Lake Management's fifteenth year of involvement in an Integrated Management Plan at Lake St. Catherine developed to control non-native Eurasian watermilfoil (*Myriophyllum spicatum*) throughout the lake. Under this plan, Eurasian watermilfoil management efforts have included herbicide treatment, diver assisted suction harvesting (DASH) and hand-pulling, boat ramp monitoring and educating lake residents and lake users.

In 2018, management activities included spot-treatment of five areas, totaling 47.2 acres with Renovate OTF (triclopyr granular) and Renovate 3 (triclopyr liquid) herbicides as well as diver hand-pulling and diver assisted suction harvesting. These efforts were consistent with the current five-year Integrated Management Plan (2014-2019).

The following report summarizes the results of 2018 Treatment Program and details findings from the late season comprehensive aquatic plant survey that has been performed annually to document in-lake plant conditions and help evaluate and refine management goals. Specific information on the 2018 diver hand-pulling and diver assisted suction harvesting efforts will be provided by the Lake St. Catherine Association (LSCA) under a separate cover.

## 2 HERBICIDE TREATMENT PROGRAM - 2018

### 2.1 Program Chronology

A chronology of the 2018 treatment program is provided below:

- Pre-treatment inspection to finalize treatment areas.....May 9
- Treatment of 47.2 acres with Renovate 3 and Renovate OTF .....June 18
- Herbicide residue monitoring .....June 19, July 17
- Comprehensive aquatic plant survey .....September 24 & 25

### 2.2 Pre-Treatment Inspection

On May 9 the entire littoral area of Lake St. Catherine (Lily Pond, Main Lake and Little Lake) was surveyed by SÖLitude biologists Amanda Mahaney and Brea Arvidson to determine the stage of Eurasian watermilfoil (EWM) growth and finalize potential management areas.

EWM plants were generally 3-4 feet tall, depending on water depth, and showing active growth with red apical meristems. Notable growth was observed within Atwater Bay, the cove along Oxbow Bay Drive and West Lake Road, another more northern small localized patch along West Lake Road, along Ferncliff Road western shoreline in the Northern Bay, and an offshore patch just south of Halls Bay along Route 30. Results of the survey were communicated to LSCA for their input and final determination on proposed treatment and DASH areas.

### 2.3 Summary of 2018 Treatment

A total of 47.2 acres amongst five areas were targeted for treatment (Figure 1). Consistent with previous years, each treatment area was evaluated with regards to EWM cover/distribution as well as several other factors including: potential for increased EWM spread; 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 VT DEC for review and approval prior to treatment.

Treatment was conducted on Monday, June 18, 2018 to allow enough time to comply with the notification requirements of ANC Permit #2014-C01 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 mostly sunny, with a passing thunderstorm and an air temperature of 89°F; wind was out of the north, estimated at <5-10 mph. Surface water temperature in the main basin was approximately 22.7°C.

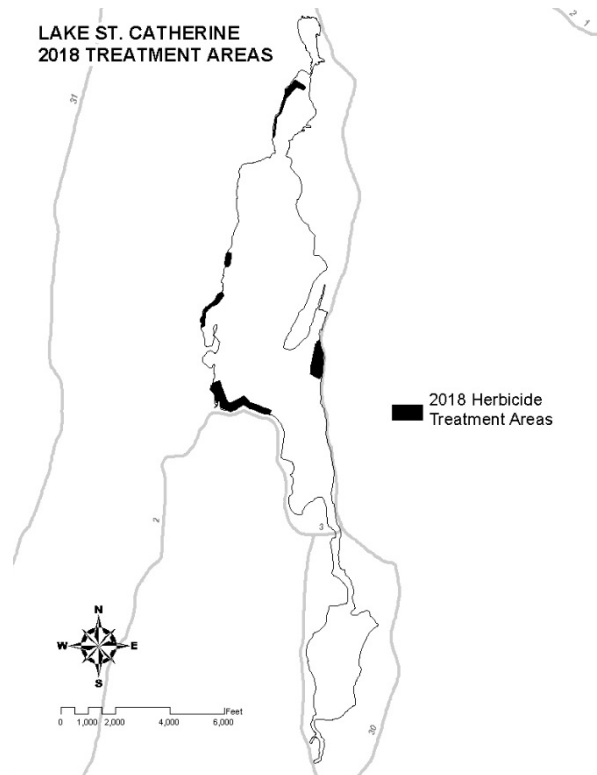


Figure 1. 2018 Treatment Areas

The treatment was conducted with a 20-foot aluminum work skiff. The granular Renovate OTF herbicide was applied using back-mounted calibrated cyclone-spreader systems. The liquid Renovate 3 herbicide was injected at depth subsurface using weighted hoses that trailed the spray boat. An onboard GPS unit was used to provide real-time guidance and ensure an even application in each of the treated areas. The State Boat Ramp located on the channel between the Main Lake and Little Lake was used as the base of operations.

Treatment 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 has been used in recent years to increase concentration-exposure-time and help increase treatment efficacy. Both Renovate 3 (liquid) and Renovate OTF (granular) formulations of triclopyr herbicide were used at Lake St. Catherine in 2018. The granular formulation has proven to be effective for steeply sloped areas, smaller EWM beds and in areas where there is potential for excessive dilution from untreated water. The liquid formulation was used in larger treatment and cove areas that were not subject to as much dilution.

The application rate for Renovate OTF (granular) was 2.25 ppm in bottom 4-6 feet of water, or 240 lbs/ac. The liquid Renovate 3 was applied at 1.5 ppm, assuming a 6 foot average depth in most treatment areas. A total of 1968 pounds of Renovate OTF and 316.7 gallons of Renovate 3 were applied. The treatment took approximately 7 hours to complete.

## 2.4 Herbicide Residue Testing

In compliance with conditions of the ANC Permit #2014-C01, water samples were collected from within and immediately downstream of Lake St. Catherine following treatment for analysis of triclopyr concentrations. Sampling was conducted 24 hours following treatment and approximately 4 weeks after treatment. Concentrations at all sample locations were below 75 ppb after 24 hours, which was the drinking water restriction imposed by DEC.

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

Samples were collected on June 19 and July 17 (Table 1). Consistent with prior years' post-treatment triclopyr sampling, residues dropped quickly with no in-treatment sample locations above the 75ppb threshold after 24 hrs. Four weeks post-treatment almost all 7 sample locations were less than 1 ppb. The LSCA was comfortable discontinuing sampling before all results were less than 1ppb, which is the irrigation restriction per the Renovate labels.

Table 1. FastEST Sampling Results (ppb)

Site	19-June	17-July
1/A	17.6	3.3
2/B	33.8	2.4
3/C	20.3	2.2
4/D	63	1.6
5/E	45.1	2.6
6/outlet	<1	<1
7/downstream	<1	<1

## 3 LATE SEASON COMPREHENSIVE AQUATIC VEGETATION SURVEY

### 3.1 Survey Methods

Using methods employed in previous years of this management program, the late season comprehensive aquatic vegetation survey conducted on September 24 & 25. All three lake basins were systematically toured by boat by SÖLitude biologists Amanda Mahaney and Kara Sliwoski. Transect and data point locations established in 2001 were relocated using a Differential GPS system (Appendix B – Figure 1).

Weather conditions the first day were sunny, calm and cool with temperatures in the mid 50s, while the second day was cloudy, very breezy, and rainy with similar temperatures.

Recorded at each data point was the following information: aquatic plants present, dominant species, plant biomass, percent total plant cover and percent EWM cover. Water depths that were recorded during the pre-treatment survey were verified using a high-resolution depth finder. The plant community was assessed through visual inspection, use of a throw-rake and with an Aqua-Vu underwater camera system. Locations where EWM plants were observed were recorded with a GPS unit. 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 EWM 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 in Appendix B.

### **3.2 Survey Findings**

Quantitative measures of the aquatic plant community documented in 2018 were comparable to some prior years. Lake-wide EWM distribution (FOC - frequency of occurrence) increased slightly from 62% in 2017 to 69% this season (Table 3). However, EWM abundance (% cover) doubled since 2017 from 8% to 16%. Overall vegetative cover also increased compared to prior years, from 46% in 2017 to 70% this year.

The composition of the vegetative community has also remained relatively unchanged since 2001 and is dominated by native pondweed species, namely (in decreasing FOC): *Potamogeton robbinsii*, *Elodea canadensis*, *Potamogeton illinoensis*, and *Zosterella dubia*. Slight FOC increases in *Ceratophyllum demersum*, *Elodea canadensis*, *Nymphaea odorata*, *Nuphar variegata*, *Potamogeton foliosus*, *Potamogeton zosteriformis*, *Vallisneria americana* and *Zosterella dubia* were observed this year in comparison to last year. Diversity has also been maintained throughout the course of management with 27 different aquatic plant species identified this fall and an average of approximately 5.5 species per point.

Comparative data for all three basins, and overall, collected during late season surveys between 2001 and 2018 is listed below (Table 2).

**Table 2.** Summary of Annual Survey Data, 2001-2018

LILY POND	2001	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
# of Data Points	24															
Total Plant Cover (%)	90	80	98	88	91	98	94	98	93	94	96	94	90	78	60	99
Milfoil Cover (%)	9	6	2	0	2	7	<1	<1	<1	1	5	1.5	2.2	7	6	6.7
Plant Biomass Index	3.1	2.5	3.3	2.5	2.8	3.3	2.7	2.3	2.9	3.1	3.5	3.4	3.5	3.2	2.9	3.9
Average Species Richness	5.67	3.58	5.17	3.59	4.54	5.58	4.83	5.46	4.13	4.21	4.46	5.04	4.8	5.5	5.54	7.75

LAKE ST. CATHERINE (Main Basin)	2001	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
# of Data Points	132															
Total Plant Cover (%)	66	46	51	57	58	66	58	63	59	56	63	63	63	37	43	60
Milfoil Cover (%)	43	16	0	4	11	4	5	2	7	8	16	15	7	6	7	16
Plant Biomass Index	1.9	1.5	1.6	1.8	2.0	2.0	2.0	1.3	1.8	1.5	2.0	2.0	2.0	2.6	1.6	2.9
Average Species Richness	2.96	2.39	2.85	3.50	3.75	4.09	3.68	3.06	2.88	2.88	2.85	2.87	3.2	3.1	3.35	4.59

LITTLE LAKE	2001	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
# of Data Points	43															
Total Plant Cover (%)	72	66	78	83	83	77	58	62	76	81	80	86	96	54	49	84
Milfoil Cover (%)	15	0	0	2	7	10	<1	5	9	14	7	10	42	25	13	22
Plant Biomass Index	2.3	2.1	2.4	2.9	2.8	2.7	2.2	2.7	3.3	2.5	3.0	3.2	3.8	3.8	2.3	3.9
Average Species Richness	5.62	3.23	3.30	3.81	4.58	4.3	4.23	4.65	3.84	4.42	4.63	4.77	4.4	4	5.49	6.79

OVERALL	2001	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
# of Data Points	199															
Total Plant Cover (%)	70	54	63	66	67	73	63	67	67	66	70	72	-	45	46	70
Milfoil Cover (%)	49	0.1	0.5	3	9	5	3	3	7	8	13	12	13	10	8	16
Plant Biomass Index	2	2	2	2	2	2	2	2	2	2	2	2	-	3	2	3.2
Average Species Richness	-	-	-	3.57	4.03	4.32	3.94	3.70	3.23	3.38	3.44	3.56	3.71	3.52	4.08	5.45



Table 3. Entire Lake System – Annual Species List and Frequency of Occurrence (%), 2001-2018

Macrophyte Species (Common Name / Scientific Name)	2001	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Water marigold <i>Bidens beckii</i> <sup>†</sup>	3	0	0	0	0	0	0	0	1	0	0	0.5	0	0	0	0
Watershield <i>Brasenia schreberi</i>	4	8	7	7	7	6	5	5	5	3	4	4	3	3	3	5
Coontail <i>Ceratophyllum demersum</i>	20	8	11	12	21	18	17	22	10	21	15	17	15	14	21	24
Muskgrass / Stonewort <i>Char asp. / Nitella sp.</i>	17	6	36	40	14	14	13	2	2	1	0	3	19	5	8	12
Spikerush <i>Eleocharis asicularia</i>	1	1	1	0	0	0	0	0	0	0	0	0	2	<1	0	0
Common waterweed <i>Elodea canadensis</i>	32	1	1	1	5	43	60	30	10	14	23	12	30	38	50	61
Quillwort <i>Isoetes sp.</i>	2	6	2	5	2	3	1	0	1	1	0	0	1	<1	<1	<1
Common duckweed <i>Lemna minor</i>	7	1	0	1	0	1	1	0	0	0	0	0	<1	<1	<1	0
Eurasian watermilfoil <i>Myriophyllum spicatum</i>	94	44	17	33	74	65	38	40	43	51	64	54	48	25	62	69
Whorled watermilfoil <i>Myriophyllum verticillatum</i>													1	0	5	0
Slender naiad <i>Najas flexilis</i>	22	0	8	39	34	22	15	16	14	8	4	7	10	9	20	19
Thread leaf naiad <i>Najas gracillima</i>																5
Spiny naiad <i>Najas minor</i>	0	0	0	0	0	0	0	0	0	0	0	0	<1	2	0	1
Yellow waterlily <i>Nuphar variegata</i>	5	5	5	2	2	1	2	1	2	1	1	0	2	<1	13	2
White waterlily <i>Nymphaea odorata</i>	16	5	11	10	11	11	10	7	7	12	12	14	13	8	1	24
Largeleaf pondweed <i>Potamogeton amplifolius</i>	33	38	43	49	52	53	51	56	23	35	32	31	13	20	19	23
Curlyleaf pondweed <i>Potamogeton crispus</i>	2	1	7	5	3	1	0	0	1	1	0	1	0	<1	1	0
Ribbonleaf pondweed <i>Potamogeton epihydrus</i>	2	6	7	3	3	5	1	1	1	4	1	2	<1	1	2	8
Leafy Pondweed <i>Potamogeton foliosus</i>																12
Variable leaf pondweed <i>Potamogeton gramineus</i>	23	1	6	6	2	4	4	4	11	8	3	3	4	3	4	14
Illinois pondweed <i>Potamogeton illinoensis</i>	4	1	2	9	23	39	29	36	35	53	56	57	44	47	50	43
Floating leaf pondweed <i>Potamogeton natans</i>	0	0	0	9	0	8	8	13	8	0	0	13	0	0	0	<1
Whitestem pondweed <i>Potamogeton praelongus</i>	0	0	0	0	0	0	0	0	0	<1	<1	3	6	10	<1	5
Thinleaf pondweed <i>Potamogeton pusillus</i>	0	0	0	5	12	6	5	12	12	5	4	0	14	2	0	12
Robbins' pondweed <i>Potamogeton robbinsii</i>	52	76	88	74	77	68	84	78	57	76	76	73	57	58	65	69
Flatstem pondweed <i>Potamogeton zosteriformis</i>	28	3	29	29	23	19	16	26	22	20	23	36	15	16	15	31
White water crowfoot <i>Ranunculus aquatilis</i>															2	0
Humped bladderwort <i>Utricularia gibba</i>	2	0	1	5	1	1	4	1	0	0	0	0	2	5	5	5
Flat leaf bladderwort <i>Utricularia intermedia</i>																3
Purple bladderwort <i>Utricularia purpurea</i>																8
Common bladderwort <i>Utricularia vulgaris</i>	8	9	2	6	7	7	11	8	2	4	4	7	7	4	10	13

Tapegrass <i>Vallisneria americana</i>	29	13	2	4	9	8	15	15	14	15	18	19	26	21	24	34
Watermeal <i>Wolffia</i> sp.	0	0	0	5	4	0	0	0	0	0	0	0	0	0	0	0
Water stargrass <i>Zosterella dubia</i>	1	1	9	8	23	17	7	13	4	2	4	11	15	19	20	38

<sup>†</sup>Formerly listed as *Megalodonta beckii* in previous years' reports.

### 3.3 Lily Pond

Annual increases in EWM frequency of occurrence in Lily Pond have been observed, as treatment has not been conducted within this basin since 2014. There was only a slight increase in both EWM FOC and percent cover within Lily Pond since last year (Chart 1, Figure 2).

Both plant biomass and average species richness values within Lily Pond remained similar to prior years' data, with healthy and plentiful native species.

*Potamogeton robbinsii* (100%) remained the most abundant plant in the basin followed by *Ceratophyllum demersum* (92%), *Elodea canadensis* (88%), *Potamogeton zosteriformis* (79%), *Utricularia vulgaris* (67%), *Zosterella dubia* (63%) *Nymphaea odorata* (71%), and *Potamogeton amplifolius* (54%) (Table 4). All other species' FOC was similar to that of previous years, with a few species showing slight increases or decreases.

**Figure 2:** Lily Pond - Fall 2018 EWM distribution

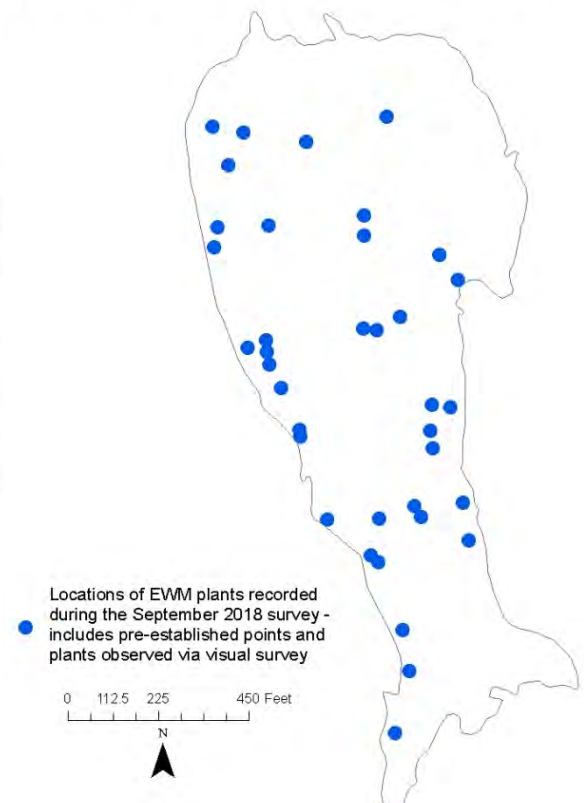
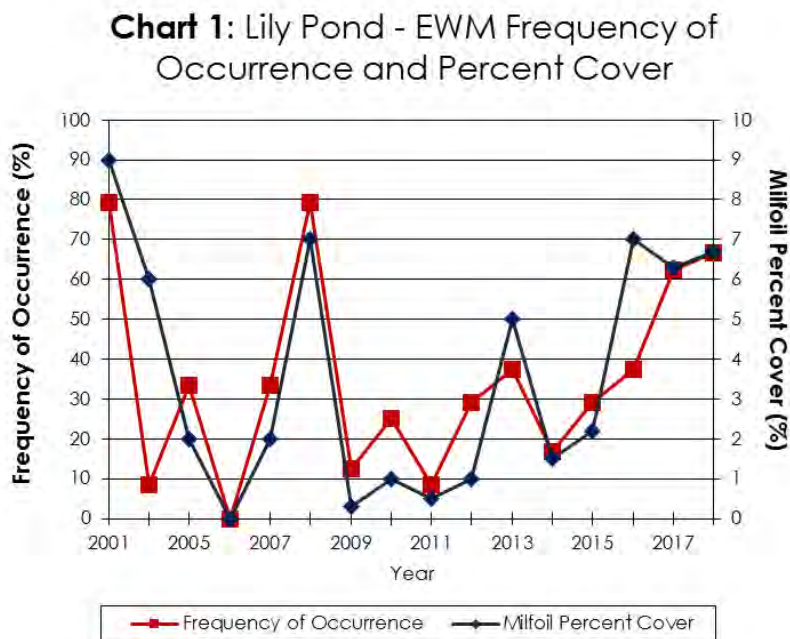


Table 4. Lily Pond – Annual Species List and Frequency of Occurrence (%), 2001-2018

Macrophyte Species (Common Name / Scientific Name)	2001	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Watershield <i>Brasenia schreberi</i>	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coontail <i>Ceratophyllum demersum</i>	71	4	50	46	83	83	83	79	75	63	67	54	64	67	67	92
Muskgrass / Stonewort <i>Chara</i> sp. / <i>Nitella</i> sp.	0	0	0	5	4	0	0	0	0	0	0	0	0	0	4	0
Common waterweed <i>Elodea canadensis</i>	29	0	8	0	8	29	46	79	17	29	17	13	48	63	83	88
Quillwort <i>Isoetes</i> sp.	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common duckweed <i>Lemna minor</i>	46	8	0	5	0	0	0	0	0	0	0	0	0	0	0	0
Eurasian watermilfoil <i>Myriophyllum spicatum</i>	79	8	33	0	33	79	13	25	8	29	42	17	28	38	63	67
Slender naiad <i>Najas flexilis</i>	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow waterlily <i>Nuphar variegatum</i>	17	17	17	0	0	0	0	4	4	0	0	0	0	0	0	0
White waterlily <i>Nymphaea odorata</i>	63	17	29	9	21	25	33	17	25	29	38	38	28	33	42	71
Largeleaf pondweed <i>Potamogeton amplifolius</i>	33	100	92	77	79	88	92	88	38	46	75	75	24	50	38	54
Curlleaf pondweed <i>Potamogeton crispus</i>	4	4	4	5	13	0	0	0	4	0	0	0	0	0	0	0
Ribbonleaf pondweed <i>Potamogeton epiphydrus</i>	0	13	4	0	4	4	4	0	4	4	0	0	0	4	0	8
Variable leaf pondweed <i>Potamogeton gramineus</i>	17	0	8	0	4	0	8	0	8	8	0	0	0	0	0	0
Illinois pondweed <i>Potamogeton illinoensis</i>	0	4	8	9	46	42	25	17	46	42	46	54	16	46	33	29
Floating leaf pondweed <i>Potamogeton natans</i>	0	0.	0	9	0	8	8	13	8	0	0	13	0	0	0	4
Whitestem pondweed <i>Potamogeton praelongus</i>																17
Thinleaf pondweed <i>Potamogeton pusillus</i>																4
Robbins' pondweed <i>Potamogeton robbinsii</i>	96	92	96	96	92	88	96	96	86	96	100	100	68	71	92	100
Flatstem pondweed <i>Potamogeton zosteriformis</i>	58	8	63	0	25	46	13	67	46	33	29	67	48	46	33	79
Humped bladderwort <i>Utricularia gibba</i>	0	0	0	41	0	0	4	0	0	0	0	0	12	25	8	0
Purple bladderwort <i>Utricularia purpurea</i>																17
Common bladderwort <i>Utricularia vulgaris</i>	29	38	0	27	4	13	17	4	17	21	17	29	28	29	50	67
Tapegrass <i>Vallisneria spiralis</i>	33	46	0	0	0	0	8	4	4	0	0	0	4	38	0	8
Watermeal <i>Wolffia</i> sp.	0	0	0	5	4	0	0	0	0	0	0	0	0	0	0	0
Water stargrass <i>Zosterella dubia</i>	4	0	38	0	25	21	8	50	0	0	0	17	40	58	29	63

### 3.4 Lake St. Catherine (Main Basin)

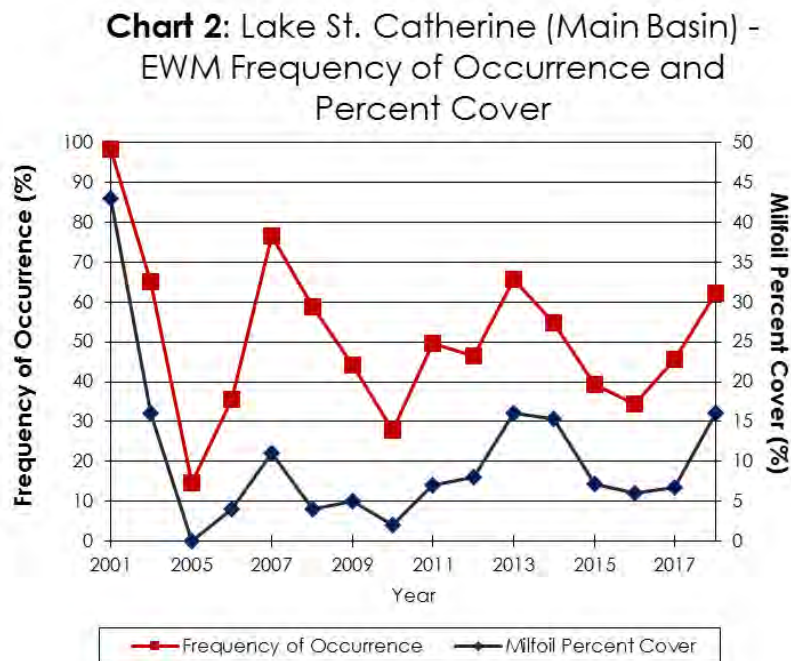
The Main Basin of Lake St. Catherine has shown slight fluctuations in native plant species distribution and composition through the years of management. Observed at 62% of the survey points EWM was the most common plant species in the Main Basin. In decreasing FOC, the following species were also prevalent in this basin: *Elodea canadensis*, *Potamogeton robbinsii*, *Vallisneria americana*, and *Zosterella dubia*. All other species observed showed FOC values that were similar to last year with  $<\pm 10\%$  change (Table 5).

EWM distribution increased from 46% to 62% over last year's FOC and percent EWM cover only increased by 9, at survey points within the Main Basin. Although EWM biomass is being kept in-check by ongoing management efforts, previously managed areas are beginning to recover.

EWM control varied throughout treatment areas, with only a few viable stems observed in some, while significant regrowth was observed in others. However, EWM growth continued to be observed outside of treatment areas and survey data points, with several dense areas throughout shoreline areas of the Main Basin (Figure 3). Annual spot-treatments and DASH efforts have been effective, but can only provide control to those areas while EWM growth remains well distributed throughout this basin.

Locations of EWM observed during the survey, in addition to those survey points where observed, were recorded with a GPS unit. All EWM points observed during the September 2018 survey are depicted in Figure 3.

Chart 2 (below) illustrates the year-to-year change in EWM frequency of occurrence and percent cover in the Main Basin.



**Figure 3:** Main Basin - Fall 2018 EWM distribution

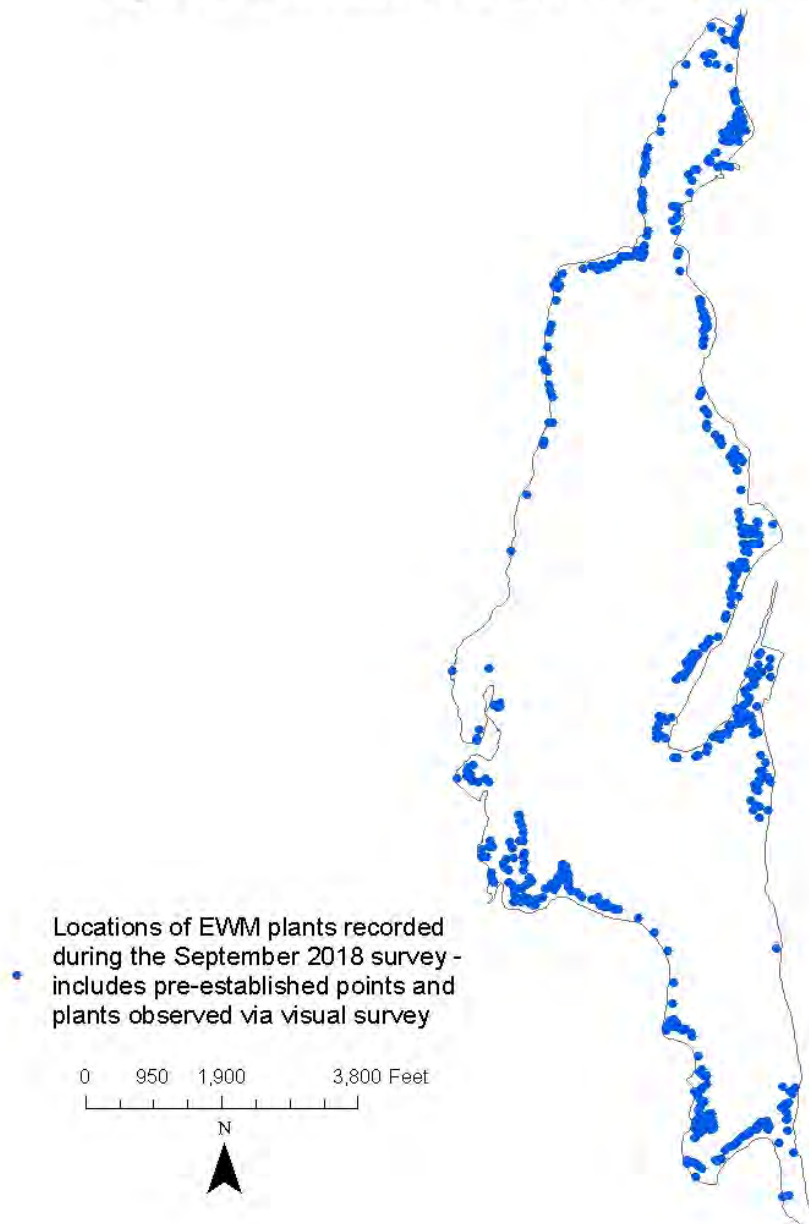


Table 5: Lake St. Catherine (Main Basin) – Annual Species List and Frequency of Occurrence (%), 2001-2018

Macrophyte Species (Common Name / Scientific Name)	2001	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Water marigold <i>Bidens beckii</i>	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Watershield <i>Brasenia schreberi</i>	0	<1	<1	2	2	2	2	2	2	<1	<1	2	3	3	2	5
Coontail <i>Ceratophyllum demersum</i>	11	11	6	7	11	10	8	14	6	11	2	5	3	5	5	6
Muskgrass / Stonewort <i>Chara</i> sp. / <i>Nitella</i> sp.	2	17	62	57	21	22	19	2	<1	0	0	5	16	9	11	14
Common waterweed <i>Elodea canadensis</i>	28	0	0	<1	5	52	71	15	9	7	19	7	30	37	45	58
Quillwort <i>Isoetes</i> sp.	2	9	<1	6	2	5	0	0	<1	<1	0	0	2	0	<1	<1
Common duckweed <i>Lemna minor</i>	2	0	0	0	0	<1	<1	0	0	0	0	0	<1	0	0	0
Eurasian watermilfoil <i>Myriophyllum spicatum</i>	98	65	15	36	77	59	44	28	50	47	66	56	39	34	46	62
Slender naiad <i>Najas flexilis</i>	19	0	12	57	50	34	22	25	20	12	6	6	16	2	28	25
Thread leaf naiad <i>Najas gracillima</i>																8
Brittle naiad <i>Najas minor</i>																2
Yellow waterlily <i>Nuphar variegatum</i>	<1	0	0	<1	<1	0	0	<1	<1	0	0	0	0	0	2	0
White waterlily <i>Nymphaea odorata</i>	3	2	2	3	3	3	3	2	2	2	<1	2	5	2	0	8
Largeleaf pondweed <i>Potamogeton amplifolius</i>	29	15	26	34	39	38	41	44	26	35	27	25	12	12	18	15
Curlyleaf pondweed <i>Potamogeton crispus</i>	2	0	9	5	2	<1	0	0	0	0	0	<1	0	0	<1	0
Ribbonleaf pondweed <i>Potamogeton epihydrus</i>	2	3	5	2	<1	4	<1	<1	<1	2	0	2	0	0	<1	4
Leafy pondweed <i>Potamogeton foliosus</i>																17
Variable leaf pondweed <i>Potamogeton gramineus</i>	18	0	5	2	2	6	3	6	15	9	3	4	6	4	5	21
Illinois pondweed <i>Potamogeton illinoensis</i>	6	<1	<1	9	16	34	23	31	33	53	57	56	40	38	52	34
Whitestem pondweed <i>Potamogeton praelongus</i>																4
Thinleaf pondweed <i>Potamogeton pusillus</i>	0	0	0	5	12	6	5	12	12	5	4	0	14	2	0	17
Robbins' pondweed <i>Potamogeton robbinsii</i>	31	65	82	62	67	58	78	73	58	67	66	61	49	47	44	58
Flatstem pondweed <i>Potamogeton zosteriformis</i>	24	2	31	42	28	19	19	23	30	20	20	32	10	4	10	23
Common bladderwort <i>Utricularia vulgaris</i>	<1	<1	<1	0	0	2	<1	3	0	<1	0	<1	<1	<1	2	2
Tapegrass <i>Vallisneria americana</i>	14	3	<1	3	9	9	13	13	10	9	15	14	23	20	19	31
Water stargrass <i>Zosterella dubia</i>		<3	5	12	28	22	8	9	5	2	2	13	13	24	21	32



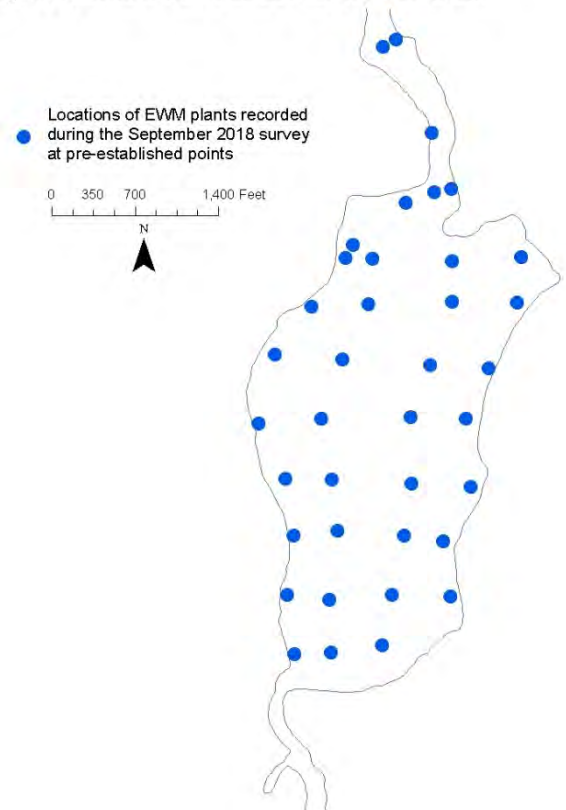
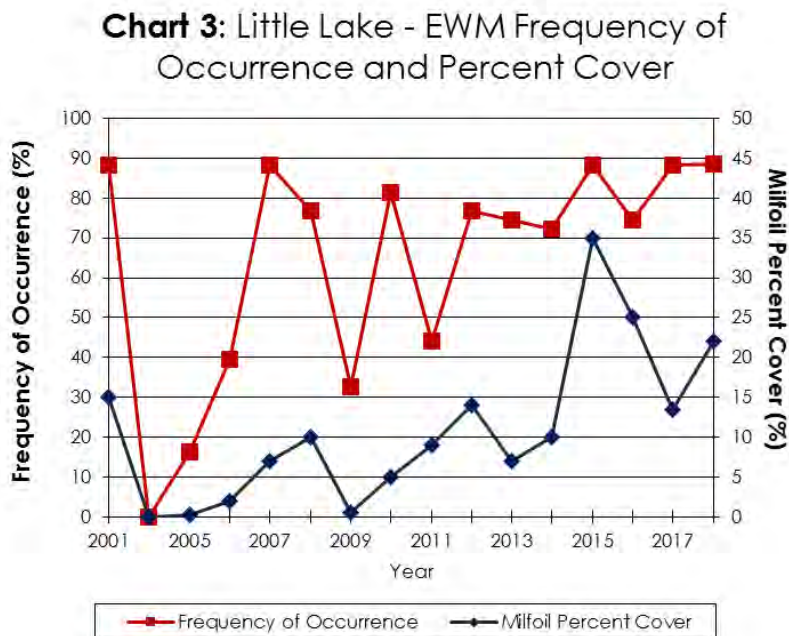
### 3.5 Little Lake

Overall plant cover within Little Lake saw a significant increase, from 49% in 2017 to 84% this year. Only nineteen (19) species were observed within this basin this year, compared to twenty-five (25) last year. Little Lake's consistent, shallow depth (6 foot average), allows for such a diverse plant community, but also allows for plant growth to dominate the entire water column, likely hindering recreational uses of the basin. Additionally, average species richness increased by ~1 species per point compared to 2017.

EWM distribution hovered around 88% of survey points, which is similar to last year, while EWM percent cover increased to ~22% (Figure 4, Table 6, Chart 3). However, as treatment is not conducted within Little Lake, this increase was anticipated.

The most commonly observed species, in decreasing order, were as follows: *Myriophyllum spicatum*, *Potamogeton robbinsii*, *Potamogeton illinoensis*, *Vallisneria americana*, *Elodea canadensis*, and *Nymphaea odorata* (Table 6). A notable increase in *Zosterella dubia* was also observed this year.

Figure 4: Little Lake - Fall 2018 EWM distribution



**Table 6:** Little Lake – Annual Species List and Frequency of Occurrence (%), 2001-2018

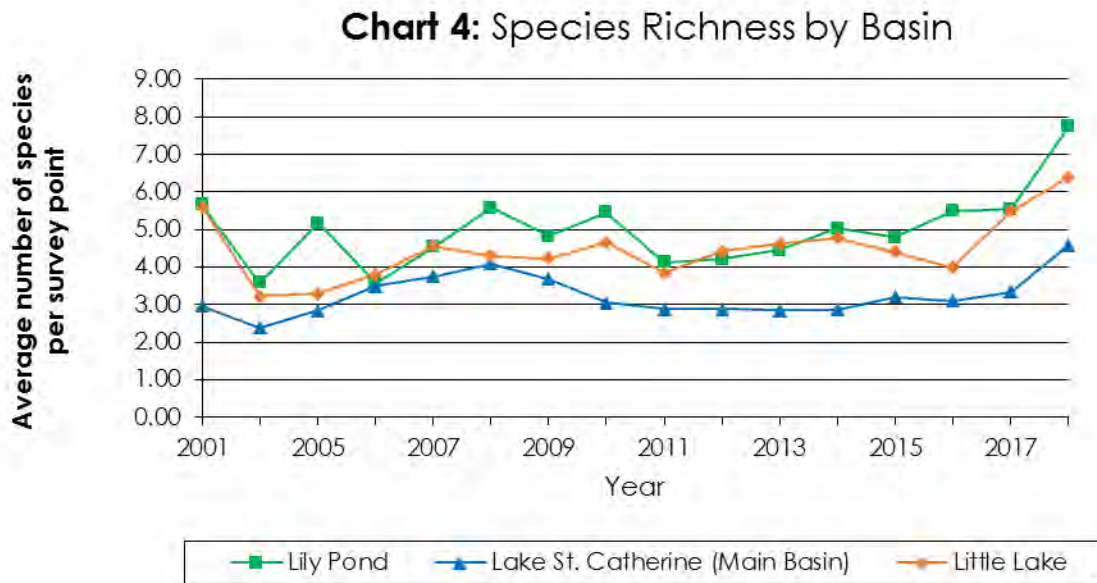
Macrophyte Species (Common Name / Scientific Name)	2001	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Water marigold <i>Bidens beckii</i> <sup>†</sup>	7	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Watershield <i>Brasenia schreberi</i>	14	30	30	23	26	21	14	12	14	12	14	12	2	2	5	7
Muskgrass / Stonewort <i>Chara</i> sp. / <i>Nitella</i> sp.	7	5	7	12	0	0	2	0	5	2	0	0	2	0	0	12
Coontail <i>Ceratophyllum demersum</i>	21	0	2	9	16	7	9	16	28	28	28	35	23	14	44	40
Spikerush <i>Eleocharis</i> sp.	5	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0
Common waterweed <i>Elodea canadensis</i>	47	5	0	0	2	23	40	47	21	28	40	26	28	28	74	54
Quillwort <i>Isoetes</i> sp.	0	0	5	2	0	0	2	0	0	2	0	0	0	0	0	0
Eurasian watermilfoil <i>Myriophyllum spicatum</i>	88	0	16	40	88	77	32	81	44	77	74	72	86	74	88	88
Whorled watermilfoil <i>Myriophyllum verticillatum</i>													4	0	5	0
Slender naiad <i>Najas flexilis</i>	40	0	0	5	2	0	5	0	5	0	2	14	0	2	7	9
Yellow waterlily <i>Nuphar variegatum</i>	9	14	12	7	7	2	7	2	5	2	2	0	7	5	5	9
White waterlily <i>Nymphaea odorata</i>	30	9	26	30	28	10	19	19	23	32	30	37	27	12	42	44
Largeleaf pondweed <i>Potamogeton amplifolius</i>	44	72	70	77	74	77	56	72	28	30	21	23	14	28	12	26
Curlyleaf pondweed <i>Potamogeton crispus</i>	0	0	0	2	0	0	0	0	0	2	0	0	0	0	2	0
Ribbonleaf pondweed <i>Potamogeton epihydrus</i>	0	12	14	7	7	7	0	0	2	9	2	2	2	2	5	21
Variable leaf pondweed <i>Potamogeton gramineus</i>	42	5	9	23	0	0	5	0	5	5	2	0	0	0	2	0
Illinois pondweed <i>Potamogeton illinoensis</i>	0	0	0	9	33	47	49	36	62	61	61	65	71	72	51	61
Thinleaf pondweed <i>Potamogeton pusillus</i>	0	0	0	2	7	2	0	0	0	0	0	0	2	0	0	0
Robbins' pondweed <i>Potamogeton robbinsii</i>	88	100	100	100	100	88	95	81	86	91	93	95	73	86	86	81
Flatstem pondweed <i>Potamogeton zosteriformis</i>	23	2	5	5	7	5	7	9	9	14	28	33	11	19	19	30
White water crowfoot <i>Ranunculus aquatilis</i>															2	0
Humped bladderwort <i>Utricularia gibba</i>	7	0	2	0	5	2	14	5	0	0	0	0	2	7	16	21
Flat leaf bladderwort <i>Utricularia intermedia</i>																12
Purple bladderwort <i>Utricularia purpurea</i>																26
Common bladderwort <i>Utricularia vulgaris</i>	16	19	7	12	30	19	35	26	5	2	9	14	14	0	11	14
Tapegrass <i>Vallisneria spiralis</i>	72	26	7	9	14	9	26	26	35	40	40	44	50	35	0	58
Water stargrass <i>Zosterella dubia</i>	2	2	5	0	7	2	5	5	2	5	14	2	9	9	9	42

<sup>†</sup>Formerly listed as *Megalodonta beckii* in previous years' reports.



### 3.6 Species Richness

In all three basins, species richness increased compared to findings from past years with an overall average of approximately five and a half species per point (Table 2, Chart 4). Each basin's increase is likely related to the higher number of species and new species observed. Overall, species richness or native plant diversity in any of the basins does not appear to be impacted adversely by the herbicide spot-treatments or other EWM management activities.



## 4 SUMMARY OF 2018 AQUATIC VEGETATION MANAGEMENT PROGRAM

### 4.1 Renovate Herbicide Treatments

Results of the 2018 Renovate herbicide treatment program at Lake St. Catherine vary slightly with prior treatment efforts performed in recent years, as some areas exhibited excellent control through the growing season, while others had more regrowth than anticipated. As with previous years, the full extent of treatment success will not be realized until regrowth can be observed next season.

Although triclopyr's high selectivity for EWM and negligible impact to non-target species at Lake St. Catherine validates its importance as part of an integrated management program, this year's varied EWM control results were interesting and persuading to switch to ProcettaCOR herbicide going forward. Although species richness and frequency of occurrence indices have fluctuated within each basin over time, no major plant composition changes have been observed as a result of triclopyr treatments. Based on data collected within the Lake St. Catherine system, as well as other large Vermont waterbodies, seasonal variability and limitations of the data point survey methodology are likely the primary factors responsible for changes in the measurable indices that have been observed year over year.

#### **4.2 Spread Prevention and Non-Chemical Control Activities**

As required by the ANC Permit, non-chemical milfoil control activities continued at Lake St. Catherine during the 2018 season. Efforts included volunteer monitoring, boat ramp greeter program, diver assisted suction harvesting and other educational efforts. Details of the non-chemical control efforts will be provided by LSCA under separate cover.

### **5 RECOMMENDATIONS FOR 2019 SEASON**

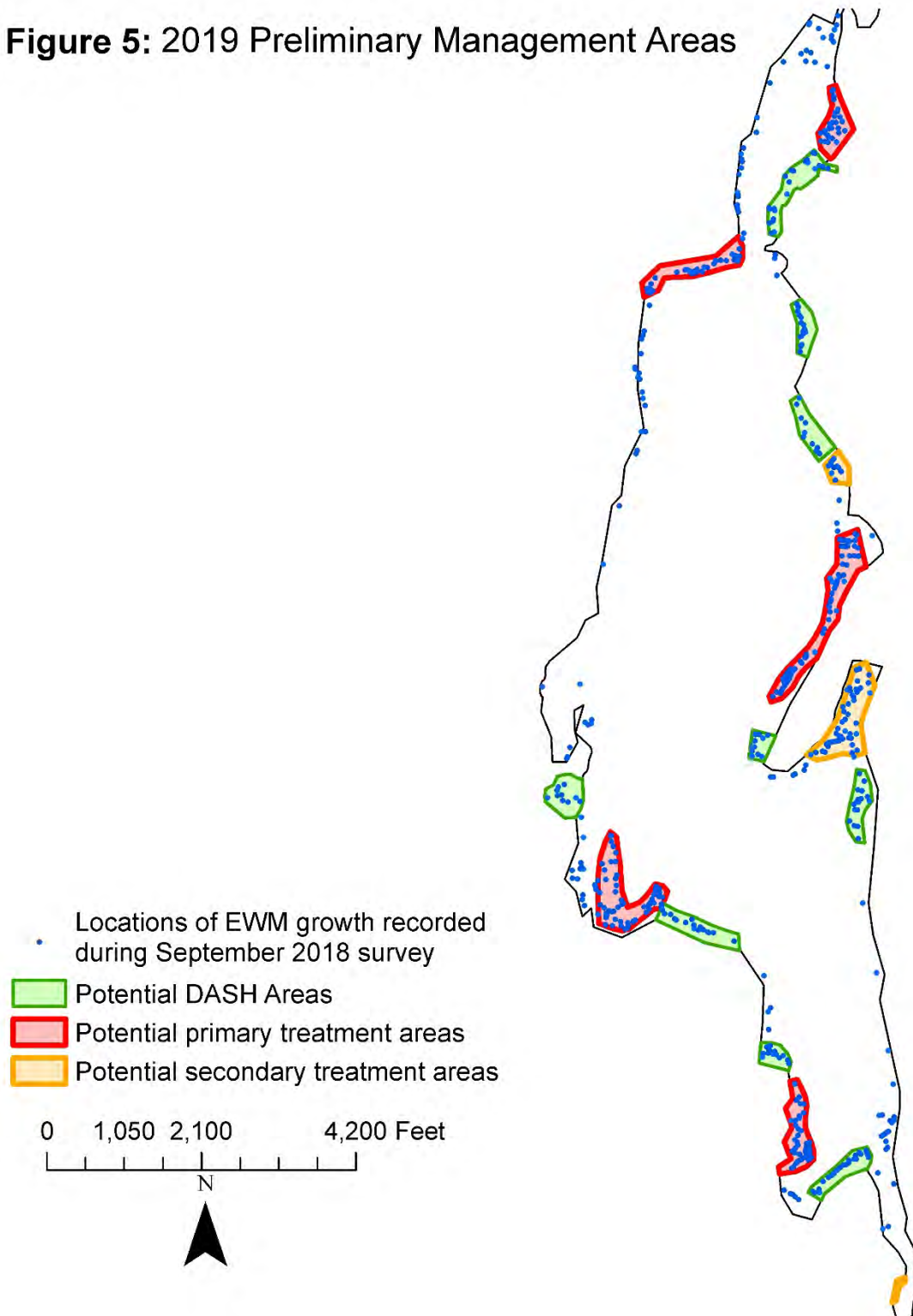
Controlling areas of dense EWM growth and maintaining it at non-nuisance levels has been the focus of recent EWM management efforts at Lake St. Catherine. Triclopyr herbicide treatments have selectively controlled EWM where used, but treatment has typically only provided control for one to two growing seasons. Triclopyr has shown some limitations in open water or small treatment area situations where dilution is increased and concentration-exposure-time (CET) is decreased, sometimes resulting in less than optimal control.

Although triclopyr has been the herbicide of choice for EWM control in Vermont for over a decade, the new herbicide, ProcellaCORT<sup>™</sup> EC, is a perfect fit for Lake St. Catherine's integrated management approach. ProcellaCOR has an extremely short CET compared to triclopyr, which will make it effective for the shoreline spot-treatments. It is also applied at concentrations targeting less than 10 parts per billion in the water, as opposed to the 1.5-2.0 parts per million (1500-2000 ppb) rates needed for triclopyr.

As such, for 2019 we are recommending treatment with ProcellaCOR using a similar management approach as has been used with triclopyr in the past. Based on the results of the September 2018 survey, preliminary 2019 treatment areas are illustrated on the following page (Figure 5). Using the EWM distribution and density observed this fall, treatment in 2019 is anticipated to be 50-70 acres within the Main Basin. Consistent with previous years, potential treatment areas will be inspected in the early spring and treatment areas will be finalized in coordination with the LSCA and VT DEC prior to conducting treatment in 2019.

If VT DEC and VT DOH have not completed their internal review of ProcellaCOR in a timely manner for treatment in 2019, the current Renovate permit for Lake St. Catherine does not expire until June 10 and treatment could be coordinated to be performed prior to that expiration, if necessary.

**Figure 5: 2019 Preliminary Management Areas**



# ***APPENDIX A***

---

## **Herbicide Residue Testing Results**

- FastEST Sampling Location Map
- SePRO Laboratory Report – 06/19/18
- SePRO Laboratory Report – 06/19/18  
(sample 3 only – not shipped with original package)
- SePRO Laboratory Report – 07/17/18



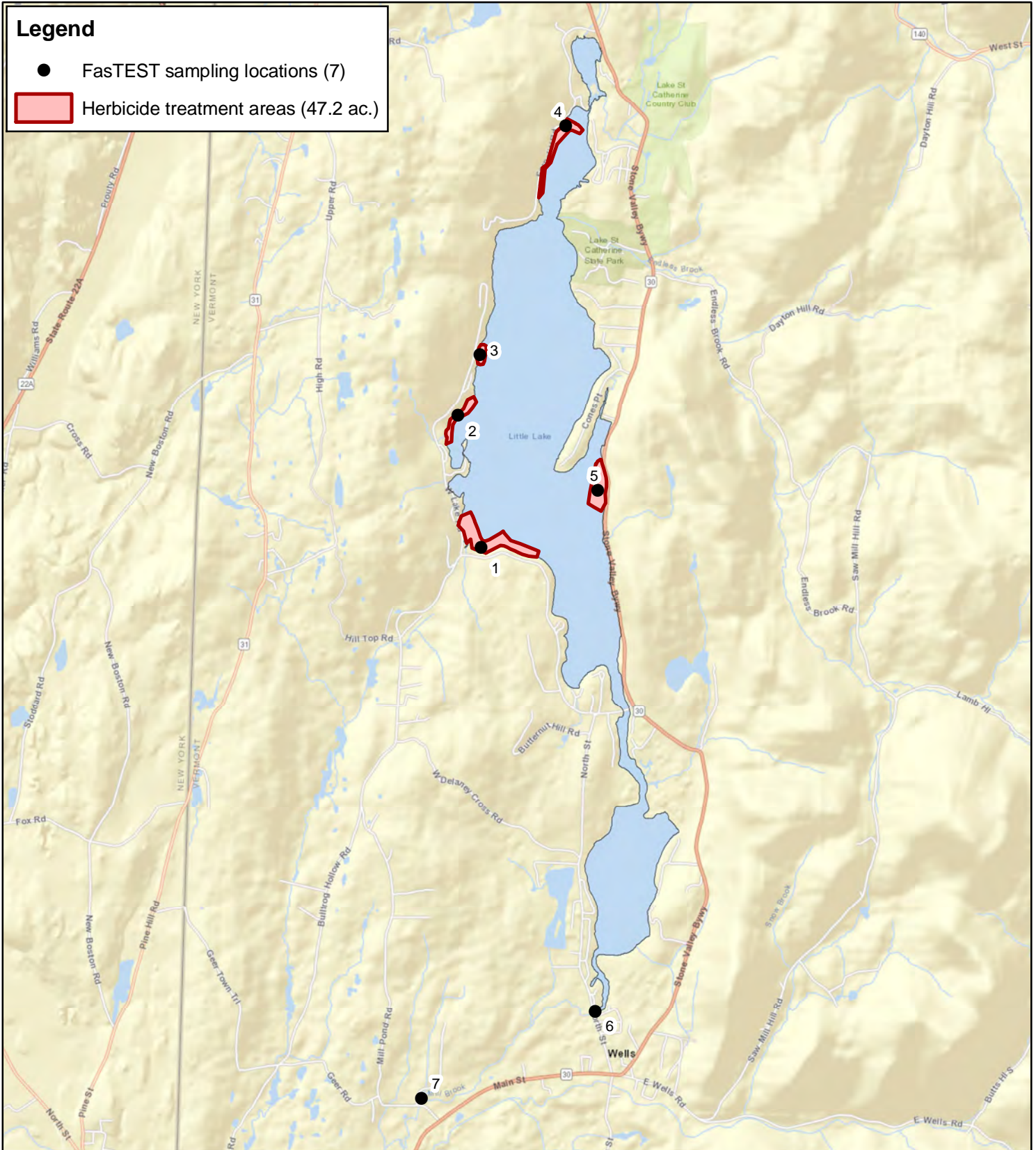
# 2018 FasTEST Sampling Locations

**SOLITUDE**  
LAKE MANAGEMENT

888.480.5253  
solitudelakemanagement.com

## Legend

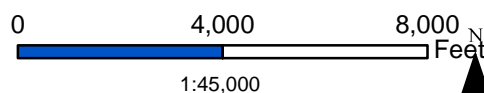
- FasTEST sampling locations (7)
- Herbicide treatment areas (47.2 ac.)



**Lake St. Catherine**  
Wells / Poultnery, VT  
Rutland County  
43.4657° N, 73.2146° W



## Lake St. Catherine



Map Date: 05/18/18  
Prepared by: KS  
Office: SHREWSBURY, MA



16013 Watson Seed Farm Road, Whitakers, NC 27891

## Chain of Custody: **LABORATORY REPORT**

### Customer Company Customer Contact

Company Name Solitude Lake Management	Contact Person: Kara Sliwoski
Address: 1320 Brookwood Drive, Ste. H Little Rock, AR 72202	E-mail Address: KSliwoski@solitudelake.com
	Phone: 508-865-1000

### Waterbody Information

Waterbody:	Lake St. Catherine
Waterbody size:	1100
Depth Average:	25

Sample ID	Sample Location	Test	Method	Results	Sampling Date / Time
CTM10203-1	1	Triclopyr (ug/L)	FAST 02	17.6	06/19/2018
CTM10204-1	2	Triclopyr (ug/L)	FAST 02	33.8	06/19/2018
CTM10205-1	4	Triclopyr (ug/L)	FAST 02	63	06/19/2018
CTM10206-1	5	Triclopyr (ug/L)	FAST 02	45.1	06/19/2018
CTM10207-1	6	Triclopyr (ug/L)	FAST 02	<1	06/19/2018
CTM10293-1	7	Triclopyr (ug/L)	FAST 02	<1	06/19/2018

#### 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.

**MEASUREMENT UNCERTAINTY:** Uncertainty of measurement has been determined and is available upon request.

**Laboratory Information**

Date / Time Received:

Date Results Sent: Thursday, June 21, 2018

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*This entire report was reviewed and approved for release.*



*Reviewed By: Laboratory Supervisor*

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16013 Watson Seed Farm Road, Whitakers, NC 27891

Chain of Custody: COC3346 **LABORATORY REPORT**

---

**Customer Company** Customer Contact

Company Name SOLitude Lake Management	Contact Person: Kara Sliwoski
Address: 1320 Brookwood Drive, Ste. H Little Rock, AR 72202	E-mail Address: ksliwoski@solitudelake.com
	Phone: 508.885.0101

**Waterbody Information**

Waterbody:	Lake St. Catherine - MA
Waterbody size:	0
Depth Average:	0

Sample ID	Sample Location	Test	Method	Results	Sampling Date / Time
CTM10325-1	3	Triclopyr (ug/L)	FAST 02	20.3	

**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.

**MEASUREMENT UNCERTAINTY:** Uncertainty of measurement has been determined and is available upon request.

**Laboratory Information**

Date / Time Received: 06/21/18 12:00 PM

Date Results Sent: Friday, June 22, 2018



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*This entire report was reviewed and approved for release.*

A handwritten signature in blue ink, consisting of a stylized 'J' followed by a series of loops and a long horizontal stroke.

*Reviewed By: Laboratory Supervisor*

---

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16013 Watson Seed Farm Road, Whitakers, NC 27891

Chain of Custody: COC3637 **LABORATORY REPORT**

---

**Customer Company Customer Contact**

Company Name SOLitude Lake Management	Contact Person: Kara Sliwoski
Address: 1320 Brookwood Drive, Ste. H Little Rock, AR 72202	E-mail Address: ksliwoski@solitudelake.com
	Phone: 508.885.0101

**Waterbody Information**

Waterbody:	Lake St. Catherine - VT
Waterbody size:	1100
Depth Average:	25

Sample ID	Sample Location	Test	Method	Results	Sampling Date / Time
CTM11225-1	1	Triclopyr (ug/L)	FAST 02	3.3	07/17/2018
CTM11226-1	2	Triclopyr (ug/L)	FAST 02	2.4	07/17/2018
CTM11227-1	3	Triclopyr (ug/L)	FAST 02	2.2	07/17/2018
CTM11228-1	4	Triclopyr (ug/L)	FAST 02	1.6	07/17/2018
CTM11229-1	5	Triclopyr (ug/L)	FAST 02	2.6	07/17/2018
CTM11230-1	6	Triclopyr (ug/L)	FAST 02	<1	07/17/2018
CTM11231-1	7	Triclopyr (ug/L)	FAST 02	<1	07/17/2018

**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.

**MEASUREMENT UNCERTAINTY:** Uncertainty of measurement has been determined and is available upon request.

**Laboratory Information**

Date / Time Received: 07/19/18 11:00 AM

Date Results Sent: Friday, July 20, 2018

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*This entire report was reviewed and approved for release.*



*Reviewed By: Laboratory Supervisor*

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## ***APPENDIX B***

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### **Comprehensive Aquatic Vegetation Survey Information**

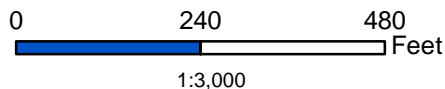
- Survey Point Location Maps
- 2018 Total Vegetation Biomass
- Fall 2018 Native Vegetation Distribution Maps
- Fall 2018 Eurasian Watermilfoil Distribution Map
- Field Data Tables



**Lake St. Catherine**  
Wells / Poultney, VT  
Rutland County  
43.4657° N, 73.2146° W

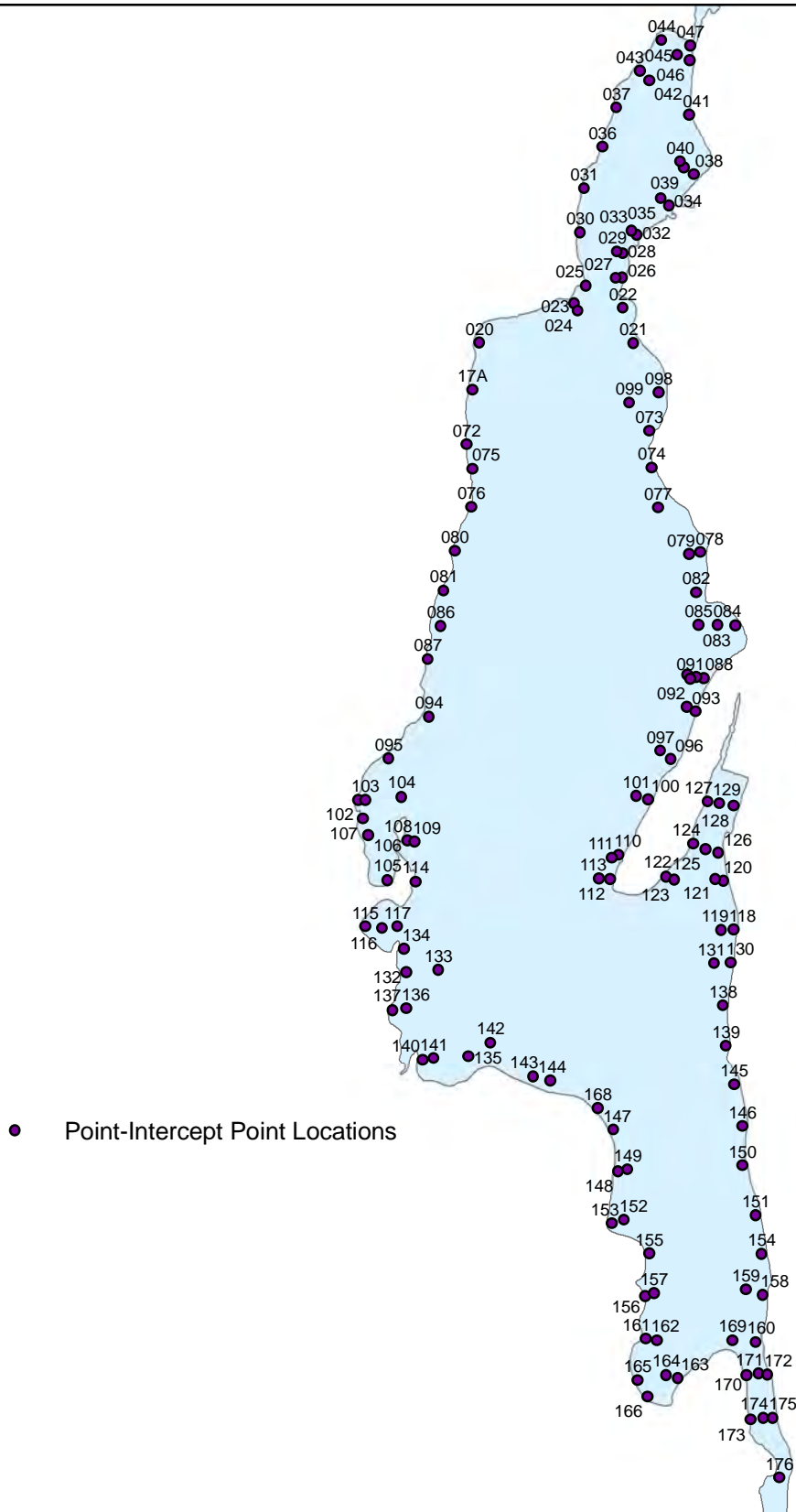


## Lake St. Catherine



Map Date: 10/13/18  
Prepared by: KS  
Office: SHREWSBURY, MA

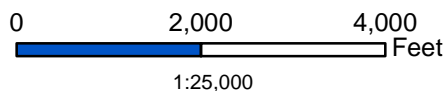
# Main Basin - Survey Point Locations



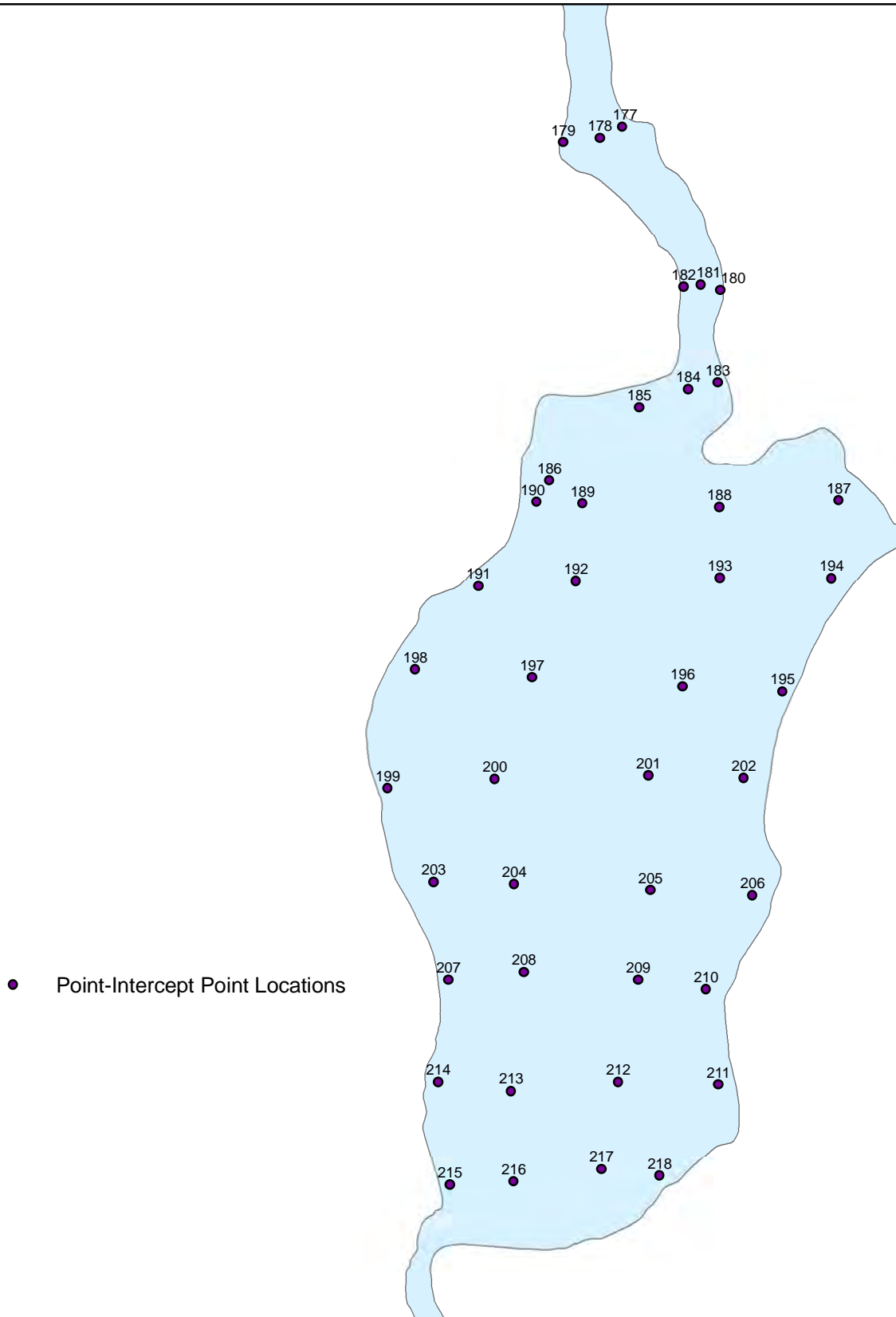
**Lake St. Catherine**  
Wells / Poultney, VT  
Rutland County  
43.4657° N, 73.2146° W



## Lake St. Catherine



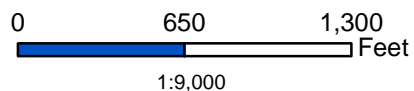
Map Date: 10/13/18  
Prepared by: KS  
Office: SHREWSBURY, MA



**Lake St. Catherine**  
Wells / Poultney, VT  
Rutland County  
43.4657° N, 73.2146° W



## Lake St. Catherine



Map Date: 10/13/18  
Prepared by: KS  
Office: SHREWSBURY, MA

## Legend

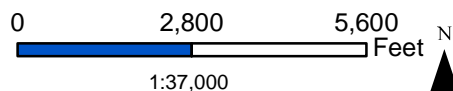
- 0 - No plant growth
- 1 - Very low plant growth
- 2 - Plant growth extending into water column
- 3 - Plant growth extending near surface
- 4 - Plant growth at surface



**Lake St. Catherine**  
Wells / Poultney, VT  
Rutland County  
43.4657° N, 73.2146° W



## Lake St. Catherine

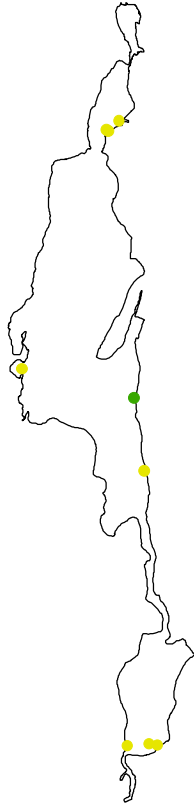


Map Date: 10/13/18  
Prepared by: KS  
Office: SHREWSBURY, MA



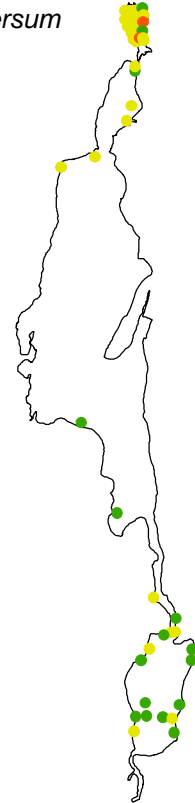
*Brasenia schreberi*

- Trace
- Sparse
- Moderate
- Dense



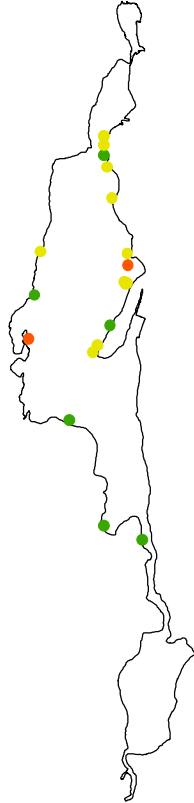
*Ceratophyllum demersum*

- Trace
- Sparse
- Moderate
- Dense



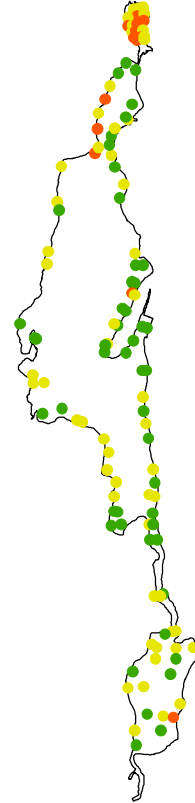
*Chara sp. / Nitella sp.*

- Trace
- Sparse
- Moderate
- Dense



*Elodea canadensis*

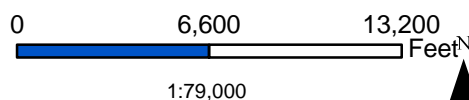
- Trace
- Sparse
- Moderate
- Dense



**Lake St. Catherine**  
Wells / Poultney, VT  
Rutland County  
43.4657° N, 73.2146° W



**Lake St. Catherine**



Map Date: 10/24/18  
Prepared by: KS  
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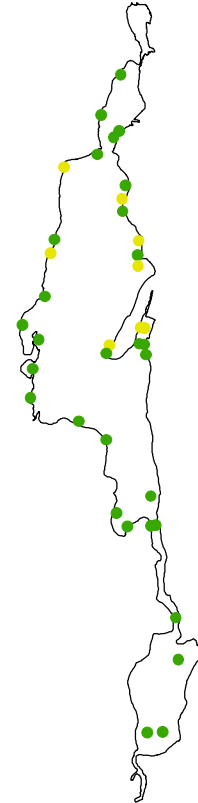
*Isoetes sp.*

- Trace
- Sparse
- Moderate
- Dense



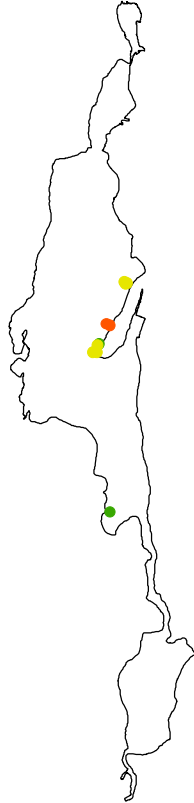
*Najas flexilis*

- Trace
- Sparse
- Moderate
- Dense



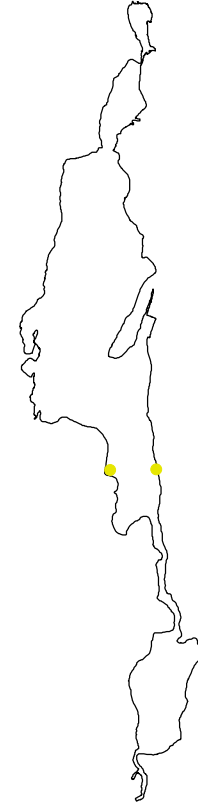
*Najas gracillima*

- Trace
- Sparse
- Moderate
- Dense



*Najas minor*

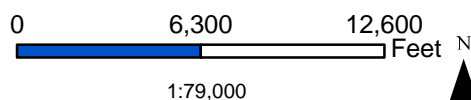
- Trace
- Sparse
- Moderate
- Dense



**Lake St. Catherine**  
Wells / Poultney, VT  
Rutland County  
43.4657° N, 73.2146° W



## Lake St. Catherine



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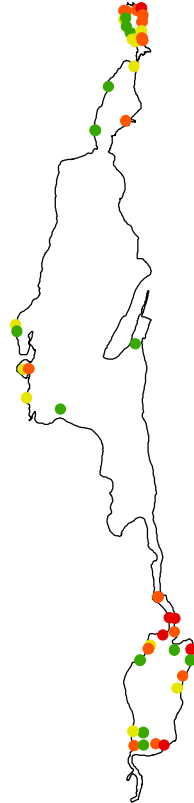
*Nuphar variegata*

- Trace
- Sparse
- Moderate
- Dense



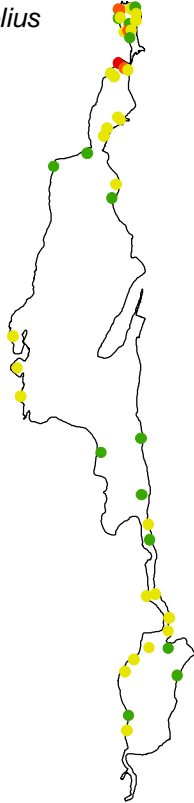
*Nymphaea odorata*

- Trace
- Sparse
- Moderate
- Dense



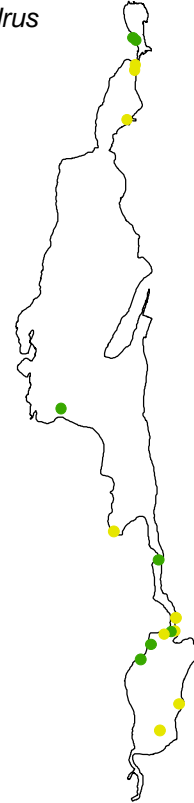
*Potamogeton amplifolius*

- Trace
- Sparse
- Moderate
- Dense



*Potamogeton epihydrus*

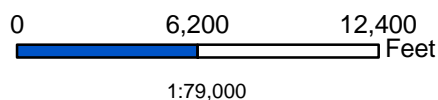
- Trace
- Sparse
- Moderate
- Dense



**Lake St. Catherine**  
Wells / Poultney, VT  
Rutland County  
43.4657° N, 73.2146° W



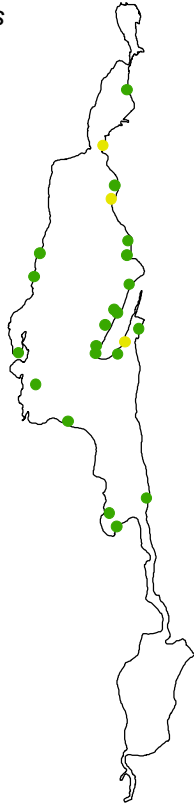
## Lake St. Catherine



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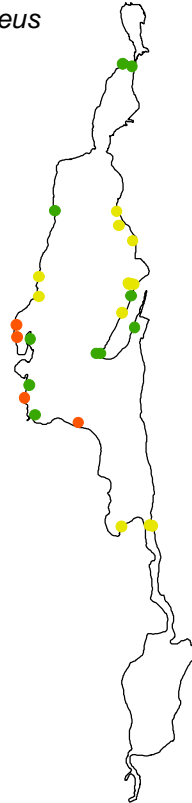
*Potamogeton foliosus*

- Trace
- Sparse
- Moderate
- Dense



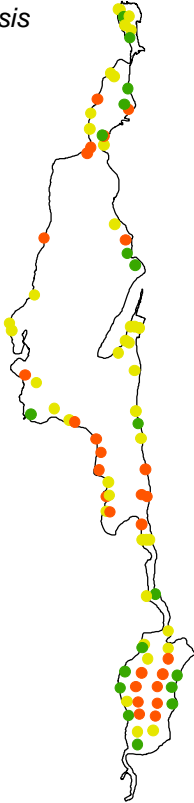
*Potamogeton gramineus*

- Trace
- Sparse
- Moderate
- Dense



*Potamogeton illinoensis*

- Trace
- Sparse
- Moderate
- Dense



*Potamogeton natans*

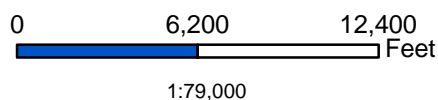
- Trace
- Sparse
- Moderate
- Dense



**Lake St. Catherine**  
Wells / Poultney, VT  
Rutland County  
43.4657° N, 73.2146° W



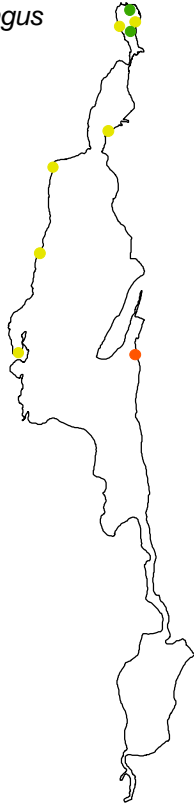
## Lake St. Catherine



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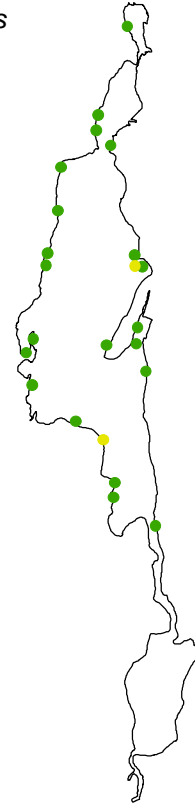
*Potamogeton praelongus*

- Trace
- Sparse
- Moderate
- Dense



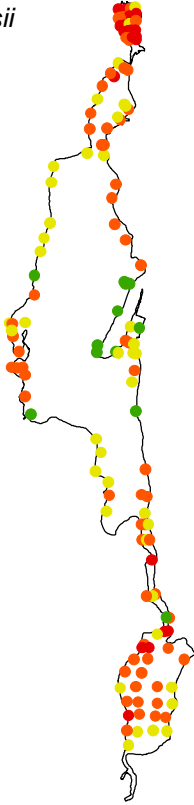
*Potamogeton pusillus*

- Trace
- Sparse
- Moderate
- Dense



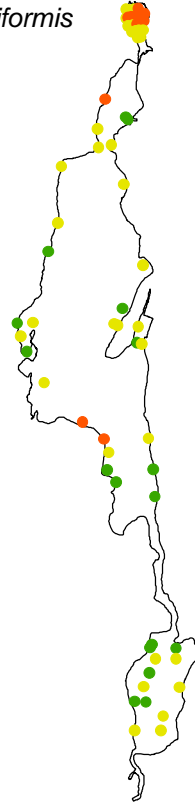
*Potamogeton robbinsii*

- Trace
- Sparse
- Moderate
- Dense



*Potamogeton zosteriformis*

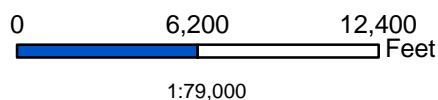
- Trace
- Sparse
- Moderate
- Dense



**Lake St. Catherine**  
Wells / Poultney, VT  
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43.4657° N, 73.2146° W



## Lake St. Catherine



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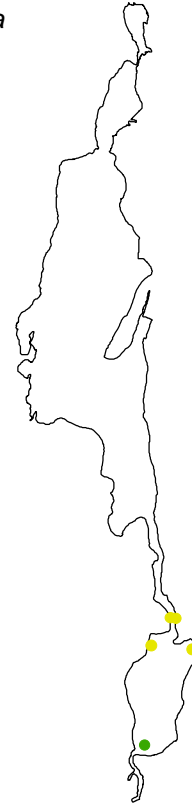
*Utricularia gibba*

- Trace
- Sparse
- Moderate
- Dense



*Utricularia intermedia*

- Trace
- Sparse
- Moderate
- Dense



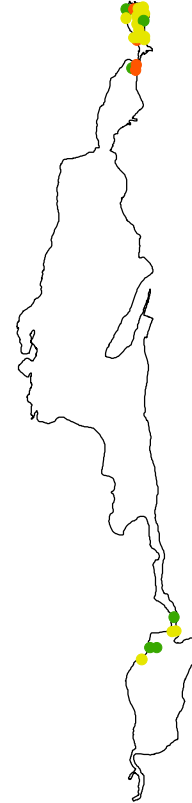
*Utricularia purpurea*

- Trace
- Sparse
- Moderate
- Dense



*Utricularia vulgaris*

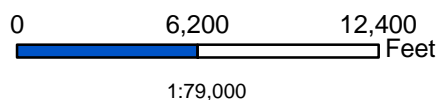
- Trace
- Sparse
- Moderate
- Dense



**Lake St. Catherine**  
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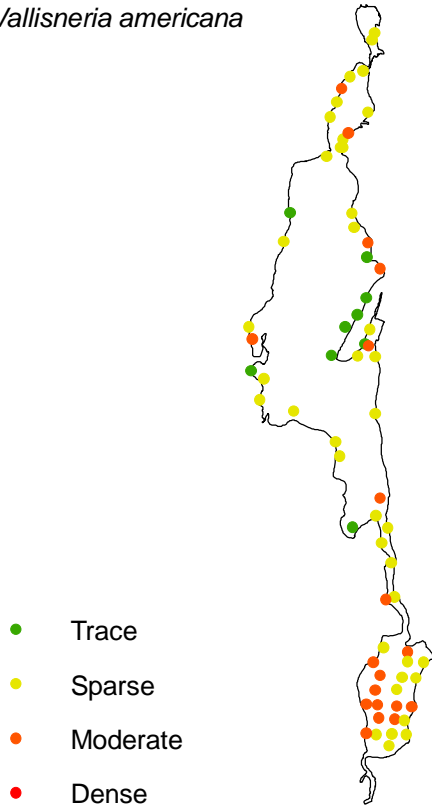


## Lake St. Catherine

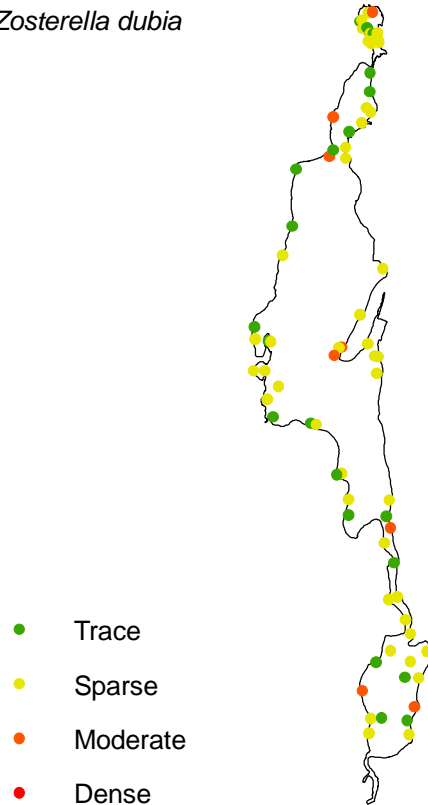


Map Date: 10/24/18  
Prepared by: KS  
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## *Vallisneria americana*



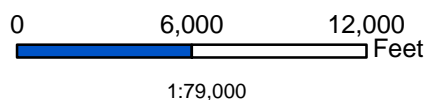
## *Zosterella dubia*



**Lake St. Catherine**  
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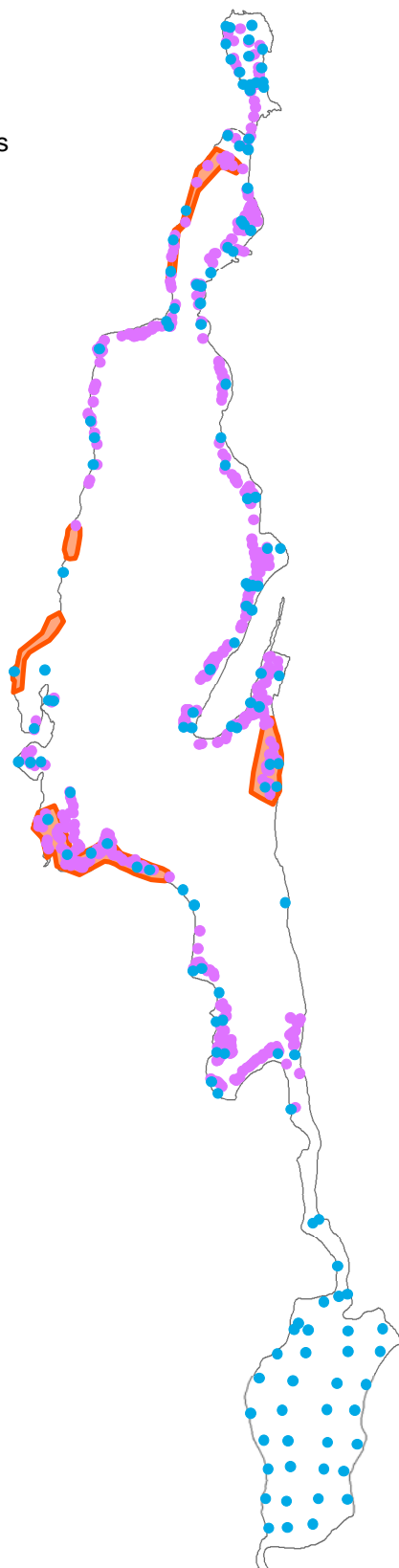
## Lake St. Catherine



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## Legend

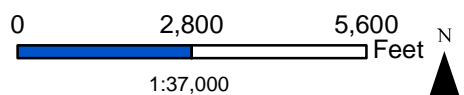
- Littoral zone EWM locations
- Pre-established point EWM locations
- 2018 Herbicide Treatment Areas



**Lake St. Catherine**  
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## Lake St. Catherine



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BJE	IDENT	SPECIES RICHNESS	BMI	% COV ALL	% COV TRG	MS	BFA	BS	CD	CE	CH	D	EC	EN	IS	MV	NF	NGR	NGU	NI	NM	NO	NV	PA	PC	PE	PF	PG	PI	PN	PPR	PPU	PR	PS	PZ	RA	UG	UI	UM	UPU	UV	VA	ZD		
29	048	8.4	95	10	T				S				M								S					T							M							M		S			
30	049	8.4	100	10	T				S												M			M						S			D		S						T				
31	050	8.4	100	10	T				S												M			M						S			D		S						T				
32	051	6.4	100	0					S				S																				D		S						M		S		
33	052	11.4	100	10	T				S				S									M		S							T		M		M					T	S		M		
34	053	6.4	100	0					T				S									D		T									S								S				
35	054	9.4	100	10	T		T		S												S			T									M		S						S		T		
36	055	6.3	100	0					S				S																T				M		M						T				
37	056	9.3	100	10	T		S		S				M																S				D		M						T	S			
38	057	9.4	100	0					S				S									M		S									S									S			
39	058	7.4	100	0					S				S											S									M		M								S		
40	059	9.4	100	15	S				S				M									T										S	T	D		S							S		
41	060	6.4	100	1					S				S																S				D		S								T		
42	061	7.3	100	15	S				S				M												T								S		M							S			
43	062	9.4	100	5	T				M				M									M		S								S		M		M					T				
44	063	7.4	100	10	T				S				S									T		S									D		S										
45	064	5.4	80	0									M											M									D		S									S	
46	065	9.4	100	0					S				M											S									D		S								S		T
199	066	8.4	100	15	T				T				S									S												D		S							S		S
47	067	8.4	100	10	T				S				M									S												M								S		S	
48	068	9.4	100	10	T								M									S		T										M		S							S		S
49	069	8.4	100	10	T				M				M									S												D		S							S		S
50	070	7.4	100	5	T				S				S									M												D									S		S
51	071	7.4	100	5	T				S				S									M												D									S		S
24		7.75	3.9	98.95833	6.708333																																								
T S M D		14	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	4	0	2	0	0	0	2	1	2	1	0	0	0	0	0	0	0	3	3	0	3	
		2	1	0	18	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	4	0	6	0	0	0	0	5	0	2	0	2	0	12	0	0	0	0	1	11	2	11		
		0	0	0	2	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	7	0	3	0	0	0	0	0	0	0	0	8	0	7	0	0	0	0	0	2	0	1		
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0		
# COUNT		14	2	0	22	0	0	0	21	0	0	0	0	0	0	0	0	0	0	0	0	17	0	13	0	2	0	0	7	1	4	1	24	0	19	0	0	0	0	4	16	2	15		
%		66.7	8.3	0.0	91.7	0.0	0.0	0.0	87.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	70.8	0.0	54.2	0.0	8.3	0.0	0.0	29.2	4.2	16.7	4.2	100.0	0.0	79.2	0.0	0.0	0.0	0.0	16.7	66.7	8.3	62.5		

[illegible]

[illegible][illegible]

[illegible]