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### APPENDICES

Appendix A: Comprehensive Aquatic Vegetation Survey Information – DFWI’s 2013 Final Report

## INTRODUCTION

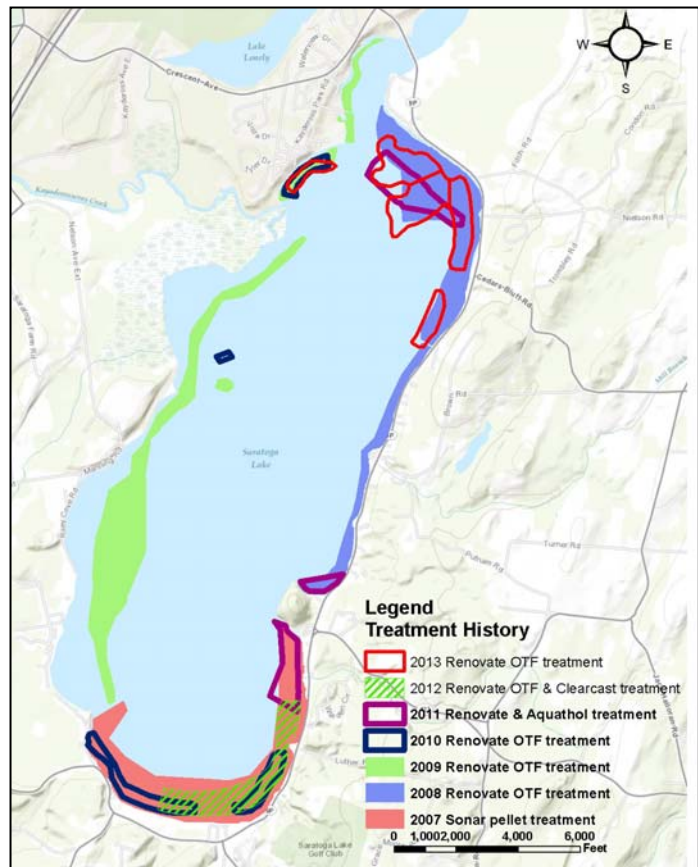
An integrated aquatic plant management program was performed at Saratoga Lake for the seventh consecutive year in 2013. The current program includes the use of aquatic herbicides to control invasive Eurasian watermilfoil (*Myriophyllum spicatum*) and curlyleaf pondweed (*Potamogeton crispus*), the use of mechanical harvesting equipment owned and operated by the Saratoga Lake Protection and Improvement District (SLPID) to manage nuisance plant growth along developed shoreline areas, and limited winter drawdown. This integrated management approach (IMP) approach was developed after nearly a decade of investigations and studies and is detailed in the following documents: Watershed Management Plan prepared by The LA Group in 2002, the Long-Term Aquatic Vegetation Management Plan prepared by Aquatic Control Technology in 2005, and the EIS prepared by The LA Group in 2007. The balance of this report details the herbicide treatment program that was performed at Saratoga Lake during the 2013 season.

## SUMMARY OF RECENT HERBICIDE TREATMENTS

Herbicide treatments were initially considered to control the dense beds of Eurasian watermilfoil that were documented to cover between 700 and 800 acres by the Darrin Fresh Water Institute (DFWI) in 2004. The considerable Eurasian watermilfoil biomass was overwhelming SLPID's harvesting program and was severely impacting recreational use of the lake. A phased herbicide treatment program was initiated in 2007 to target all of the dense beds of Eurasian watermilfoil over a three-year period. It was then hoped that drawdown and harvesting could be used to keep nuisance plant growth at manageable levels, and herbicides would be used as a complimentary maintenance strategy to control invasive species.

Since 2007, the following herbicide treatments have been performed at Saratoga Lake:

Year	acres treated	location	herbicide applied
2007	158	south end	Sonar PR & Q (fluridone pellets)
2008	292	northeast and east shore	Renovate OTF (triclopyr granular)
2009	285	northwest and west shore	Renovate OTF
2010	50	various locations	Renovate OTF
2011	100	northeast & southeast shore	Renovate 3 (triclopyr liquid) & Aquathol K (endothall liquid)
2012	100	southeast shore	Renovate OTF & Clearcast 2.7G (imazamox granular)
2013	172	northeast & northwest shore	Renovate OTF



The three-year treatment program performed during the 2007, 2008 and 2009 seasons was very effective at reducing the distribution and biomass of Eurasian watermilfoil lake-wide. Spot-treatment of recovering Eurasian watermilfoil was performed in 2010. Maintenance level treatments were continued in 2011, 2012 and 2013 and were expanded to also target curlyleaf pondweed in 2011 and 2012.

## HERBICIDE TREATMENT PROGRAM - 2013

Herbicide treatment efforts were focused on the northeast and northwest shorelines in 2013. Despite reduced densities from what was documented in 2008 and 2009 in these areas, milfoil growth was widespread and abundant from 4-10 feet in depth.

Contact Exposure Time (CET) has been difficult to maintain in small treatment areas in past years, so larger treatment blocks were intentionally selected to increase the potential for success. Granular triclopyr (Renovate OTF) was again used for treatment. Granular herbicide formulations were selected to limit mixing and dilution caused by wind and wave action and to help improve CET. Renovate OTF was used successfully at Saratoga Lake in previous years and provided selective and effective milfoil control.

### Program Chronology

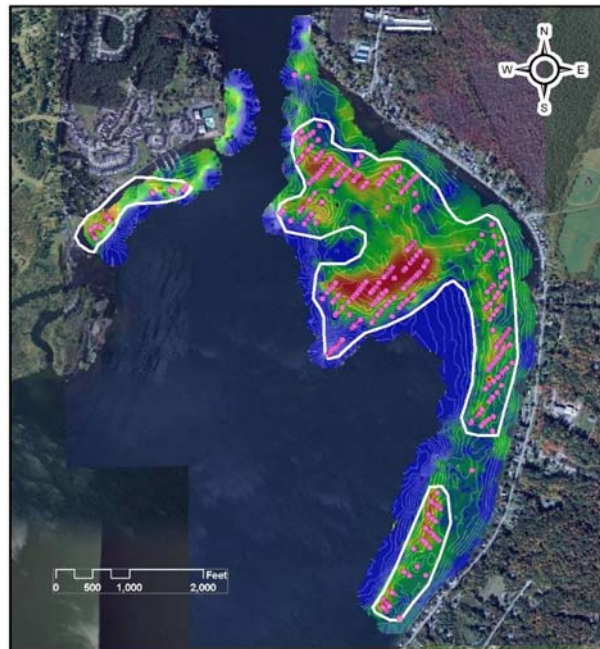
A chronology of the 2013 treatment program is provided below:

- Pre-treatment inspection and finalize treatment areas.....(Oct-Nov 2012)
- Submission of permit application to DEC ..... January 17
- DEC permit issuance ID 5-4199-00002/00008 & 11..... May 27
- Treatment of approximately 172 acres with Renovate OTF for EWM control..... June 5 & 6
- Post-treatment inspections..... July 3
- Comprehensive aquatic plant survey (DFWI) .....Aug 28 & 29
- Late season inspection ..... Oct 15

### Pre-Treatment Inspection

On 12 November 2012 the littoral zone on the northeast and northwest portions of Saratoga Lake was surveyed with a hydro acoustic mapping system to determine the size and density of the milfoil infestation in this area of the lake. Areas of dense milfoil growth were also confirmed by visual observation.

Areas identified for treatment in 2013 were dictated by the density and distribution of milfoil observed during the November survey. A map generated from the hydro acoustic survey including manually entered GPS points denoting dense milfoil growth (pictured to the right).

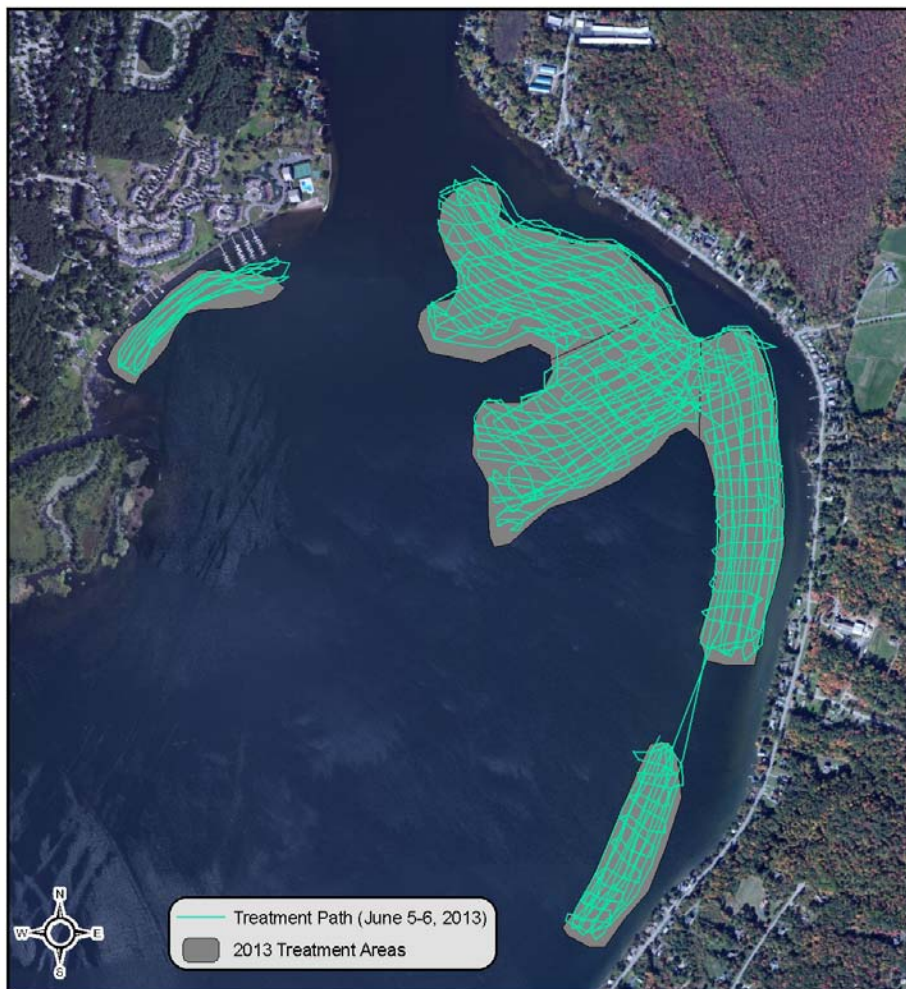


### Summary of 2013 Treatment

Treatment dates of Wednesday, 5 June and Thursday 6 June 2013 were selected so that the one-day swimming restriction would not be imposed over a weekend. Weather conditions on both days were ideal with an air temperature of 75°F, sunny/partly cloudy conditions and light winds (<5mph) out of the W/SW. The surface water temperature was approximately 20.4° C and the dissolved oxygen concentration was 9.4 mg/L.

The treatment was conducted using a 24-foot fiberglass work skiff outfitted with two calibrated, cyclone seeder/spreaders mounted in the stern. This produced an approximate 30-foot swath during the application. Renovate OTF (EPA Reg. No. 67690-42; SLN NY-070004) granules were loaded into the spreaders and evenly applied throughout pre-determined treatment sectors.

The treatment boat was equipped with a WAAS GPS unit that had the treatment areas pre-loaded and was used for real-time navigation in order to insure that even applications were made within the designated treatment areas. The Fitch Road access point on the NE shoreline of the lake used as the base of operations. Crop Production Services (CPS) delivered the Renovate OTF herbicide directly to the lake.



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 on the following day. There was approximately 16-20 hours between the two applications. This split application approach was used to increase CET and treatment efficacy.

Renovate OTF herbicide was applied at a target dose of 1.3-1.5 ppm in the bottom 5-feet of the water column. It was expected that the majority of the targeted milfoil growth would be found in the lower 5 feet of the water column at the time of treatment. This application rate was consistent with previous treatments performed at Saratoga Lake. A total of 30,700 pounds of Renovate OTF (granular) was applied to the three distinct treatment areas. The herbicide application took two full work days to complete.



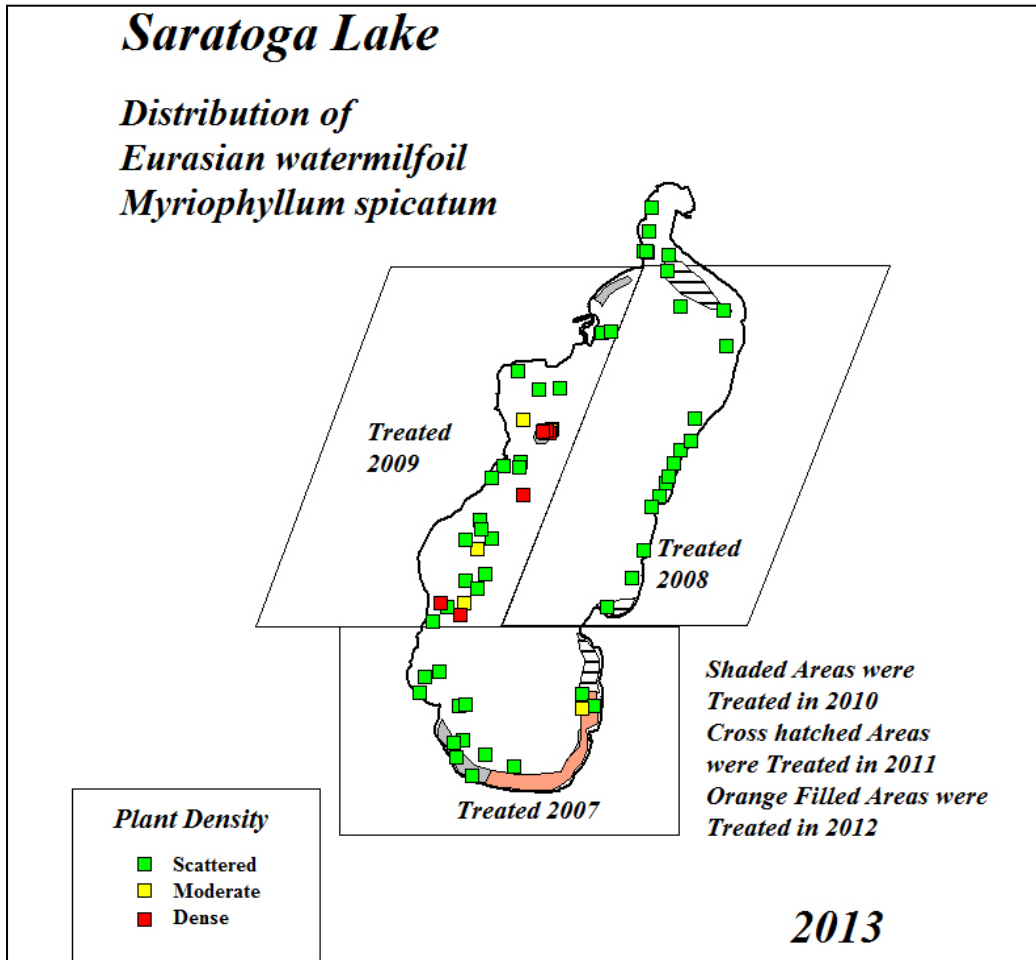
### Post-Treatment Inspections

Approximately four weeks post-treatment (7/3/13) ACT conducted a visual inspection of the treatment area and found that most of the targeted milfoil plants were dead and decomposing on the bottom. Low-density EWM remained erect in water column in some of the treated areas but most of the observed plants were showing signs of treatment impact. The 19 acre treatment area along the eastern shore had the most remaining milfoil but overall cover of milfoil was less than 10%. Healthy growth of native plant species observed growing in the treatment area included: *Potamogeton richardonii*, *Zosterella dubia*, *Stuckenia pectinatus*, *Elodea canadensis*, *Ceratophyllum demersum* & *Potamogeton zosteriformis*.

### 2013 LATE SEASON COMPREHENSIVE AQUATIC VEGETATION SURVEY

The annual comprehensive aquatic plant survey was conducted by DFWI in late August. A copy of their interim report is provided in Attachment B. A point-intercept vegetation survey was performed throughout the littoral zone of the lake consistent with their survey efforts in prior years.

Map from DFWI 2013 final report



Within the treatment area there was an obvious reduction in EWM between the 2012 and 2013 surveys. Only 5 instances of low-density milfoil recorded among the 50-60 data points located in the treatment areas. According to the DFWI Final Report (Appendix A), EWM frequency within treated areas was reduced from 42% in 2012 to 9% in 2013.

**Frequency of Occurrence data from DFWI surveys**

Year	2004	2007	2008	2009	2010	2011	2012	2013
<i>Treatment performed</i>	<i>Pre-treatment</i>	<i>South end Sonar 158 acres</i>	<i>East and northeast shore Renovate OTF 292 acres</i>	<i>West shore Renovate OTF 285 acres</i>	<i>Spot-treatment Renovate OTF 50 acres</i>	<i>Spot-treatment Renovate &amp; Aquathol liquid 100 acres</i>	<i>Spot-treatment Renovate OTF &amp; Clearcast 2.7G granular 100 acres</i>	<i>Spot-treatment Renovate OTF granular 172 acres</i>
Eurasian watermilfoil	54.2%	49.7%	13.0%	6.8%	22.1%	29.3%	25.6%	23.1%
Curlyleaf pondweed	5.6%	5.6%	5.6%	3.1%	9.4%	0.7%	2.3%	2.3%

In reviewing the survey data for the entire lake produced by DFWI, there appeared to be slight decline in frequency of occurrence of EWM between 2012 and 2013 from 26% to 23%. The frequency of occurrence of CLP remained low at just 2.3%; indices for CLP have been comparably low over the past three years. The maintenance treatments performed over the past four years appear to be maintaining the lake-wide populations of EWM and CLP at relatively low levels.

Native species continue to dominate the aquatic plant community in Saratoga Lake. Quantitative measures of frequency of occurrence and species richness were consistent with prior years. Twenty-nine species were encountered during the 2013 survey, which is the same number that was found in 2009 and remains comparable with prior years. Slight changes in the frequency of occurrence values of native species are seen from year to year, but this is attributable to annual variation in growth and limitations of the survey methodology that is being employed. The only noteworthy difference seen in 2013 was the continued expansion in the frequency of occurrence of Richardsons' Pondweed (*Potamogeton richardonii*), which increased from 0.3% in 2011 to 22% in 2012 and 33% in 2013. Increased densities of this plant were also reported at other area waterbodies, which suggests that the increased growth may be due to weather or other factors that are influencing the entire region and not simply Saratoga lake. Indices for all other recorded plant species were consistent with results from prior years.

**SUMMARY AND DISCUSSION**

By all measures, the 2013 herbicide treatment at Saratoga Lake provided reasonably effective control of Eurasian watermilfoil. Only low densities occurrences of milfoil were found in the treatment areas during post-treatment inspections and late season surveys, while the treated areas supported diverse and abundant growth of numerous native plant species. As has been the case in prior years, the smallest treatment areas with the greatest edge to area ratio appear to be subject to the most dilution with untreated water. This reduces the herbicide CET and results in reduced treatment efficacy.

The most significant challenge encountered during the 2013 treatment program was the numerous significant rainfall events that began approximately one-week after the treatment. This caused elevated water levels in the lake and accelerated outflow that carried triclopyr residues further downstream than predicted. This necessitated

additional sampling and notification to downstream riparian owners of the temporary restrictions on the use of treated lake water for irrigation purposes.

Saratoga Lake is a productive system and it will continue to support growth of invasive Eurasian watermilfoil and curlyleaf pondweed for the foreseeable future. Herbicide treatment programs performed since 2007 have controlled dense beds of Eurasian watermilfoil and have allowed for recovery of a diverse native plant assemblage. However, the treatments do not provide complete control and recovery of Eurasian watermilfoil will occur at accelerated rates if ongoing management is not continued. Future herbicide treatments should continue to be “fine-tuned” based on the recent experiences at Saratoga Lake and at other lakes in the Northeast.

## **RECOMMENDATIONS FOR 2014 SEASON**

The results of the DFWI August 2013 survey and observations made during late season inspections suggest that the southern end, especially the southwest shoreline will support the most robust Eurasian watermilfoil growth on the lake during the 2014 season and is expected to be the focus of management efforts.

We will work with SLPID to prioritize potential treatment areas based on the available data and will attempt to finalize the 2014 treatment areas and treatment protocol over the winter, so permits can be submitted to NYSDEC early next year to allow ample time for review.

Based on the positive results from previous treatments we anticipate the use of Renovate (triclopyr) herbicide will be considered in 2014, but we will evaluate all available herbicide treatment options to achieve selective control of the nuisance Eurasian watermilfoil and curlyleaf pondweed growth. We will work closely with all of the involved parties to develop treatment protocols that will provide the desired level of control, while minimizing impact to lake riparian owners and downstream riparian owners that use water for domestic purposes and for irrigation. We will also try to develop and propose a sampling protocol that will allow for assessment of the treatment effectiveness and provide the necessary protection for downstream water users. Treatment timing will likely stay similar to recent years, targeting a treatment date between mid-May and early-June. The objective will be to schedule treatment when there is at least 3 or more feet of active Eurasian watermilfoil growth, and when there is still a temperature gradient in the water column that will help limit herbicide dissipation. The herbicides, formulations and application approaches used will ultimately depend on treatment area configuration. It will also be necessary to maintain some flexibility in the treatment date should there be adverse weather conditions, such as heavy rainfall or high winds that could accelerate dilution and mixing.

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## ***ATTACHMENT A***

- Comprehensive Aquatic Plant Survey – 2013 Interim Report (prepared by Darrin Fresh Water Institute)