Technical Report No. 61

Monitoring and Evaluation of Cyanobacteria in Lake Champlain

Summer 2009

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This technical report is the sixty-first in a series of reports prepared under the Lake Champlain Basin Program. Those in print are listed below.

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MONITORING AND EVALUATION OF CYANOBACTERIA IN LAKE CHAMPLAIN

Summer 2009

Report to

Lake Champlain Basin Program

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EXECUTIVE SUMMARY

In 2009, 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 2009, bloom conditions were prevalent 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 ranged from 0.01 - 54.12 µg/L, with highest concentrations in Missisquoi Bay. No anatoxin-*a* was found at any site in 2009.

Once again, an e-mail notification system worked well to keep public health officials informed about algal and toxin conditions. In 2009, 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 2009 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).
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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 2009:

- 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-µm 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'
Long Point	N. Ferrisburgh, off of Long Point Road
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. 2009 sampling sites in Lake Champlain.

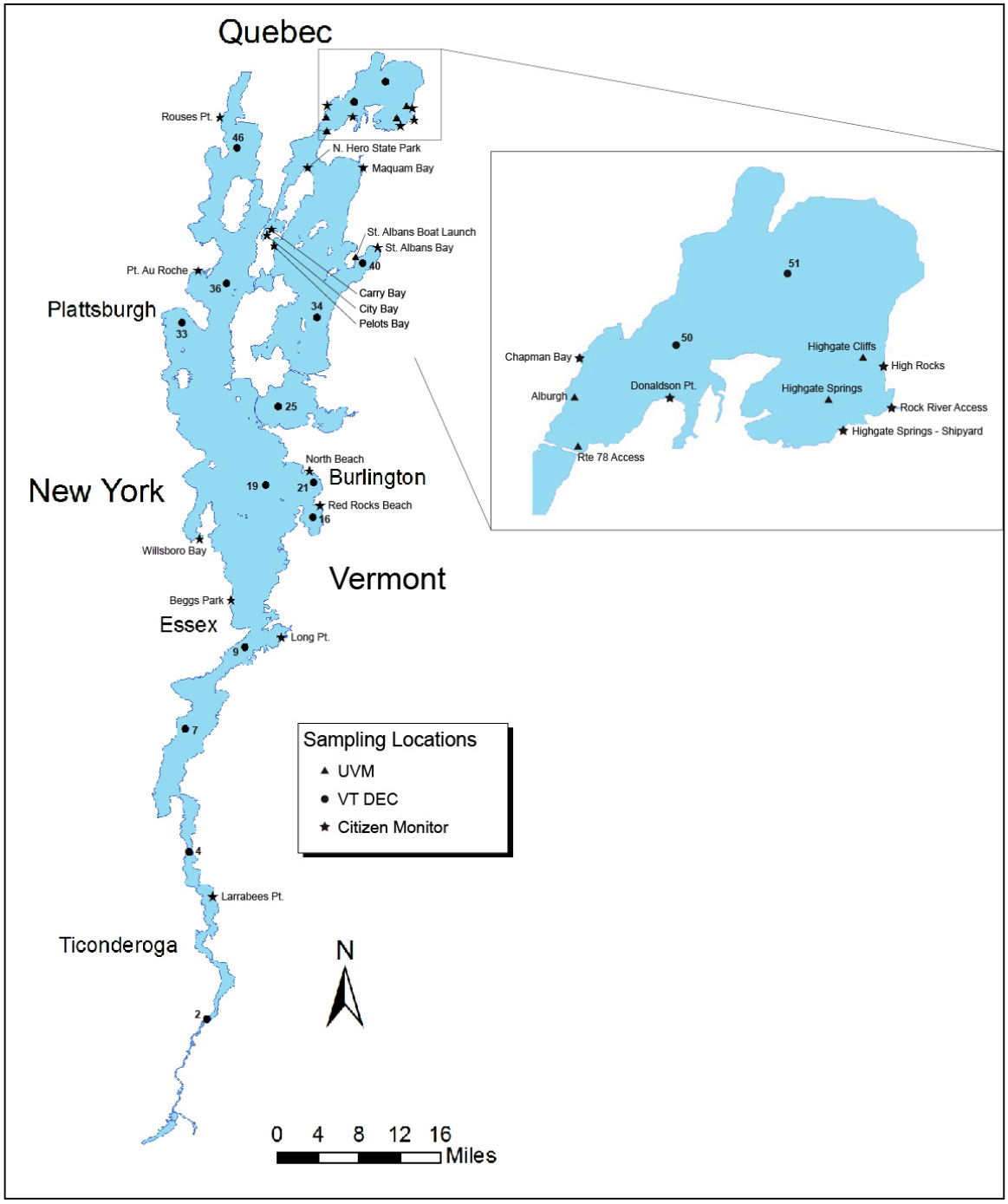


Table 3. Outline of our prototype tiered sampling and alert framework.

Qualitative Sampling	
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 *Quantitative sampling*
Quantitative Sampling	
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 V*igilance level*
Vigilance Level	
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 *Alert Level 1* Return to *Quantitative sampling* if densities fall below 2,000 BGA cells/mL Notify public health officials that BGA are abundant and blooms could form
Alert Level 1	
Frequency:	1/wk at midday (or more frequently as needed)
Collect:	Whole water phytoplankton samples Whole water chlorophyll *a* Whole water toxin samples
Conclusions:	If microcystin concentration exceeds 6 µg/L (VDH recreational standard), proceed to *Alert Level 2* Notify public health officials of potential risks to humans and animals
Alert Level 2	
Frequency:	1/wk at mid-day (or more frequently as weather conditions dictate)
Collect:	As for Alert Level 1
Conclusions:	Return to *Alert Level 1* 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. Chlorophyll samples were filtered within 24 hours and frozen prior to 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
Anabaena spp., Aulacoseira spp., Fragilaria spp.	fragment	1 – 20	10
	small	20 – 100	60
	medium	100 – 1000	500
	large	>1000	1000
Microcystis spp., Coelosphaerium spp.	small	<100	50
	medium	100 - 1000	500
	large	>1000	1000
Gloeotrichia spp.	fragment	single trichome	20
	small	quarter of a colony	2500
	medium	half of a colony	5000
	large	entire colony	10,000
Aphanizomenon spp.	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 2009 (Table 5).

Table 5. Number of quantitative samples collected and analyzed in the cyanobacteria monitoring program in 2009.

Sample Type	Phytoplankton*		Microcystin	Anatoxin***
	Net	Whole Water **	Whole Water Plankton	Whole Water Plankton
Number of Samples Collected	241	253	384	198
Number of Samples Analyzed	236	221	42	29

* 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.

In 2009, none of the Long Term Monitoring sites reached Alert status (Table 6). Among the UVM Monitoring Sites, Highgate Cliffs and Highgate Springs in Missisquoi Bay and the St. Albans Bay boat launch site reached Alert status. All of the citizen sampling sites in Missisquoi and St. Albans Bays reached Alert status, as did the North Beach and Red Rocks sites in the Main Lake. Occasional samples in the Inland Sea and Burlington Bay also reached Alert Level

Table 6. Summary of monitoring status achieved and cyanobacteria generic composition at monitoring stations in 2009.

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	06/09/09	56 (08/20/09)	*Anabaena, Aphanizomenon*
	4. Crown Point	Quantitative	07/09/09	368 (08/20/09)	*Anabaena*
	7. Cole Bay	Quantitative	06/09/09	386 (08/26/09)	*Anabaena, Aphanizomenon, Microcystis*
	9. Diamond Island	Quantitative	06/09/09	203 (08/26/09)	*Anabaena, Aphanizomenon, Microcystis*
Main	16. Shelburne Bay	Quantitative	06/10/09	159 (08/27/09)	*Anabaena, Aphanizomenon, Microcystis*
	19. Main Lake	Quantitative	06/10/09	191 (09/16/09)	*Anabaena, Aphanizomenon, Microcystis*
	21. Burlington Harbor	Quantitative	06/10/09	339 (07/13/09)	*Anabaena, Aphanizomenon*
	25. Malletts Bay	Quantitative	06/18/09	138 (08/20/09)	*Anabaena, Aphanizomenon, Microcystis*
Northwest	33. Cumberland Bay	Quantitative	06/08/09	110 (07/28/09)	*Anabaena, Microcystis*

	36. Point au Roche	Quantitative	07/13/09	86 (09/03/09)	*Anabaena, Aphanizomenon, Microcystis*
	46. Alburg Center	Quantitative	06/18/09	43 (09/18/09)	*Anabaena, Aphanizomenon, Microcystis*
Northeast	34. Inland Sea	Quantitative	06/08/09	333 (08/26/09)	*Anabaena, Aphanizomenon, Microcystis*
	40. St. Albans Bay	Quantitative	06/08/09	735 (08/26/09)	*Anabaena, Aphanizomenon, Microcystis*
Missisquoi Bay	50. Missisquoi Bay	Quantitative	06/05/09	1,251 (07/29/09)	*Anabaena, Aphanizomenon, Microcystis*
	51. Missisquoi Bay	Quantitative	06/05/09	1,394 (07/29/09)	*Anabaena, Aphanizomenon, Microcystis*

UVM Monitoring Sites

Region	Location	Monitoring Status	Date Achieved	Highest Microcystin (µg/L) Observed	Maximum Density of Potentially Toxic Cells/mL	Cyanobacteria Present
Main	Burlington Water Bay	Quantitative	08/31/09	not measured	77 (08/31/09)	*Anabaena, Aphanizomenon, Microcystis*
	Champlain Water Bay	Quantitative	08/31/09	not measured	104 (08/31/09)	*Anabaena, Aphanizomenon, Microcystis*
	North Beach	Quantitative	08/31/09	not measured	185 (08/31/09)	*Anabaena, Aphanizomenon, Microcystis*

	North Beach-Shoreline	Quantitative	08/31/09	not measured	219 (08/31/09)	*Aphanizomenon*
	Red Rocks Beach	Quantitative	08/31/09	not measured	88 (08/31/09)	*Aphanizomenon, Microcystis*
	Red Rocks Beach-shoreline	Quantitative	08/31/09	not measured	88 (06/22/09)	*Anabaena*
Northeast	St. Albans Boatlaunch	Alert 1	08/19/09	0.013 (08/19/09)	6,050 (08/19/09)	*Anabaena, Aphanizomenon, Microcystis*
Missisquoi Bay	Rte. 78 Access	Vigilance	07/15/09	not measured	3,315 (07/15/09)	*Aphanizomenon*
	Alburg	Vigilance	07/21/09	not measured	3,090 (07/21/09)	*Anabaena, Aphanizomenon, Microcystis*
	Highgate Cliffs	Alert 2	07/15/09	54.12 (07/15/09)	33,490 (07/15/09)	*Anabaena, Aphanizomenon, Microcystis*
	Highgate Springs	Alert 2	08/12/09	16.935 (08/12/09)	59,395 (08/12/09)	*Anabaena, Aphanizomenon, Microcystis*
	Rock River Access	Quantitative	06/09/09	not measured	0 (06/09/09)	none observed

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	Vigilance	08/04/09	not measured	3,070 (08/04/09)	*Anabaena, Microcystis*
Main	Beggs Park	Vigilance	08/11/09	not measured	2,202 (09/01/09)	*Anabaena, Aphanizomenon*
	Long Point	Vigilance	07/21/09	not measured	3,158 (07/21/09)	*Anabaena*
	North Beach-shoreline	Alert Level 1	08/19/09	0.03 (08/19/09)	4,043 (08/19/09)	*Anabaena, Aphanizomenon*
	Red Rocks Beach-shoreline	Alert Level 1	07/13/09	0.03 (07/13/09)	12,763 (08/26/09)	*Anabaena, Aphanizomenon*
	Willsboro Bay	Vigilance	08/25/09	not measured	2,500 (08/25/09)	*Anabaena, Aphanizomenon*
Northwest	Point au Roche	Quantitative	08/11/09	not measured	877 (08/18/09	*Anabaena, Microcystis*
	Rouses Point	Quantitative	08/04/09	not measured	1,044 (08/11/09)	*Aphanizomenon*
Northeast	Carry Bay	Quantitative	07/14/09	not measured	1,851 (09/09/09)	*Anabaena, Aphanizomenon*
	City Bay	Vigilance	08/11/09	not measured	3,290 (08/11/09)	*Aphanizomenon*
	Maquam Bay	Quantitative	07/15/09	not measured	1,044 (08/18/09)	*Aphanizomenon, Microcystis*
	North Hero State Park	Quantitative	07/07/09	not measured	1,974 (08/17/09)	*Aphanizomenon, Microcystis*
	Pelots Bay	Quantitative	07/28/09	not measured	1,483 (09/01/09	*Aphanizomenon*

	St. Albans Bay Park	Alert Level 1	08/03/09	0.03 (08/18/09)	31,521 (08/18/09)	*Anabaena, Aphanizomenon, Microcystis*
	Chapman Bay	Alert Level 1	07/28/09	0.29 (07/28/09)	20,649 (07/28/09	*Anabaena, Aphanizomenon, Microcystis*
Missisquoi Bay	Donaldson Point	Alert Level 1	08/04/09	0.54 (08/18/09)	8,860 (08/18/09)	*Anabaena, Microcystis*
	High Rocks	Alert Level 2	07/15/09	9.29 (07/15/09)	46,298 (07/15/09)	*Anabaena, Aphanizomenon, Microcystis*
	Highgate Spings-Shipyard	Alert Level 1	07/28/09	0.93 (08/26/09)	172,667 (09/29/09)	*Anabaena, Aphanizomenon*
	Rock River Access	Alert Level 2	07/18/09	6.43 (07/21/09)	20,760 (08/10/09)	*Anabaena, Aphanizomenon, Microcystis*

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
Melo Boat Slip	Alert 2	10/15/09	23.36 (10/15/09)	1,830,000 (10/15/09)	*Anabaena*
Dunham Bay	Alert 1	08/26/09	0.08 (08/26/09)	4,781 (08/26/09)	*Anabaena, Aphanizomenon*
Kelly Bay	Alert 1	09/01/09	0.03 (09/01/09)	31,184 (09/01/09)	*Anabaena*

Rte 2 Bridge	Alert 1	09/08/09	0.06 (09/08/09)	22,842 (09/08/09)	*Anabaena*
Highgate Springs-Shipyard*	Quantitative	06/30/09	not measured	0 (06/30/09)	*none observed*
vicinity of Donaldson Point and Alburgh shore	Alert 1	09/09/09	0.06 (09/09/09)	22,842 (09/09/09)	*Anabaena, Aphanizomenon, Microcysis*

*Sample collected by UVM when Highgate Springs site could not be accessed by boat.

The highest concentrations of microcystins in 2009 were found in the eastern part of Missisquoi Bay, at the Highgate Springs sampling site (Table 7), but concentrations reaching Alert Level 2 were also found in other sites in Missisquoi Bay, including a site in the western portion of the bay near Donaldson Point, and in Burlington Bay, in the *Melosira* Boat Slip at the Leahy Center for Lake Champlain. Low concentrations of microcystins were found at several sites in the Main Lake, in St. Albans Bay, and in the Northeast Arm.

Table 7. Number of samples tested and maximum concentration of microcystins measured in 2009.

Region	Collected by	Location	No. Samples Tested	Maximum Microcystin Conc. (µg/L)
South Lake	Citizen Monitor	Larrabee's Point	0	
Main Lake	Citizen Monitor	Beggs Park	0	
		Long Point	0	
		North Beach shoreline	1	0.03
		Red Rocks Beach shoreline	3	0.03
		Willsboro Bay	0	
	UVM	Burlington Water Bay	0	
		Champlain Water Bay	0	
		Melo Boat Slip	2	23.36
		North Beach shoreline	0	
		Red Rocks Beach shoreline	0	
Northwest Lake	Citizen Monitor	Point Au Roche State Park	0	
		Rouses Point	0	
Northeast Lake	Citizen Monitor	Carry Bay	0	
		City Bay	0	
		Dunham Bay	1	0.08

		Kelly Bay	1	0.03
		Maquam Bay	0	
		North Hero State Park	0	
		Pelots Bay	0	
		Rt 2 bridge	1	0.06
St. Albans Bay	Citizen Monitor	St. Albans Bay Park	2	0.17
	UVM	St. Albans Boat Launch	2	0.01
Missisquoi Bay	Citizen Monitor	Chapman Bay	1	0.29
		Donaldson Point	2	0.54
		High Rocks	5	19.10
		Highgate Springs- Shipyard	6	0.93
		Rock River Access	3	6.42
	UVM	Alburg	0	
		Highgate Cliffs	4	54.16
		Highgate Springs	7	16.74
		Highgate Springs- Shipyard	0	
		Rock River Access	0	
		Rte 78 Access	0	
		vicinity of Donaldson Point and Alburgh shore	1	25.77

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 2009, 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.

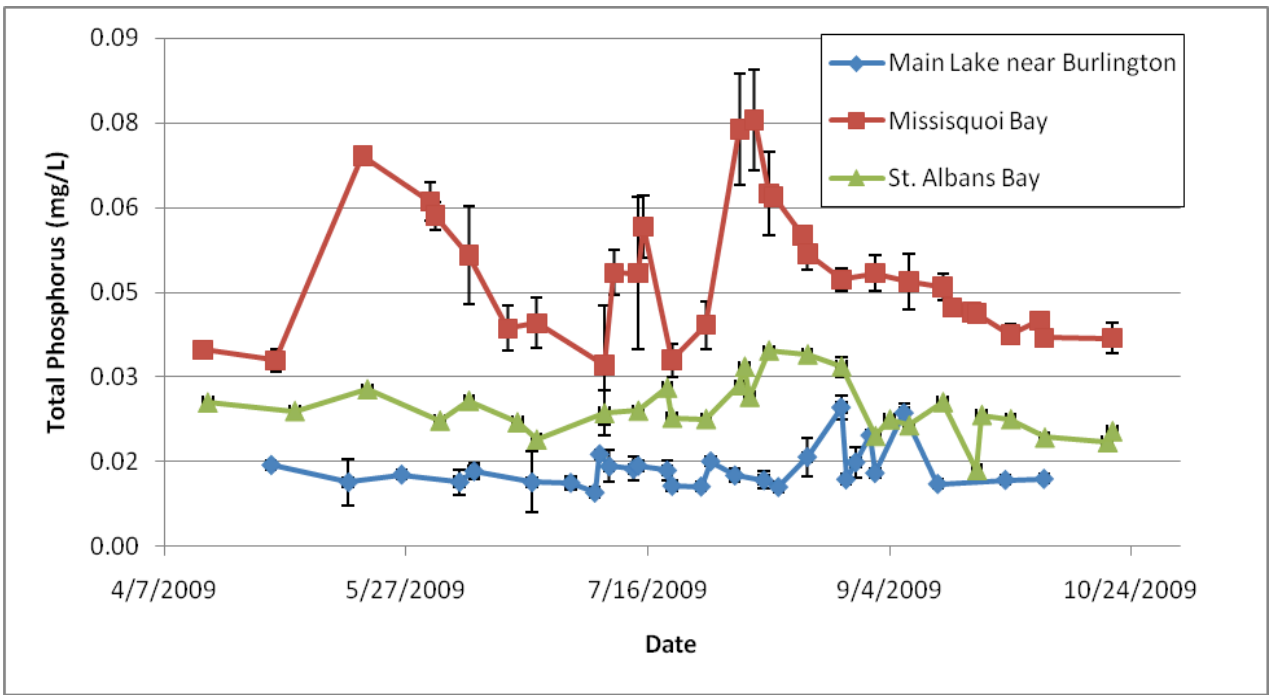


Figure 2. Total Phosphorus concentrations (mg/L) in Missisquoi Bay, St. Albans Bay, and the Main Lake near Burlington over the 2009 growing season. Main Lake data is from VTDEC Stations 19 and 21 and UVM data, Missisquoi Bay data is from VTDEC Stations 50 and 51 and UVM data, and St. Albans Bay data is from VTDEC Station 40 and UVM data.

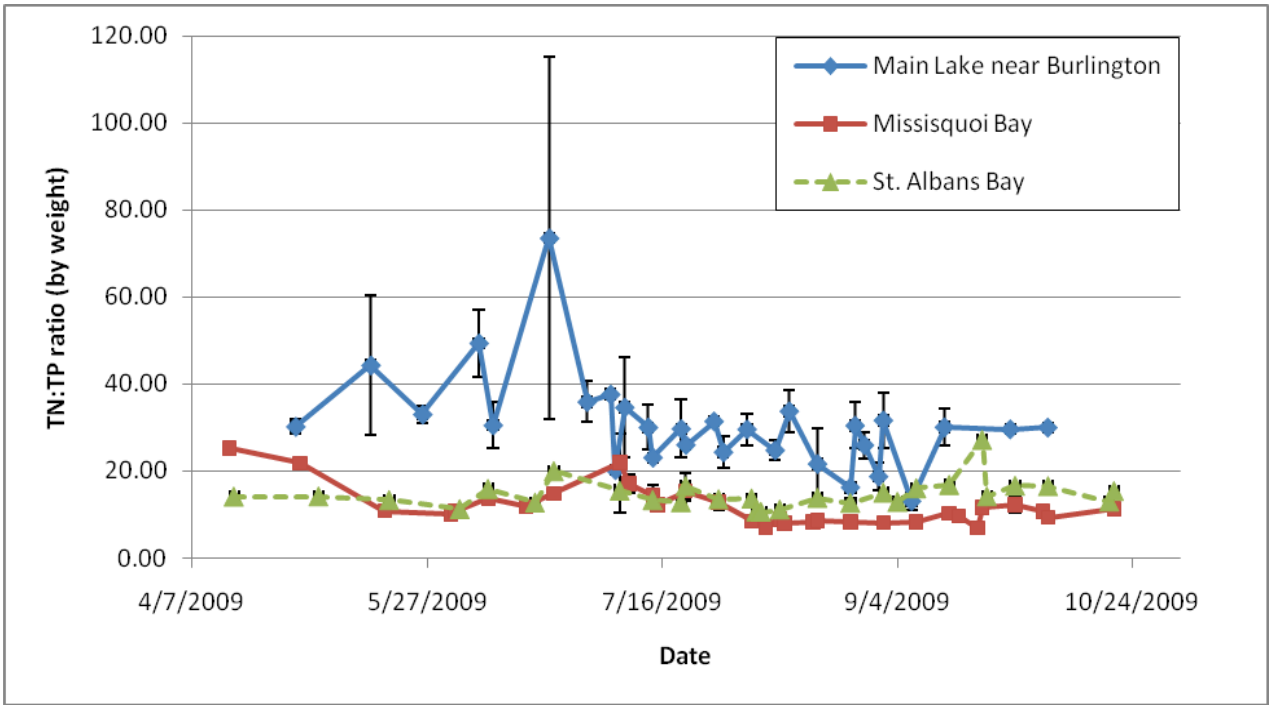


Figure 3. 2009 TN:TP ratios by weight across all sampling sites in Missisquoi Bay, St. Albans Bay, and the Main Lake near Burlington.

DISCUSSION AND CONCLUSIONS

Comparison of Patterns of Cyanobacteria and Toxins 2003-2009

There were significant differences in median densities of phytoplankton between Missisquoi Bay, St. Albans Bay, and Burlington Bay (Table 8). Highest median densities of potentially toxic cyanobacteria were found in Missisquoi Bay in all years except for 2007, when densities in St. Albans Bay exceeded those in all other locations.

Composition of the phytoplankton has also varied over time and between sites (Figures 4-6). In Missisquoi Bay, cyanobacteria once again dominated the phytoplankton, and *Microcystis* spp. was the most abundant cyanobacteria taxon. *Aphanizomenon* and *Anabaena* spp. also comprised a significant percentage of the community composition (Figure 4). In St. Albans Bay (Figure 5), *Anabaena* was the most abundant cyanobacteria taxon, while in Burlington Bay, cyanobacteria comprised less than 50% of the phytoplankton, as they did in previous years (Figure 6).

Table 8. Seasonal median densities of phytoplankton in Missisquoi, Burlington, and St. Albans Bays 2003-2009.

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

Figure 4. Seasonal mean percent generic composition of phytoplankton in Missisquoi Bay, 2003-2009.

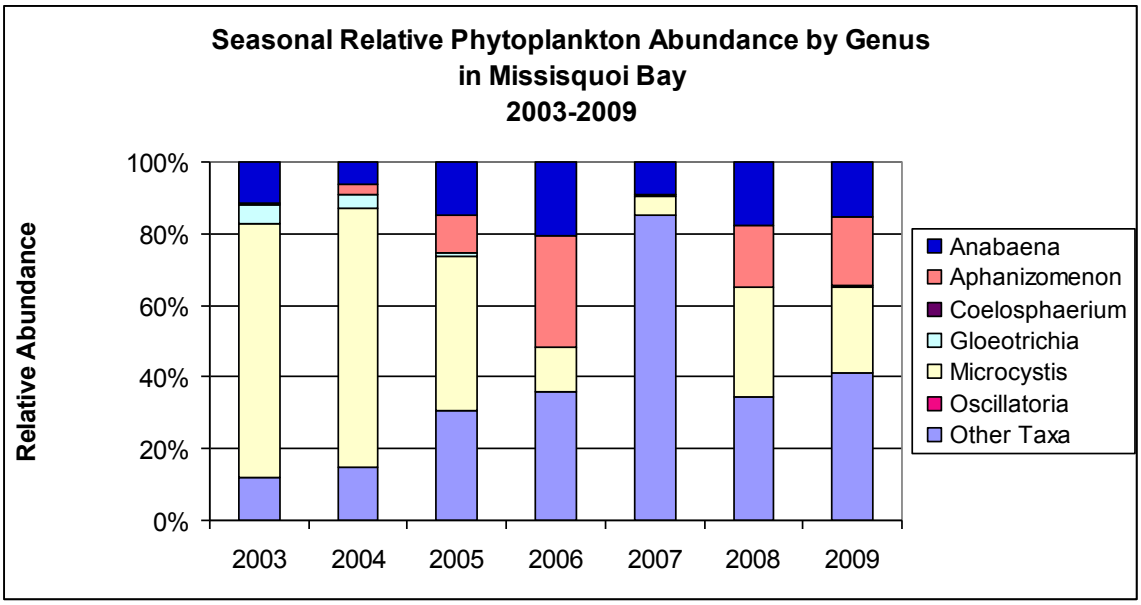


Figure 5. Seasonal mean percent generic composition of phytoplankton in St. Albans Bay, 2003-2009.

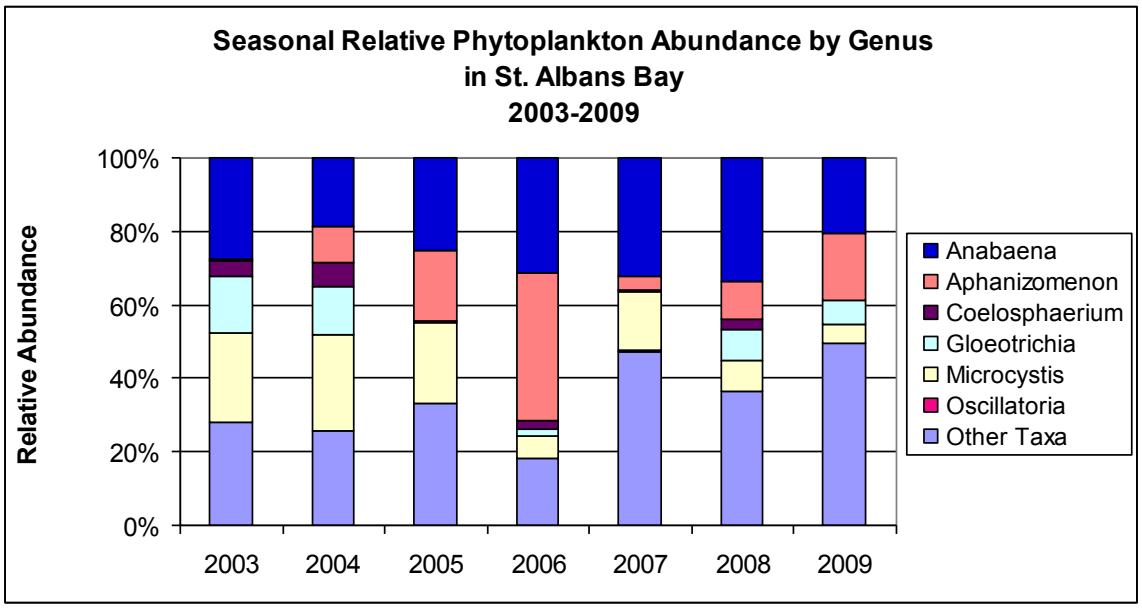
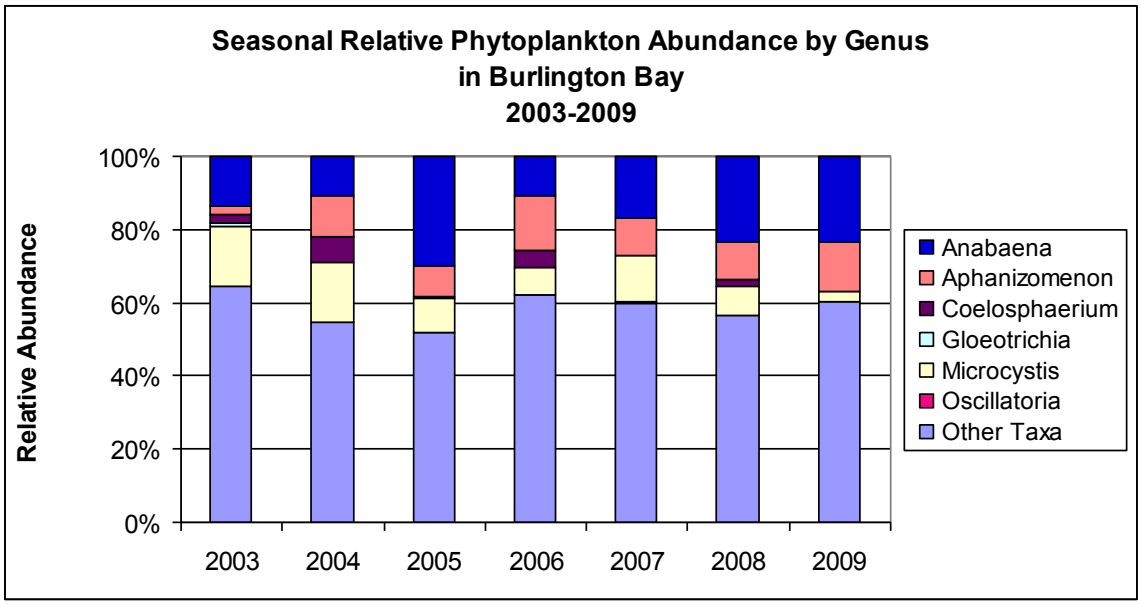


Figure 6. Seasonal mean percent generic composition of phytoplankton in Burlington Bay, 2003-2009.



The median microcystin concentrations in all lake segments except St. Albans Bay were lower in 2009 than in 2008, but not outside the range of what has been documented over the seven years of this monitoring program (Table 9). In Missisquoi Bay, the total number of samples reaching Alert level, and thus tested for microcystin, was the smaller than any previous year except 2007, when no blooms occurred in Missisquoi Bay.

Table 9. Microcystin concentrations (µg/L) in various lake segments, 2003 – 2009.

Lake Region		2003	2004	2005	2006	2007	2008	2009
Burlington Bay, Main Lake	Median	0.02		7.42	0.04	2.82	0.47	0.03
	Range	ND - 0.12		6.04 - 8.80	0.04 - 3.47	0.02-5.61	0.03 - 1.49	0.03 - 23.36
	# of Samples	9		2	6	2	3	6
Missisquoi Bay	Median	0.20	0.88	0.74	0.64		2.30	0.54
	Range	ND - 23.90	ND - 6490	ND - 22.10	0.03 - 21.29		0.06 - 94.58	0.03 - 54.16
	# of Samples	160	142	125	134		86	29
Northeast Bays	Median	0.05	0.51	0.08	0.27	0.05	0.30	0.06
	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
	# of Samples	6	8	7	14	4	4	3
South Lake	Median	0.53		0.05				
	Range	ND - 1.4		ND - 0.067				
	# of Samples	3		3				
St. Albans Bay	Median	0.05	0.04	0.44	0.06	0.05	0.04	0.02
	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
	# of Samples	16	22	15	34	40*	10	4

* includes extra samples as part of the SolarBee monitoring effort

Coordination

Coordination meetings were held with Vermont Department of Health officials in May 2009, 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 September.

The e-mail notification system again worked well in 2009 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 2009, our volunteer effort included 18 volunteers across all sections of the lake providing a good perspective

on shoreline conditions lake-wide. In addition, through our partnership with the Lake Champlain Committee, we were able to catch several transitory bloom events along shorelines in New York and Vermont.

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Appendix A. Results of Qualitative Sample Screening – Data Summary 2009

Date	UVM Sample No.	Sample Location	BGA?	Microcystis	Aphanizomenon	Gleoeotrichia	Anabaena	Coelospherium	Oscillatoria	Status
06/05/09	5239	VT DEC Sta 50	YES	X						Go to quantitative
	5241	VT DEC Sta 34	YES	X	X		X			Go to quantitative
	5238	VT DEC Sta 46	NO							Remain at qualitative
	5240	VT DEC Sta 51	YES	X						Go to quantitative
06/08/09	5242	VT DEC Sta 40	YES	X	X		X			Go to quantitative
	5244	VT DEC Sta 36	NO							Remain at qualitative
	5243	VT DEC Sta 33	YES	X						Go to quantitative
	5222	North Beach Shoreline	YES		X					Go to quantitative
	5224	Red Rocks Beach Shoreline	NO							Remain at qualitative
06/09/09	5245	VT DEC Sta 02	YES	X	X					Go to quantitative
	5246	VT DEC Sta 04	NO							Remain at qualitative
	5247	VT DEC Sta 07	YES	X	X		X			Go to quantitative
	5248	VT DEC Sta 09	YES	X	X		X			Go to quantitative
	5235	Rock River Access	YES				X			Go to quantitative
	5226	Rte 78 Access	YES	X	X					Go to quantitative
	5232	Highgate Springs	YES	X						Go to quantitative
06/10/09	5228	Alburgh	YES	X	X					Go to quantitative
	5237	St. Albans Boatlaunch	YES	X			X			Go to quantitative
	5249	VT DEC Sta 16	YES	X	X				X	Go to quantitative
	5230	Highgate Cliffs	YES	X						Go to quantitative
	5250	VT DEC Sta 19	YES	X	X					Go to quantitative
	5251	VT DEC Sta 21	YES	X	X		X			Go to quantitative
06/18/09	5268	VT DEC Sta 25	YES	X	X		X	X		Go to quantitative
	5269	VT DEC Sta 46	YES	X						Go to quantitative
06/22/09	5254	Red Rocks Beach Shoreline	YES				X			Go to quantitative
06/23/09	5275	VT DEC Sta 04	NO							Remain at qualitative
06/24/09	5276	VT DEC Sta 36	NO							Remain at qualitative
07/07/09	5301	Point Au Roche	NO							Remain at qualitative
	5298	Shoreham/Larrabees Point	NO							Remain at qualitative

	5300	Pelot's Bay	NO							Remain at qualitative
	5299	North Hero State Park	YES				X			Go to quantitative
	5304	Willsboro Bay	NO							Remain at qualitative
	5302	Begg's Park	YES				X			Go to quantitative
	5303	Rouses Point	NO							Remain at qualitative
	5306	City Bay	YES		X					Go to quantitative
	5284	Donaldson Point	YES				X			Go to quantitative
	5285	Chapman Bay	NO							Remain at qualitative
	5309	Maquam Bay	NO							Remain at qualitative
	5286	Highgate Springs-Shipyard	NO							Remain at qualitative
	5305	Carry Bay	NO							Remain at qualitative
	5308	Long Point	NO							Remain at qualitative
	5310	St. Albans Bay Park	NO							Remain at qualitative
	5287	High Rocks	NO							Remain at qualitative
07/09/09	5315	VT DEC Sta 04	YES	X			X			Go to quantitative
07/13/09	5331	VT DEC Sta 36	YES	X	X		X	X		Go to quantitative
07/14/09	5336	Shoreham/Larrabees Point	NO							Remain at qualitative
	5337	Long Point	NO							Remain at qualitative
	5338	Chapman Bay	YES		X					Go to quantitative
	5339	Carry Bay	YES		X					Go to quantitative
	5343	Rouses Point	NO							Remain at qualitative
	5345	Willsboro Bay	NO							Remain at qualitative
	5346	Point Au Roche	NO							Remain at qualitative
	5347	St. Albans Bay Park	YES				X			Go to quantitative
07/15/09	5350	Pelot's Bay	NO							Remain at qualitative
	5349	Maquam Bay	YES				X			Go to quantitative
	5348	High Rocks	YES	X	X		X			Go to quantitative
07/21/09	5366	Shoreham/Larrabees Point	YES				X			Go to quantitative
	5368	Point Au Roche	NO							Remain at qualitative
	5370	Rouses Point	NO							Remain at qualitative
	5372	Pelot's Bay	NO							Remain at qualitative
	5377	Long Point	YES				X			Go to quantitative
	5369	Willsboro Bay	NO							Remain at qualitative
07/28/09	5405	Willsboro Bay	NO							Remain at qualitative

	5407	Rouses Point	NO							Remain at qualitative
	5408	Pelot's Bay	YES				X			Go to quantitative
	5442	Point Au Roche	NO							Remain at qualitative
	5444	Rouses Point	YES		X					Go to quantitative
08/11/09	5481	Point Au Roche	YES		X					Go to quantitative
	5482	Willsboro Bay	YES	X	X					Go to quantitative

Appendix B. Counts of Algae in Quantitative Samples – Data Summary 2009

Location	Sample Type	Date	Rep	CountRep	Bacillariophyceae	Chlorophyceae	Chrysophyceae	Cryptophyceae	Dinophyceae	Euglenophyceae	Myxophyceae	Potential Toxin Producers (cells/mL)	Total (cells/mL)	Collection Source
VTDEC Sta34	net	06/03/09	1	1	214.6		4.5	1.3			8.2	8.2	228.7	VT DEC
VTDEC Sta40	net	06/03/09	1	1	172.3		15.4		0.2				187.9	VT DEC
VTDEC Sta33	net	06/04/09	1	1	10.6	0.5	11.9						22.9	VT DEC
VTDEC Sta50	net	06/04/09	1	1	4.9	1.1	0.5	0.1		0.0	0.9	0.8	7.5	VT DEC
VTDEC Sta51	net	06/04/09	1	1	11.4	2.0	0.3	0.0			5.9	5.1	19.7	VT DEC
VTDEC Sta02	net	06/05/09	1	1	35.1	2.6	20.0	0.8	0.0	0.0			58.6	VT DEC
North Beach shoreline	counted ww as net	06/07/09	1	1	105.2		350.8	228.0					684.0	UVM
North Beach shoreline	counted ww as net	06/07/09	2	1	84.2		63.1	42.1					189.4	UVM
VTDEC Sta07	net	06/08/09	1	1	17.6		1.4		0.0				19.0	VT DEC
VTDEC Sta09	net	06/08/09	1	1	18.2		7.6	0.0			1.5	1.5	27.4	VT DEC
Alburg	net	06/09/09	1	1	11.7	9.9	1.2	0.5			2.0	2.0	25.4	UVM
Alburg	net	06/09/09	2	1	24.9	3.8	1.3	0.1			14.9	14.4	45.0	UVM
Highgate Cliffs	net	06/09/09	1	1	21.8	7.1	1.8	0.0			8.0	8.0	38.8	UVM
Highgate Cliffs	net	06/09/09	2	1	26.8	10.5	0.1			0.0	4.9	4.8	42.4	UVM
Highgate Springs	net	06/09/09	1	1	16.4	7.8	1.2	0.0			16.6	16.6	42.1	UVM
Highgate Springs	net	06/09/09	2	1	15.9	9.3	3.8	0.6			1.8	1.5	31.3	UVM

Rock River Access	counted ww as net	06/09/09	1	1	35.1	87.7	1043.5	17.5					1183.8	UVM
Rock River Access	counted ww as net	06/09/09	2	1	105.2		3125.2	178.9	31.6				3440.9	UVM
Rte 78 Access	net	06/09/09	1	1	36.3	7.1	4.4	1.0			1.5	1.5	50.3	UVM
Rte 78 Access	net	06/09/09	2	1	38.2	0.5	9.9	0.8					49.5	UVM
St. Albans Boat Launch	net	06/09/09	1	1	41.8		24.6	0.1	0.1				66.7	UVM
St. Albans Boat Launch	net	06/09/09	2	1	106.4		14.0		0.2				120.6	UVM
VTDEC Sta16	net	06/10/09	1	1	6.4	0.0	11.5		0.0		1.0	1.0	18.9	VT DEC
VTDEC Sta19	net	06/10/09	1	1	11.2		3.0	0.0			1.5	1.5	15.7	VT DEC
VTDEC Sta21	net	06/10/09	1	1	4.1		0.8	0.0			4.0	4.0	9.0	VT DEC
VTDEC Sta25	net	06/16/09	1	1	131.9	0.0	4.6	0.1	0.1		106.6	106.6	243.2	VT DEC
VTDEC Sta46	net	06/17/09	1	1	1.5		13.9	0.0					15.5	VT DEC
VTDEC Sta50	net	06/17/09	1	1	9.4	4.4	6.9	0.1					20.9	VT DEC
VTDEC Sta51	net	06/17/09	1	1	46.7	8.6	0.8	0.1			34.9	34.9	91.2	VT DEC
VTDEC Sta34	net	06/19/09	1	1	48.3	0.2	1.1	0.0	0.2		9.1	9.1	59.0	VT DEC
VTDEC Sta40	net	06/19/09	1	1	30.3	0.5	9.5	0.3	0.1	0.3	0.8		41.9	VT DEC
North Beach shoreline	counted ww as net	06/22/09	1	1	17.5		61.4	43.8	8.8				131.5	UVM
North Beach shoreline	counted ww as net	06/22/09	2	1	96.5		5331.5	394.6	8.8				5831.3	UVM
Red Rocks Beach shoreline	counted ww as net	06/22/09	1	1	43.8		26.3	140.3			87.7	87.7	298.1	UVM
Red Rocks Beach shoreline	counted ww as net	06/22/09	2	1	105.2		26.3	394.6					526.1	UVM
VTDEC Sta02	net	06/22/09	1	1	147.4	19.5	99.3			0.4	4.7		271.3	VT DEC
Alburg	counted	06/23/09	1	1	35.1		122.8	35.1					192.9	UVM

	ww as net													
Alburg	counted ww as net	06/23/09	2	1	8.8		166.6	140.3					315.7	UVM
Highgate Cliffs	counted ww as net	06/23/09	1	1	149.1	8.8	149.1	43.8					350.8	UVM
Highgate Cliffs	counted ww as net	06/23/09	2	1			70.2	114.0					184.1	UVM
Highgate Springs	net	06/23/09	1	1	12.1	1.0	0.2				11.6	9.2	24.9	UVM
Highgate Springs	net	06/23/09	2	1	6.4	4.1	5.2	0.4					16.1	UVM
Rock River Access	counted ww as net	06/23/09	1	1		8.8	692.7	122.8					824.3	UVM
Rock River Access	counted ww as net	06/23/09	2	1	78.9	61.4	201.7	236.8					578.7	UVM
Rte 78 Access	counted ww as net	06/23/09	1	1	70.2		17.5	157.8					245.5	UVM
Rte 78 Access	counted ww as net	06/23/09	2	1	8.8	35.1	192.9	280.6					517.4	UVM
St. Albans Boat Launch	net	06/23/09	1	1	258.8		3.6	8.9	0.1				271.4	UVM
St. Albans Boat Launch	net	06/23/09	2	1	64.8		1.1	1.0					66.8	UVM
VTDEC Sta33	net	06/23/09	1	1	11.1	0.2	2.6	0.3		0.0	1.4	1.4	15.5	VT DEC
Highgate Springs-Shipyard	counted ww as net	06/29/09	1	1		315.7	1341.6	342.0					1999.3	UVM
Rte 78 Access-	counted	06/29/09	1	1	78.9	96.5	508.6	131.5					815.5	UVM

shore	ww as net													
VTDEC Sta16	net	06/30/09	1	1	15.4		3.2	0.1	0.0		7.0	7.0	25.8	VT DEC
VTDEC Sta19	net	06/30/09	1	1	29.7		5.6	0.0			9.0	9.0	44.3	VT DEC
VTDEC Sta21	net	06/30/09	1	1	16.6		4.0		0.0		3.2	3.2	23.8	VT DEC
VTDEC Sta09	net	07/02/09	1	1	16.6		12.1	0.2			105.6	105.6	134.6	VT DEC
Donaldson Point	counted ww as net	07/05/09	1	1	210.5	8.8	342.0	105.2					666.4	BGA VLNTR
Highgate Springs-Shipyard	counted ww as net	07/05/09	1	1	43.8		385.8	157.8			105.2		701.5	BGA VLNTR
North Hero State Park	counted ww as net	07/05/09	1	1	175.4						87.7	87.7	263.1	BGA VLNTR
Beggs Park	counted ww as net	07/06/09	1	1	87.7		70.2	26.3			526.1	526.1	710.3	BGA VLNTR
City Bay	counted ww as net	07/06/09	1	1	403.4		96.5	78.9	8.8				587.5	BGA VLNTR
Red Rocks Beach shoreline	counted ww as net	07/06/09	1	1			10.5	10.5					21.0	BGA VLNTR
Rock River Access	counted ww as net	07/06/09	1	1	309.5		216.6	1485.5					2011.7	BGA VLNTR
VTDEC Sta25	net	07/06/09	1	1	8.4	11.9	0.5	0.0	0.2	0.1	31.4	31.4	52.4	VT DEC
Alburg	counted ww as net	07/07/09	1	1	52.6	8.8	166.6	350.8			105.2		684.0	UVM
Alburg	counted ww as net	07/07/09	2	1	26.3	447.2	157.8	368.3	8.8	8.8			1017.2	UVM
Rte 78 Access	net	07/07/09	1	1	713.4	9.5	5.0	0.7			4.1	4.1	732.7	UVM
Rte 78 Access	net	07/07/09	2	1	125.3	16.9	3.6	0.1					145.9	UVM

St. Albans Boat Launch	net	07/07/09	1	1	173.4	13.4	2.4		2.2		51.8	51.8	243.3	UVM
St. Albans Boat Launch	net	07/07/09	2	1	247.3	2.4	9.1	0.3	5.3		118.6	118.6	383.0	UVM
VTDEC Sta34	net	07/07/09	1	1	270.0	23.7	2.8	0.2	14.8		151.0	151.0	462.8	VT DEC
VTDEC Sta40	net	07/07/09	1	1	275.7	14.2	0.2		6.8	0.2	34.7	34.7	331.7	VT DEC
VTDEC Sta02	net	07/08/09	1	1	10.4	3.4	15.6	0.1	0.1	0.0	4.9	4.6	34.5	VT DEC
VTDEC Sta04	net	07/08/09	1	1	9.8	6.8	0.1			0.0	2.7	2.7	19.4	VT DEC
VTDEC Sta46	net	07/09/09	1	1	30.7	0.0	0.4	0.1			0.7	0.7	31.9	VT DEC
VTDEC Sta50	net	07/09/09	1	1	101.5	7.9	0.5				240.1	240.1	350.1	VT DEC
VTDEC Sta51	net	07/09/09	1	1	0.4	76.4	0.8	0.2			1099.1	1099.1	1176.9	VT DEC
VTDEC Sta33	net	07/10/09	1	1	419.6		10.8	0.5			6.6	6.6	437.4	VT DEC
VTDEC Sta36	net	07/10/09	1	1	330.4						13.1	5.8	343.5	VT DEC
Beggs Park	counted ww as net	07/11/09	1	1	412.1		87.7	35.1					534.9	BGA VLNTR
Carry Bay	counted ww as net	07/12/09	1	1	87.7	192.9	157.8	122.8					561.2	BGA VLNTR
Chapman Bay	counted ww as net	07/12/09	1	1	1587.2	122.8	105.2	17.5			17.5		1850.2	BGA VLNTR
Donaldson Point	counted ww as net	07/12/09	1	1	631.4	526.1	903.2	350.8	17.5		1315.3	1140.0	3744.3	BGA VLNTR
Highgate Springs-Shipyard	counted ww as net	07/12/09	1	1	1780.1	806.7	403.4	70.2		8.8	3902.1	3902.1	6971.2	BGA VLNTR
North Hero State Park	counted ww as net	07/12/09	1	1	105.2		219.2	26.3					350.8	BGA VLNTR
City Bay	counted ww as net	07/13/09	1	1	289.4	131.5	105.2	192.9	35.1				754.1	BGA VLNTR
High Rocks	counted	07/13/09	1	1	4840.4	122.8	52.6		17.5		38933.8	38933.8	43967.1	BGA

	ww as net													VLNTR
Maquam Bay	counted ww as net	07/13/09	1	1	8.8	1403.0	26.3	78.9			87.7	87.7	1604.7	BGA VLNTR
Red Rocks Beach shoreline	counted ww as net	07/13/09	1	1	1508.2	26.3	105.2	491.1	8.8	8.8	3726.8	3726.8	5875.1	BGA VLNTR
St. Albans Bay Park	counted ww as net	07/13/09	1	1	87.7	140.3	78.9	105.2					412.1	BGA VLNTR
VTDEC Sta16	net	07/13/09	1	1	4363.3		3.9				25.7	25.7	4392.8	VT DEC
VTDEC Sta19	net	07/13/09	1	1	2210.3		4.1				2.6	2.6	2216.9	VT DEC
VTDEC Sta21	net	07/13/09	1	1	1952.5		1.9				312.7	312.7	2267.1	VT DEC
Alburg	counted ww as net	07/14/09	1	1	3954.8		17.5	17.5					3989.8	UVM
Alburg	counted ww as net	07/14/09	2	1	3169.9		39.5	328.8					3538.2	UVM
Highgate Cliffs	counted ww as net	07/14/09	1	1	6541.6	2437.7	87.7	35.1			23369.0	23369.0	32471.1	UVM
Highgate Cliffs	counted ww as net	07/14/09	2	1	8132.2	3568.5	57.2	640.5			33478.0	33478.0	45876.4	UVM
Highgate Springs	counted ww as net	07/14/09	1	1	4296.7	420.9	96.5	17.5			3498.8	3498.8	8330.4	UVM
Highgate Springs	counted ww as net	07/14/09	2	1	7365.8	515.6	21.0	210.5			9575.6	9575.6	17688.6	UVM
North Beach shoreline	counted ww as net	07/14/09	1	1	1771.3		157.8	87.7			613.8	613.8	2630.7	BGA VLNTR
Rte 78 Access	counted	07/14/09	1	1	4498.4	122.8	26.3	26.3			3314.6	3314.6	7988.4	UVM

	ww as net													
Rte 78 Access	counted ww as net	07/14/09	2	1	4428.3		157.8	8.8			438.4	438.4	5033.3	UVM
St. Albans Boat Launch	counted ww as net	07/14/09	1	1	87.7	8.8	175.4	105.2	26.3				403.4	UVM
St. Albans Boat Launch	counted ww as net	07/14/09	2	1	63.1	10.5	136.8	284.1					494.6	UVM
VTDEC Sta07	net	07/14/09	1	1	1121.4		22.8	34.2			11.4	11.4	1189.8	VT DEC
VTDEC Sta09	net	07/14/09	1	1	632.1	0.2	20.0				89.0	89.0	741.3	VT DEC
VTDEC Sta25	net	07/17/09	1	1	7.8	0.4	0.4		0.0		64.0	64.0	72.6	VT DEC
Beggs Park	counted ww as net	07/18/09	1	1	263.1	8.8	78.9	17.5					368.3	BGA VLNTR
High Rocks	counted ww as net	07/18/09	1	1	3025.3	543.7	35.1				30568.3	30568.3	34172.3	BGA VLNTR
Rock River Access	counted ww as net	07/18/09	1	1	1166.3	8.8	87.7	105.2			5752.4	5752.4	7120.3	BGA VLNTR
Chapman Bay	counted ww as net	07/19/09	1	1	1683.6	122.8	8.8	8.8			4568.6	2464.1	6392.5	BGA VLNTR
Highgate Springs-Shipyard	counted ww as net	07/19/09	1	1	1762.5	263.1	8.8				1534.6	1534.6	3568.9	BGA VLNTR
Larrabee's Point	counted ww as net	07/19/09	1	1		210.5	201.7	43.8					456.0	BGA VLNTR
Long Point	counted ww as net	07/19/09	1	1	175.4		52.6	52.6					280.6	BGA VLNTR
North Hero	counted	07/19/09	1	1	87.7		140.3	26.3			201.7	201.7	456.0	BGA

State Park	ww as net													VLNTR
Carry Bay	counted ww as net	07/20/09	1	1		105.2	306.9	701.5					1113.6	BGA VLNTR
City Bay	counted ww as net	07/20/09	1	1	52.6		78.9	87.7					219.2	BGA VLNTR
Donaldson Point	counted ww as net	07/20/09	1	1	4568.6	210.5	192.9	2244.8			2464.1	2464.1	9680.8	BGA VLNTR
Long Point	counted ww as net	07/20/09	1	1	534.9	192.9	131.5	1148.7	43.8		3156.8	3156.8	5208.7	BGA VLNTR
Maquam Bay	counted ww as net	07/20/09	1	1	8.8	210.5	17.5	412.1					648.9	BGA VLNTR
Red Rocks Beach shoreline	counted ww as net	07/20/09	1	1	389.7		175.4	526.1			974.3	974.3	2065.6	BGA VLNTR
St. Albans Bay Park	counted ww as net	07/20/09	1	1	736.6	210.5	17.5	78.9					1043.5	BGA VLNTR
VTDEC Sta34	net	07/20/09	1	1	35.7	1.1	10.4		65.0		23.3	23.3	135.6	VT DEC
VTDEC Sta40	net	07/20/09	1	1	610.2	1.0	8.5		0.8		4.7	4.7	625.1	VT DEC
Alburg	net	07/21/09	1	1	323.5						3089.8	3089.8	3413.3	UVM
Alburg	net	07/21/09	2	1	302.9	14.7					2453.4	2453.4	2771.0	UVM
Highgate Cliffs	net	07/21/09	1	1	362.0	38.5					3984.3	3984.3	4384.7	UVM
Highgate Cliffs	net	07/21/09	2	1	330.2	9.7			0.4		997.5	997.5	1337.8	UVM
Highgate Springs	net	07/21/09	1	1	527.2	14.3					6760.2	6760.2	7301.7	UVM
Highgate Springs	net	07/21/09	2	1	4190.8	123.8					13914.0	2448.0	18228.7	UVM
North Beach shoreline	counted ww as net	07/21/09	1	1	1236.4		157.8	1253.9			701.5	701.5	3349.7	BGA VLNTR

Rte 78 Access	net	07/21/09	1	1	243.3	21.1	0.4		0.4		1816.6	1813.4	2081.7	UVM
Rte 78 Access	net	07/21/09	2	1	1415.4	45.9					2853.8	2853.8	4315.1	UVM
St. Albans Boat Launch	net	07/21/09	1	1	1043.1	7.3			0.4		694.0	694.0	1744.8	UVM
St. Albans Boat Launch	net	07/21/09	2	1	1004.5	32.8					3124.4	85.1	4161.7	UVM
vicinity of Donaldson Point and Alburgh shore	counted ww as net	07/21/09	1	1							819866.7	819866.7	819866.7	UVM
VTDEC Sta02	net	07/22/09	1	1	112.0	19.2	20.2	0.5	2.0		40.7	40.7	194.6	VT DEC
VTDEC Sta04	net	07/22/09	1	1	41.0	8.1	3.6				26.2	26.2	78.9	VT DEC
Chapman Bay	counted ww as net	07/26/09	1	1	87.7						20641.9	20641.9	20729.6	BGA VLNTR
Donaldson Point	counted ww as net	07/26/09	1	1	271.8	210.5	78.9	201.7			3034.0	3034.0	3796.9	BGA VLNTR
Highgate Springs-Shipyard	counted ww as net	07/26/09	1	1	789.2		61.4				4945.6	4945.6	5796.2	BGA VLNTR
Larrabee's Point	counted ww as net	07/26/09	1	1	105.2	210.5	175.4	8.8					499.8	BGA VLNTR
North Hero State Park	counted ww as net	07/26/09	1	1		438.4	166.6	648.9			736.6	736.6	1990.5	BGA VLNTR
Carry Bay	counted ww as net	07/27/09	1	1	114.0		271.8	140.3					526.1	BGA VLNTR
City Bay	counted ww as net	07/27/09	1	1	622.6		17.5	210.5					850.6	BGA VLNTR
High Rocks	counted ww as net	07/27/09	1	1	789.2						3235.7	3235.7	4024.9	BGA VLNTR

Long Point	counted ww as net	07/27/09	1	1	613.8	8.8	87.7	17.5					727.8	BGA VLNTR
Maquam Bay	counted ww as net	07/27/09	1	1	175.4		35.1	254.3			166.6	166.6	631.4	BGA VLNTR
North Beach shoreline	counted ww as net	07/27/09	1	1	271.8	35.1	105.2	35.1					447.2	BGA VLNTR
Pelots Bay	counted ww as net	07/27/09	1	1		35.1	140.3	131.5					306.9	BGA VLNTR
Red Rocks Beach shoreline	counted ww as net	07/27/09	1	1			35.1	43.8			271.8	271.8	350.8	BGA VLNTR
Rock River Access	counted ww as net	07/27/09	1	1			640.1	184.1	8.8		3095.4	3095.4	3928.5	BGA VLNTR
St. Albans Bay Park	counted ww as net	07/27/09	1	1	236.8	70.2		8.8			420.9	420.9	736.6	BGA VLNTR
VTDEC Sta33	net	07/27/09	1	1	161.2		0.7	9.5	0.2		109.6	109.6	281.3	VT DEC
VTDEC Sta36	net	07/27/09	1	1	207.4				0.2		48.5	48.5	256.1	VT DEC
Alburg	net	07/28/09	1	1	58.6	9.1					175.8	175.8	243.5	UVM
Alburg	net	07/28/09	2	1	101.0	14.7					601.2	601.2	716.8	UVM
Highgate Cliffs	net	07/28/09	1	1	792.2	0.7					2390.3	2390.3	3183.1	UVM
Highgate Cliffs	net	07/28/09	2	1	1057.6	101.5					1922.3	1911.4	3081.3	UVM
Highgate Springs	net	07/28/09	1	1	449.8	61.6					789.3	789.3	1300.7	UVM
Highgate Springs	net	07/28/09	2	1	562.7						1113.5	1107.6	1676.2	UVM
Rte 78 Access	net	07/28/09	1	1	128.5						3027.0	3027.0	3155.5	UVM
Rte 78 Access	net	07/28/09	2	1	63.9		1.3				1572.6	1572.6	1637.8	UVM
St. Albans Boat Launch	net	07/28/09	2	1	34.8	7.4	1.9		0.2		26.2	26.2	70.5	UVM

VTDEC Sta46	net	07/28/09	1	1	4.6	0.0	0.1	0.2	0.0		0.1	0.1	5.0	VT DEC
VTDEC Sta50	net	07/28/09	1	1	133.9	7.4		4.1			1250.7	1250.7	1396.1	VT DEC
VTDEC Sta51	net	07/28/09	1	1	48.3	7.2					1393.7	1393.7	1449.2	VT DEC
St. Albans Boat Launch	net	07/29/09	1	1	39.6	2.4					50.6	49.7	92.6	UVM
VTDEC Sta16	net	07/29/09	1	1	270.9	2.0	3.6		0.2		46.3	46.3	323.0	VT DEC
VTDEC Sta19	net	07/29/09	1	1	299.7		0.2	0.4					300.3	VT DEC
VTDEC Sta21	net	07/29/09	1	1	366.3	0.2	0.3				148.1	148.1	514.8	VT DEC
Chapman Bay	counted ww as net	08/02/09	1	1	17.5		87.7	70.2	8.8		219.2	219.2	403.4	BGA VLNTR
Donaldson Point	counted ww as net	08/02/09	1	1	263.1		35.1				7550.0	7550.0	7848.1	BGA VLNTR
High Rocks	counted ww as net	08/02/09	1	1		438.4	35.1	8.8			771.7	771.7	1253.9	BGA VLNTR
Larrabee's Point	counted ww as net	08/02/09	1	1	350.8			87.7			876.9	876.9	1315.3	BGA VLNTR
Long Point	counted ww as net	08/02/09	1	1	324.4	17.5	342.0	245.5	8.8		175.4	175.4	1113.6	BGA VLNTR
North Hero State Park	counted ww as net	08/02/09	1	1			8.8	570.0			552.4	552.4	1131.2	BGA VLNTR
Rock River Access	counted ww as net	08/02/09	1	1			508.6	26.3			2718.3	2718.3	3253.2	BGA VLNTR
Beggs Park	counted ww as net	08/03/09	1	1			35.1	52.6			87.7	87.7	175.4	BGA VLNTR
Carry Bay	counted ww as net	08/03/09	1	1			263.1	648.9					912.0	BGA VLNTR
City Bay	counted	08/03/09	1	1	96.5		17.5	315.7			438.4	438.4	868.1	BGA

	ww as net													VLNTR
Highgate Springs-Shipyard	counted ww as net	08/03/09	1	1			61.4	140.3			771.7	771.7	973.3	BGA VLNTR
Maquam Bay	counted ww as net	08/03/09	1	1				35.1					35.1	BGA VLNTR
North Beach shoreline	counted ww as net	08/03/09	1	1	10.5			210.5			315.7	315.7	536.7	BGA VLNTR
Pelots Bay	counted ww as net	08/03/09	1	1		8.8	8.8	8.8			876.9	876.9	903.2	BGA VLNTR
Red Rocks Beach shoreline	counted ww as net	08/03/09	1	1	8.8		8.8	17.5			9461.6	9461.6	9496.7	BGA VLNTR
Rouses Point	counted ww as net	08/03/09	1	1				201.7					201.7	BGA VLNTR
St. Albans Bay Park	counted ww as net	08/03/09	1	1	87.7	8.8		61.4			118783.1	9172.2	118940.9	BGA VLNTR
Alburg	net	08/04/09	1	1	14.8	14.1					772.5	772.5	801.5	UVM
Alburg	net	08/04/09	2	1	16.6	9.1					769.9	769.9	795.6	UVM
Highgate Cliffs	net	08/04/09	1	1	15.1				3.0		7878.1	7878.1	7896.2	UVM
Highgate Cliffs	net	08/04/09	2	1							5291.8	5291.8	5291.8	UVM
Highgate Springs	net	08/04/09	1	1					0.6		2598.0	2598.0	2598.6	UVM
Highgate Springs	net	08/04/09	2	1	6.3	6.3					1890.2	1890.2	1902.8	UVM
Rte 78 Access	net	08/04/09	1	1	38.8	6.7			0.3		394.8	394.8	440.6	UVM
Rte 78 Access	net	08/04/09	2	1	36.5	19.7					265.1	265.1	321.3	UVM
St. Albans Boat Launch	net	08/04/09	1	1	24.3	43.4	0.1		0.2		88.6	88.6	156.7	UVM
St. Albans Boat	net	08/04/09	2	1	19.6	42.9			0.1		232.5	232.5	295.1	UVM

Launch														
VTDEC Sta25	net	08/04/09	0	1	3.7	0.1	0.3		0.1		52.4	52.4	56.5	VT DEC
VTDEC Sta07	net	08/05/09	0	1	193.6	0.2		0.2			137.7	137.7	331.6	VT DEC
VTDEC Sta09	net	08/05/09	0	1	150.9	11.8	0.4	0.6	0.4		68.3	68.3	232.2	VT DEC
VTDEC Sta34	net	08/06/09	1	1	79.5	20.2	3.6	0.0	1.3	0.0	26.9	26.9	131.4	VT DEC
VTDEC Sta40	net	08/06/09	1	1	36.8	34.6	0.7		0.6		72.7	72.7	145.3	VT DEC
VTDEC Sta02	net	08/07/09	1	1	1.5	1.2	9.1	0.0	0.0		2.2	2.2	14.0	VT DEC
VTDEC Sta04	net	08/07/09	1	1	458.3	18.0			0.5		92.9	92.9	569.7	VT DEC
Carry Bay	counted ww as net	08/09/09	1	1	17.5		385.8	684.0					1087.3	BGA VLNTR
Chapman Bay	counted ww as net	08/09/09	1	1	26.3	105.2	157.8	201.7					491.1	BGA VLNTR
Highgate Springs-Shipyard	counted ww as net	08/09/09	1	1		70.2	701.5	245.5	17.5		570.0	570.0	1604.7	BGA VLNTR
Larrabee's Point	counted ww as net	08/09/09	1	1	420.9		434.1	631.4			328.8	328.8	1815.2	BGA VLNTR
Long Point	counted ww as net	08/09/09	1	1		271.8	254.3	149.1	8.8		350.8	350.8	1034.7	BGA VLNTR
North Beach shoreline	counted ww as net	08/09/09	1	1	359.5	52.6	52.6	131.5		8.8	771.7	771.7	1376.7	BGA VLNTR
North Hero State Park	counted ww as net	08/09/09	1	1	70.2	114.0	324.4	1157.5					1666.1	BGA VLNTR
Red Rocks Beach shoreline	counted ww as net	08/09/09	1	1	201.7	596.3	78.9	61.4			508.6	508.6	1446.9	BGA VLNTR
Alburg	net	08/10/09	1	1		7.9			0.2		204.0	204.0	212.0	UVM
Alburg	net	08/10/09	2	1	2.1	5.1		0.1			270.4	270.4	277.7	UVM
Beggs Park	counted	08/10/09	1	1	35.1		8.8				2139.6	2139.6	2183.4	BGA

	ww as net													VLNTR
City Bay	counted ww as net	08/10/09	1	1		184.1		157.8			3288.3	3288.3	3630.3	BGA VLNTR
Donaldson Point	counted ww as net	08/10/09	1	1	26.3	140.3	420.9	263.1		17.5			868.1	BGA VLNTR
High Rocks	counted ww as net	08/10/09	1	1	17.5	254.3	473.5	228.0			2744.7	2665.7	3718.0	BGA VLNTR
Highgate Cliffs	net	08/10/09	1	1	5.1				0.9		2534.9	2534.9	2540.9	UVM
Highgate Cliffs	net	08/10/09	2	1		40.3					1980.8	1980.8	2021.0	UVM
Highgate Springs	net	08/10/09	1	1	14.0						3188.1	3188.1	3202.1	UVM
Highgate Springs	net	08/10/09	2	1	9.1						1222.4	1222.4	1231.4	UVM
Maquam Bay	counted ww as net	08/10/09	1	1			87.7	78.9	8.8		613.8	613.8	789.2	BGA VLNTR
Pelots Bay	counted ww as net	08/10/09	1	1	87.7		61.4	52.6			990.9	990.9	1192.6	BGA VLNTR
Point Au Roche State Park	counted ww as net	08/10/09	1	1	35.1		8.8				157.8	157.8	201.7	BGA VLNTR
Rock River Access	counted ww as net	08/10/09	1	1	14.6	1973.0	380.0	43.8			20753.0	20753.0	23164.4	BGA VLNTR
Rouses Point	counted ww as net	08/10/09	1	1	8.8			157.8			1043.5	1043.5	1210.1	BGA VLNTR
Rte 78 Access	net	08/10/09	1	1	1.9	13.3					194.1	194.1	209.3	UVM
Rte 78 Access	net	08/10/09	2	1	4.3	6.2	0.1				218.3	218.3	228.8	UVM
St. Albans Bay Park	counted ww as	08/10/09	1	1	140.3	26.3	43.8	43.8			876.9	876.9	1131.2	BGA VLNTR

	net													
St. Albans Boat Launch	net	08/10/09	1	1	42.4	17.6		0.2			228.8	228.8	289.0	UVM
St. Albans Boat Launch	net	08/10/09	2	1	305.7	16.1	0.1		0.1		113.1	113.1	435.0	UVM
VTDEC Sta33	net	08/10/09	1	1	40.5	0.2	0.0				9.9	9.9	50.6	VT DEC
VTDEC Sta36	net	08/10/09	1	1	132.6	0.3	0.1				76.4	76.4	209.4	VT DEC
Willsboro Bay	counted ww as net	08/10/09	1	1	648.9	201.7	8.8				1210.1	1210.1	2069.5	BGA VLNTR
VTDEC Sta46	net	08/11/09	1	1	8.5	0.1	0.2	0.1	0.1		15.0	15.0	23.9	VT DEC
VTDEC Sta50	net	08/11/09	1	1	7.0		0.2	4.3	0.2		764.9	764.9	776.5	VT DEC
VTDEC Sta51	net	08/11/09	1	1	12.9	6.6	1.0	1.8			1319.2	1319.2	1341.6	VT DEC
Highgate Springs	counted ww as net	08/12/09	1	1					26.3		59689.7	59374.0	59716.0	UVM
VTDEC Sta16	net	08/12/09	1	1	170.5	4.5		0.1	0.6		146.8	146.8	322.5	VT DEC
VTDEC Sta19	net	08/12/09	1	1	49.1	0.9	0.4		0.4		100.6	100.6	151.6	VT DEC
VTDEC Sta21	net	08/12/09	1	1	46.2	0.8			0.1		58.8	58.8	106.0	VT DEC
High Rocks	counted ww as net	08/15/09	1	1	131.5	973.3	61.4				4814.1	4814.1	5980.4	BGA VLNTR
Rock River Access	counted ww as net	08/15/09	1	1	8.8	412.1	61.4	43.8			8155.0	8155.0	8681.2	BGA VLNTR
Larrabee's Point	counted ww as net	08/16/09	1	1	87.7				8.8		166.6	166.6	263.1	BGA VLNTR
Long Point	counted ww as net	08/16/09	1	1			35.1	131.5			3077.9	3077.9	3244.5	BGA VLNTR
North Hero State Park	counted ww as net	08/16/09	1	1	8.8	578.7					2236.1	1973.0	2823.6	BGA VLNTR
St. Albans Bay	counted	08/16/09	1	1	1578.4	4092.1	102.3	14.6	14.6		31217.2	30778.7	37019.2	BGA

Park	ww as net													VLNTR
Beggs Park	counted ww as net	08/17/09	1	1		78.9		8.8			87.7	87.7	175.4	BGA VLNTR
Carry Bay	counted ww as net	08/17/09	1	1		289.4	8.8	140.3			1297.8	1297.8	1736.2	BGA VLNTR
Chapman Bay	counted ww as net	08/17/09	1	1		149.1	78.9						228.0	BGA VLNTR
City Bay	counted ww as net	08/17/09	1	1	175.4		26.3	35.1			438.4	438.4	675.2	BGA VLNTR
Donaldson Point	counted ww as net	08/17/09	1	1	122.8	1806.4	8.8				8856.6	8856.6	10794.5	BGA VLNTR
Maquam Bay	counted ww as net	08/17/09	1	1		105.2	17.5	78.9			1043.5	1043.5	1245.2	BGA VLNTR
Point Au Roche State Park	counted ww as net	08/17/09	1	1	447.2	447.2	17.5				438.4	438.4	1350.4	BGA VLNTR
Rouses Point	counted ww as net	08/17/09	1	1	8.8		43.8	114.0					166.6	BGA VLNTR
Willsboro Bay	counted ww as net	08/17/09	1	1	648.9	394.6	61.4				876.9	876.9	1981.8	BGA VLNTR
Alburg	net	08/18/09	1	1	73.4	19.9	4.4				1131.1	1071.9	1228.8	UVM
Alburg	net	08/18/09	2	1	81.6	4.3			0.2		773.5	746.9	859.5	UVM
Highgate Cliffs	net	08/18/09	1	1	78.0	31.2			1.5		1877.1	1877.1	1987.8	UVM
Highgate Cliffs	net	08/18/09	2	1	66.2				1.5		1870.8	1870.8	1938.5	UVM
Highgate Springs	net	08/18/09	1	1	46.6				1.9		1567.1	1567.1	1615.6	UVM
Highgate	net	08/18/09	2	1	39.7	8.8			0.6		1600.2	1600.2	1649.3	UVM

Springs														
North Beach shoreline	counted ww as net	08/18/09	1	1							4042.4	4042.4	4042.4	BGA VLNTR
Red Rocks Beach shoreline	counted ww as net	08/18/09	1	1	11.4		11.4	68.6					91.5	BGA VLNTR
Rte 78 Access	net	08/18/09	1	1	63.0	51.0	2.2		0.2		802.9	802.9	919.3	UVM
Rte 78 Access	net	08/18/09	2	1	48.0	12.9	0.1		0.1		202.3	189.0	263.5	UVM
St. Albans Boat Launch	net	08/18/09	1	1	240.3						24535.4	6050.2	24775.7	UVM
St. Albans Boat Launch	net	08/18/09	2	1	16.0						4643.8	4643.8	4659.8	UVM
VTDEC Sta25	net	08/18/09	1	1	45.9	0.7	6.0		0.2		137.6	137.6	190.3	VT DEC
Highgate Springs-Shipyard	counted ww as net	08/19/09	1	1	52.6	570.0	43.8	8.8	8.8		4384.4	4384.4	5068.4	BGA VLNTR
VTDEC Sta02	net	08/19/09	1	1	76.0	8.6	1.3	0.2	0.4		74.2	56.3	160.7	VT DEC
VTDEC Sta04	net	08/19/09	1	1	505.5		1.8		2.2		368.3	368.3	877.7	VT DEC
Carry Bay	counted ww as net	08/23/09	1	1	122.8		43.8	61.4					228.0	BGA VLNTR
Donaldson Point	counted ww as net	08/23/09	1	1	955.8	8.8					1736.2	1631.0	2700.8	BGA VLNTR
Larrabee's Point	counted ww as net	08/23/09	1	1	105.2		8.8	35.1		17.5			166.6	BGA VLNTR
Long Point	counted ww as net	08/23/09	1	1	438.4	35.1	70.2	35.1			219.2		798.0	BGA VLNTR
North Hero State Park	counted ww as net	08/23/09	1	1			8.8	8.8			359.5	359.5	377.1	BGA VLNTR
Beggs Park	counted ww as	08/24/09	1	1	8.8	43.8	201.7	228.0			438.4	438.4	920.7	BGA VLNTR

	net													
Chapman Bay	counted ww as net	08/24/09	1	1	8.8	8.8	131.5	140.3			114.0	114.0	403.4	BGA VLNTR
City Bay	counted ww as net	08/24/09	1	1	17.5	403.4	43.8	35.1		8.8	175.4	175.4	684.0	BGA VLNTR
Dunham Bay	counted ww as net	08/24/09	1	1	26.3						4779.0	4779.0	4805.3	BGA VLNTR
High Rocks	counted ww as net	08/24/09	1	1	1587.2		96.5		8.8		9365.2	9365.2	11057.5	BGA VLNTR
Highgate Springs-Shipyard	counted ww as net	08/24/09	1	1	547.2	2009.8	442.0	21.0			11269.7	11269.7	14289.7	BGA VLNTR
Maquam Bay	counted ww as net	08/24/09	1	1	8.8		8.8	52.6					70.2	BGA VLNTR
Pelots Bay	counted ww as net	08/24/09	1	1	8.8	228.0	70.2	8.8					315.7	BGA VLNTR
Point Au Roche State Park	counted ww as net	08/24/09	1	1	17.5		368.3	289.4			876.9	876.9	1552.1	BGA VLNTR
Rock River Access	counted ww as net	08/24/09	1	1	263.1	438.4	166.6	17.5			3621.5	3621.5	4507.2	BGA VLNTR
Rouses Point	counted ww as net	08/24/09	1	1		315.7	26.3	8.8			35.1		385.8	BGA VLNTR
St. Albans Bay Park	counted ww as net	08/24/09	1	1		955.8	385.8	43.8			1701.2	1701.2	3086.6	BGA VLNTR
VTDEC Sta07	net	08/24/09	1	1	357.3	18.3	0.2		0.7		394.5	385.5	771.0	VT DEC
VTDEC Sta09	net	08/24/09	1	1	188.1	41.1	8.3		0.7		202.9	202.9	441.1	VT DEC

Willsboro Bay	counted ww as net	08/24/09	1	1	8.8		35.1	96.5			2499.1	2499.1	2639.4	BGA VLNTR
Alburg	net	08/25/09	1	1	60.7	0.8	0.0		0.2		76.5	76.5	138.1	UVM
Alburg	net	08/25/09	2	1	53.6	2.5	0.1		0.2		52.1	52.1	108.5	UVM
Highgate Cliffs	net	08/25/09	1	1	248.3						1246.3	1246.3	1494.7	UVM
Highgate Cliffs	net	08/25/09	2	1	183.7	22.2					1085.5	1085.5	1291.3	UVM
Highgate Springs	net	08/25/09	1	1	6676.6	0.5			1.1		1791.0	1791.0	8469.2	UVM
Highgate Springs	net	08/25/09	2	1	260.6	3.7					1370.0	1332.7	1634.3	UVM
North Beach shoreline	counted ww as net	08/25/09	1	1		806.7	70.2	385.8			964.6	964.6	2227.3	BGA VLNTR
Red Rocks Beach shoreline	counted ww as net	08/25/09	1	1	87.7	8.8		96.5			23807.5	23369.0	24000.4	BGA VLNTR
Rte 78 Access	net	08/25/09	1	1	944.6				5.5		1828.2	1828.2	2778.3	UVM
Rte 78 Access	net	08/25/09	2	1	762.5		0.6	1.3		0.6	664.7	664.7	1429.7	UVM
St. Albans Boat Launch	net	08/25/09	1	1	55.9	37.9	0.2		0.1		428.1	422.0	522.3	UVM
St. Albans Boat Launch	net	08/25/09	2	1	7.5	43.5	0.2				206.5	200.5	257.9	UVM
VTDEC Sta34	net	08/25/09	1	1	93.1	0.4			0.1		338.9	332.5	432.5	VT DEC
VTDEC Sta40	net	08/25/09	1	1	11.3	58.2	0.4		0.4		734.7	734.7	804.9	VT DEC
VTDEC Sta16	net	08/26/09	1	1	382.2	3.3	0.2		0.2		161.5	161.5	547.3	VT DEC
VTDEC Sta19	net	08/26/09	1	1	64.4	0.3	0.5	0.2	0.3		130.2	130.2	195.8	VT DEC
VTDEC Sta21	net	08/26/09	1	1	36.0	5.0	1.3		0.2		131.7	128.7	174.2	VT DEC
Burlington Water Bay	net	08/28/09	2	1	47.5	1.9	1.9		0.2	0.1	60.0	60.0	111.6	UVM
Champlain Water Bay	net	08/28/09	1	1	62.7	9.6	1.5		0.2	0.2	71.5	69.5	145.6	UVM
Champlain Water Bay	net	08/28/09	2	1	111.6	8.5	0.2		0.2	0.1	104.2	104.2	224.9	UVM
North Beach	net	08/28/09	1	1	95.2	14.4					188.5	184.8	298.1	UVM

North Beach	net	08/28/09	2	1	653.6	0.1	1.1	0.1	0.2		133.4	133.4	788.5	UVM
Red Rocks Beach	net	08/28/09	1	1	52.2	3.3			0.2	0.1	79.1	78.4	134.8	UVM
Red Rocks Beach	net	08/28/09	2	1	37.3	9.6				0.2	59.1	59.1	106.1	UVM
Beggs Park	counted ww as net	08/29/09	1	1			35.1	61.4			2201.0	2201.0	2297.4	BGA VLNTR
Carry Bay	counted ww as net	08/30/09	1	1	8.8		298.1	2814.8			333.2	333.2	3454.9	BGA VLNTR
Chapman Bay	counted ww as net	08/30/09	1	1	35.1	219.2	52.6	210.5	17.5				534.9	BGA VLNTR
Donaldson Point	counted ww as net	08/30/09	1	1	456.0	70.2	35.1	201.7	35.1		438.4	438.4	1236.4	BGA VLNTR
Highgate Springs-Shipyard	counted ww as net	08/30/09	1	1	710.3	149.1	8.8	26.3	17.5		2893.7	2893.7	3805.7	BGA VLNTR
Larrabee's Point	counted ww as net	08/30/09	0	1	96.5		43.8		8.8		1929.2	1929.2	2078.2	BGA VLNTR
North Hero State Park	counted ww as net	08/30/09	1	1	17.5		8.8	52.6					78.9	BGA VLNTR
City Bay	counted ww as net	08/31/09	1	1	114.0	8.8	17.5	17.5			350.8	350.8	508.6	BGA VLNTR
High Rocks	counted ww as net	08/31/09	1	1	350.8	70.2	8.8	8.8	8.8		9645.8	9645.8	10093.0	BGA VLNTR
Kelly Bay	counted ww as net	08/31/09	1	1	26.3		184.1	39.5			31173.3	31173.3	31423.2	BGA VLNTR
Maquam Bay	counted	08/31/09	1	1	17.5								17.5	BGA

	ww as net													VLNTR
North Beach shoreline	counted ww as net	08/31/09	1	1	8.8	184.1	70.2	1140.0			14950.9	219.2	16353.9	UVM
Pelots Bay	counted ww as net	08/31/09	1	1			70.2	368.3			1481.9	1481.9	1920.4	BGA VLNTR
Red Rocks Beach shoreline	counted ww as net	08/31/09	1	1			26.3	149.1					175.4	UVM
Rock River Access	counted ww as net	08/31/09	1	1	114.0	114.0	271.8	122.8	8.8	8.8	1841.5	1841.5	2481.6	BGA VLNTR
Rouses Point	counted ww as net	08/31/09	1	1	8.8		17.5	534.9					561.2	BGA VLNTR
St. Albans Bay Park	counted ww as net	08/31/09	1	1	26.3	271.8	8.8	78.9			526.1	526.1	912.0	BGA VLNTR
VTDEC Sta25	net	08/31/09	1	1	141.6	0.4	1.8		0.2		34.3	34.3	178.3	VT DEC
VTDEC Sta33	net	08/31/09	1	1	5.1	0.8	0.3	0.1	0.1		11.5	11.5	17.9	VT DEC
VTDEC Sta36	net	08/31/09	1	1	20.0	2.4	0.0		0.0		26.0	26.0	48.5	VT DEC
Willsboro Bay	counted ww as net	08/31/09	1	1	8.8			8.8	8.8				26.3	BGA VLNTR
Alburg	net	09/01/09	1	1	87.9	0.8					121.6	121.6	210.3	UVM
Alburg	net	09/01/09	2	1	125.6	0.9	0.2				98.3	98.3	224.9	UVM
Highgate Cliffs	net	09/01/09	1	1	439.7						2074.6	2074.6	2514.3	UVM
Highgate Cliffs	net	09/01/09	2	1	660.2						2218.2	2218.2	2878.4	UVM
Highgate Springs	net	09/01/09	1	1	619.3				0.7		2230.0	2230.0	2849.9	UVM
Highgate Springs	net	09/01/09	2	1	853.5	23.3					1249.0	1249.0	2125.9	UVM
Rte 78 Access	net	09/01/09	1	1	148.1	6.4			0.2		540.2	540.2	694.8	UVM

Rte 78 Access	net	09/01/09	2	1	164.0	0.2					503.6	503.6	667.7	UVM
St. Albans Boat Launch	net	09/01/09	1	1	25.5	9.4	0.1	0.2	0.1		102.9	102.9	138.2	UVM
St. Albans Boat Launch	net	09/01/09	2	1	8.2	18.0	0.1	0.1			129.0	129.0	155.4	UVM
VTDEC Sta46	net	09/01/09	1	1	25.3	3.7	0.1		0.0		38.2	38.2	67.3	VT DEC
VTDEC Sta50	net	09/01/09	1	1	88.2		0.3		0.1		431.2	431.2	519.8	VT DEC
VTDEC Sta51	net	09/01/09	1	1	323.4						686.0	686.0	1009.4	VT DEC
VTDEC Sta02	net	09/02/09	1	1	17.8	2.6	3.9	0.6	0.2		25.6	25.6	50.7	VT DEC
VTDEC Sta04	net	09/02/09	1	1	16.5	92.6	3.8		3.2		202.0	202.0	318.1	VT DEC
VTDEC Sta34	net	09/04/09	1	1	16.4	7.6	0.7		0.4		121.5	121.5	146.5	VT DEC
VTDEC Sta40	net	09/04/09	1	1	33.2	19.2	6.3		0.1		944.0	195.1	1002.8	VT DEC
Donaldson Point	counted ww as net	09/06/09	1	1	175.4			8.8			2630.7	2630.7	2814.8	BGA VLNTR
Highgate Springs-Shipyard	counted ww as net	09/06/09	1	1	473.5	831.3	347.2	10.5	21.0		6734.5	6734.5	8418.1	BGA VLNTR
North Hero State Park	counted ww as net	09/06/09	1	1	35.1		8.8				570.0	570.0	613.8	BGA VLNTR
Beggs Park	counted ww as net	09/07/09	1	1		39.5	13.2	210.5			1973.0	1973.0	2236.1	BGA VLNTR
Carry Bay	counted ww as net	09/07/09	1	1	26.3		8.8	87.7	8.8		2288.7	1850.2	2420.2	BGA VLNTR
Chapman Bay	counted ww as net	09/07/09	1	1	35.1	447.2	96.5	78.9	219.2		306.9	306.9	1183.8	BGA VLNTR
High Rocks	counted ww as net	09/07/09	1	1	8.8	1666.1	201.7	52.6	105.2				2034.4	BGA VLNTR
Larrabee's Point	counted ww as	09/07/09	1	1		140.3	8.8	17.5	17.5		114.0	114.0	298.1	BGA VLNTR

	net													
Long Point	counted ww as net	09/07/09	1	1			52.6	315.7			657.7	657.7	1026.0	BGA VLNTR
North Beach shoreline	counted ww as net	09/07/09	1	1	8.8		17.5	87.7					114.0	BGA VLNTR
Red Rocks Beach shoreline	counted ww as net	09/07/09	1	1	122.8		8.8	26.3					157.8	BGA VLNTR
Rock River Access	counted ww as net	09/07/09	1	1	309.5	309.5	804.7	154.7					1578.4	BGA VLNTR
Alburg	net	09/08/09	1	1	23.3				0.1		311.3	311.3	334.7	UVM
Alburg	net	09/08/09	2	1	10.0			0.2			85.1	85.1	95.3	UVM
City Bay	counted ww as net	09/08/09	1	1	13.2			65.8			328.8	328.8	407.8	BGA VLNTR
Highgate Cliffs	net	09/08/09	1	1	121.0	21.6	0.6		0.6		1971.5	1971.5	2115.3	UVM
Highgate Cliffs	net	09/08/09	2	1	63.8			3.5	2.3		1264.3	1264.3	1333.9	UVM
Highgate Springs	net	09/08/09	1	1	105.7	4.9			1.2		689.4	689.4	801.2	UVM
Highgate Springs	net	09/08/09	2	1	188.5		0.7	5.6	0.7		2066.4	2066.4	2261.9	UVM
Maquam Bay	counted ww as net	09/08/09	1	1	8.8			17.5	17.5		438.4	438.4	482.3	BGA VLNTR
Pelots Bay	counted ww as net	09/08/09	1	1		52.6	65.8	315.7					434.1	BGA VLNTR
Rouses Point	counted ww as net	09/08/09	1	1			13.2	105.2					118.4	BGA VLNTR
Rt 2 bridge	counted ww as net	09/08/09	1	1		63.1	126.3	84.2			22834.1	22834.1	23107.7	BGA VLNTR

Rte 78 Access	net	09/08/09	1	1	19.3						200.9	200.9	220.2	UVM
Rte 78 Access	net	09/08/09	2	1	21.5	1.5			0.4		67.8	67.8	91.1	UVM
St. Albans Boat Launch	net	09/08/09	1	1	22.5	6.7					490.3	479.0	519.6	UVM
St. Albans Boat Launch	net	09/08/09	2	1	5.7	8.9	0.4				415.1	415.1	430.1	UVM
VTDEC Sta07	net	09/08/09	1	1	43.0	26.1	0.2	0.4	0.6		101.4	101.4	171.7	VT DEC
VTDEC Sta09	net	09/08/09	1	1	27.6	19.2	0.1		0.1		193.9	193.9	241.1	VT DEC
Willsboro Bay	counted ww as net	09/08/09	1	1	131.5			105.2					236.8	BGA VLNTR
VTDEC Sta25	net	09/10/09	1	1	209.9	1.4	11.4	1.3	0.2		13.1	13.1	237.3	VT DEC
Highgate Springs-Shipyard	counted ww as net	09/13/09	1	1	157.8	315.7	434.1				6182.1	6182.1	7089.6	BGA VLNTR
VTDEC Sta16	net	09/14/09	1	1	4.1	0.1			0.1		58.5	49.8	62.7	BGA VLNTR
VTDEC Sta19	net	09/14/09	1	1	10.5	0.2					197.4	191.5	208.2	VT DEC
VTDEC Sta21	net	09/14/09	1	1	8.1						71.9	71.9	80.0	VT DEC
Alburg	net	09/15/09	1	1	335.5	0.3					50.4	50.4	386.2	UVM
Alburg	net	09/15/09	2	1	18.0	1.2	44.1	0.1	0.2		9.8	9.8	73.4	UVM
Highgate Cliffs	net	09/15/09	1	1	123.2		1.2				1921.2	1921.2	2045.7	UVM
Highgate Cliffs	net	09/15/09	2	1	137.0		1.2	1.2			1977.4	1977.4	2116.8	UVM
Highgate Springs	net	09/15/09	1	1	161.4					1.2	1825.1	1825.1	1987.8	UVM
Highgate Springs	net	09/15/09	2	1	154.7						3403.6	3403.6	3558.3	UVM
Rte 78 Access	net	09/15/09	1	1	14.5	2.2	0.1		0.1		29.8	29.8	46.7	UVM
Rte 78 Access	net	09/15/09	2	1	24.8	0.1	0.1		0.2		28.2	26.5	53.3	UVM
St. Albans Boat Launch	net	09/15/09	1	1	49.3	8.1					701.4	542.7	758.8	UVM
St. Albans Boat Launch	net	09/15/09	2	1	25.7						520.6	520.6	546.3	UVM
VTDEC Sta33	net	09/16/09	1	1	4.8	0.3	0.7	0.1	0.1		37.4	34.7	43.4	VT DEC

VTDEC Sta36	net	09/16/09	1	1	20.8		0.1		0.0		87.0	83.9	108.0	VT DEC
VTDEC Sta46	net	09/17/09	1	1	10.2	0.1	0.1	0.0	0.0		44.1	42.9	54.6	VT DEC
VTDEC Sta50	net	09/17/09	1	1	0.4		10.4	0.0	0.2		11.5	11.5	22.5	VT DEC
VTDEC Sta51	net	09/17/09	1	1	5.7	1.1	0.5				853.2	853.2	860.5	VT DEC
Highgate Springs-Shipyard	counted ww as net	09/20/09	1	1	87.7		210.5	149.1	8.8		3718.0	3718.0	4174.0	BGA VLNTR
Alburg	counted ww as net	09/22/09	1	1	17.5			52.6	17.5				87.7	UVM
Alburg	counted ww as net	09/22/09	2	1	8.8		122.8	70.2			1210.1	1210.1	1411.8	UVM
Highgate Cliffs	net	09/22/09	1	1	35.5		4.1	2.5	0.3		1136.3	1136.3	1178.7	UVM
Highgate Cliffs	net	09/22/09	2	1	66.6	11.5	0.7				1494.8	1494.8	1573.6	UVM
Highgate Springs	net	09/22/09	1	1	123.9			4.1		2.1	4683.6	4677.4	4813.7	UVM
Highgate Springs	net	09/22/09	2	1	202.0		3.7				6454.1	6454.1	6659.8	UVM
Rte 78 Access	net	09/22/09	1	1	14.0	16.9	0.5	0.3	0.3		588.7	588.7	620.6	UVM
Rte 78 Access	net	09/22/09	1	2	8.2		0.3		1.6		121.0	116.9	131.2	UVM
Rte 78 Access	net	09/22/09	2	1	3.6		0.9	2.3	0.6		58.2	58.2	65.6	UVM
Rte 78 Access	net	09/22/09	2	2	6.3	2.3	1.3	2.3	0.6		40.8	40.8	53.5	UVM
St. Albans Boat Launch	counted ww as net	09/22/09	1	1	52.6			52.6					105.2	UVM
St. Albans Boat Launch	counted ww as net	09/22/09	2	1							0.0		0.0	UVM
VTDEC Sta02	net	09/22/09	1	1	28.0	6.6	0.3	0.4	0.3	0.7	20.6	20.6	56.8	VT DEC
VTDEC Sta04	net	09/22/09	1	1	2.3	1.7	0.2			0.0	7.7	3.2	11.9	VT DEC
VTDEC Sta34	net	09/23/09	1	1	28.8		3.9		0.2		77.6	62.2	110.4	VT DEC
VTDEC Sta40	net	09/23/09	1	1	292.9		0.2				351.7	351.7	644.9	VT DEC
Highgate Springs-	counted ww as	09/27/09	1	1			1066.7	133.3			172666.7	172666.7	173866.7	BGA VLNTR

Shipyard	net													
Burlington Water Bay	net	09/28/09	1	1	63.5	6.2	2.2	0.1	0.3	0.0	78.7	76.9	151.0	UVM
Alburg	counted ww as net	09/29/09	1	1	96.5		210.5	8.8					315.7	UVM
Alburg	counted ww as net	09/29/09	2	1			52.6	13.2			328.8	328.8	394.6	UVM
Highgate Cliffs	counted ww as net	09/29/09	1	1	43.8		228.0	105.2			3753.1	3753.1	4130.1	UVM
Highgate Cliffs	counted ww as net	09/29/09	2	1	13.2		486.7	131.5			263.1	263.1	894.4	UVM
Highgate Springs	net	09/29/09	1	1	78.8	0.2	0.8				508.6	508.6	588.4	UVM
Highgate Springs	net	09/29/09	2	1	95.4	5.2	1.1	0.2			551.3	551.3	653.3	UVM
Rte 78 Access	net	09/29/09	1	1	9.5		0.9				234.2	234.2	244.6	UVM
Rte 78 Access	net	09/29/09	2	1	17.9		0.5	0.5			121.3	121.3	140.1	UVM
St. Albans Boat Launch	counted ww as net	09/29/09	1	1	280.6						710.3	710.3	990.9	UVM
St. Albans Boat Launch	counted ww as net	09/29/09	2	1			26.3	39.5			1578.4	1578.4	1644.2	UVM
Highgate Springs-Shipyard	counted ww as net	10/04/09	1	1	140.3		298.1	385.8			87.7	87.7	912.0	BGA VLNTR
Alburg	net	10/06/09	1	1	2.0		1.0	0.2			14.3	14.3	17.6	UVM
Alburg	net	10/06/09	2	1	1.4		0.1	1.7			8.5	8.5	11.8	UVM
Highgate Cliffs	net	10/06/09	1	1	11.2		1.9	0.2			139.8	129.2	153.0	UVM
Highgate Cliffs	net	10/06/09	2	1	9.0	5.4	0.9	1.1			129.8	129.8	146.3	UVM
Highgate Springs	net	10/06/09	1	1	9.7		40.6	0.1			29.7	28.2	80.2	UVM

Highgate Springs	net	10/06/09	2	1	15.0		0.3	1.4			135.6	76.9	152.3	UVM
Rte 78 Access	net	10/06/09	1	1	2.7	0.1	4.8	1.6	0.2		33.9	33.9	43.3	UVM
Rte 78 Access	net	10/06/09	2	1	2.5		4.3	3.3			12.1	12.1	22.2	UVM
St. Albans Boat Launch	counted ww as net	10/06/09	1	1	8.8		70.2	412.1					491.1	UVM
St. Albans Boat Launch	counted ww as net	10/06/09	2	1			26.3	368.3			789.2	789.2	1183.8	UVM
Melo Boat Slip	counted ww as net	10/15/09	1	1	333.3						1830000.0	1830000.0	1830333.3	UVM
Alburg	counted ww as net	10/20/09	1	1	8.8		315.7	657.7					982.1	UVM
Alburg	counted ww as net	10/20/09	2	1	21.0		178.9	652.4					852.3	UVM
Highgate Cliffs	counted ww as net	10/20/09	1	1	78.9		605.1	578.7					1262.7	UVM
Highgate Cliffs	counted ww as net	10/20/09	2	1	157.8		357.8	1125.9					1641.5	UVM
Highgate Springs	counted ww as net	10/20/09	1	1	125.3		425.9	300.6					851.8	UVM
Highgate Springs	counted ww as net	10/20/09	2	1	80.9		333.9	1497.5			151.8	151.8	2064.1	UVM
Rte 78 Access	counted ww as net	10/20/09	1	1	52.6		355.1	368.3					776.0	UVM
Rte 78 Access	counted ww as	10/20/09	2	1	84.2		420.9	662.9	21.0				1189.1	UVM

	net													
St. Albans Boat Launch	counted ww as net	10/20/09	1	1	17.5		17.5	315.7			2665.7	2665.7	3016.5	UVM
St. Albans Boat Launch	counted ww as net	10/20/09	2	1	8.8		17.5	149.1			175.4	175.4	350.8	UVM
Melo Boat Slip	counted ww as net	10/21/09	1	1			122.8	157.8			128376.2	128376.2	128656.8	UVM

Appendix C. Results of Toxin Analyses – Data Summary 2009

Collection Date	Sample Location	Rep	Microcystin by ELISA (analyzed by UVM)		Anatoxin-a by HPLC (analyzed by VDH)		
			Conc. In Lakewater (µg/L)	Analysis Date	Less than Reportable Limit	Reportable Limit (ng/mL)	Date Reported
07/14/09	Highgate Cliffs	1	54.158	07/16/09			
07/14/09	Highgate Cliffs	2	20.489	07/16/09			
07/14/09	Highgate Springs	1	0.441	07/16/09			
07/14/09	Highgate Springs	2	0.241	07/16/09			
07/13/09	Red Rocks Beach shoreline	1	0.032	07/16/09	X	0.0025	07/28/09
07/13/09	High Rocks	1	19.097	07/16/09			
07/21/09	Highgate Springs	1	1.417	07/23/09	X	0.0025	07/28/09
07/21/09	Highgate Springs	2	1.325	07/23/09			
07/18/09	High Rocks	1	9.291	07/23/09	X	0.002	07/28/09
07/18/09	Rock River Access	1	6.423	07/23/09	X	0.002	07/28/09
07/21/09	vicinity of Donaldson Point and Alburgh shore	1	25.772	07/23/09			
07/26/09	Highgate Springs- Shipyard	1	0.348	07/30/09	X	0.0025	07/31/09
07/26/09	Chapman Bay	1	0.291	07/30/09	X	0.0025	07/31/09
08/04/09	Highgate Cliffs	1	1.914	08/06/09	X	0.0017	09/15/09
08/04/09	Highgate Cliffs	2	1.129	08/06/09			
08/03/09	Red Rocks Beach shoreline	1	0.032	08/06/09	X	0.0025	09/15/09
08/02/09	Donaldson Point	1	0.026	08/06/09	X	0.002	09/15/09
08/03/09	St. Albans Bay Park	1	0.172	08/06/09	X	0.0033	09/15/09
08/10/09	Rock River Access	1	1.248	08/13/09	X	0.002	08/20/09
08/12/09	Highgate Springs	1	16.735	08/13/09	X	0.002	08/20/09
08/18/09	St. Albans Boat Launch	1	0.013	08/20/09			
08/18/09	St. Albans Boat Launch	2	0.013	08/20/09			
08/16/09	St. Albans Bay Park	1	0.032	09/10/09	X	0.0025	08/24/09

08/19/09	Highgate Springs- Shipyard	1	0.241	08/20/09	X	0.0025	08/24/09
08/15/09	Rock River Access	1	0.225	08/20/09	X	0.0020	08/24/09
08/15/09	High Rocks	1	0.537	08/20/09	X	0.0020	08/24/09
08/17/09	Donaldson Point	1	0.543	08/20/09	X	0.0033	08/24/09
08/18/09	North Beach shoreline	1	0.026	08/20/09	X	0.0020	08/24/09
08/24/09	Highgate Springs- Shipyard	1	0.926	08/27/09	X	0.0025	09/15/09
08/24/09	High Rocks	1	0.535	08/27/09	X	0.002	09/15/09
08/25/09	Red Rocks Beach shoreline	1	0.026	08/27/09	X	0.002	09/15/09
08/24/09	Dunham Bay	1	0.079	08/27/09	X	0.001	09/15/09
08/31/09	Kelly Bay	1	0.026	09/10/09			
08/31/09	High Rocks	1	0.282	09/10/09	X	0.002	09/15/09
09/06/09	Highgate Springs- Shipyard	1	0.097	09/10/09	X	0.0025	09/15/09
09/08/09	Rt 2 bridge	1	0.064	09/10/09	X	0.005	09/15/09
09/13/09	Highgate Springs- Shipyard	1	0.032	09/17/09	X	0.0025	10/29/09
09/22/09	Highgate Springs	1	0.035	09/24/09			
09/22/09	Highgate Springs	2	0.044	09/24/09			
09/27/09	Highgate Springs- Shipyard	1	0.711	10/01/09	X	0.0025	10/29/09
10/15/09	Melo Boat Slip	1	23.360	01/08/10	X	0.1	10/29/09
10/21/09	Melo Boat Slip	1	0.106	01/08/10	X	0.0025	10/29/09

Appendix D. Total Phosphorus and Total Nitrogen Data Summary, 2009

Date	Location	Time	Rep	TN, mg/L	TP, µg/L
06/07/09	North Beach shoreline	10:58:00	1	0.62	13.55
06/07/09	North Beach shoreline	10:58:00	2	0.52	13.79
06/07/09	Red Rocks Beach shoreline	10:20:00	1	0.47	9.12
06/07/09	Red Rocks Beach shoreline	10:20:00	2	0.58	9.26
06/09/09	Rte 78 Access	11:05:00	1	0.49	42.33
06/09/09	Rte 78 Access	11:05:00	2	0.45	38.10
06/09/09	Alburg	10:55:00	1	0.60	66.57
06/09/09	Alburg	10:55:00	2	0.72	61.99
06/09/09	Highgate Cliffs	10:33:00	1	0.58	43.83
06/09/09	Highgate Cliffs	10:33:00	2	0.58	31.10
06/09/09	Highgate Springs	10:20:00	1	0.70	35.67
06/09/09	Highgate Springs	10:00:00	2	0.64	37.02
06/09/09	Rock River Access	11:40:00	1	0.92	75.13
06/09/09	Rock River Access	11:40:00	2	1.12	84.60
06/09/09	St. Albans Boat Launch	12:10:00	1	0.47	26.84
06/09/09	St. Albans Boat Launch	12:10:00	2	0.35	24.74
06/22/09	North Beach shoreline	10:37:00	1	0.55	16.49
06/22/09	North Beach shoreline	10:37:00	2	0.52	17.03
06/22/09	Red Rocks Beach shoreline	11:06:00	1	0.70	6.85
06/22/09	Red Rocks Beach shoreline	11:06:00	2	0.69	5.21
06/23/09	Rte 78 Access	11:03:00	1	0.66	29.50
06/23/09	Rte 78 Access	11:03:00	2	0.47	32.56
06/23/09	Alburg	10:45:00	1	0.48	27.21
06/23/09	Alburg	10:45:00	2	0.42	29.38
06/23/09	Highgate Cliffs	10:22:00	1	0.56	42.58
06/23/09	Highgate Cliffs	10:22:00	2	0.60	44.65
06/23/09	Highgate Springs	10:12:00	1	0.68	43.38
06/23/09	Highgate Springs	10:12:00	2	0.68	40.30

06/23/09	Rock River Access	11:25:00	1	0.51	53.40
06/23/09	Rock River Access	11:25:00	2	0.59	52.22
06/23/09	St. Albans Boat Launch	11:58:00	1	0.32	16.50
06/23/09	St. Albans Boat Launch	11:58:00	2	0.44	21.44
07/05/09	North Beach shoreline	10:30:00	1	0.36	9.57
07/06/09	Red Rocks Beach shoreline	13:40:00	1	0.33	16.33
07/07/09	Rte 78 Access	10:14:00	1	0.72	25.69
07/07/09	Rte 78 Access	10:14:00	1	0.72	25.69
07/07/09	Rte 78 Access	10:14:00	2	0.51	17.39
07/07/09	Rte 78 Access	10:14:00	2	0.51	17.39
07/07/09	Alburg	10:35:00	1	0.70	64.88
07/07/09	Alburg	10:35:00	1	0.70	64.88
07/07/09	Alburg	10:35:00	2	0.60	20.22
07/07/09	Alburg	10:35:00	2	0.60	20.22
07/07/09	St. Albans Boat Launch	11:11:00	1	0.44	14.47
07/07/09	St. Albans Boat Launch	11:11:00	2	0.37	16.74
07/13/09	Red Rocks Beach shoreline	14:00:00	1	0.31	11.99
07/14/09	Rte 78 Access	10:00:00	1	0.54	41.67
07/14/09	Rte 78 Access	10:00:00	2	0.57	37.58
07/14/09	Alburg	10:20:00	1	0.49	33.62
07/14/09	Alburg	10:20:00	2	0.49	28.30
07/14/09	Highgate Cliffs	10:37:00	1	0.68	99.85
07/14/09	Highgate Cliffs	10:37:00	2	0.65	76.82
07/14/09	Highgate Springs	10:49:00	1	0.66	35.34
07/14/09	Highgate Springs	10:49:00	2	0.71	33.74
07/14/09	St. Albans Boat Launch	11:46:00	1	0.30	25.43
07/14/09	St. Albans Boat Launch	11:46:00	2	0.34	22.66
07/14/09	North Beach shoreline	10:50:00	1	0.33	14.30
07/20/09	Red Rocks Beach shoreline	13:45:00	1	0.31	13.50
07/21/09	Rte 78 Access	11:15:00	1	0.51	22.00
07/21/09	Rte 78 Access	11:15:00	2	0.47	20.42
07/21/09	Alburg	10:57:00	1	0.64	39.99

07/21/09	Alburg	10:57:00	2	0.57	23.86
07/21/09	Highgate Cliffs	10:37:00	1	0.72	44.07
07/21/09	Highgate Cliffs	10:37:00	2	0.60	38.24
07/21/09	Highgate Springs	10:15:00	1	0.69	38.65
07/21/09	Highgate Springs	10:15:00	2	0.47	40.51
07/21/09	St. Albans Boat Launch	11:20:00	1	0.44	19.42
07/21/09	St. Albans Boat Launch	11:20:00	2	0.45	26.06
07/21/09	North Beach shoreline	11:20:00	1	0.28	10.77
07/27/09	North Beach shoreline	12:00:00	1	0.30	9.71
07/27/09	Red Rocks Beach shoreline	13:45:00	1	0.37	11.58
07/28/09	Rte 78 Access		1	0.44	40.15
07/28/09	Rte 78 Access		2	0.49	37.22
07/28/09	Alburg		1	0.49	30.67
07/28/09	Alburg		2	0.54	32.57
07/28/09	Highgate Cliffs		1	0.48	34.37
07/28/09	Highgate Cliffs		2	0.53	38.00
07/28/09	Highgate Springs		1	0.47	28.26
07/28/09	Highgate Springs		2	0.56	34.71
07/28/09	St. Albans Boat Launch		2	0.30	22.72
07/29/09	St. Albans Boat Launch		1	0.31	22.45
08/03/09	Red Rocks Beach shoreline	12:28:00	1	0.26	8.66
08/03/09	North Beach shoreline	13:45:00	1	0.41	12.47
08/04/09	Rte 78 Access	11:03:00	1	0.53	65.15
08/04/09	Rte 78 Access	11:03:00	2	0.49	67.83
08/04/09	Alburg	10:54:00	1	0.58	51.54
08/04/09	Alburg	10:54:00	2	0.50	60.03
08/04/09	Highgate Cliffs	10:23:00	1	0.48	106.92
08/04/09	Highgate Cliffs	10:23:00	2	0.59	96.01
08/04/09	Highgate Springs	10:10:00	1	1.02	77.15
08/04/09	Highgate Springs	10:10:00	2	0.59	66.49
08/04/09	St. Albans Boat Launch	11:57:00	1	0.38	26.18
08/04/09	St. Albans Boat Launch	11:57:00	2	0.40	30.82

08/09/09	Red Rocks Beach shoreline	12:50:00	1	0.23	10.26
08/09/09	North Beach shoreline	14:00:00	1	0.36	13.28
08/10/09	Rte 78 Access		1	0.43	59.26
08/10/09	Rte 78 Access		2	0.43	51.87
08/10/09	Alburg		1	0.46	44.44
08/10/09	Alburg		2	0.52	44.90
08/10/09	Highgate Cliffs		1	0.48	76.80
08/10/09	Highgate Cliffs		2	0.58	74.11
08/10/09	Highgate Springs		1	1.03	73.35
08/10/09	Highgate Springs		2	0.43	75.21
08/10/09	St. Albans Boat Launch		1	0.43	35.20
08/10/09	St. Albans Boat Launch		2	0.34	34.07
08/18/09	Rte 78 Access	10:44:00	1	0.32	47.70
08/18/09	Rte 78 Access	10:44:00	2	0.43	49.08
08/18/09	Alburg	10:35:00	1	0.46	45.17
08/18/09	Alburg	10:35:00	2	0.41	47.45
08/18/09	Highgate Cliffs	10:00:00	1	0.65	61.62
08/18/09	Highgate Cliffs	10:07:00	2	0.41	45.14
08/18/09	Highgate Springs	10:00:00	1	0.47	59.03
08/18/09	Highgate Springs	10:00:00	2	0.41	58.94
08/18/09	St. Albans Boat Launch	11:32:00	1	0.44	33.97
08/18/09	St. Albans Boat Launch	11:32:00	2	0.50	33.96
08/18/09	North Beach shoreline	13:30:00	1	0.37	12.44
08/18/09	Red Rocks Beach shoreline	12:45:00	1	0.26	19.26
08/25/09	Rte 78 Access	10:51:00	1	0.39	44.89
08/25/09	Rte 78 Access	10:51:00	2	0.37	42.09
08/25/09	Alburg	10:38:00	1	0.42	43.15
08/25/09	Alburg	10:38:00	2	0.43	45.50
08/25/09	Highgate Cliffs	10:17:00	1	0.36	50.78
08/25/09	Highgate Cliffs	10:17:00	2	0.40	51.91
08/25/09	Highgate Springs	10:07:00	1	0.38	48.24
08/25/09	Highgate Springs	10:07:00	2	0.34	51.49

08/25/09	St. Albans Boat Launch	11:47:00	1	0.46	31.77
08/25/09	St. Albans Boat Launch	11:47:00	2	0.46	35.47
08/25/09	Red Rocks Beach shoreline	12:45:00	1	0.45	26.64
08/25/09	North Beach shoreline	13:35:00	1	0.35	22.52
08/28/09	Burlington Water Bay	10:41:00	2	0.36	11.08
08/28/09	Champlain Water Bay	10:16:00	1	0.32	12.81
08/28/09	Champlain Water Bay	10:16:00	2	0.35	16.43
08/28/09	North Beach	10:52:00	1	0.32	11.48
08/28/09	North Beach	10:52:00	2	0.35	11.22
08/28/09	Red Rocks Beach	10:00:00	1	0.46	31.19
08/28/09	Red Rocks Beach	10:00:00	2	0.39	13.93
08/31/09	Red Rocks Beach shoreline	11:20:00	1	0.41	18.73
08/31/09	North Beach shoreline	12:00:00	1	0.32	20.59
09/01/09	Rte 78 Access	11:05:00	1	0.33	39.38
09/01/09	Rte 78 Access	11:05:00	2	0.28	39.72
09/01/09	Alburg	10:52:00	1	0.32	40.24
09/01/09	Alburg	10:52:00	2	0.37	33.37
09/01/09	Highgate Cliffs	10:20:00	1	0.34	44.38
09/01/09	Highgate Cliffs	10:20:00	2	0.31	52.46
09/01/09	Highgate Springs	10:10:00	1	0.54	43.09
09/01/09	Highgate Springs	10:10:00	2	0.31	38.93
09/01/09	St. Albans Boat Launch	11:55:00	1	0.30	16.98
09/01/09	St. Albans Boat Launch	11:55:00	2	0.29	22.21
09/07/09	Red Rocks Beach shoreline	12:00:00	1	0.33	21.96
09/07/09	North Beach shoreline	14:00:00	1	0.28	25.28
09/08/09	Rte 78 Access	10:47:00	1	0.32	45.20
09/08/09	Rte 78 Access	10:47:00	2	0.31	46.27
09/08/09	Alburg	10:40:00	1	0.33	38.25
09/08/09	Alburg	10:40:00	2	0.34	36.81
09/08/09	Highgate Cliffs	10:20:00	1	0.30	68.69
09/08/09	Highgate Cliffs	10:20:00	2	0.36	52.82
09/08/09	Highgate Springs	10:08:00	1	0.58	41.15

09/08/09	Highgate Springs	10:08:00	2	0.48	45.77
09/08/09	St. Albans Boat Launch	11:40:00	1	0.40	19.75
09/08/09	St. Albans Boat Launch	11:40:00	2	0.29	23.19
09/15/09	Rte 78 Access	10:39:00	1	0.38	49.38
09/15/09	Rte 78 Access	10:39:00	2	0.42	46.01
09/15/09	Alburg	10:30:00	1	0.40	41.20
09/15/09	Alburg	10:30:00	2	0.40	43.73
09/15/09	Highgate Cliffs	10:10:00	1	0.45	43.29
09/15/09	Highgate Cliffs	10:10:00	2	0.52	40.78
09/15/09	Highgate Springs	10:00:00	1	0.67	52.81
09/15/09	Highgate Springs	10:00:00	2	0.54	50.26
09/15/09	St. Albans Boat Launch	11:36:00	1	0.45	28.87
09/15/09	St. Albans Boat Launch	11:36:00	2	0.41	22.23
09/22/09	Rte 78 Access	10:37:00	1	0.39	39.48
09/22/09	Rte 78 Access	10:37:00	2	0.42	37.76
09/22/09	Alburg	10:20:00	1	0.41	38.72
09/22/09	Alburg	10:20:00	2	0.37	43.17
09/22/09	Highgate Cliffs	10:09:00	1	0.53	43.97
09/22/09	Highgate Cliffs	10:09:00	2	0.52	40.15
09/22/09	Highgate Springs	10:00:00	1	0.54	43.00
09/22/09	Highgate Springs	10:00:00	2	0.68	43.33
09/22/09	St. Albans Boat Launch	11:20:00	1	0.34	14.91
09/22/09	St. Albans Boat Launch	11:20:00	2	0.40	12.22
09/28/09	Burlington Water Bay	10:41:00	1	0.35	11.82
09/29/09	Rte 78 Access	11:00:00	1	0.41	44.26
09/29/09	Rte 78 Access	11:00:00	2	0.43	39.73
09/29/09	Alburg	10:42:00	1	0.41	37.20
09/29/09	Alburg	10:42:00	2	0.40	32.00
09/29/09	Highgate Cliffs	10:21:00	1	0.39	37.87
09/29/09	Highgate Cliffs	10:21:00	2	0.34	40.02
09/29/09	Highgate Springs	10:30:00	1	0.47	34.36
09/29/09	Highgate Springs	10:30:00	2	0.77	35.10

09/29/09	St. Albans Boat Launch	11:40:00	1	0.33	26.00
09/29/09	St. Albans Boat Launch	11:40:00	2	0.42	19.09
10/06/09	Rte 78 Access	10:40:00	1	0.32	36.31
10/06/09	Rte 78 Access	10:40:00	2	0.33	40.92
10/06/09	Alburg	10:30:00	1	0.30	43.49
10/06/09	Alburg	10:30:00	2	0.41	32.80
10/06/09	Highgate Cliffs	10:10:00	1	0.33	35.46
10/06/09	Highgate Cliffs	10:10:00	2	0.35	40.40
10/06/09	Highgate Springs	10:00:00	1	0.34	35.48
10/06/09	Highgate Springs	10:00:00	2	0.37	30.66
10/06/09	St. Albans Boat Launch	11:30:00	1	0.32	19.33
10/20/09	Rte 78 Access	10:45:00	1	0.42	45.64
10/20/09	Rte 78 Access	10:45:00	2	0.30	42.48
10/20/09	Alburg	10:35:00	1	0.38	36.94
10/20/09	Alburg	10:35:00	2	0.37	38.44
10/20/09	Highgate Cliffs	10:18:00	1	0.35	34.60
10/20/09	Highgate Cliffs	10:18:00	2	0.44	34.95
10/20/09	Highgate Springs	10:10:00	1	0.40	31.89
10/20/09	Highgate Springs	10:10:00	2	0.57	30.04
10/20/09	St. Albans Boat Launch	11:42:00	1	0.24	17.30
10/20/09	St. Albans Boat Launch	11:42:00	2	0.39	23.59