

Vermont's Experience with Cyanotoxins

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Progression of Cyanobacteria response in VT

Cyanobacteria result from elevated P



Control nuisance blooms by reducing P inputs

History of nuisance blooms:

Champlain – St. Albans since 1980s

Missisquoi Bay infrequent
a few inland lakes

September 1999 – 2 dogs die after swimming in Lake Champlain near Burlington



But this part of Champlain
doesn't fit the paradigm

Cyanotoxins can be present in any lake
Toxin levels of concern most prevalent in thick scums
occurring where P is high



Teach the public to avoid visible cyanobacteria
Control nuisance cyanobacteria through P reduction

The Champlain Monitoring Program

- Champlain is both a recreational asset and a water supply
 - ~200,000 people rely on Champlain water for drinking
 - \$3.8 billion in estimated tourist-generated revenue in 1998-99
- Collaborative effort
 - Coordinated by Dr. Mary Watzin (UVM, Rubenstein School)
 - Partners include
 - State of Vermont – DEC, VDH, FPR
 - State of New York – DEC, DOH
 - Lake Champlain Committee
 - Citizen volunteers
- Tiered response protocol in effect 2001 - present
 - developed and implemented by UVM

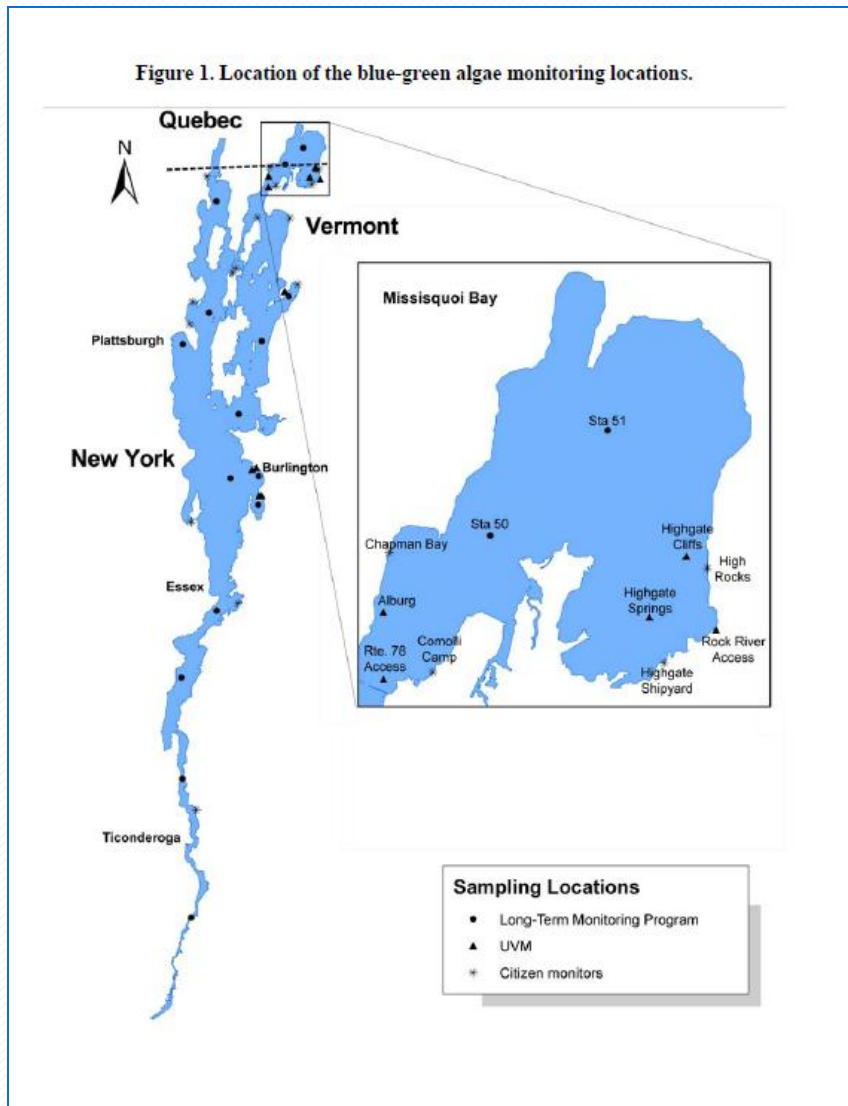
Champlain Tiered Protocol



3m tow w/63µm net or
surface grab
Rapid count protocol



- **Qualitative** – catch initial stages of population transition to cyanobacteria
 - Sample monthly to biweekly
- **Quantitative** – potentially toxic cyanobacteria present
 - Sample biweekly
- **Vigilance** – potentially toxic cyanobacteria >2000/mL
 - Sample weekly
- **Alert** – population reached density of concern >4000 cells/mL
 - Sample weekly, whole water surface grabs
 - Test for microcystin and/or anatoxin
 - Presence of toxins
 - Drinking water: cyanotoxin ≥ 1.0 ug/L triggers risk assessment and potential health advisories
 - VT recreational action levels trigger advisories and outreach to towns
 - ≤ 6 µg/L microcystin-LR
 - ≤ 10 ug/L anatoxin-a



The Sampling Network

- Champlain Long-term Monitoring Project
 - 15 stations lakewide
 - biweekly visits May to October
- UVM staff
 - 3 stations near Burlington beaches and water intake structures
 - Stations on high priority bays
 - Sampling mid-June to end of blooms
- Lake Champlain Committee volunteers
 - shoreline stations around the lake, primarily Missisquoi bay
 - Active during prime recreational months of July - September

Weekly Status

October 22, 2009

All of Lake Champlain is generally safe.

This is the final update for the 2009 surveillance season. Those recreating on the lake should watch for and avoid areas of any remaining accumulations of algae, which can move around with changing winds and weather.

[Lake Status Map](#)

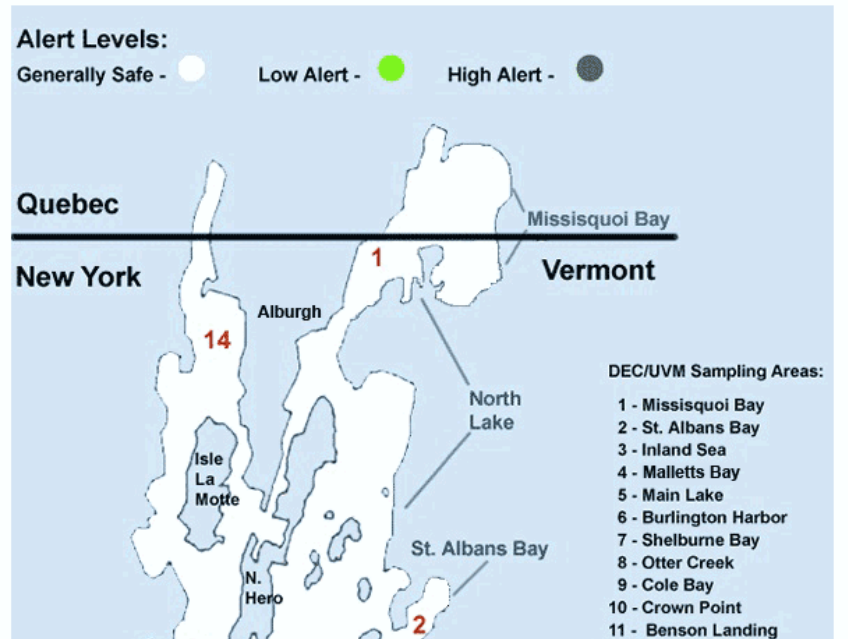
Updates courtesy of Rubenstein School of Environment and Natural Resources, University of Vermont

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Lake Status Map

The color-coded map of Lake Champlain illustrates alert levels in areas where blooms are present:

See [Alert Level Descriptions](#) for more detail.



Communicating Results

- VDH issues an annual reminder early
- UVM updates state and water facility staff via weekly email
- VDH issues public health alerts and works with local officials as needed
- VDH posts monitoring results for Champlain on their webpage
 - Often picked up by local TV and newspaper
 - Posted on several other webpages (Basin Program and Champlain Committee)

Recommended Beach Protocol

Close and post a public beach if **any** of the following conditions are met:

- Visible cyanobacteria bloom/scum or potential cyanobacteria bloom/scum
- Microcystin-LR (equivalents) $\geq 6\mu\text{g/L}$
- Anatoxin $\geq 10\mu\text{g}$

Re-open only when **all three** conditions are met:

- No visible cyanobacteria bloom/scum
- Microcystin $\leq 6\mu\text{g/L}$
- Anatoxin $\leq 10\mu\text{g/L}$

ATTENTION
SWIMMING AREA CLOSED



as of _____

The _____ local health officer has determined that swimming in this area presents a public health risk because of water contaminated by _____.

It will be retested on _____ (date).

For more information contact:

Phone: _____
Signed: _____
Local Town Health Officer



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DEPARTMENT OF HEALTH
healthvermont.gov

What have we learned?

- The monitoring program is effective
 - Excellent coverage
 - Dedicated network of state, university and citizen monitors
 - Routinely detect cyanobacteria and toxins before they reach levels of concern in the problem areas
 - The public is more aware
- Microcystin is most frequently detected
 - Concentrations vary widely
 - Highest detection ~6500 ug/L (2004)
 - More likely to be elevated in eutrophic bays
 - Not detected or low concentration in most parts of Champlain
- Anatoxin is rarely detected
 - Several of the dog deaths on Champlain have been linked to anatoxin
 - Collection and analytical methodology may still need to be refined
- Recreational concentrations of concern link to high density populations and scums

What doesn't work, yet

- Water supply facilities unsure how to utilize the data
 - Champlain suppliers have guidelines for responding to toxins
 - Not always sure when that first crucial sample should be taken
 - Many are small facilities with limited staff and budgets
- Inconsistent response to situations of concerns by local officials
 - VDH offers guidance and assistance to towns, but does not regulate
- Cyanobacteria populations change rapidly and monitoring data is static
- Pets can be affected in areas considered mostly safe
- This is a costly program
 - Statewide implementation is not feasible



Larry DuPont, 2008

Responding on other VT lakes

- Strong emphasis on outreach and education
 - All Vermonters need to recognize cyanobacteria scums
 - All Vermonters need to know who to contact for assistance
- Empowering towns to respond to local cyanobacteria events
 - On-line photos of blooms and other aquatic phenomena
 - Outreach to town health officials
 - Availability of toxin testing at low cost for towns and individual landowners
- Assisting towns in developing a local monitoring and response protocol
 - Identify local stakeholders and potential volunteers
 - Use a visual approach that can include toxin analysis as budgets permit
 - Increase local communication
- Guidance on reducing nutrient inputs that lead to high density blooms and scums

Next steps

- Focus on drinking water
 - There are no guidelines for acceptable levels in drinking water
 - need that guidance at the federal level
 - need to find \$\$ to help small water facilities cope
- Focus on reducing fear factor
 - People deal with similar risks daily
 - They can recognize and cope with cyanobacteria
 - They can improve water quality and reduce frequency of thick scums
- Use emerging consciousness about the effect of human activity on the environment
 - Global warming may be good for cyanobacteria
 - Reducing P now is crucial



Vermont Resources and Information

- http://healthvermont.gov/enviro/bg_algae/bgalgae.aspx
- http://www.lcbp.org/publication_search.aspx
 - Annual reports for the monitoring program are on-line
 - Keyword = cyanobacteria
- Watzin et al, 2006. Application of the WHO Alert Level Framework to Cyanobacteria Monitoring of Lake Champlain, Vermont. *Environ. Toxic.* 21(3):278 - 288
- Stone and Bress, 2007. Addressing Public Health Risks for Cyanobacteria in Recreational Waters: the Oregon and Vermont Framework. *Integr. Environ. Assess. Management* 3(1):137 - 143