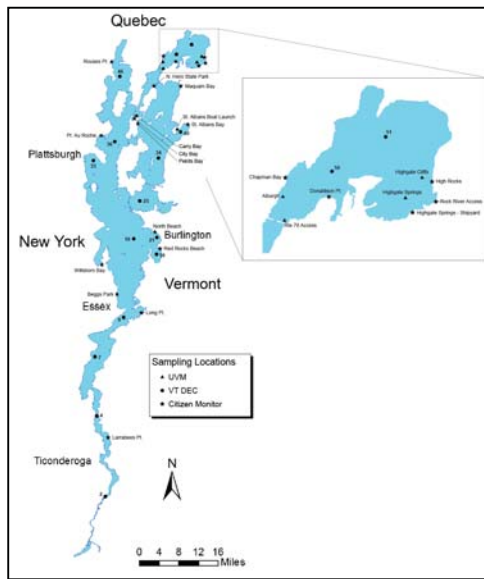


Monitoring and Evaluation of Cyanobacteria in Lake Champlain



September 2011

Final Report

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MONITORING AND EVALUATION OF CYANOBACTERIA IN LAKE CHAMPLAIN

Summer 2010

Report to

Lake Champlain Basin Program

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September 5, 2011

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EXECUTIVE SUMMARY

In 2010, monitoring for potential toxin-producing cyanobacteria continued on Lake Champlain with the following specific objectives:

- Continue monitoring of BGA at the Long-term Water Quality and Biological Monitoring Project sites in partnership with the Vermont DEC, and at selected stations in the greater Burlington area, St. Albans Bay and Missisquoi Bay.
- Continue to work with volunteer citizen monitors in Missisquoi Bay, the north lake and, and other selected sites (in partnership with the Lake Champlain Committee).
- Continue screening for the presence of toxins when potential toxin-producing BGA are observed.
- Continue to use a tiered BGA alert system framework, incorporating data and knowledge gained in previous years.
- Continue e-mail communication network among state and provincial agencies in Vermont, New York and Quebec to facilitate regular exchange of information about current BGA conditions and the potential for human exposure to toxins.

Collections of net and whole water plankton began in June in most locations, and continued into mid-October. Sample sites encompassed all of Lake Champlain, but a special effort was made in Missisquoi Bay, St. Albans Bay, and the north lake, areas known to have problems with toxic blooms in the past. Citizen monitors living around the lake near 18 specific sites were recruited to collect samples from shoreline locations where algae accumulated.

In 2010, bloom conditions occurred in Missisquoi Bay, several locations in the north lake, and in St. Albans Bay. Transient algal accumulations were found at scattered sites in the Main Lake. Microcystin concentrations remained low throughout the season, never reaching Alert Level 2 at any site on the lake. St. Albans Bay Park was the only site in 2010 with measurable anatoxin-*a*, but only a trace was detected.

Once again, our e-mail notification system worked well to keep public health officials informed about algal and toxin conditions. In 2010, we continued to collaborate with Vermont Department of Health to post information about blue-green algae and the weekly results of our testing on their web site to improve communication with all users of Lake Champlain. Information from all locations where samples were tested was included on the website.

INTRODUCTION

Lake Champlain is one of the largest lakes in the United States and is often called the "Sixth Great Lake." Although primarily a recreational lake, it also serves as a source of drinking water and a site for the disposal of municipal wastes in communities throughout the basin.

In response to a dog-poisoning attributed to cyanobacteria toxins in 1999, the LCBP initiated a study to investigate the occurrence of potential toxin-producing cyanobacteria and their toxins in Lake Champlain in 2000. Over the following years, this monitoring program has evolved to document the presence and extent of toxic cyanobacteria blooms in Lake Champlain, and the levels of cyanotoxins that have occurred.

In addition, a project supported through NOAA's MERHAB program began in 2002 and continued through 2007 on Lake Champlain, through a partnership between UVM, SUNY-ESF and SUNY-Plattsburgh. The project has multiple objectives, including documenting the distribution of cyanotoxins in the lake, developing a rapid screening method for anatoxin-*a*, and developing methods for monitoring throughout the lower Great Lakes (Lakes Erie, Ontario and Champlain). Data collected from this project are not available rapidly enough to drive the weekly public alert system, but data are regularly shared among the project investigators.

Beginning in 2003, regular monitoring has been conducted by UVM in partnership with the LCBP long-term monitoring program and with citizen monitors recruited with the assistance of the Lake Champlain Committee. In 2010 we continued this effort with the following specific objectives:

Objectives:

- Continue monitoring of BGA at the Long-term Water Quality and Biological Monitoring Project sites in partnership with the Vermont DEC, and at selected stations in the greater Burlington area, St. Albans Bay and Missisquoi Bay.
- Continue to work with volunteer citizen monitors in Missisquoi Bay, the north lake and, and other selected sites (in partnership with the Lake Champlain Committee).
- Continue screening for the presence of toxins when potential toxin-producing BGA are observed.
- Continue to use a tiered BGA alert system framework, incorporating data and knowledge gained in previous years
- Continue e-mail communication network among state and provincial agencies in Vermont, New York and Quebec to facilitate regular exchange of information about current BGA conditions and the potential for human exposure to toxins.

METHODS

Field Collection

To survey plankton populations lakewide, we established partnerships with the VT DEC and NY DEC staff conducting the LCBP long-term monitoring program. VT DEC staff collected plankton samples from the 15 LTMP sites during their routine collections (Tables 1, Figure 1). Working with the Lake Champlain Committee, we also recruited volunteers to sample shoreline locations in Missisquoi Bay, Maquam Bay, and other areas of the lake (Table 2, Figure 1). We also sampled sites in Missisquoi Bay, St. Albans Bay, and Burlington Bay, where the highest population density of basin residents live and two large water supply systems draw their water.

Frequency. Monitoring for the presence of BGA began in June at the LTMP sites and at the UVM sites and in early July at the citizen monitoring sites. The LTMP sites were sampled approximately biweekly regardless of bloom conditions, as dictated by the state's regular program activities. Frequency of sample collection in Burlington Bay, Missisquoi Bay, and St. Albans Bay was bi-weekly or weekly, as determined following the tiered alert system framework (Table 3). This framework, based on recommendations in Chorus and Bartram (1999) calls for less frequent sampling initially, then weekly sampling once bloom conditions appear. Citizen monitors sampled weekly from July through August. In Missisquoi and St. Albans Bay, weekly sampling was initiated in July and continued through October, when cell densities indicated the decline of the bloom.

Analytical Parameters. The following types of samples were collected in Burlington Bay, St. Albans Bay and Missisquoi Bay during 2010:

- whole water and net plankton
- whole water for total nitrogen
- whole water for total phosphorus
- whole water for toxins (the analysis of this parameter began when microscopic analysis indicated potential toxin-producing taxa have reached densities of concern)

At the LTMP sites, only net plankton samples were collected for this project; however, total nitrogen, total phosphorus, and chlorophyll samples were collected as part of the Long-Term Biomonitoring Project.

Sample Collection. Net plankton samples were obtained using a 63- μ m Wisconsin net. A single 3 m tow was collected, placed in a cooler, and transported back to the laboratory where the total volume was recorded and a subsample was preserved for analysis.

Total nitrogen, total phosphorus, and whole water plankton samples were collected by surface grab sampling. Two replicates were collected for each parameter.

The following tables and maps document sampling locations on Lake Champlain.

Table 1. Location of monitoring sites sampled by UVM and VT DEC.

Sample site – Location or number	Latitude	Longitude
Alburgh	44°59.5548'	73°12.8382'
Highgate Cliffs	45°00.494'	73°05.977'
Highgate Springs	44°59.506'	73°06.803'
Rock River Access	44°59.3124'	73°05.2914'
Rte 78 Access	44°58.078'	73°13.267'
St. Albans Boat Launch	44°47.6544'	73°10.3362'
North Beach	44°29.4084'	73°14.2536'
Red Rocks Beach	44°26.5134'	73°13.4664'
VTDEC Sta02	43°42.89'	73°22.98'
VTDEC Sta04	43°57.10'	73°24.47'
VTDEC Sta07	44°07.56'	73°24.77'
VTDEC Sta09	44°14.53'	73°19.75'
VTDEC Sta16	44°25.55'	73°13.92'
VTDEC Sta19	44°28.26'	73°17.95'
VTDEC Sta21	44°28.49'	73°13.90'
VTDEC Sta25	44°34.92'	73°16.87'
VTDEC Sta33	44°42.07'	73°25.09'
VTDEC Sta34	44°42.49'	73°13.61'
VTDEC Sta36	44°45.37'	73°21.30'
VTDEC Sta40	44°47.12'	73°09.73'
VTDEC Sta46	44°56.90'	73°20.40'
VTDEC Sta50	45°00.80'	73°10.43'
VTDEC Sta51	45°02.50'	73°07.78'

Table 2. Location of monitoring sites sampled by citizen monitors.

Site	Description of Location
Vermont	
Carry Bay	Savage Pt. East
Chapman Bay	southwest of Canadian border
City Bay	middle of North Hero, eastern side, off of Rte. 2
Donaldson Point	northeast of Sandy Pt.
High Rocks	northeast of Rock River Bay
Highgate Springs- Shipyard	southwest of boat ramp
Larrabees Point	Shoreham, Lat 43° 51.325', Lon 073° 22.594'
Kingsland Bay	Ferrisburgh
Maquam Bay	Boat ramp at the town beach in Swanton
North Hero State Park	southeast of Stephenson Pt.
Pelots Bay	Savage Pt. South
St. Albans Bay Park	State Park, off of Rte. 36
New York	
Beggs Park	Town Beach at Essex
Point Au Roche State Park	St. Armand Beach
Rouses Point	water treatment plant, near flushing line
Willsboro Bay	near water filtration intake

Figure 1. 2010 sampling sites in Lake Champlain.

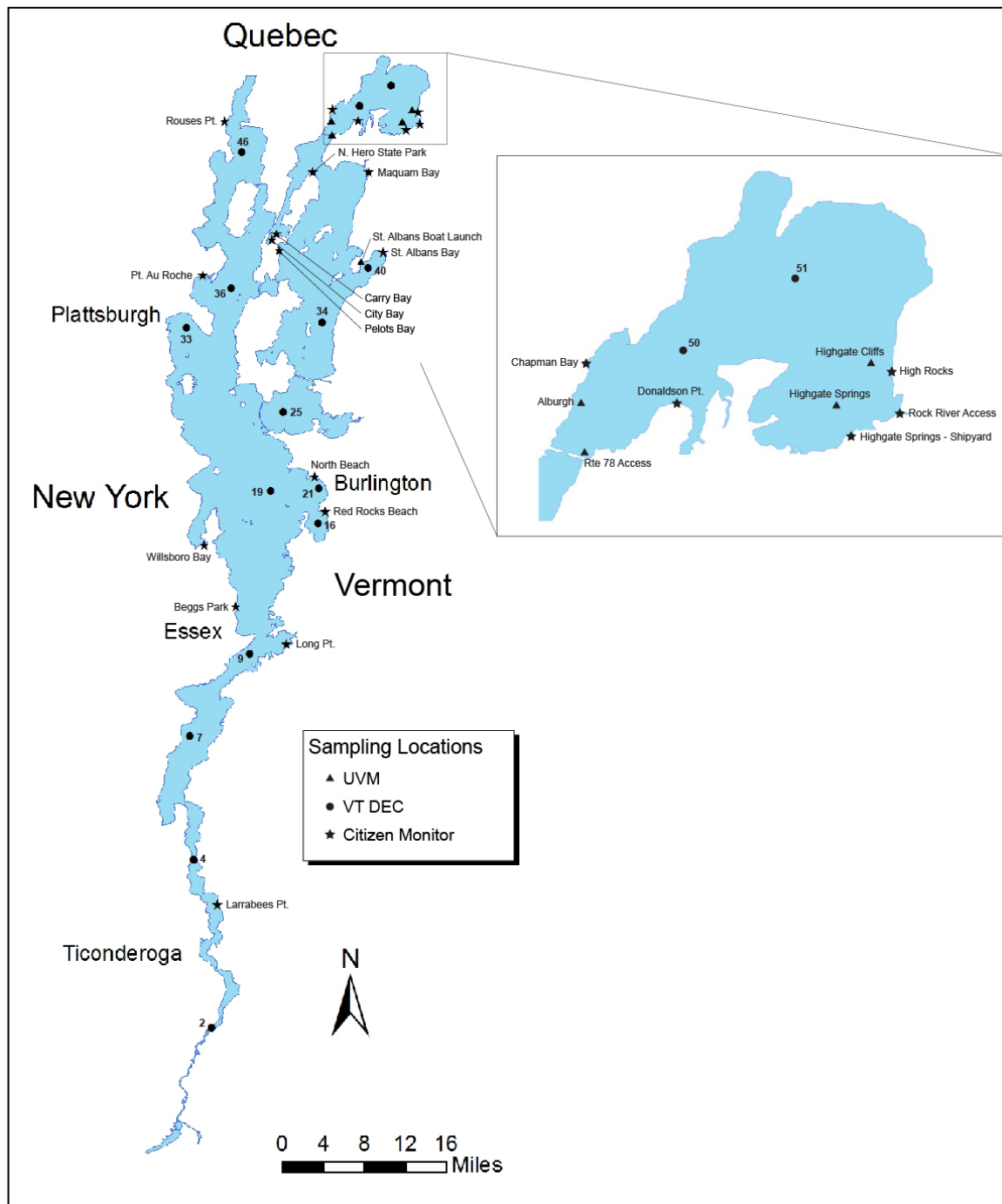


Table 3. Outline of our prototype tiered sampling and alert framework.

<u>Qualitative Sampling</u>	
Frequency:	2/month
Collect:	Vertical plankton tows (63-µm net, upper 3 m) Screened within 48 hours
Conclusions:	If potential toxin-producing taxa observed, proceed to <i>Quantitative sampling</i>
<u>Quantitative Sampling</u>	
Frequency:	2/month
Collect:	Vertical plankton tow (63-µm net, upper 3m) Full enumeration within 48 hours
Conclusions:	If BGA reaches densities reach 2000 cells/mL, proceed to <i>Vigilance level</i>
<u>Vigilance Level</u>	
Frequency:	1/wk at midday
Collect:	Vertical plankton tow (63-µm net, upper 3m) Full enumeration within 48 hours
Conclusions:	If BGA exceed 4,000 cells/mL, proceed to <i>Alert Level 1</i> Return to <i>Quantitative sampling</i> if densities fall below 2,000 BGA cells/mL Notify public health officials that BGA are abundant and blooms could form
<u>Alert Level 1</u>	
Frequency:	1/wk at midday (or more frequently as needed)
Collect:	Whole water phytoplankton samples Whole water chlorophyll <i>a</i> Whole water toxin samples
Conclusions:	If microcystin concentration exceeds 6 µg/L (VDH recreational standard), proceed to <i>Alert Level 2</i> Notify public health officials of potential risks to humans and animals
<u>Alert Level 2</u>	
Frequency:	1/wk at mid-day (or more frequently as weather conditions dictate)
Collect:	As for Alert Level 1
Conclusions:	Return to <i>Alert Level 1</i> if microcystin concentration drops below 6 µg/L Notify public health officials that significant risk to humans and animals exists. Public Health Advisories should be issued by appropriate agencies.

Preservation and storage. Nalgene high-density polyethylene bottles were used for all samples, excluding total nitrogen samples which were collected in 50 mL polypropylene centrifuge tubes. Total phosphorus containers were cleaned with 2.4 N hydrochloric acid solution prior to use. Nitrogen samples were preserved with sulfuric acid to a pH less than 2 and stored at 4°C until analysis. Total phosphorus samples were frozen until analysis. Plankton samples were preserved with 1% Lugols iodine solution and stored in the dark until analysis. Lake water samples for toxin analysis were preserved in one of three ways: filtered and frozen upon return to the lab, filtered and delivered for analysis to Vermont Department of Health (VDH).

Sample Analysis

Net and whole water plankton. Plankton were analyzed either as qualitative or quantitative samples. Initially samples were evaluated qualitatively: all taxa present were noted and recorded. Once potentially toxic cyanobacteria were identified in the samples, evaluation became quantitative; individual algal units in the samples were identified and enumerated, and densities were calculated for each taxon. Whole water samples were collected when blooms were too dense to sample effectively by net samples; the same quantitative counting method, described below, was applied to both sample types.

For both sample types, an aliquot of well-mixed sample was placed in a Sedgwick Rafter cell and allowed to settle for 10 minutes. Slides were examined at 100X with phase contrast using inverted Olympus IX70 and IX71 microscopes. For qualitative screening, the entire chamber was scanned and algal taxa present were recorded. For quantitative screening, algal units were identified and enumerated. Counting continued until 100 cells of the most abundant genus had been observed or at least 10 fields had been examined. Algal units were categorized by size (single cells, fragments of colonies or filaments, small, medium, or large colonies or filaments). The enumerated natural units were multiplied by a cell factor to estimate cell densities (Table 4). Cell densities were extrapolated to reflect plankton populations in the original lake water.

Total Phosphorus. Total phosphorus samples were thawed and mixed thoroughly. An aliquot (generally 50 mL) was digested using ammonium persulfate (1998) and analyzed following Quikchem™ Method 10-115-01-1-F using a Lachat Quikchem™ 8000 Series Flow Injection Analyzer.

Total Nitrogen. Total nitrogen samples were analyzed using persulfate digestion (APHA 1998) and cadmium reduction following Quikchem™ Method 10-107-06-2-H using a Lachat Quikchem™ 8000 Series Flow Injection Analyzer.

Table 4. Cell factors used to estimate field densities of colonial algae.

Taxon	Unit Category	Estimated Cells/Unit	Cell Factor
<i>Anabaena spp.</i> , <i>Aulacoseira spp.</i> , <i>Fragilaria spp.</i>	fragment	1 – 20	10
	small	20 – 100	60
	medium	100 – 1000	500
	large	>1000	1000
<i>Microcystis spp.</i> , <i>Coelosphaerium spp.</i>	small	<100	50
	medium	100 - 1000	500
	large	>1000	1000
<i>Gloeotrichia spp.</i>	fragment	single trichome	20
	small	quarter of a colony	2500
	medium	half of a colony	5000
	large	entire colony	10,000
<i>Aphanizomenon spp.</i>	fragment	single trichome	measured
	small	small flake	200
	medium	medium flake	500
	large	large flake	1000

Toxin Sample Preparation. Filters for analysis of toxins by high performance liquid chromatography (HPLC) at the Vermont Department of Health were placed on ice and delivered to the lab within 24 hours. Filters for ELISA assay by UVM were placed in 15 mL glass centrifuge tubes with Teflon-lined caps in 8 mL of 50% methanol, shaken well and stored at –80°C until analysis.

Microcystin(s) by ELISA. Toxin samples in 50% methanol were thawed, shaken and re-frozen two times before beginning analysis. Extracted samples were diluted with deionized water until methanol represented less than 5% of the total volume, following recommendations to improve the accuracy of the method (Metcalf et al. 2000). Microcystin plate kits were purchased from Envirologix Inc. (Portland, ME).

Samples were run in duplicate following manufacturer’s instructions on a KC Jr. plate reader (Biotek Instruments), utilizing standards provided in the kit. Mean values were used to determine the toxin concentration of each pair of samples. Samples exceeding the range recommended by the kit were diluted and re-analyzed. Samples below the range were also re-analyzed using manufacturer recommended dilution procedures for the standards.

Anatoxin-a by HPLC. At Vermont Department of Health, algal material was freeze-dried and then extracted with acidified methanol. Solid phase extraction cartridges were eluted with 100% methanol. Samples were analyzed following James et al. (1997).

RESULTS

Cyanobacteria and Toxins at the Monitoring Sites

While many of the samples collected at the Long Term Monitoring Sites were analyzed qualitatively until mid summer, almost all of the samples collected by UVM and the citizen monitors were analyzed quantitatively. The total number of samples collected and screened for phytoplankton densities and toxin analysis was about 500 in 2010 (Table 5).

Table 5. Number of quantitative samples collected and analyzed in the cyanobacteria monitoring program in 2010.

Sample Type	Phytoplankton*		Microcystin	Anatoxin***
	Net	Whole Water **	Whole Water	Whole Water
Number of Samples Collected	255	223	382	203
Number of Samples Analyzed	255	204	27	25
* Analyzed using Rapid Count Protocol				
** does not include wwp samples that had companion net samples				
***Analyzed at VDH				

The alert status reached and the maximum density of potentially toxic cyanobacteria cells at each site monitored are listed in Table 4. *Aphanizomenon* spp., *Microcystis* spp. and *Anabaena flos-aquae* were all widely distributed at sites across Lake Champlain.

Table 6. Summary of monitoring status achieved and cyanobacteria generic composition at monitoring stations in 2010.

LCBP Long Term Monitoring Program Sites

Region	Station/Location	Monitoring Status	Date Achieved	Maximum Density of Potentially Toxic Cells/mL	Cyanobacteria Present
South	2. Benson Landing	Quantitative	07/09/10	13 (07/09/10)	<i>Anabaena, Aphanizomenon</i>
	4. Crown Point	Quantitative	07/09/10	103 (08/25/10)	<i>Microcystis, Anabaena</i>
	7. Cole Bay	Quantitative	06/24/10	143 (09/15/10)	<i>Anabaena, Microcystis, Aphanizomenon</i>
	9. Diamond Island	Quantitative	06/24/10	280 (07/16/10)	<i>Anabaena</i>
Main	16. Shelburne Bay	Quantitative	06/16/10	246 (09/28/10)	<i>Anabaena, Microcystis, Aphanizomenon</i>
	19. Main Lake	Quantitative	06/16/10	392 (07/07/10)	<i>Anabaena</i>
	21. Burlington Harbor	Quantitative	06/16/10	417 (07/07/10)	<i>Anabaena</i>
	25. Malletts Bay	Quantitative	06/21/10	50 (09/22/10)	<i>Microcystis, Anabaena</i>
Northwest	33. Cumberland Bay	Quantitative	07/16/10	96 (09/22/10)	<i>Anabaena, Microcystis, Aphanizomenon</i>
	36. Point au Roche	Quantitative	07/06/10	197 (09/22/10)	<i>Anabaena, Microcystis, Aphanizomenon</i>
	46. Alburgh Center	Quantitative	07/06/10	474 (09/09/10)	<i>Anabaena, Microcystis, Aphanizomenon</i>
Northeast	34. Inland Sea	Quantitative	07/06/10	239 (08/31/10)	<i>Anabaena, Microcystis, Aphanizomenon</i>
	40. St. Albans Bay	Quantitative	07/06/10	1752 (08/03/10)	<i>Anabaena, Microcystis, Aphanizomenon</i>
Missisquoi Bay	50. Missisquoi Bay	Vigilance	08/25/10	2628 (08/25/10)	<i>Anabaena, Microcystis, Aphanizomenon</i>

	51. Missisquoi Bay	Vigilance	08/27/10	2450 (08/27/10)	<i>Anabaena, Aphanizomenon</i>
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UVM Monitoring Sites

Region	Location	Monitoring Status	Date Achieved	Highest Microcystin (µg/L) Observed	Maximum Density of Potentially Toxic Cells/mL	Cyanobacteria Present
Main	North Beach-shoreline	Qualitative	06/22/10	not measured	0 (06/22/10)	<i>not observed</i>
	Red Rocks Beach-shoreline	Alert 1	07/08/10	0.13 (07/15/10)	810,000	<i>Anabaena</i>
Northeast	St. Albans Boatlaunch	Alert 1	07/20/10	0.008 (07/22/10)	11,842 (07/20/10)	<i>Anabaena, Aphanizomenon</i>
Missisquoi Bay	Rte. 78 Shoreline	Quantitative	09/28/10	not measured	468 (09/28/10)	<i>Anabaena, Aphanizomenon</i>
	Rte. 78 Access	Vigilance	09/08/10	not measured	3013 (09/22/10)	<i>Anabaena, Aphanizomenon</i>
	Alburgh	Vigilance	09/08/10	not measured	2790 (09/08/10)	<i>Anabaena, Aphanizomenon, Microcystis</i>
	Alburgh shoreline	Alert 1	09/28/10	0.01 (09/30/10)	7763 (09/28/10)	<i>Anabaena, Aphanizomenon</i>
	Highgate Cliffs	Alert 1	08/18/10	0.12 (08/19/10)	4324 (08/18/10)	<i>Anabaena, Aphanizomenon, Microcystis</i>
	Highgate Springs	Vigilance	08/11/10	not measured	3962 (08/11/10)	<i>Anabaena, Aphanizomenon, Microcystis</i>

Citizen Monitoring Sites

Region	Location	Monitoring Status	Date Achieved	Highest Microcystin (µg/L) Observed	Maximum Density of Potentially Toxic Cells/mL	Cyanobacteria Present
South	Larrabee's Point	Quantitative	07/13/10	not measured	1579 (08/10/10)	<i>Anabaena</i>
Main	Beggs Park	Quantitative	07/13/10	not measured	1974 (08/03/10)	<i>Anabaena</i>
	Kingsland Bay	Quantitative	07/13/10	not measured	175 (07/13/10)	<i>Anabaena</i>
	North Beach-shoreline	Vigilance	07/07/10	0.03 (07/08/10)	3895 (07/07/10)	<i>Anabaena</i>
	Red Rocks Beach-shoreline	Vigilance	09/07/10	not measured	2982 (09/07/10)	<i>Anabaena</i>
	Willsboro Bay	Quantitative	07/13/10	not measured	614 (07/13/10)	<i>Anabaena</i>
Northwest	Point au Roche	Alert 1	07/13/10	0.03 (07/15/10)	4868 (07/13/10)	<i>Anabaena</i>
	Rouses Point	Quantitative	07/13/10	not measured	263 (07/13/10)	<i>Anabaena</i>
Northeast	Carry Bay	Quantitative	07/27/10	not measured	1404 (08/31/10)	<i>Anabaena, Microcystis</i>
	City Bay	Quantitative	08/10/10	not measured	263 (08/10/10)	<i>Anabaena</i>
	Maquam Bay	Quantitative	09/07/10	not measured	132 (09/07/10)	<i>Aphanizomenon</i>
	North Hero State Park	Alert 1	08/24/10	0.03 (08/22/10)	7132 (09/08/10)	<i>Anabaena, Aphanizomenon</i>
	Pelots Bay	Vigilance	07/27/10	not measured	3816 (08/31/10)	<i>Anabaena, Aphanizomenon</i>
	St. Albans Bay Park	Alert 1	07/21/10	0.80 (09/09/10)	123,867 (07/27/10)	<i>Anabaena, Aphanizomenon, Microcystis</i>

	Chapman Bay	Alert 1	08/25/10	0.04 (09/09/10)	22,632 (08/25/10)	<i>Anabaena, Aphanizomenon, Microcystis</i>
Missisquoi Bay	Donaldson Point	Alert 1	08/24/10	0.03 (08/26/10)	135,842 08/24/10	<i>Anabaena, Aphanizomenon</i>
	High Rocks	Alert 1	09/07/10	0.07 (09/06/10)	6228 (09/07/10)	<i>Anabaena, Aphanizomenon, Microcystis</i>
	Highgate Spings-Shipyard	Alert 1	09/07/10	0.03 (09/09/10)	7316 (09/07/10)	<i>Anabaena, Aphanizomenon</i>
	Rock River Access	Alert 1	09/07/10	0.03 (09/06/10)	6105 (09/07/10)	<i>Anabaena, Aphanizomenon</i>

Supplemental samples collected when bloom conditions were apparent.

Location	Monitoring Status	Date Achieved	Highest Microcystin (µg/L) Observed	Maximum Density of Potentially Toxic Cells/mL	Cyanobacteria Present
Alburgh FD#1 Raw water intake***	Quantitative	08/31/10	not measured	1,412 (08/31/10)	<i>Anabaena, Aphanizomenon, Microcystis</i>
Burlington Dingy Dock*	Alert 1	10/18/10)	0.14 (10/21/10)	4704 (10/18/10)	<i>Anabaena, Aphanizomenon</i>
Carry Bay**	Quantitative	08/27/10	not measured	1,865 (08/27/10)	<i>Anabaena, Aphanizomenon</i>
Dunham Bay***	Alert 1	08/31/10	0.13 (09/02/10)	29,895 (08/31/10)	<i>Anabaena, Aphanizomenon</i>
Kill Kare boat slip*	Alert 1	08/12/10	0.13 (08/19/10)	42874 (08/12/10)	<i>Anabaena, Aphanizomenon, Microcystis</i>
Melo boat slip*	Alert 1	07/06/10	0.02 (07/08/10)	14,731 (07/06/10)	<i>Anabaena</i>
Palisades, NY (west of Kingsland Bay)**	Quantitative	06/24/10	not measured	92 (06/24/10)	<i>Anabaena</i>
Point Bay Marina***	Alert 1	07/07/10	0.13 (07/08/10)	78,138 (07/07/10)	<i>Anabaena</i>

Port Henry, NY***	Alert 1	07/07/10	Not measured	335,526 (07/07/10)	<i>Anabaena</i>
Red Rocks Beach- shoreline*	Alert 1	07/08/10	0.13 07/15/10	810,000 07/08/10	<i>Anabaena</i>
west of Highgate Cliffs*	Quantitative	07/16/10	Not measured	1,211 (07/16/10)	<i>Aphanizomenon</i>
West Port, NY***	Alert 1	07/07/10	Not measured	167,500 (07/07/10)	<i>Anabaena, Microcystis</i>

Sample collected by UVM*, VT DEC**, Citizen Monitor***

Microcystin concentrations were low at all sites throughout the 2010 summer season, never reaching 1 µg/L at any site.

Table 7. Number of samples tested and maximum concentration of microcystins measured in 2010.

Region	Collected by	Location	No. Samples Tested	Maximum Microcystin Conc. (µg/L)
Main Lake	Citizen Monitor	North Beach shoreline	1	0.03
		Point Bay Marina	1	0.13
	UVM	Burlington Dingy Dock	1	0.14
		Melo Boat Slip	1	0.02
		Red Rocks Beach shoreline	1	0.13
Northwest Lake	Citizen Monitor	Point Au Roche State Park	1	0.03
Northeast Lake	Citizen Monitor	Dunham Bay	1	0.13
		North Hero State Park	2	0.03
St. Albans Bay	Citizen Monitor	St. Albans Bay Park	4	0.8
	UVM	St. Albans Boat Launch	2	0.01
		St. Albans Bay Bay Park	1	0.12
		Kill Kare Boat Slip	1	0.13
Missisquoi Bay	Citizen Monitor	Chapman Bay	2	0.04
		Donaldson Point	3	0.03
		High Rocks	1	0.07
		Highgate Springs- Shipyard	1	0.03
		Rock River Access	1	0.03
	UVM	Alburgh shore	1	0.01
		Highgate Cliffs	1	0.12

Nutrients at the Cyanobacteria Monitoring Sites

Concentrations of total phosphorus (TP) and total nitrogen (TN) were averaged by date for monitoring sites in Burlington Bay, St. Albans Bay, and Missisquoi Bay. Mean concentrations of both nutrients were almost always highest in Missisquoi Bay, intermediate in St. Albans Bay, and lowest at Burlington Bay. The TP data illustrate this pattern (Figure 2), which is consistent with previous years.

We also calculated the ratio of TN:TP in Burlington Bay, St. Albans Bay, and Missisquoi Bay (Figure 3). Consistent with previous years, this ratio was highest in Burlington Bay. In 2010, both Missisquoi Bay and St. Albans Bays showed very similar ratios, with both sites below 20:1 for most of the growing season. Additional analysis of the relationship between nutrient concentrations, and nutrient ratios is underway and will be part of separate publications.

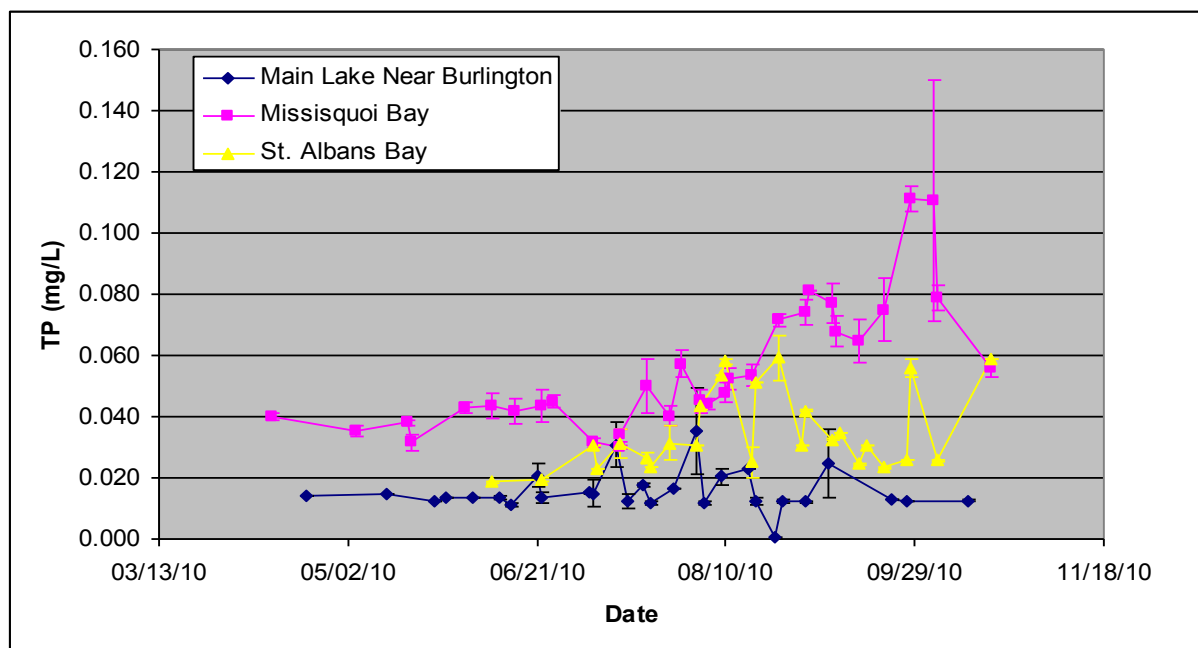


Figure 2. Total Phosphorus concentrations (mg/L) in Missisquoi Bay, St. Albans Bay, and the Main Lake near Burlington over the 2010 growing season. Main Lake data is from VTDEC Stations 19 and 21 and UVM data, Missisquoi Bay data is from VTDEC Stations 50 and 51 and UVM data, and St. Albans Bay data is from VTDEC Station 40 and UVM data.

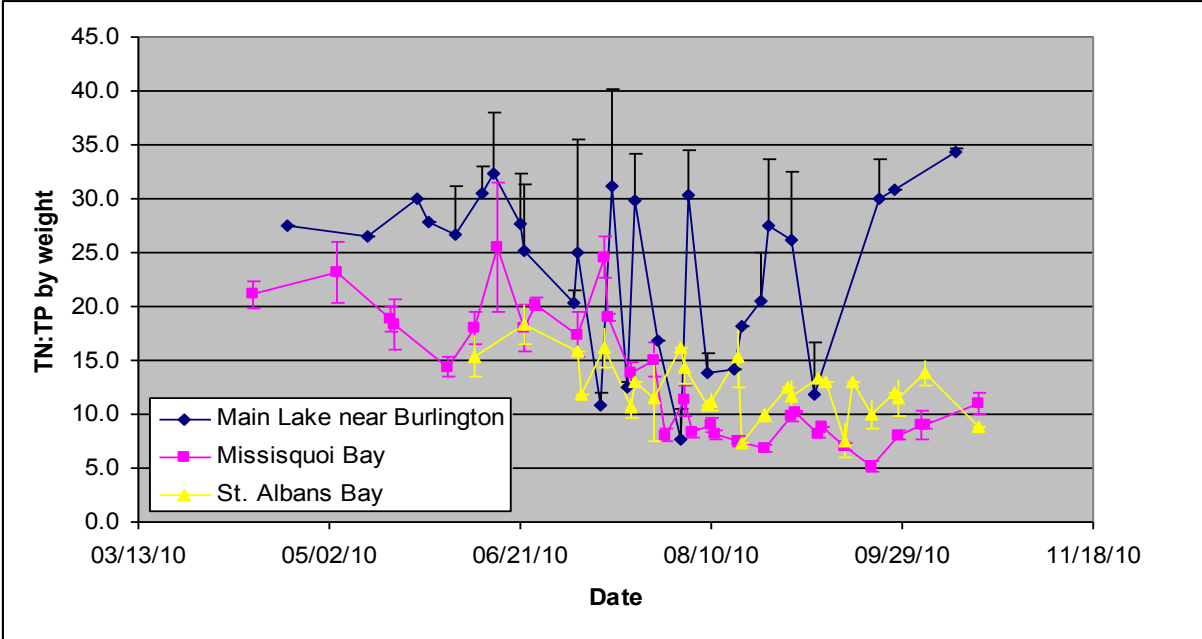


Figure 3. 2010 TN:TP ratios by weight across all sampling sites in Missisquoi Bay, St. Albans Bay, and the Main Lake near Burlington.

DISCUSSION AND CONCLUSIONS

Comparison of Patterns of Cyanobacteria and Toxins 2003-2010

The median densities of phytoplankton differed between Missisquoi Bay, St. Albans Bay, and Burlington Bay (Table 8), with Burlington Bay showing higher densities than previous years. Seasonal mean generic composition (Figures 4-6) showed small increases in evenness of distribution compared to previous years. The median microcystin concentrations in all lake segments were low, consistent with what has been observed over the last several years since 2007 (Table 9).

In general, the data from 2010, when combined with data from the years since 2007, show some improvement in the nuisance bloom conditions in Lake Champlain.

Table 8. Seasonal median densities of phytoplankton in Missisquoi, Burlington, and St. Albans Bays 2003-2010.

Median Denisties per Year (cells/mL)									
Region		2003	2004	2005	2006	2007	2008	2009	2010
Missisquoi Bay	Total Phytoplankton	15360	16533	11505	19677	181	2745	1254	1125
	Total Potentially Toxic Cyanobacteria	6456	5933	3723	10295	0	1841	665	464
Burlington Bay	Total Phytoplankton	980	265	705	540	134	886	399	2552
	Total Potentially Toxic Cyanobacteria	312	70	188	111	34	115	96	526
St. Albans Bay	Total Phytoplankton	10024	5333	5587	5607	1635	2564	491	902
	Total Potentially Toxic Cyanobacteria	5374	897	2624	4042	673	2296	207	647

Figure 4. Seasonal mean percent generic composition of phytoplankton in Missisquoi Bay, 2003-2010.

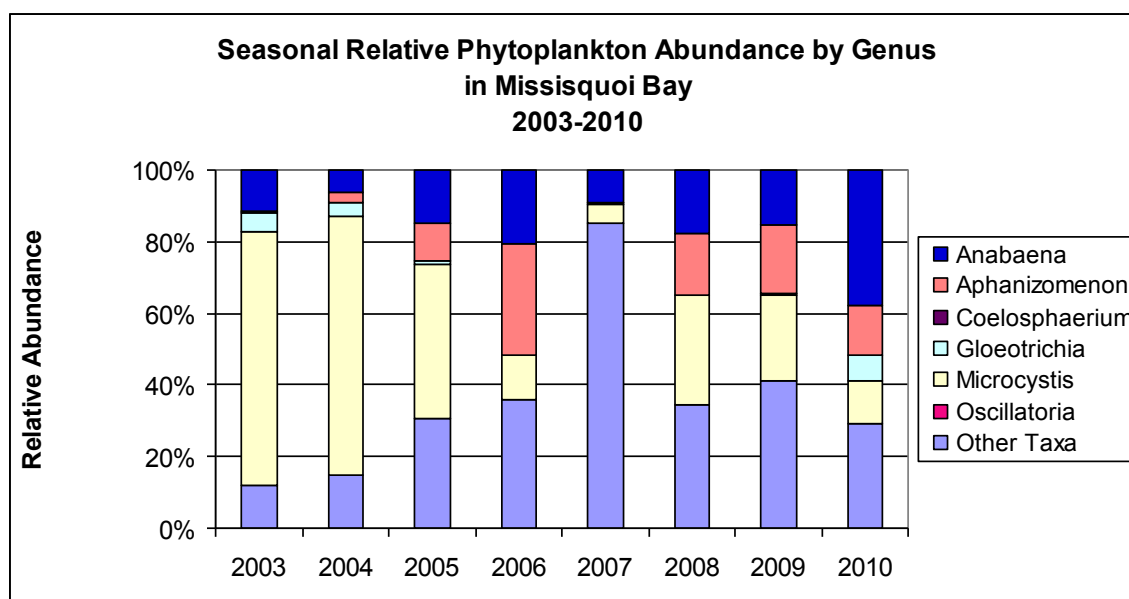


Figure 5. Seasonal mean percent generic composition of phytoplankton in St. Albans Bay, 2003-2010.

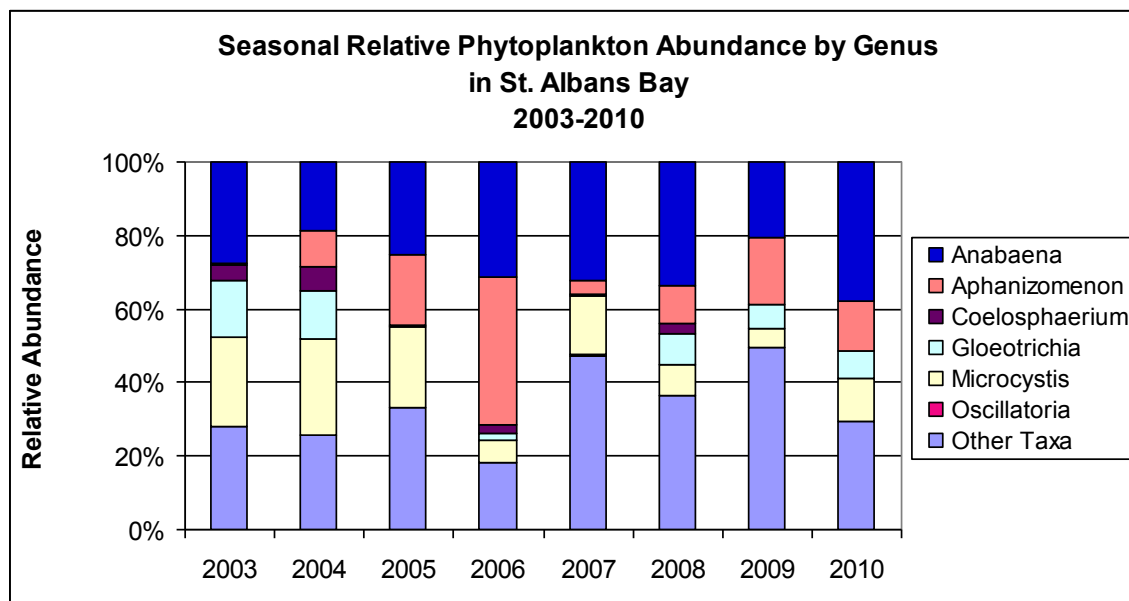


Figure 6. Seasonal mean percent generic composition of phytoplankton in Burlington Bay, 2003-2010.

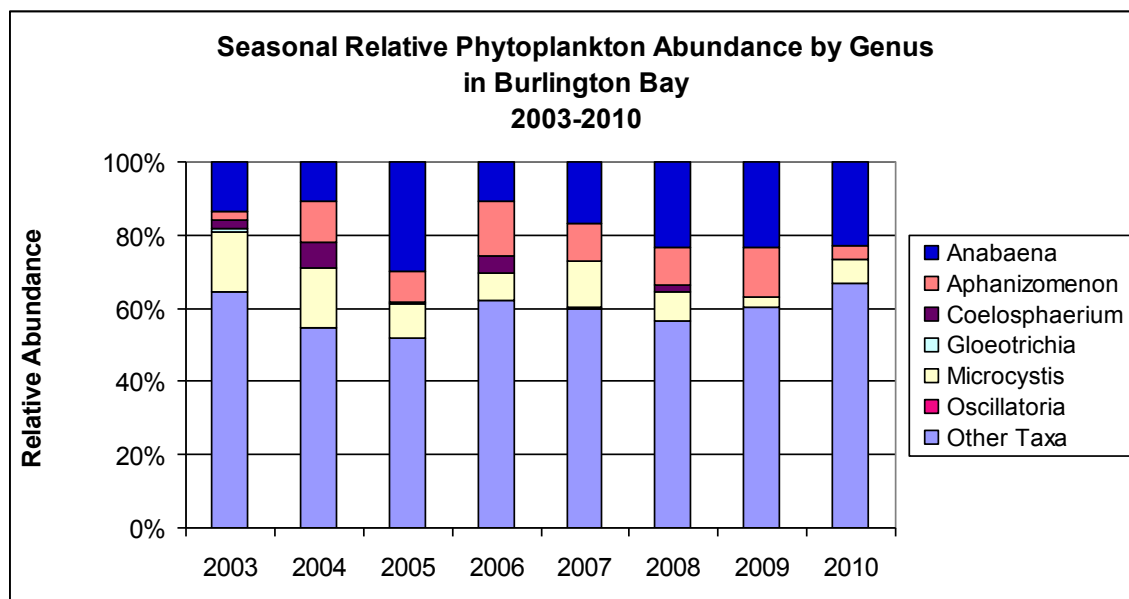


Table 9. Microcystin concentrations (µg/L) in various lake segments, 2003 – 2010.

Lake Region		2003	2004	2005	2006	2007	2008	2009	2010
Burlington Bay/Main Lake	Median	0.02		7.42	0.04	2.82	0.47	0.03	0.13
	Range	ND - 0.12		6.04 - 8.80	0.04 - 3.47	0.02-5.61	0.03 - 1.49	0.03 - 23.36	0.02 - 0.14
	n	9		2	6	2	3	6	5
Missisquoi Bay	Median	0.20	0.88	0.74	0.64		2.30	0.54	0.03
	Range	ND - 23.90	ND - 6490	ND - 22.10	0.03 - 21.29		0.06 - 94.58	0.03 - 54.16	0.01 - 0.12
	n	160	142	125	134		86	29	10
Northeast Bays	Median	0.05	0.51	0.08	0.27	0.05	0.30	0.06	0.03
	Range	ND - 0.18	ND - 17.50	ND - 0.19	0.04 - 42.14	0.04-0.07	0.03 - 22.50	0.03 - 0.08	0.03 - 0.13
	n	6	8	7	14	4	4	3	3
South Lake	Median	0.53		0.05					
	Range	ND - 1.4		ND - 0.067					
	n	3		3					
St. Albans Bay	Median	0.05	0.04	0.44	0.06	0.05	0.04	0.02	0.09
	Range	ND - 0.46	ND - 22.50	0.06 - 0.94	0.01 - 0.43	0.03-0.54	0.02 - 0.12	0.01 - 0.17	0.01 - 0.80
	n	16	22	15	34	40*	10	4	8
Northwest Lake	Median								0.03
	Range								0.03 - 0.03
	n								1

* includes extra samples as part of the SolarBee monitoring effort

Coordination

Coordination meetings were held with Vermont Department of Health officials in May 2010, and an e-mail distribution list that included about 40 partner organizations and individuals was again established for regular information sharing over the summer season. Beginning in June, weekly or bi-weekly e-mail updates on monitoring results were distributed to these officials and to other professionals with an interest in bloom conditions and public health. Working with the Vermont Department of Health, we also posted background information about cyanobacteria and cyanotoxins, and provided information for a map depicting bloom conditions across the lake on their website (http://healthvermont.gov/enviro/bg_algae/weekly_status.aspx). Information on bloom conditions was updated on a weekly basis from early July through mid-October.

The e-mail notification system again worked well in 2010 for rapid communication among the professional community. Our partnership with the Vermont Department of Health to post weekly information about bloom conditions on their website also continued to work well.

Our volunteer citizen monitoring effort also continues to be highly successful. In 2010, 18 volunteers, coordinated by the Lake Champlain Committee (LCC), collected samples across all major sections of the lake providing a good perspective on shoreline conditions lake-wide, and the LCC was able to collect samples from several transitory blooms in the main and northern lake.

ACKNOWLEDGMENTS

Principal funding for this project was provided by the Lake Champlain Basin Program, but additional support was provided by gifts to the Rubenstein Ecosystem Science Laboratory. We gratefully acknowledge Kirk Kimball and Marie Sawyer, Vermont Department of Health, who conducted the anatoxin-*a* analyses. We also thank Angela Shambaugh, Pete Stangel, and other staff of Vermont and New York DEC for assistance with field sampling; and Mike Winslow and Lori Fisher, Lake Champlain Committee and Jennifer Bowman, US Fish and Wildlife Service, who coordinated and assisted with the citizen monitoring effort. And finally, none of the shoreline data collection would have been possible without our dedicated group of volunteer monitors. To all we are very grateful.

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MONITORING AND EVALUATION OF CYANOBACTERIA IN LAKE CHAMPLAIN

Summer 2010

Appendices A – E

**Report to
Lake Champlain Basin Program**

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Appendix A	Pages 2-4
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Appendix A. Results of Qualitative Sample Screening – Data Summary 2010

Date	UVM Sample No.	Sample Location	BGA?	Microcystis	Aphanizomenon	Gloeotrichia	Anabaena	Coelospherium	Oscillatoria	Status
06/10/10	5721	Highgate Springs	YES				X			Go to quantitative
	5723	St. Albans Boatlaunch	YES				X			Go to quantitative
	5714	Rte 78 Access	YES	X						Go to quantitative
	5716	Alburgh	YES	X			X			Go to quantitative
	5718	Highgate Cliffs	YES	X						Go to quantitative
06/11/10	5726	Red Rocks Beach shoreline	NO							Remain at Qualitative
	5727	Red Rocks Beach shoreline	NO							Remain at Qualitative
	5724	North Beach shoreline	NO							Remain at Qualitative
	5725	North Beach shoreline	NO							Remain at Qualitative
06/16/10	5728	VT DEC Sta 16	YES	X	X					Go to quantitative
	5729	VT DEC Sta 19	YES		X			X		Go to quantitative
	5730	VT DEC Sta 21	YES		X		X	X		Go to quantitative
06/21/10	5747	VT DEC Sta 02	NO							Remain at Qualitative
	5749	VT DEC Sta 25	YES	X			X			Go to quantitative
	5748	VT DEC Sta 04	YES	X						Go to quantitative
	5743	North Beach shoreline	YES				X			Go to quantitative
06/24/10	5745	Red Rocks Beach shoreline	YES	X						Go to quantitative
	5750	VT DEC Sta	YES		X		X			Go to quantitative
	5751	VT DEC Sta 09	YES				X			Go to quantitative
07/06/10	5763	VT DEC Sta 46	YES	X			X			Go to quantitative
	5764	VT DEC Sta 50	YES	X	X					Go to quantitative
	5765	VT DEC Sta 51	YES	X	X		X			Go to quantitative
	5766	VT DEC Sta 34	YES	X	X		X			Go to quantitative
	5768	VT DEC Sta 33	YES	X						Go to quantitative
	5761	VT DEC Sta 36	YES	X	X		X			Go to quantitative
	5767	VT DEC Sta 40	YES	X	X			X		Go to quantitative
07/07/10	5770	Larrabees Point Shoreham	NO							Remain at Qualitative
	5780	St. Albans Bay Park	YES				X			Go to quantitative
	5775	City Bay	NO							Remain at Qualitative
	5778	Donaldson Point	NO							Remain at Qualitative

	5773	Point Au Roche	YES				X			Go to quantitative
	5777	Pelots Bay	NO							Remain at Qualitative
	5779	Highgate Springs Shipyard	NO							Remain at Qualitative
	5784	Maquam Bay	NO							Remain at Qualitative
	5774	Rouses Point	NO							Remain at Qualitative
	5776	Carry Bay	NO							Remain at Qualitative
	5781	Chapman Bay	NO							Remain at Qualitative
	5782	Rock River access	YES				X			Go to quantitative
	5813	North Hero State Park	NO							Remain at Qualitative
	5783	High Rocks	NO							Remain at Qualitative
07/08/10	5792	Kingsland Bay	NO							Remain at Qualitative
07/09/10	5804	VT DEC Sta 02	YES		X		X	X		Go to quantitative
07/13/10	5814	North Hero State Park	YES		X					Go to quantitative
	5816	City Bay	NO							Remain at Qualitative
	5820	Chapman Bay	NO							Remain at Qualitative
	5826	Maquam Bay	YES				X			Go to quantitative
	5807	Kingsland Bay	YES				X			Go to quantitative
	5808	Larrabees Point Shoreham	YES				X			Go to quantitative
	5809	Beggs Park	YES				X			Go to quantitative
	5810	Willsboro	YES				X			Go to quantitative
	5812	Rouses Point	YES				X			Go to quantitative
	5815	Carry Bay	YES	X	X		X			Go to quantitative
	5817	Pelots Bay	YES				X			Go to quantitative
	5822	Highgate Springs Shipyard	YES				x			Go to quantitative
	5821	Donaldson Point	NO							Remain at Qualitative
07/14/10	5824	High Rocks	NO							Remain at Qualitative
07/20/10	5848	City Bay	YES		X					Go to quantitative
	5861	Donaldson Point	YES	X						Go to quantitative
	5859	High Rocks	YES	X	X					Go to quantitative
	5894	Chapman Bay	NO							Remain at Qualitative

08/03/10	5935	Chapman Bay	YES		X					Go to quantitative
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Appendix B. Counts of Algae in Quantitative Samples – Data Summary 2010

Location	Sample Type	Date	Rep	CountRep	Bacillariophyceae	Chlorophyceae	Chrysophyceae	Cryptophyceae	Dinophyceae	Euglenophyceae	Myxophyceae	Potential Toxin Producers (cells/mL)	Total (cells/mL)	Collection Source
Rte 78 Access	net	06/09/10	1	1	5.8	5.4	0.0				1.7		12.9	UVM
Rte 78 Access	net	06/09/10	2	1	1.7	1.7	0.6						4.0	UVM
Alburgh	net	06/09/10	1	1	0.4	3.4	0.0				0.8	0.8	4.6	UVM
Alburgh	net	06/09/10	2	1	3.8	8.4							12.2	UVM
Highgate Cliffs	net	06/09/10	1	1	15.2	6.1	38.1				11.8	10.7	71.1	UVM
Highgate Cliffs	net	06/09/10	2	1	10.4	4.6	6.2						21.2	UVM
Highgate Springs	net	06/09/10	1	1	8.9	1.0	16.5				2.6	2.0	28.9	UVM
Highgate Springs	net	06/09/10	2	1	6.4	4.0	4.5				1.0	1.0	15.9	UVM
St. Albans Boat Launch	net	06/09/10	1	1	0.5		3.5	0.5			15.5	15.5	20.1	UVM
St. Albans Boat Launch	net	06/09/10	2	1	0.1						8.0	8.0	8.1	UVM
Sta 16	net	06/14/10	1	1	0.7		0.0				0.6	0.6	1.3	VT DEC
Sta 19	net	06/14/10	1	1	4.2		0.0				2.3	2.3	6.4	VT DEC
Sta 21	net	06/14/10	1	1	1.7		0.2				0.6	0.6	2.5	VT DEC

Rte 78 Access	net	06/22/10	1	1	32.1	9.6	13.7				4.7	4.7	60.1	UVM
Rte 78 Access	net	06/22/10	2	1	15.7	37.4	7.8				6.4	4.2	67.3	UVM
Alburgh	net	06/22/10	1	1	12.8	23.1	3.5		0.1		2.7	2.7	42.0	UVM
Alburgh	net	06/22/10	2	1	7.7	11.9	1.2				4.7	4.7	25.5	UVM
Highgate Cliffs	net	06/22/10	1	1	22.8	34.5	6.1				25.4	25.4	88.8	UVM
Highgate Cliffs	net	06/22/10	2	1	4.9	36.8	0.9	0.1			3.7	3.7	46.4	UVM
Highgate Springs	net	06/22/10	1	1	26.4	22.2	0.6				18.4	18.4	67.6	UVM
Highgate Springs	net	06/22/10	2	1	22.2	18.8	1.3				8.4	8.4	50.7	UVM
St. Albans Boat Launch	net	06/22/10	1	1	9.9	0.3	3.6		0.5				14.4	UVM
St. Albans Boat Launch	net	06/22/10	2	1		0.1			0.6		0.9	0.9	1.6	UVM
Rock River Access	counted d ww as net	06/22/10	1	1	35.1		368.3	61.4					464.7	UVM
Rock River Access	counted d ww as net	06/22/10	2	1	17.5	149.1	166.6						333.2	UVM
Red Rocks Beach shoreline	counted d ww as net	06/21/10	1	1	31.6		999.7	2935.8		10.5			3977.6	UVM
Red Rocks Beach shoreline	counted d ww as net	06/21/10	2	1			768.2	2588.6					3356.7	UVM
North Beach shoreline	counted d ww as net	06/21/10	1	1	17.5		315.7	2481.6					2814.8	UVM

North Beach shoreline	counted dww as net	06/21/10	2	1			94.7	1410.0					1504.7	UVM
Sta 04	net	06/15/10	1	1	48.8		2.4		1.1				52.3	VT DEC
Sta 25	net	06/18/10	1	1	87.1		0.6		0.3		6.9	6.9	94.8	VT DEC
Sta 07	net	06/23/10	1	1	320.8		48.1				9.0	9.0	377.9	VT DEC
Sta 09	net	06/23/10	1	1	218.5		25.1	0.9			84.3	84.3	328.8	VT DEC
Palisades	net	06/23/10	1	1	99.0		9.6		0.1		89.4	89.4	198.0	VT DEC
Rte 78 Access	net	07/06/10	1	1	19.8								19.8	UVM
Rte 78 Access	net	07/06/10	2	1	62.5	8.3					15.3	15.3	86.1	UVM
Alburgh	net	07/06/10	1	1	47.4	11.3							58.7	UVM
Alburgh	net	07/06/10	2	1	73.8	19.5	0.2						93.4	UVM
Highgate Cliffs	net	07/06/10	1	1	44.3	22.4	26.3						93.0	UVM
Highgate Cliffs	net	07/06/10	2	1	58.0	19.2	0.8				11.9	8.9	89.9	UVM
Highgate Springs	net	07/06/10	1	1	37.7	7.9							45.6	UVM
Highgate Springs	net	07/06/10	2	1	23.4	5.7	0.0						29.1	UVM
St. Albans Boat Launch	net	07/06/10	1	1	6.7						6762.6	76.2	6769.3	UVM
St. Albans Boat Launch	net	07/06/10	2	1	3.7	2.3			0.5		4817.4	197.7	4823.9	UVM
Sta 46	net	06/25/10	1	1	9.9	0.5	7.9	0.2	0.0		0.6	0.6	19.1	VT DEC
Sta 50	net	06/25/10	1	1	27.1	24.8	97.6			0.2	9.0	9.0	158.7	VT DEC

Sta 51	net	06/25/10	1	1	39.7	17.5	2.5				12.7	10.9	72.3	VT DEC
Sta 34	net	07/01/10	1	1	135.5	15.4	162.5		13.2		13.0	13.0	339.6	VT DEC
Sta 40	net	07/01/10	1	1	4.6	2.5	5.4	0.0	0.8		11.7	11.7	25.1	VT DEC
Sta 33	net	07/02/10	1	1	88.0		2.4	0.3					90.7	VT DEC
Sta 36	net	07/02/10	1	1	151.1	5.5	4.1	0.2			74.8	74.8	235.6	VT DEC
North Beach shoreline	counted ww as net	07/05/10	1	1	631.4		463.0	31.6			3893.4	3893.4	5019.3	BGA VLNTR
Red Rocks Beach shoreline	counted ww as net	07/05/10	1	1	4135.4		1020.7	410.4					5566.5	BGA VLNTR
Point Au Roche State Park	counted ww as net	07/05/10	1	1	889.4		100.2		50.1				1039.7	BGA VLNTR
St. Albans Bay Park	counted ww as net	07/05/10	1	1	315.7	1073.3	178.9						1567.9	BGA VLNTR
Rock River Access	counted ww as net	07/06/10	1	1		3858.3	43.8	17.5					3919.7	BGA VLNTR
Port Henry	counted ww as net	07/05/10	1	1							335409.2	335409.2	335409.2	BGA VLNTR
Westport boatlaunch	counted ww as net	07/05/10	1	1							167500.0	167500.0	167500.0	BGA VLNTR
Sta 16	net	07/06/10	1	1	2098.8		0.5				113.0	113.0	2212.3	VT DEC
Sta 19	net	07/06/10	1	1	1372.2						391.9	391.9	1764.2	VT DEC
Sta 21	net	07/06/10	1	1	1210.7						417.2	417.2	1627.9	VT DEC
Melo Boat Slip	net	07/06/10	1	1	562.3						14731.2	14731.2	15293.4	UVM

Point Bay Marina	counted dww as net	07/07/10	1	1	627.3		20.2		20.2		78110.4	78110.4	78778.2	BGA VLNTR
Rte 78 Access	net	07/13/10	1	1	74.2	17.4	0.3	0.3	0.1		29.1	29.1	121.4	UVM
Rte 78 Access	net	07/13/10	2	1	106.2	17.1	0.2				9.1		132.6	UVM
Alburgh	net	07/13/10	1	1	331.5	25.5		0.3	0.1		114.6	114.6	472.1	UVM
Alburgh	net	07/13/10	2	1	92.1	7.9					7.9	7.9	107.9	UVM
Highgate Cliffs	net	07/13/10	1	1	833.4	32.3	0.6				190.0	190.0	1056.3	UVM
Highgate Cliffs	net	07/13/10	2	1	1312.4	190.4	19.1						1521.9	UVM
Highgate Springs	net	07/13/10	1	1	371.7		0.5				101.8	101.8	474.1	UVM
Highgate Springs	net	07/13/10	2	1	714.8	75.2					30.8	30.8	820.7	UVM
St. Albans Boat Launch	counted dww as net	07/13/10	1	1	87.7	105.2	70.2	149.1					412.1	UVM
St. Albans Boat Launch	counted dww as net	07/13/10	2	1			175.4	61.4					236.8	UVM
Red Rocks Beach shoreline	counted dww as net	07/08/10	1	1							810000.0	810000.0	810000.0	BGA VLNTR
Sta 02	net	07/07/10	1	1	92.8	17.3	34.7				51.0	12.5	195.8	VT DEC
Sta 04	net	07/07/10	1	1	16.7	3.0	1.8		0.0		52.6	52.6	74.1	VT DEC
Sta 25	net	07/08/10	1	1	1.4	0.0	1.0		0.3		3.5	3.5	6.2	VT DEC
Kingsland Bay Beach	counted dww as net	07/10/10	1	1	1332.9		149.1	17.5			175.4	175.4	1674.9	BGA VLNTR

Larrabee's Point	counted d ww as net	07/11/10	1	1	87.7	87.7	35.1				368.3	263.1	578.7	BGA VLNTR
Beggs Park	counted d ww as net	07/11/10	1	1	359.5		61.4	35.1			87.7	87.7	543.7	BGA VLNTR
Willsboro Bay	counted d ww as net	07/12/10	1	1	1148.7						613.8	613.8	1762.5	BGA VLNTR
Point Au Roche State Park	counted d ww as net	07/12/10	1	1	26.3	1486.3	131.5		13.2		4866.7	4866.7	6524.0	BGA VLNTR
Rouses Point	counted d ww as net	07/12/10	1	1			3893.4	3183.1			263.1	263.1	7339.5	BGA VLNTR
North Hero State Park	counted d ww as net	07/11/10	1	1	87.7			70.2			280.6	280.6	438.4	BGA VLNTR
Carry Bay	counted d ww as net	07/12/10	1	1	8.8	517.4	192.9	263.1					982.1	BGA VLNTR
Pelots Bay	counted d ww as net	07/12/10	1	1	8.8	105.2	87.7	35.1					236.8	BGA VLNTR
North Beach shoreline	counted d ww as net	07/12/10	1	1	5015.8	26.3	26.3	789.2			175.4	175.4	6033.0	BGA VLNTR
Red Rocks Beach shoreline	counted d ww as net	07/12/10	1	1	1052.3	578.7	8.8				1052.3	1052.3	2692.0	BGA VLNTR
Highgate Springs-Shipyard	counted d ww as net	07/11/10	1	1	17.5	26.3	175.4	17.5		8.8	219.2	87.7	464.7	BGA VLNTR
St. Albans Bay Park	counted d ww as net	07/11/10	1	1		989.1			21.0				1010.2	BGA VLNTR
Rock River	counted d ww	07/12/10	1	1	39.5	9707.1	368.3	105.2	13.2				10233.3	BGA VLNTR

Access	as net													
Maquam Bay	counted as net	07/12/10	1	1			35.1	43.8					78.9	BGA VLNTR
Rte 78 Access	net	07/20/10	1	1	30.1	3.3	0.1				79.7	77.1	113.3	UVM
Rte 78 Access	net	07/20/10	2	1	6.1	8.6	0.3	0.3			8.4	8.4	23.6	UVM
Alburgh	net	07/20/10	1	1	5.8	0.4					77.0	77.0	83.2	UVM
Alburgh	net	07/20/10	2	1	1.0			0.1			30.1	30.1	31.2	UVM
Highgate Cliffs	net	07/20/10	1	1	183.1	59.0	0.6				728.7	726.3	971.4	UVM
Highgate Cliffs	net	07/20/10	2	1	179.9	45.0		0.6	0.6		924.3	924.3	1150.4	UVM
Highgate Springs	net	07/20/10	1	1	22.1	6.9					14.4	14.4	43.4	UVM
Highgate Springs	net	07/20/10	2	1	22.5	0.6					51.9	51.9	75.1	UVM
St. Albans Boat Launch	counted as net	07/20/10	1	1	175.4		105.2	122.8			26096.1	26096.1	26499.5	UVM
St. Albans Boat Launch	counted as net	07/20/10	1	2			52.6	131.5					184.1	UVM
St. Albans Boat Launch	counted as net	07/20/10	2	1			8.8	35.1			552.4	552.4	596.3	UVM
St. Albans Boat Launch	counted as net	07/20/10	2	2			8.8	17.5			175.4	175.4	201.7	UVM
St. Albans Bay Park	counted as net	07/20/10	1	1		140.3	35.1	35.1			97948.2	10259.6	98158.7	BGA VLNTR
Sta 07	net	07/12/10	1	1	1930.9						80.0	80.0	2010.9	VT DEC
Sta 09	net	07/12/10	1	1	1556.0						279.6	279.6	1835.6	VT DEC

		0												
Sta 46	net	07/14/10	1	1	36.6		0.1				120.0	120.0	156.6	VT DEC
Sta 50	net	07/14/10	1	1	93.5	16.6	0.2				10.1	0.9	120.4	VT DEC
Sta 51	net	07/14/10	1	1	40.3	8.7	0.6		0.0		22.8	22.8	72.4	VT DEC
Sta 33	net	07/15/10	1	1	1030.5		1.8				5.1	5.1	1037.5	VT DEC
Sta 36	net	07/15/10	1	1	347.1				0.2		1.9	1.9	349.2	VT DEC
City Bay	counted d ww as net	07/19/10	1	1		438.4	43.8						482.3	BGA VLNTR
Kingsland Bay Beach	counted d ww as net	07/18/10	1	1			96.5	8.8					105.2	BGA VLNTR
Larrabee's Point	counted d ww as net	07/18/10	1	1	105.2		96.5	43.8					245.5	BGA VLNTR
Beggs Park	counted d ww as net	07/18/10	1	1	587.5		52.6	43.8					684.0	BGA VLNTR
North Beach shoreline	counted d ww as net	07/19/10	1	1	1236.4	8.8				8.8			1253.9	BGA VLNTR
Red Rocks Beach shoreline	counted d ww as net	07/19/10	1	1	61.4	61.4	61.4	8.8			5533.2	271.8	5726.1	BGA VLNTR
Willsboro Bay	counted d ww as net	07/19/10	1	1	3910.9	245.5					71554.0		75710.4	BGA VLNTR
Point Au Roche State Park	counted d ww as net	07/19/10	1	1	894.4	35.1	8.8	8.8					947.0	BGA VLNTR
Rouses Point	counted d ww as net	07/19/10	1	1	8.8		96.5	17.5					122.8	BGA VLNTR

Carry Bay	counted d ww as net	07/19/1 0	1	1		578.7	199.9						778.7	BGA VLNTR
Highgate Springs- Shipyard	counted d ww as net	07/18/1 0	1	1	201.7	1955. 5	35.1				368.3		2560.5	BGA VLNTR
High Rocks	counted d ww as net	07/18/1 0	1	1	289.4	798.0	17.5				876.9	876.9	1981.8	BGA VLNTR
Rock River Access	counted d ww as net	07/18/1 0	1	1	10.5	378.8	536.7	284.1	115. 7				1325.9	BGA VLNTR
Donaldso n Point	counted d ww as net	07/18/1 0	1	1		438.4	35.1						473.5	BGA VLNTR
Maquam Bay	counted d ww as net	07/19/1 0	1	1				8.8					8.8	BGA VLNTR
Sta 34	net	07/20/1 0	1	1	235.2	1.1	1.4	0.1	1.1		399.9	28.4	638.8	VT DEC
Sta 40	net	07/20/1 0	1	1	43.5	1.4	0.0		0.3		167.3	167.3	212.5	VT DEC
Sta 16	net	07/21/1 0	1	1	204.0	0.6	0.7	0.7			4.1	4.1	210.0	VT DEC
Sta 19	net	07/21/1 0	1	1	513.3		0.9	0.4			15.6	15.6	530.2	VT DEC
Sta 21	net	07/21/1 0	1	1	426.8	2.4	7.2				1.6	1.6	438.1	VT DEC
Rte 78 Access	net	07/26/1 0	1	1	29.2	4.6	1.5				97.8	97.8	133.0	UVM
Rte 78 Access	net	07/26/1 0	2	1	21.7	8.0	4.9				838.1	36.1	872.7	UVM
Alburgh	net	07/26/1 0	1	1	8.8	4.5	0.2				13.6	13.6	27.0	UVM
Alburgh	net	07/26/1 0	2	1	7.1	5.9	1.1	0.2			10.1	10.1	24.4	UVM
Highgate Cliffs	counted d ww as net	07/26/1 0	1	1	2569.3	1201. 3	140.3	26.3			3086.6	2893.7	7023.9	UVM

Highgate Cliffs	counted dww as net	07/26/10	2	2	1052.3	648.9	368.3		8.8				2078.2	UVM
Highgate Cliffs	counted dww as net	07/26/10	2	1	1499.5	210.5	342.0						2051.9	UVM
Highgate Springs	net	07/26/10	1	1	14.4	2.0					12.8	12.8	29.2	UVM
Highgate Springs	net	07/26/10	2	1	16.1	3.1					15.5	15.5	34.7	UVM
St. Albans Boat Launch	net	07/26/10	1	1	13.0	4.8			0.7		64.6	64.6	83.1	UVM
St. Albans Boat Launch	net	07/26/10	2	1	9.0	4.4	0.1		0.2		40.9	35.8	54.5	UVM
Rte 78 Access	net	08/03/10	1	1	2190.1		1.6				315.3	315.3	2507.0	UVM
Rte 78 Access	net	08/03/10	2	1	1725.7		1.6						1727.2	UVM
Alburgh	net	08/03/10	1	1	253.6	5.2					26.0	26.0	284.7	UVM
Alburgh	net	08/03/10	2	1	108.0			0.1			9.1	9.1	117.2	UVM
Highgate Cliffs	net	08/03/10	1	1	2134.6						941.8	941.8	3076.4	UVM
Highgate Cliffs	net	08/03/10	2	1	1028.9				0.5		556.5	556.5	1586.0	UVM
Highgate Springs	net	08/03/10	1	1	946.8	4.7					219.2	219.2	1170.7	UVM
Highgate Springs	net	08/03/10	2	1	911.9	35.5	1.3				307.8	307.8	1256.4	UVM
St. Albans Boat Launch	net	08/03/10	1	1	138.6	16.5					1591.5	1591.5	1746.5	UVM
St. Albans Boat Launch	net	08/03/10	2	1	34.4			12.0	3.4		2956.9	2956.9	3006.8	UVM

Highgate Springs	net	07/26/10	3	1	18.5	3.3	0.0		0.0		13.4	13.4	35.2	UVM
Highgate Springs	net	08/03/10	3	1	541.2						96.6	96.6	637.8	UVM
Highgate Springs-Shipyard	counted ww as net	07/25/10	1	1	613.8	114.0	175.4	61.4					964.6	BGA VLNTR
Donaldson Point	counted ww as net	07/26/10	1	1		78.9	140.3	122.8			491.1	491.1	833.0	BGA VLNTR
Maquam Bay	counted ww as net	07/26/10	1	1		43.8	8.8	26.3					78.9	BGA VLNTR
St. Albans Bay Park	counted ww as net	07/26/10	1	1							123866.7	123866.7	123866.7	BGA VLNTR
Red Rocks Beach shoreline	counted ww as net	07/26/10	1	1			26.3						26.3	BGA VLNTR
Kingsland Bay Beach	counted ww as net	07/24/10	1	1	17.5	8.8	43.8						70.2	BGA VLNTR
Larrabee's Point	counted ww as net	07/25/10	1	1							1227.6	1227.6	1227.6	BGA VLNTR
Beggs Park	counted ww as net	07/25/10	1	1	87.7								87.7	BGA VLNTR
Pelots Bay	counted ww as net	07/25/10	1	1	87.7		96.5	61.4	8.8		1666.1	1666.1	1920.4	BGA VLNTR
North Hero State Park	counted ww as net	07/25/10	1	1	26.3	70.2	8.8						105.2	BGA VLNTR
Willsboro Bay	counted ww as net	07/26/10	1	1	96.5	289.4	52.6						438.4	BGA VLNTR

Rouses Point	counted d ww as net	07/26/10	1	1		35.1	17.5	61.4					114.0	BGA VLNTR
City Bay	counted d ww as net	07/26/10	1	1			35.1	219.2	8.8				263.1	BGA VLNTR
Carry Bay	counted d ww as net	07/26/10	1	1	1315.3		35.1	114.0			745.4	745.4	2209.8	BGA VLNTR
Point Au Roche State Park	counted d ww as net	07/26/10	1	1	87.7			8.8					96.5	BGA VLNTR
North Beach shoreline	counted d ww as net	07/27/10	1	1	228.0		140.3						368.3	BGA VLNTR
Melo Boat Slip	counted d ww as net	07/27/10	1	1							2806.0	2806.0	2806.0	UVM
Sta 02	net	07/22/10	1	1	159.1	11.7	1.6		0.2		1.2	1.2	173.7	VT DEC
Sta 04	net	07/22/10	1	1	400.3		0.4	0.2			24.4	24.4	425.3	VT DEC
Sta 25	net	07/26/10	1	1	2.0		2.8		0.4		3.5	2.9	8.6	VT DEC
Sta 07	net	07/27/10	1	1	372.7	0.6	0.2		0.2		16.3	16.3	389.9	VT DEC
Sta 09	net	07/27/10	1	1	170.7		7.9		0.2		114.1	114.1	292.9	VT DEC
Larrabee's Point	counted d ww as net	08/10/10	1	1	96.5	17.5	17.5			8.8	798.0	798.0	938.3	BGA VLNTR
City Bay	counted d ww as net	08/02/10	1	1	1460.0	78.9							1538.9	BGA VLNTR
Pelots Bay	counted d ww as net	08/02/10	1	1	447.2	324.4	254.3	534.9			1753.8	1753.8	3314.6	BGA VLNTR
Carry Bay	counted d ww as net	08/02/10	1	1	61.4		96.5	157.8			947.0	947.0	1262.7	BGA VLNTR

Rouses Point	counted d ww as net	08/10/10	1	1	16.4	98.6	74.0	41.1			32.9	32.9	263.1	BGA VLNTR
Point Au Roche State Park	counted d ww as net	08/02/10	1	1	350.8	35.1		52.6					438.4	BGA VLNTR
North Hero State Park	counted d ww as net	08/01/10	1	1	8.8								8.8	BGA VLNTR
Kingsland Bay Beach	counted d ww as net	08/01/10	1	1			131.5	105.2					236.8	BGA VLNTR
Beggs Park	counted d ww as net	08/01/10	1	1	26.3		6.6	19.7			1973.0	1973.0	2025.6	BGA VLNTR
Willsboro Bay	counted d ww as net	08/02/10	1	1	17.5		35.1	8.8			87.7	87.7	149.1	BGA VLNTR
Red Rocks Beach shoreline	counted d ww as net	08/02/10	1	1		105.2	26.3	52.6					184.1	BGA VLNTR
North Beach shoreline	counted d ww as net	08/02/10	1	1			17.5	17.5					35.1	BGA VLNTR
Sta 50	net	07/29/10	1	1	1270.9	28.9					28.9	28.9	1328.6	VT DEC
Sta 51	net	07/29/10	1	1	1813.2	80.2					80.2	80.2	1973.7	VT DEC
Sta 33	net	07/30/10	1	1	109.1	3.0	2.5		0.0		5.8	5.2	120.5	VT DEC
Sta 36	net	07/30/10	1	1	241.5	0.3	0.1	0.6	0.3		76.0	76.0	318.8	VT DEC
Sta 46	net	07/30/10	1	1	337.4	18.0					14.7	12.8	370.2	VT DEC
Sta 34	net	08/02/10	1	1	376.8	8.2			0.3		112.7	112.7	498.1	VT DEC
Sta 40	net	08/02/10	1	1	207.0	1.5			0.4		1751.0	1751.0	1959.9	VT DEC

Chapman Bay	counted dww as net	08/01/10	1	1	8.8		87.7						96.5	BGA VLNTR
St. Albans Bay Park	counted dww as net	08/01/10	1	1		543.7	149.1				947.0	947.0	1639.8	BGA VLNTR
Donaldson Point	counted dww as net	08/01/10	1	1	52.6	70.2	17.5						140.3	BGA VLNTR
Highgate Springs-Shipyard	counted dww as net	08/02/10	1	1	87.7		8.8						96.5	BGA VLNTR
Rock River Access	counted dww as net	08/02/10	1	1		70.2	175.4						245.5	BGA VLNTR
High Rocks	counted dww as net	08/02/10	1	1	8.8	122.8	8.8				438.4	438.4	578.7	BGA VLNTR
Maquam Bay	counted dww as net	08/02/10	1	1			87.7						87.7	BGA VLNTR
Sta 16	net	08/04/10	1	1	11.0	0.2	1.9	0.2	0.1		56.7	56.7	70.2	VT DEC
Sta 19	net	08/04/10	1	1	10.7	0.3	1.6	0.1	0.2		33.1	33.1	46.2	VT DEC
Sta 21	net	08/04/10	1	1	16.4	0.2	3.0	0.2	0.1		34.1	34.1	54.0	VT DEC
Rte 78 Access	net	08/10/10	1	1	2292.2						184.9	184.9	2477.0	UVM
Rte 78 Access	net	08/10/10	2	1	2461.6						181.0	181.0	2642.6	UVM
Alburgh	net	08/10/10	1	1	429.5	2.4	0.5		0.2		49.7	49.7	482.2	UVM
Alburgh	net	08/10/10	2	1	699.6		1.4	1.4			104.9	104.9	807.4	UVM
Highgate Cliffs	net	08/10/10	1	1	521.8						358.4	358.4	880.1	UVM
Highgate Cliffs	net	08/10/10	2	1	522.9						869.8	869.8	1392.8	UVM

Highgate Springs	net	08/10/10	2	1	1482.6						73.1	73.1	1555.7	UVM
Highgate Springs	net	08/10/10	3	1	1634.1	15.5					3962.1	3962.1	5611.7	UVM
St. Albans Boat Launch	net	08/10/10	1	1	657.3	18.6	1.3		0.9		2817.1	2817.1	3495.1	UVM
St. Albans Bay Park	net	08/10/10	2	1	69.3	97.0	1.7				2339.5	2339.5	2507.6	BGA VLNTR
Red Rocks Beach shoreline	counted d ww as net	08/09/10	1	1	87.7	70.2	78.9	1823.9			622.6	613.8	2692.0	BGA VLNTR
North Beach shoreline	counted d ww as net	08/09/10	1	1	17.5		43.8	464.7			447.2	438.4	1131.2	BGA VLNTR
Kingsland Bay Beach	counted d ww as net	08/08/10	1	1	35.1	70.2	166.6	1306.6			43.8	43.8	1622.2	BGA VLNTR
Larrabee's Point	counted d ww as net	08/08/10	1	1	87.7		236.8		8.8		1578.4	1578.4	1911.6	BGA VLNTR
Carry Bay	counted d ww as net	08/08/10	1	1			263.1						263.1	BGA VLNTR
North Hero State Park	counted d ww as net	08/08/10	1	1	438.4	35.1	26.3						499.8	BGA VLNTR
City Bay	counted d ww as net	08/09/10	1	1			43.8				263.1	263.1	306.9	BGA VLNTR
Rouses Point	counted d ww as net	08/09/10	1	1			447.2	570.0					1017.2	BGA VLNTR
Beggs Park	counted d ww as net	08/07/10	1	1		8.8							8.8	BGA VLNTR
Point Au Roche	counted d ww	08/09/10	1	1		35.1	61.4	96.5					192.9	BGA VLNTR

State Park	as net													
Pelots Bay	counted d ww as net	08/09/10	1	1		131.5	228.0	192.9			1052.3	1052.3	1604.7	BGA VLNTR
Willsboro Bay	counted d ww as net	08/09/10	1	1	8.8	17.5	52.6	473.5					552.4	BGA VLNTR
Donaldson Point	counted d ww as net	08/09/10	1	1	613.8	491.1	561.2	228.0	8.8		175.4	175.4	2078.2	BGA VLNTR
Highgate Springs-Shipyard	counted d ww as net	08/08/10	1	1			17.5						17.5	BGA VLNTR
High Rocks	counted d ww as net	08/09/10	1	1	350.8	280.6	157.8	105.2	43.8				938.3	BGA VLNTR
Rock River Access	counted d ww as net	08/09/10	1	1	17.5		26.3	8.8		8.8	87.7	87.7	149.1	BGA VLNTR
St. Albans Bay Park	counted d ww as net	08/09/10	1	1	800.0	8266.7					9066.7	9066.7	24133.3	BGA VLNTR
Chapman Bay	counted d ww as net	08/08/10	1	1	87.7	736.6	43.8	17.5					885.7	BGA VLNTR
Maquam Bay	counted d ww as net	08/09/10	1	1		438.4	8.8	140.3					587.5	BGA VLNTR
Sta 25	net	08/05/10	1	1	24.5	0.3	4.5		0.5		19.9	19.8	49.6	VT DEC
Sta 07	net	08/09/10	1	1	362.1	45.3	4.2		4.7		663.2	663.2	1079.5	VT DEC
Sta 07	net	08/10/10	1	1	24.3	0.9			0.2		61.9	61.9	87.2	VT DEC
Sta 09	net	08/10/10	1	1	14.9	0.2	1.3	0.0			26.9	26.9	43.3	VT DEC
Kill Kare boat slip	counted d ww	08/11/10	1	1			10.5		10.5		42858.7	42858.7	42879.8	BGA VLNTR

	as net													
Sta 46	net	08/11/1 0	0	1	14.4	0.2	0.1		0.1		36.7	36.7	51.6	VT DEC
Sta 50	net	08/11/1 0	0	1	454.7	2.3					68.9	68.9	525.9	VT DEC
Sta 51	net	08/11/1 0	0	1	659.6	2.9					168.0	168.0	830.5	VT DEC
Rte 78 Access	net	08/17/1 0	1	1	1578.5	11.2	6.1				931.8	931.8	2527.7	UVM
Rte 78 Access	net	08/17/1 0	2	1	684.5						510.0	510.0	1194.5	UVM
Alburgh	net	08/17/1 0	1	1	409.8	16.6					1204.9	1204.9	1631.2	UVM
Alburgh	net	08/17/1 0	2	1	386.3						1197.5	1197.5	1583.9	UVM
Highgate Cliffs	net	08/17/1 0	1	1	1626.7						4323.7	4323.7	5950.4	UVM
Highgate Cliffs	net	08/17/1 0	2	1	1170.0		0.9		0.9		2512.6	2512.6	3684.4	UVM
Highgate Springs	net	08/17/1 0	1	1	1099.8						252.5	242.9	1352.3	UVM
Highgate Springs	net	08/17/1 0	2	1	961.2						184.9	184.9	1146.1	UVM
Highgate Springs	net	08/17/1 0	3	1	850.3	29.6					492.6	492.6	1372.5	UVM
St. Albans Boat Launch	net	08/17/1 0	1	1	38.6	1.9	0.2				168.6	148.5	209.3	UVM
St. Albans Boat Launch	net	08/17/1 0	2	1	7.3	7.9	3.1	0.1	0.1		116.3	116.3	134.8	UVM
Red Rocks Beach shoreline	counte d ww as net	08/16/1 0	1	1	35.1	8.8	8.8	43.8					96.5	BGA VLNTR
North Beach shoreline	counte d ww as net	08/16/1 0	1	1	43.8		8.8	87.7					140.3	BGA VLNTR

Rock River Access	counted dww as net	08/17/10	1	1	236.8	8.8	3270.8	289.4	8.8		219.2	157.8	4033.7	BGA VLNTR
Beggs Park	counted dww as net	08/15/10	1	1	105.2		26.3	70.2					201.7	BGA VLNTR
Larrabee's Point	counted dww as net	08/15/10	1	1	201.7	43.8	78.9	131.5	8.8		271.8	271.8	736.6	BGA VLNTR
North Hero State Park	counted dww as net	08/15/10	1	1	534.9		35.1	17.5			701.5	701.5	1289.0	BGA VLNTR
Carry Bay	counted dww as net	08/15/10	1	1		534.9	78.9	96.5					710.3	BGA VLNTR
Willsboro Bay	counted dww as net	08/16/10	1	1			43.8	8.8	8.8				61.4	BGA VLNTR
City Bay	counted dww as net	08/16/10	1	1	96.5	613.8	35.1	35.1					780.4	BGA VLNTR
Pelots Bay	counted dww as net	08/16/10	1	1		350.8	368.3	8.8			438.4	438.4	1166.3	BGA VLNTR
Rouses Point	counted dww as net	08/16/10	1	1		192.9	219.2	8.8	17.5				438.4	BGA VLNTR
Point Au Roche State Park	counted dww as net	08/16/10	1	1		70.2		52.6					122.8	BGA VLNTR
Kingsland Bay Beach	counted dww as net	08/15/10	1	1			105.2	640.1					745.4	BGA VLNTR
Maquam Bay	counted dww as net	08/16/10	1	1			26.3	52.6					78.9	BGA VLNTR
St. Albans Bay Park	counted dww as net	08/16/10	1	1	87.7	420.9	403.4	8.8			114.0	114.0	1034.7	BGA VLNTR

Highgate Springs-Shipyard	counted wastewater as net	08/15/10	1	1	1604.7	1144.3	499.8	13.2			2696.4	2696.4	5958.4	BGA VLNTR
Chapman Bay	counted wastewater as net	08/15/10	1	1							114.0	114.0	114.0	BGA VLNTR
Sta 34	net	08/17/10	1	1	190.6	0.5	2.3		4.6		145.6	145.6	343.6	VT DEC
Sta 40	net	08/17/10	1	1	303.0	33.5	5.2	0.9	1.4		171.9	171.9	515.9	VT DEC
Sta 16	net	08/18/10	1	1	6.3	0.7	10.6	0.8	0.1		11.0	11.0	29.5	VT DEC
Sta 19	net	08/18/10	1	1	4.3	0.3	1.0	0.1	0.1		17.4	17.4	23.1	VT DEC
Sta 21	net	08/18/10	1	1	2.5	1.9	3.8	0.5	0.1		20.9	20.9	29.6	VT DEC
Rte 78 Access	net	08/24/10	1	1	65.9	13.2					1920.2	1920.2	1999.2	UVM
Rte 78 Access	net	08/24/10	2	1	78.4	21.6			0.7		1725.4	1725.4	1826.0	UVM
Alburgh	net	08/24/10	1	1	100.1		5.0	1.7			1203.2	1203.2	1310.0	UVM
Alburgh	net	08/24/10	2	1	23.8	2.7	0.7				1348.4	1348.4	1375.5	UVM
Highgate Cliffs	net	08/24/10	1	1	199.0						2231.7	2231.7	2430.7	UVM
Highgate Cliffs	net	08/24/10	2	1	237.2						1987.0	1987.0	2224.2	UVM
Highgate Springs	net	08/24/10	1	1	216.8		0.6				1079.4	1079.4	1296.8	UVM
Highgate Springs	net	08/24/10	2	1	311.2	13.7					739.2	739.2	1064.0	UVM
Highgate Springs	net	08/24/10	3	1	369.8	4.5	3.2				723.0	717.9	1100.4	UVM
St. Albans Boat Launch	net	08/24/10	1	1	3.9				0.9		844.9	844.9	849.7	UVM

St. Albans Boat Launch	net	08/24/10	2	1		0.6			0.3		954.2	954.2	955.2	UVM
Larrabee's Point	counted dww as net	08/22/10	1	1	263.1	35.1	96.5	359.5			526.1	526.1	1280.3	BGA VLNTR
Kingsland Bay Beach	counted dww as net	08/22/10	1	1		35.1	78.9	342.0	17.5				473.5	BGA VLNTR
Beggs Park	counted dww as net	08/23/10	1	1	17.5		52.6	403.4					473.5	BGA VLNTR
Willsboro Bay	counted dww as net	08/23/10	1	1			26.3	78.9					105.2	BGA VLNTR
Point Au Roche State Park	counted dww as net	08/23/10	1	1		35.1	61.4	157.8			526.1	526.1	780.4	BGA VLNTR
Rouses Point	counted dww as net	08/23/10	1	1			61.4	114.0	70.2				245.5	BGA VLNTR
North Hero State Park	counted dww as net	08/22/10	1	1					8.8		4033.7	4033.7	4042.4	BGA VLNTR
City Bay	counted dww as net	08/23/10	1	1			70.2	263.1					333.2	BGA VLNTR
Pelots Bay	counted dww as net	08/23/10	1	1			245.5	236.8	8.8		87.7	87.7	578.7	BGA VLNTR
Carry Bay	counted dww as net	08/22/10	1	1			78.9	114.0					192.9	BGA VLNTR
North Beach	counted dww as net	08/23/10	1	1			26.3	114.0					140.3	BGA VLNTR
Red Rocks Beach	counted dww as net	08/23/10	1	1			8.8	70.2					78.9	BGA VLNTR

Highgate Springs-Shipyard	counted d ww as net	08/22/10	1	1	438.4	35.1	43.8	96.5	8.8		1753.8	1753.8	2376.4	BGA VLNTR
Donaldson Point	counted d ww as net	08/22/10	1	1		631.4	131.5	157.8	52.6		135794.7	135794.7	136768.0	BGA VLNTR
Rock River Access	counted d ww as net	08/23/10	1	1		84.2	42.1	2262.4	52.6				2441.3	BGA VLNTR
High Rocks	counted d ww as net	08/23/10	1	1	613.8	429.7	61.4	254.3	8.8		1008.4	1008.4	2376.4	BGA VLNTR
Maquam Bay	counted d ww as net	08/23/10	1	1			26.3	70.2					96.5	BGA VLNTR
St. Albans Bay Park	counted d ww as net	08/23/10	1	1		8.8	1210.1	122.8			1701.2	1701.2	3042.8	BGA VLNTR
Chapman Bay	counted d ww as net	08/23/10	1	1	52.6	657.7	78.9	26.3			22623.7	22623.7	23439.2	BGA VLNTR
Sta 02	net	08/23/10	1	1	193.7	27.8	4.4	0.3					226.2	VT DEC
Sta 04	net	08/23/10	1	1	17.2				0.1		6.0	6.0	23.4	VT DEC
Sta 25	net	08/19/10	1	1	97.5		0.7		0.7		21.8	21.8	120.8	VT DEC
Sta 50	net	08/24/10	1	1	142.5						2628.1	2628.1	2770.6	VT DEC
Rte 78 Access	net	08/31/10	1	1	20.7	2.6	1.0	0.6			1066.0	1066.0	1090.9	UVM
Rte 78 Access	net	08/31/10	2	1	18.0				1.0		856.8	856.8	875.8	UVM
Alburgh	net	08/31/10	1	1	36.0	6.9	0.7	1.1			1025.5	961.5	1070.1	UVM
Alburgh	net	08/31/10	2	1	54.7						721.4	721.4	776.2	UVM
Highgate Cliffs	net	08/31/10	1	1	152.2	34.0	0.6		0.6		833.4	833.4	1020.9	UVM

Highgate Cliffs	net	08/31/10	2	1	125.2				1.0		1418.2	1418.2	1544.3	UVM
Highgate Springs	net	08/31/10	1	1	136.1		1.9	1.3	0.6		332.5	332.5	472.4	UVM
Highgate Springs	net	08/31/10	2	1	15.4	0.5					49.3	49.3	65.1	UVM
Highgate Springs	net	08/31/10	3	1	126.0		0.4				202.4	202.4	328.9	UVM
St. Albans Boat Launch	net	08/31/10	1	1	27.9		0.5	0.5			1194.9	1194.9	1223.8	UVM
St. Albans Boat Launch	net	08/31/10	2	1	0.7						744.5	744.5	745.2	UVM
Sta 07	net	08/24/10	1	1	13.4	4.3	2.8	0.3	0.4		81.5	81.5	102.6	VT DEC
Sta 09	net	08/24/10	1	1	15.2	4.6	4.0	0.2	0.2		21.9	20.7	46.1	VT DEC
Sta 33	net	08/24/10	1	1	17.5	4.1	4.0	0.2			5.3	5.3	31.1	VT DEC
Sta 36	net	08/24/10	1	1	38.2	4.1	0.2	0.5			72.2	72.2	115.1	VT DEC
Sta 46	net	08/24/10	1	1	34.2	4.0	0.3	1.8			41.7	41.7	82.1	VT DEC
Sta 51	net	08/24/10	1	1	71.2						2632.1	2632.1	2703.4	VT DEC
Carry Bay	net	08/26/10	1	1	16.2						1795.4	1795.4	1811.5	BGA VLNTR
Kingsland Bay Beach	counted ww as net	08/28/10	1	1	35.1		8.8	26.3					70.2	BGA VLNTR
Carry Bay	counted ww as net	08/29/10	1	1	622.6	701.5	350.8	219.2			3709.2	1403.0	5603.3	BGA VLNTR
Beggs Park	counted ww as net	08/29/10	1	1	43.8		61.4	114.0					219.2	BGA VLNTR

City Bay	counted d ww as net	08/29/1 0	1	1		8.8	43.8		8.8		52.6	52.6	114.0	BGA VLNTR
North Hero State Park	counted d ww as net	08/29/1 0	1	1	184.1	157.8	114.0	61.4			3156.8	2893.7	3674.2	BGA VLNTR
Larrabee's Point	counted d ww as net	08/29/1 0	1	1	78.9	43.8	70.2	87.7			114.0	114.0	394.6	BGA VLNTR
Rouses Point	counted d ww as net	08/30/1 0	1	1			52.6	70.2	78.9				201.7	BGA VLNTR
Point Au Roche State Park	counted d ww as net	08/30/1 0	1	1			35.1	35.1	35.1				105.2	BGA VLNTR
Willsboro Bay	counted d ww as net	08/30/1 0	1	1	8.8	35.1	8.8	52.6					105.2	BGA VLNTR
Pelots Bay	counted d ww as net	08/30/1 0	1	1		70.2	43.8	87.7	8.8		3814.5	3814.5	4024.9	BGA VLNTR
North Beach shoreline	counted d ww as net	08/30/1 0	1	1	96.5		61.4	61.4			2192.2	2192.2	2411.4	BGA VLNTR
Red Rocks Beach shoreline	counted d ww as net	08/30/1 0	1	1			35.1	52.6			876.9	876.9	964.6	BGA VLNTR
Dunham Bay	counted d ww as net	08/30/1 0	1	1		289.4					29884.3	29884.3	30173.7	BGA VLNTR
Sta 34	net	08/30/1 0	1	1	55.2	7.3	2.7		0.5		239.4	239.4	305.2	VT DEC
Sta 40	net	08/30/1 0	1	1	62.4	13.2			1.1		995.8	995.8	1072.5	VT DEC
Sta 16	net	08/31/1 0	1	1	52.0	1.2	3.6		0.0		42.4	42.4	99.3	VT DEC
Sta 19	net	08/31/1 0	1	1	143.4	1.2	2.7		0.9		86.9	86.9	235.2	VT DEC

Sta 21	net	08/31/10	1	1	49.8	0.1	1.9		0.2		60.1	60.1	112.0	VT DEC
Alburgh	counted d ww as net	08/30/10	1	1	8.8	35.1	52.6	8.8			1411.8	1411.8	1517.0	BGA VLNTR
Donaldson Point	counted d ww as net	08/29/10	1	1	87.7	87.7	61.4	43.8			4770.3	4770.3	5050.9	BGA VLNTR
St. Albans Bay Park	counted d ww as net	08/29/10	1	1	289.4	6103.1	78.9				10680.5	10680.5	17151.9	BGA VLNTR
Highgate Springs-Shipyard	counted d ww as net	08/29/10	1	1	701.5	70.2	61.4	184.1			87.7	87.7	1104.9	BGA VLNTR
Maquam Bay	counted d ww as net	08/30/10	1	1			26.3						26.3	BGA VLNTR
Chapman Bay	counted d ww as net	08/30/10	1	1		368.3	26.3	8.8			2876.2	2876.2	3279.6	BGA VLNTR
Rte 78 Access	net	09/07/10	1	1	645.4	4.4	4.4	1.5			1355.1	1353.7	2010.7	UVM
Rte 78 Access	net	09/07/10	2	1	773.6		1.7				2245.0	2245.0	3020.2	UVM
Alburgh	net	09/07/10	1	1	459.6	18.9		2.7			1509.6	1509.6	1990.8	UVM
Alburgh	net	09/07/10	2	1	233.1	1.1	0.3				922.4	922.4	1157.0	UVM
Highgate Cliffs	net	09/07/10	1	1	591.1	5.3			0.6		556.8	556.8	1153.8	UVM
Highgate Cliffs	net	09/07/10	2	1	733.2	32.0			0.6		459.0	459.0	1225.0	UVM
Highgate Springs	net	09/07/10	1	1	650.3	31.9			1.3		736.4	736.4	1419.9	UVM
Highgate Springs	net	09/07/10	2	1	735.7	9.9					508.3	508.3	1253.9	UVM
Highgate Springs	net	09/07/10	3	1	810.5	26.4					706.3	706.3	1543.2	UVM

St. Albans Boat Launch	net	09/07/10	1	1	20.7	8.8	0.2				452.1	452.1	481.8	UVM
St. Albans Boat Launch	net	09/07/10	2	1	6.0	0.2	0.2				515.4	515.4	521.7	UVM
Red Rocks Beach shoreline	counted ww as net	09/06/10	1	1	131.5	8.8	17.5	122.8	17.5		2981.4	2981.4	3367.2	BGA VLNTR
North Beach shoreline	counted ww as net	09/06/10	1	1	377.1		96.5	306.9	8.8				789.2	BGA VLNTR
Maquam Bay	counted ww as net	09/07/10	1	1	35.1		52.6	78.9	70.2		570.0	131.5	806.7	BGA VLNTR
St. Albans Bay Park	counted ww as net	09/06/10	1	1	26.3	605.1	105.2	78.9			9680.8	9680.8	10496.3	BGA VLNTR
Rock River Access	counted ww as net	09/06/10	1	1	473.5	131.5	473.5		131.5	26.3	6103.1	6103.1	7339.5	BGA VLNTR
High Rocks	counted ww as net	09/06/10	1	1	2753.4	947.0	456.0	105.2			6225.9	6225.9	10487.6	BGA VLNTR
Chapman Bay	counted ww as net	09/06/10	1	1	338.2	2142.1	187.9		18.8		11349.4	11199.1	14036.5	BGA VLNTR
Highgate Springs-Shipyard	counted ww as net	09/05/10	1	1	894.4	3183.1	736.6	157.8	52.6		7497.4	7313.2	12521.9	BGA VLNTR
Donaldson Point	counted ww as net	09/03/10	1	1	1631.0	368.3	473.5	26.3	26.3		15520.9	15415.7	18046.3	BGA VLNTR
Kingsland Bay Beach	counted ww as net	09/07/10	1	1					8.8				8.8	BGA VLNTR
Willsboro Bay	counted ww	09/07/10	1	1	263.1			26.3					289.4	BGA VLNTR

	as net													
Larrabee's Point	counted d ww as net	09/07/10	1	1	157.8	105.2	114.0	61.4	8.8		87.7	87.7	534.9	BGA VLNTR
Rouses Point	counted d ww as net	09/07/10	1	1			8.8	8.8	8.8				26.3	BGA VLNTR
North Hero State Park	counted d ww as net	09/07/10	1	1	359.5						7129.1	7129.1	7488.6	BGA VLNTR
Carry Bay	counted d ww as net	09/07/10	0	1		175.4	78.9	149.1			964.6	964.6	1367.9	BGA VLNTR
Pelots Bay	counted d ww as net	09/07/10	0	1		175.4	114.0	70.2	17.5		1210.1	1210.1	1587.2	BGA VLNTR
City Bay	counted d ww as net	09/07/10	0	1	175.4		17.5						192.9	BGA VLNTR
Point Au Roche State Park	counted d ww as net	09/07/10	0	1			8.8				1359.2	1359.2	1367.9	BGA VLNTR
Beggs Park	counted d ww as net	09/07/10	0	1	1578.4	35.1	17.5	43.8					1674.9	BGA VLNTR
Rte 78 Access	net	09/14/10	1	1	461.7		6.6	3.3			2247.8	2165.6	2719.4	UVM
Rte 78 Access	net	09/14/10	2	1	409.8	3.4					1371.0	1371.0	1784.1	UVM
Alburgh	net	09/14/10	1	1	368.1	27.5					1415.7	1415.7	1811.3	UVM
Alburgh	net	09/14/10	2	1	210.2						1713.7	1713.7	1923.9	UVM
Highgate Cliffs	net	09/14/10	1	1	1882.1	12.2					780.4	742.1	2674.7	UVM
Highgate Cliffs	net	09/14/10	2	1	1281.0	36.2					760.2	760.2	2077.5	UVM

Highgate Springs	net	09/14/10	1	1	1475.4		1.2				701.7	701.7	2178.3	UVM
Highgate Springs	net	09/14/10	2	1	807.5	1.9					338.5	338.5	1147.9	UVM
Highgate Springs	net	09/14/10	3	1	1000.0	2.0					369.8	369.8	1371.7	UVM
St. Albans Boat Launch	net	09/14/10	1	1	35.8	46.2	0.4		0.9		5130.1	706.3	5213.5	UVM
St. Albans Boat Launch	net	09/14/10	2	1	13.6	2.5	0.4	1.3	1.5		1034.9	1034.9	1054.2	UVM
Sta 25	net	09/01/10	1	1	199.8	0.8	1.3	0.7	0.2		35.8	35.8	238.5	VT DEC
Sta 02	net	09/02/10	1	1	18.2	6.6	72.6	0.2	0.2				97.7	VT DEC
Sta 04	net	09/02/10	1	1	58.6	20.7			0.1		55.9	55.9	135.2	VT DEC
Sta 46	net	09/08/10	1	1	9.8		2.9				473.8	473.8	486.4	VT DEC
Sta 50	net	09/08/10	1	1	639.8	7.4	0.5				1036.4	1036.4	1684.0	VT DEC
Sta 51	net	09/08/10	1	1	473.4		0.4		0.4		216.6	216.6	690.8	VT DEC
Highgate Springs-Shipyard	counted ww as net	09/12/10	1	1	526.1	210.5	350.8	228.0			789.2	789.2	2104.5	BGA VLNTR
Sta 07	net	09/14/10	1	1	231.8	0.2	1.3		0.2		151.9	151.9	385.5	VT DEC
Sta 09	net	09/14/10	1	1	204.0	2.5	1.7	1.3			76.0	76.0	285.5	VT DEC
Rte 78 Access	net	09/21/10	1	1	180.7	6.6				1.6	2364.5	2364.5	2553.4	UVM
Rte 78 Access	net	09/21/10	2	1	110.9						3013.1	3013.1	3124.0	UVM
Alburgh	net	09/21/10	1	1	127.3	0.6					360.9	360.3	488.8	UVM
Alburgh	net	09/21/10	2	1	100.6	19.1					319.9	319.9	439.7	UVM

		0												
Highgate Cliffs	net	09/21/10	1	1	228.8						756.6	744.7	985.3	UVM
Highgate Cliffs	net	09/21/10	2	1	360.5	3.7					1135.0	1135.0	1499.1	UVM
Highgate Springs	net	09/21/10	1	1	209.8	4.4					529.4	529.4	743.5	UVM
Highgate Springs	net	09/21/10	2	1	438.6	43.0					709.6	709.6	1191.2	UVM
Highgate Springs	net	09/21/10	3	1	401.0		0.9				1664.3	515.9	2066.2	UVM
St. Albans Boat Launch	net	09/21/10	1	1	26.5	3.8					211.8	211.8	242.1	UVM
St. Albans Boat Launch	net	09/21/10	2	1	2.3	12.7	0.7	3.0			242.6	242.6	261.2	UVM
Sta 34	net	09/17/10	1	1	81.5	4.0	2.6			0.2	181.9	181.9	270.3	VT DEC
Sta 40	net	09/17/10	1	1	101.2	57.5	0.5				600.3	587.4	759.4	VT DEC
Highgate Springs-Shipyard	counted ww as net	09/19/10	1	1			105.2	78.9			828.7	828.7	1012.8	BGA VLNTR
Sta 25	net	09/01/10	1	1	253.8		3.1				50.1	50.1	306.9	VT DEC
Sta 33	net	09/21/10	1	1	104.7	0.8	0.4		0.2		95.9	95.9	202.0	VT DEC
Sta 36	net	09/21/10	1	1	290.3						196.6	196.6	486.9	VT DEC
Rte 78 Access-shore	net	09/28/10	1	1	35.7	8.6					299.9	299.9	344.2	UVM
Rte 78 Access-shore	net	09/28/10	2	1	44.2	9.6					468.2	468.2	522.0	UVM
Alburgh - Shore	counted ww	09/28/10	1	1			434.1	13.2			3551.4	3551.4	3998.6	UVM

	as net													
Alburgh - Shore	counted d ww as net	09/28/10	2	1	13179.6	342.0			39.5		7760.4	7760.4	21321.5	UVM
St. Albans Boat Launch	net	09/28/10	1	1	3.8				0.4		1345.3	1345.3	1349.5	UVM
St. Albans Boat Launch	net	09/28/10	2	1					0.4		1610.6	1610.6	1611.0	UVM
Sta 16	net	09/27/10	1	1	24.2	1.9	2.8			0.2	245.8	245.8	275.0	VT DEC
Sta 19	net	09/27/10	1	1	56.2	4.6	2.8		0.2		256.7	256.7	320.5	VT DEC
Sta 21	net	09/27/10	1	1	26.8		4.2	0.1	0.1		148.8	148.8	180.2	VT DEC
Highgate Springs-Shipyard	counted d ww as net	09/26/10	1	1	13.2	105.2	39.5				802.4	802.4	960.2	BGA VLNTR
Rte 78 Access	net	10/05/10	1	1	50.0	2.2	0.5				212.0	212.0	264.6	UVM
Rte 78 Access	net	10/05/10	2	1	80.8		1.0				506.2	506.2	588.0	UVM
Alburgh	net	10/05/10	1	1	19.1	31.8					1727.1	1725.5	1778.0	UVM
Alburgh	net	10/05/10	2	1	107.1		5.4				1780.8	1780.8	1893.2	UVM
Highgate Cliffs	net	10/05/10	1	1	17.1	0.2	0.6				174.8	174.8	192.7	UVM
Highgate Cliffs	net	10/05/10	2	1	14.0	0.5	4.6				82.0	82.0	101.1	UVM
Highgate Springs	net	10/05/10	1	1	63.6	0.6					326.8	326.8	391.0	UVM
Highgate Springs	net	10/05/10	2	1	108.9		0.6				349.8	349.8	459.3	UVM
Highgate Springs	net	10/05/10	3	1	72.0	1.2					333.1	333.1	406.2	UVM

St. Albans Boat Launch	net	10/05/10	1	1	9.9	4.2	2.2	0.3	0.2		42.1	42.1	58.9	UVM
St. Albans Boat Launch	net	10/05/10	2	1	2.4	9.2	2.8	0.2	0.2		3.7	3.7	18.4	UVM
Highgate Springs-Shipyard	counted d ww as net	10/03/10	1	1			52.6	17.5					70.2	BGA VLNTR
Sta 50	net	10/06/10	1	1	61.6	0.4					536.3	536.3	598.3	VT DEC
Sta 51	net	10/06/10	1	1	63.4						209.9	209.9	273.3	VT DEC
Rte 78 Access	counted d ww as net	10/19/10	1	1	263.1	420.9	210.5	21.0			547.2	452.5	1462.6	UVM
Rte 78 Access	counted d ww as net	10/19/10	2	1	175.4		149.1	8.8			263.1	263.1	596.3	UVM
Alburgh	counted d ww as net	10/19/10	1	1	599.8	536.7	157.8	21.0	10.5		2367.6	1988.8	3693.4	UVM
Alburgh	counted d ww as net	10/19/10	2	1	378.8	336.7	157.8				526.1	526.1	1399.5	UVM
Highgate Cliffs	counted d ww as net	10/19/10	1	1	10.1	101.2	50.6				80.9		242.8	UVM
Highgate Cliffs	counted d ww as net	10/19/10	2	1			26.3	17.5					43.8	UVM
Highgate Springs	counted d ww as net	10/19/10	1	1	10.1	172.0	60.7	30.4					273.2	UVM
Highgate Springs	counted d ww as net	10/19/10	2	1	8.8	70.2	70.2				87.7	87.7	236.8	UVM
Highgate Springs	counted d ww	10/19/10	3	1	43.8		70.2	8.8					122.8	UVM

	as net													
St. Albans Boat Launch	net	10/19/1 0	1	1	16.3	5.0	3.7				19.3	19.3	44.3	UVM
St. Albans Boat Launch	net	10/19/1 0	2	1	45.3		0.7	0.1			12.0	12.0	58.1	UVM
Burlington Dinghy Dock	counte d ww as net	10/18/1 0	1	1	210.5	328.8	59.2	243.3			4702.3	4702.3	5544.1	UVM
Highgate Springs- Shipyard	counte d ww as net	10/13/1 0	1	1	52.6	410.4	484.0	10.5			1957.2	1957.2	2914.8	BGA VLNTR

Appendix C. Results of Toxin Analyses – Data Summary 2010

Collection Date	Sample Location	Rep	Sample Type	Microcystin by ELISA (analyzed by UVM)		Anatoxin-a by HPLC (analyzed by VDH)		
				Toxin Conc In Lake Water, ug/L	Analysis Date	Less than Reportable Limit	Reportable Limit (ng/mL)	Report (ng/mL)
07/05/10	North Beach shoreline	1	wwp	0.0256	07/08/10	X	0.002	
07/06/10	Melo Boat Slip	1	wwp	0.016	07/08/10	X	0.0012	
07/07/10	Point Bay Marina	1	wwp	0.128	07/08/10	X	0.01	
07/08/10	Red Rocks Beach shoreline	1	wwp	0.128	07/15/10	X	0.01	
07/08/10	Red Rocks Beach shoreline	1	ww filtrate			X	0.5	
07/12/10	Point Au Roche State Park	1	wwp	0.0256	07/15/10	X	0.002	
07/20/10	St. Albans Boat Launch	1	wwp	0.008	07/22/10			
07/20/10	St. Albans Boat Launch	2	wwp	0.008	07/22/10			
07/20/10	St. Albans Bay Park	1	wwp	0.016	07/22/10	X	0.0012	
07/26/10	St. Albans Bay Park	1	wwp	0.0853	07/29/10	X	0.0033	
08/09/10	St. Albans Bay Park	1	wwp	0.1	08/12/10	X	0.01	
08/11/10	Kill Kare boat slip	1	wwp	0.128	08/19/10	X	0.01	
08/17/10	Highgate Cliffs	1	wwp			X	0.001	
08/17/10	Highgate Cliffs	2	wwp	0.12	08/19/10			
08/22/10	North Hero State Park	1	wwp	0.032	08/26/10	X	0.01	
08/22/10	Donaldson Point	1	wwp	0.0256	08/26/10	X	0.008	
08/23/10	Chapman Bay	1	wwp	0.032	08/26/10	X	0.01	
08/30/10	Dunham Bay	1	wwp	0.128	09/02/10	X	0.01	
08/29/10	Donaldson Point	1	wwp	0.0256	09/02/10			
08/29/10	St. Albans Bay Park	1	wwp	0.61	09/02/10		0.0025	0.0082
09/06/10	St. Albans Bay Park	1	wwp	0.8	09/09/10		0.0025	0.0043
09/06/10	Rock River Access	1	wwp	0.0256	09/09/10	X	0.002	
09/06/10	High Rocks	1	wwp	0.07	09/09/10	X	0.002	
09/06/10	Chapman Bay	1	wwp	0.0427	09/09/10	X	0.0033	
09/05/10	Highgate Springs- Shipyard	1	wwp	0.032	09/09/10	X	0.0025	
09/03/10	Donaldson Point	1	wwp	0.0256	09/09/10	X	0.002	
09/07/10	North Hero State Park	1	wwp	0.032	09/09/10	X	0.0025	
09/28/10	Alburgh - Shore	1	wwp	0.0133	09/30/10			
09/28/10	Alburgh - Shore	2	wwp			X	0.0045	
10/18/10	Burlington Dinghy Dock	1	wwp	0.14	10/21/10	X	0.001	

Appendix D. Total Phosphorus and Total Nitrogen Data Summary 2010

Date	Location	Time	Rep	TN mg/L	TP µg/L
06/09/10	Alburgh	10:28	1		37.19
06/09/10	Alburgh	10:28	2	0.49	37.68
06/09/10	Highgate Cliffs	10:05	1	1.18	62.85
06/09/10	Highgate Cliffs	10:05	2	1.04	52.63
06/09/10	Highgate Springs	10:00	1	0.74	38.12
06/09/10	Highgate Springs	10:00	2	0.77	37.25
06/09/10	Rte 78 Access	10:40	1	0.97	43.71
06/09/10	Rte 78 Access	10:40	2	0.40	33.19
06/09/10	St. Albans Boat Launch	11:50	1	0.32	18.47
06/09/10	St. Albans Boat Launch	11:50	2	0.25	18.61
06/11/10	North Beach shoreline	10:25	1	0.37	14.67
06/11/10	North Beach shoreline	10:25	2	0.40	13.55
06/11/10	Red Rocks Beach shoreline	10:00	1	0.44	14.70
06/11/10	Red Rocks Beach shoreline	10:00	2	0.44	11.79
06/21/10	North Beach shoreline	11:23	1	0.62	16.02
06/21/10	North Beach shoreline	11:23	2	0.39	12.79
06/21/10	Red Rocks Beach shoreline	10:50	1	0.74	29.75
06/21/10	Red Rocks Beach shoreline	10:50	2	0.40	23.97
06/22/10	Alburgh	10:33	1	0.48	31.18
06/22/10	Alburgh	10:33	2	0.55	30.79
06/22/10	Highgate Cliffs	10:10	1	0.65	28.63

06/22/10	Highgate Cliffs	10:10	2	0.70	33.40
06/22/10	Highgate Springs	10:00	1	0.85	29.12
06/22/10	Highgate Springs	10:00	2	0.88	32.37
06/22/10	Rock River Access	11:30	1	0.99	70.43
06/22/10	Rock River Access	11:30	2	0.78	69.02
06/22/10	Rte 78 Access	10:45	1	0.57	60.32
06/22/10	Rte 78 Access	10:45	2	0.60	50.63
06/22/10	St. Albans Boat Launch	12:08	1	0.41	20.26
06/22/10	St. Albans Boat Launch	12:08	2	0.31	18.82

Appendix E. Partnerships 2010

Key Partners in Implementing Monitoring Program

- Lake Champlain Basin Program
- Lake Champlain Committee
- Missisquoi National Wildlife Refuge
- Vermont DEC
- Vermont Department of Health

Recipients of Weekly Alerts

- Association of Water Suppliers
- Clinton County Public Health
- Lake Champlain Basin Program
- Lake Champlain Committee
- Ministry of Sustainable Development, Environment and Parks
- Missisquoi National Wildlife Refuge
- New York DEC
- New York Department of Health
- Panton Water District
- Quebec Municipalities
- SUNY ESF
- SUNY Plattsburgh
- Vermont DEC
- Vermont Department of Health
- Water Treatment Plant Operators