

Cyanobacteria

(Blue-green Algae)

Guidance for Vermont Communities



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Introduction	3
<i>Reason for this Guidance</i>	3
<i>Basis for this Guidance</i>	3
<i>Scope and Limitations of this Guidance</i>	4
Background Information about Cyanobacteria	5
<i>What are Cyanobacteria?</i>	5
<i>Factors that May Influence the Formation of Blooms</i>	5
<i>Possible Harmful Effects of Cyanobacterial Blooms on an Ecosystem.....</i>	5
<i>Common Misidentifications.....</i>	5
Public Health Concerns About Cyanobacteria	6
<i>Cyanobacteria and Toxin Production.....</i>	6
<i>Health Concerns</i>	6
<i>Illnesses that May be Caused by Cyanobacterial Toxins</i>	6
<i>Additional Causes for Concern</i>	7
Possible Exposure to Vermonters	8
<i>Recreational.....</i>	8
<i>Drinking Water</i>	8
Assessment of Blooms.....	9
Development of Monitoring Plans	10
<i>Where to Monitor</i>	10
<i>Frequency of Monitoring</i>	10
<i>Identification of Cyanobacteria</i>	11
<i>Monitoring Categories.....</i>	11
<i>Suggested Actions Based on Visual Monitoring System:.....</i>	11
Toxin Testing.....	12
<i>State assistance for drinking water supply concerns.....</i>	13
Voluntary Reporting.....	14

Appendix A: Ways to identify a cyanobacteria/blue-green algae accumulation..... 16

Appendix B: Visual Assessment and Common Misidentifications (Photos) 18

Appendix C: BGA Health Alert Template 24

Appendix D: Recreational (Public) Beach Guidance 26

Appendix E: Template Signs for Postings: 28

Appendix F: Sample Data Sheet..... 31

Appendix G: References 33

Appendix H: Abbreviations..... 35

Appendix I: Vermont Contacts 36

Cyanobacteria (Blue-green Algae) Guidance for Vermont Communities

Introduction

Reason for this Guidance

Within the past decade, an increasing number of Vermont lakes and ponds have reported mild and sporadic occurrences of cyanobacterial (blue-green algae) blooms.

The seemingly rapid onset of cyanobacterial blooms and the potential health effects of exposure to toxins, which may be present in these blooms, can cause anxiety within a community. With no state-wide program or federal funding available to address these local concerns, the Vermont Department of Health (VDH) and the Vermont Department of Environmental Conservation (DEC) have developed this document as a reference guide for communities whose lakes and ponds are impacted by cyanobacterial blooms.

The objectives of this community guide:

- provide tools for identification of cyanobacteria and cyanobacterial blooms;
- provide a quick reference guide on the nature of cyanobacteria
- provide tools to allow communities to develop and implement low-cost, sustainable monitoring programs for cyanobacterial blooms;
- provide assessment tools to determine public health risk from cyanobacterial blooms;
- provide guidance for determining use-restrictions of water impacted by cyanobacterial blooms to protect public health;
- provide guidance for public information strategies;
- Provide appropriate contact information if additional state or federal resources are needed.

Basis for this Guidance

This guidance document has been developed using currently available scientific data. Guidance from federal and international health organizations: Centers for

Disease Control (CDC), US Environmental Protection Agency (USEPA), World Health Organization (WHO), and other state and international protocols.

Additionally, the VDH, the DEC, the Lake Champlain Basin Program (LCBP), the University of Vermont (UVM), and the Lake Champlain Committee (LCC) have all provided valuable knowledge, data and experience which have been incorporated into this document.

Scope and Limitations of this Guidance

With increased climatic pressures and more intense use of Vermont lakes and ponds, the appearance of cyanobacterial blooms is expected to continue to increase in the coming years. Lakes and ponds previously not impacted by blooms may experience blooms. This guide is specifically intended for lakes and ponds with new or sporadic appearances of cyanobacterial blooms. It is not appropriate for guidance in heavily impacted areas, which have regular thick persistent cyanobacterial blooms for long periods of time (e.g., Missisquoi Bay in Lake Champlain).

The focus of this document is to ensure adequate protection of public and animal health when cyanobacterial blooms occur in lakes and ponds. Its intent is to assist local officials and other community members identify and respond to the cyanobacterial blooms so as to best protect public and animal health.

This guide, however, is *not* a regulatory guide, a prevention manual, nor a practice for public water system operation.

Background Information about Cyanobacteria

What are Cyanobacteria?

Cyanobacteria are common and natural aquatic organisms present in many surface waters. Cyanobacteria are single-celled microscopic bacteria and can be found in fresh, salt or brackish waters. Like plants, they use sunlight to make food and energy. Under most conditions they are too small to be seen by the human eye.

In waters, where nutrients are readily available and certain environmental conditions exist, cyanobacteria can multiply rapidly creating visible floating colonies. If these growth conditions continue, large, floating, mat-like accumulations of cyanobacteria can form on the surface of the water. This abundant, visible growth is typically referred to as a 'bloom' or 'scum'. The thickest blooms usually occur in calm waters, such as near shorelines or in protected bays. In Vermont, blooms most often occur in late summer or early fall.

Cyanobacteria have been commonly referred to as 'blue-green algae'. However, cyanobacterial blooms are not always blue-green. In fact, they can be blue, bright green, brown, white or red. Bloom appearance can be best described as "pea soup" or "spilled paint" on the water's surface. Appendices A and B may be used to help identify a bloom.

Factors that May Influence the Formation of Blooms

Cyanobacteria are common in Vermont lakes and ponds, however the occurrence of blooms is becoming more frequent. Two suggested reasons for the increasing number of lakes and ponds impacted by blooms are increased temperature of water and air and increased nutrient content of waters. However, there are other unidentified factors which contribute to bloom formation.

Possible Harmful Effects of Cyanobacterial Blooms on an Ecosystem

Large accumulations of blooms can block the sunlight needed by other animals or plants in the water body. Additionally, the large amount of oxygen and nutrients used by cyanobacteria can rob other aquatic life of these essentials resulting in their death.

Common Misidentifications

Identification of cyanobacteria can be difficult. Because of its microscopic size, it is usually not visible to the human eye until colonies or blooms have formed. There are other floating organisms which may be misidentified as cyanobacteria, such as: diatoms, green algae, duckweed and pollen.

Public Health Concerns About Cyanobacteria

Cyanobacteria and Toxin Production

Some types of cyanobacteria will naturally produce compounds in their cells that can be toxic to humans and other animals. Not all cyanobacteria produce toxins. Types that are known to produce toxins may not produce them under all conditions. Assessing the potential risk from a cyanobacterial bloom to humans and animals can be difficult.

Toxins produced by multiplying cyanobacteria generally stay inside the cells, but some toxins may leak out into the surrounding water, particularly if the bloom has been growing over a long period of time.

When a toxin producing bloom dies and breaks up, toxins will be released into the surrounding water. This is generally the time of highest concern for public health because the lack of a visual cue (*i.e.*, water appears clear) to avoid the water is not present.

Health Concerns

Some exposures to cyanobacterial scums and toxins have caused health effects in people and animals. These effects have been confirmed by laboratory toxin tests.

Illnesses that May be Caused by Cyanobacterial Toxins

Depending on the type, amount and route of exposures different types of health effects can be caused by cyanobacterial toxins.

- People may get rashes or other skin irritations from coming into contact with blooms. Usually these skin irritations are not associated with toxins, but rather other non-toxic compounds produced by blooms: lipopolysaccharides (LPSs).
- Inhalation of water droplets that have toxins in them may cause allergic-like reactions, runny noses, or sore throats.
- Swallowing water that has high levels of cyanobacterial toxins in it can cause:
 - Severe stomach problems like diarrhea and vomiting.
 - Liver damage which may take hours or days to show up in people or animals. Symptoms can include abdominal pain, diarrhea, and vomiting.
 - Numb lips, tingling fingers and toes, or dizziness.

Additional Causes for Concern

Children and pets are at higher risk for illness from exposure to toxins because of their smaller size and bodyweight and can ingest a relatively larger dose of toxin. They are also the most likely to be playing in thick blooms near the shoreline.

Cyanobacteria toxins have no known antidotes. There is a report from Montana of a successful treatment of a dog with microcystin poisoning.

To date, in Vermont there have been no known human-related deaths from cyanobacterial blooms. Multiple unconfirmed reports of human illness ranging from skin irritations, to respiratory issues and severe gastrointestinal illness have been reported.

In previous summers, deaths of two dogs were thought to be a result of the dogs swallowing a large amount of cyanobacterial scum. Other reports of animal illnesses have also been received, but not confirmed.

Because symptoms of toxin ingestion or contact may be relatively mild, they can appear as non-specific or can occur after a significant time delay, there may be an underreporting of medical issues for both people and animals (pets and livestock) associated with cyanobacteria.

There is ongoing research on potential health effects of exposure to the toxins produced by some species of cyanobacteria. The Vermont Department of Health evaluates any new findings and makes updates to guidance materials as necessary.

Possible Exposure to Vermonters

Recreational

Public recreational areas that have blooms present or blooms that recently died can expose swimmers to toxins through skin contact, inhalation of water droplets or ingestion of water.

Level of Potential Exposure	<i>Recreational Activity</i>	Primary Exposure Pathway of Concern
High	Swimming/wading	Ingestion
	Diving	Ingestion
	Water skiing/wake boarding	Ingestion/inhalation
	Wind surfing	Ingestion/inhalation
	Jet skiing	Ingestion/inhalation
Moderate	Fish consumption	Ingestion
	Canoeing	Inhalation/skin
	Rowing	Inhalation/skin
	Sailing	Inhalation/skin
	Kayaking	Inhalation/skin
	Motor boating	Inhalation
Low/none	Catch and Release fishing	Skin
	Hiking	Not applicable
	Picnicking	Not applicable
	Sightseeing	Not applicable
		(Based on Stone and Bress, 2007)

Drinking Water

Also non-treated household water supplies that are pumped from waters with cyanobacterial blooms may have exposures through drinking, bathing, and other activities.

Assessment of Blooms

Local visual monitoring programs for cyanobacterial blooms can be an effective alternative management approach to costly and time-consuming analytical testing. To initiate a local monitoring program there are several suggested steps.

Key stakeholders in a community should be identified

Local Watershed Groups or Associations: These groups already have an interest in the water quality of the area. They know the lakes and ponds within the region and may already have monitoring or tracking programs in place for other water contaminants or nuisance species.

Vermont Watershed Management Division: This group is responsible for water quality issues in the state and can provide assistance in responding to the underlying causes of cyanobacteria blooms. www.vtwaterquality.org

Beach Managers: Private and public lakes and ponds may have managers already monitoring the waters to ensure safe recreational waters and are a good resource. They can include: State Parks, Local Parks and Recreation Departments, Army Corps of Engineers, and camp owners.

Health Officials: Local state or town health officials can assist with technical assessments and obtaining direct help from other state or federal agencies. Local district health offices may be able to provide guidance in environmental health issues. http://healthvermont.gov/local/district/district_office.aspx#find

Local Science Teachers: Teachers may have access to microscopes or other equipment that may be useful in identifying types of cyanobacteria. Additionally cyanobacteria can be used in curricula as examples of real-life science.

Agricultural and Veterinary Community: In Vermont, most reported cyanobacterial illnesses have been seen in dogs. Additionally, there is significant concern about livestock, who potentially could ingest large quantities of water.

Public water supply operators: Operators who have intakes that may be impacted by a cyanobacterial bloom play a key role in protecting public health.

Interested Community Members: Visual Monitoring Programs for cyanobacteria can be very low intensive and require little input. Community members can be easily trained to assist in monitoring for cyanobacteria.

Development of Monitoring Plans

Where to Monitor

During the winter or early spring key stakeholders should meet and begin to identify lakes and ponds of concern. Waters of highest concern can be those which have had cyanobacterial blooms in the past and pose a moderate to high risk related to the use of the water. To be considered in ranking:

Priority Ranking	Description of blooms	Implications for monitoring
1	Waters where blooms occur annually for at least a short period of time	Monitoring will enhance capability to determine sporadic blooms that may be missed.
2	Waters that have periodic blooms, not necessarily annually	Monitoring will identify conditions and locations that may cause blooms. Frequent monitoring of these waters will not be cost-effective because of the limited appearances and typically low health threat.
3	Waters that have never had a bloom reported	Monitoring will likely indicate no blooms of health concerns and would be misuse of resources.

Key criteria for concern:

Cyanobacterial blooms in the past and

- Recreational beaches
- boat launches or fishing accesses (particularly where dogs may play in the water)
- Areas near drinking water intakes (public or private)
- Likelihood of other recreational activities (jet skiing, kayaking etc)
- Areas that provide water for livestock or field irrigation.

Frequency of Monitoring

Frequency of monitoring or inspecting lakes and ponds will depend on water use and exposure frequency and past occurrences of blooms.

Designated bathing areas with an historical record of blooms should be monitored on a consistent basis. At the beginning of the summer, **every two weeks** should be sufficient. If dense populations are noted, weekly monitoring should begin. Postings at the designated beach area with a local contact number could help with passive monitoring: allowing beach users to report any possible sightings and initiate consistent monitoring by trained volunteers.

All drinking water intakes should be monitored regularly for the appearance of blooms near the intake.

Identification of Cyanobacteria

Initially, the correct identification of cyanobacteria can be challenging. Appendices A and B provide photos and guidance for determining what is or is *not* cyanobacteria.

Monitoring Categories

When monitoring, assign the waterbody to a standard category based on the guide in Appendix B. Sample data sheets are provided in Appendix F. At a minimum it is important to note:

- Name of the waterbody;
- Identifiable location on the water (e.g., access point, public beach name);
- Date of observation;
- Time of observation;
- Rating of Visual Observation (*i.e.*, Category 1, 2, or 3);
- Approximate size of area affected (e.g., entire bay, sporadic shoreline accumulations).

Other data may be collected such as recent weather, air and water temperature.

Suggested Actions Based on Visual Monitoring System:

- i) **Category 1** indicates no to little cyanobacteria. Health risks from the cyanobacteria are not likely.
 - (1) *Notifications*: Not needed
 - (2) *Further monitoring*: Continue on same frequency
 - (3) *Posting*: Not needed
 - (4) *Other actions*: None
- ii) **Category 2** indicates that cyanobacteria are present in low to moderate amounts. Depending on duration of bloom, toxin production is likely low and toxins, if present, are contained in the cells

- (1) *Notifications*: Local notifications may be appropriate so that surveillance for potential health effects are increased and preparations for possible testing are initiated. If the area is publicly used, notify the local Town Health Officer, local District Health Office, the Watershed Management Division and Beach Manager.
 - (2) *Further monitoring*: Monitoring of a Category 2 area should be increased to weekly.
 - (3) *Posting*: May be appropriate to alert water users to be on the *look out* for possible blooms and to avoid them. (Appendix E)
 - (4) *Other actions*: None
- iii) **Category 3** indicates cyanobacteria are present in moderate to high amounts. Potential for adverse health effects are possible if toxins are present and people or animals are exposed.
- (1) *Notifications*: Continued local notifications are appropriate. If not previously notified, contact the local Town Health Officer, local District Health Office, the Watershed Management Division and the Beach Manager. If all water users cannot be contacted directly *via* postings or other methods, a media release may be appropriate (See Appendix C for sample). Consider notifications to local healthcare providers and veterinarians.
 - (2) *Further monitoring*: Continue weekly monitoring until two consecutive weeks without a bloom presence.
 - (3) *Posting*: Public areas that have heavy blooms may be posted to alert water users to potential issues and closed for recreation. (Appendix E)
 - (4) *Other actions*:
 - (a) It is recommended that recreational beaches with blooms should be posted and closed. Toxin testing should be considered prior to reopening. See Beach reopening guidance in Appendix D.
 - (b) Upon notification, the Vermont Department of Health can add the public beach closings as a result of cyanobacteria to its website, where the public can also find links to FAQs and other informational materials.

Toxin Testing

The Vermont Department of Health Public Health Laboratory has the capability to test for two types of toxins from cyanobacterial blooms. The Laboratory can analyze for microcystin-LR and anatoxin-(a). In *most* cases toxin testing is not required for these periodic blooms. Kits can be bought from the VDH Laboratory by calling 1-800-660-9997.

For Private Drinking Water Supplies: KIT BGA-2A and KIT ANA

For Private Swimming Waters BGA-3 and KIT ANA

The Vermont Department of Health recommends analyzing for toxins when blooms appear at public beaches and at drinking water intakes.

When a cyanobacterial bloom appears at a public beach, the Vermont Department of Health recommends beach closure. The wide degree of variability of toxins makes it impossible to characterize the risk. When the bloom ends, testing is then recommended to check and ensure that toxins, if present, are below established guideline values. Current Vermont Department of Health beach guidelines are in Appendix D.

If a bloom appears near or over a private water intake pipe, the Vermont Department of Health recommends switching to a known safe source of water (bottled or other) for all water uses. Private water supplies can be tested after the bloom has gone away to check for toxins.

If a bloom appears near a public water intake, the operator should consult with the Drinking Water & Groundwater Protection Division of the Department of Environmental Conservation for testing and operational guidance.

State assistance for drinking water supply concerns

Operators of **Public** Water Supplies that have concerns regarding cyanobacterial blooms should call the Drinking Water & Groundwater Protection Division of The Vermont Department of Environmental Conservation for advice and consultation. A Guidance Practice for cyanobacterial Toxins is maintained by the Drinking Water & Groundwater Protection Division.

Drinking Water & Groundwater
Protection Division 1 National Life Drive,
Main 2 Montpelier, VT 05620-3521

Toll-free in Vermont: 1-800-823-6500
Outside Vermont: 1-802-828-1535

Voluntary Reporting

There are no requirements to report cyanobacterial blooms to the state. However, the information that communities provide can be very valuable to the state agencies. Reporting of a bloom is coordinated through the Department of Health. Monitors can call 1-800-439-8550 to report the sightings. Additionally any data collected by monitoring groups can provide valuable insight into the health of Vermont lakes and ponds and can be submitted at the end of the monitoring season, usually late September.

Any health effects for animals and humans are very important to track. There is no requirement to report health effects, but if a treating healthcare provider, veterinarian or other suspects ill health effects, the Vermont Department of Health would appreciate the information. The Vermont Department of Health has a Public Health Veterinarian, a State Toxicologist and a Medical Epidemiologist to assist in suspected cases. Additionally, the CDC has requested assistance from Vermont to track any suspected cases.

Appendices

Appendix A: Ways to identify a cyanobacteria/blue-green algae accumulation

STEP 1 Examine the material visually:

NOT cyanobacteria if :

- you can see leaf-like structures or roots
- the material is long and stringy, or can be lifted out of the water on a stick
- if it is firmly attached to plants, rock or the bottom (e.g. you can't lift it out)

MAY be potentially hazardous cyanobacteria if :

- the material consists of small particles that are pinhead size or smaller
- the material is collecting in a layer at the surface or along the shoreline
- the water is murky and colored a brownish green, milky green or blue

STEP 2 Do the "float" test:

Many cyanobacteria can regulate their buoyancy and will float to the top of the water when it is calm. Most other algae don't have this ability. Most debris and plant material will sink or be identifiable as debris. Microscopic animals will swim randomly and often with a jerky motion.

You can check to see if cyanobacteria are present by filling a clear 2L soda bottle or a bucket with water. The water should be collected away from any debris or large plant material floating along the shoreline. Allow the bucket or bottle to stand in a quiet sunny place, out of the wind. If present, cyanobacteria will often begin to move toward the surface. Wait 15 – 30 minutes and observe the upper portion of the container. Cyanobacteria, which may be a mix of several different kinds, will tend to accumulate in the upper portion while debris and plant material will be at the bottom. There may be smaller material in the middle, which will remain suspended for some time. When filling the container from a dense accumulation, minimize skin contact with the material by wearing gloves or a plastic bag over your hands.



Cyanobacteria

A thin layer of cyanobacteria at the top is usually not a problem. Cyanobacteria are found in most water bodies at concentrations that are not of concern. If you have ruled out non- cyanobacteria using the steps above, and there is a thick layer that is more than an inch deep at the top of the container, it may be prudent to have the sample examined microscopically.

Be aware that the concentration of cyanobacteria at a location can change daily, even hourly, as the weather conditions change. If you do the float test routinely, you will begin to become familiar with how the water and cyanobacteria look under different conditions. Also, cyanobacteria may not always move to the surface in 30 minutes. If there is a bloom in progress, with a large amount of cyanobacteria in the water, at least a portion should move toward the surface. With experience, you will become familiar with how your lake looks and when conditions warrant a closer examination.

ads 8 Aug 2005/edited Lab 12/2008

Appendix B: Visual Assessment and Common Misidentifications (Photos)

A Visual Assessment of Cyanobacteria (Blue-green Algae) Presence

The goal is to assist you in determining whether cyanobacteria are likely present in your water by making a series of visual observations. Begin by observing the water or the shoreline. Don't disturb it or create waves. Select the best description from the following options:

CATEGORY 1 – LOW RISK OF CYANOBACTERIA

1. The water is clear. There is no visible floating material. There are few visible particles. The water does not look cloudy brown or green. If near shore, the bottom is clearly visible more than 5 feet out. If offshore, canoe paddles or boat hook clearly visible well below the surface.



2. The water is mostly clear. The bottom is visible several feet out from shore. Canoe paddle or boat hook is visible several feet below the surface.



2a. Material is present in long strands or hairs that tangle around paddles or boat hooks **OR** material is made of small particles bright mustard yellow or grass green in color.



Pine pollen- Lake Champlain



Duckweed - Lake Champlain



Floating green algae



Attached green algae

CATEGORY 2 – CYANOBACTERIA ARE PRESENT IN LOW NUMBERS

Small particles are not mustard yellow or bright green **OR** particles can be seen distributed in a thin dispersed layer at the surface or along the shore.



Cyanobacteria



Cyanobacteria (photo courtesy of Mel Effron, 2006)

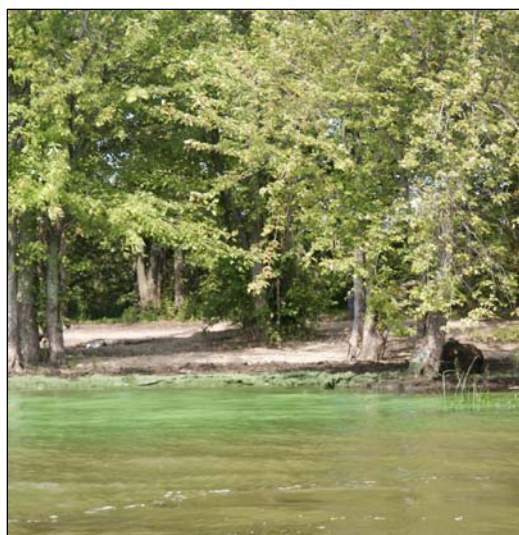
CATEGORY 3 – CYANOBACTERIA ARE PRESENT IN HIGH NUMBERS

The water is discolored and cloudy. The bottom is not visible close to shore. Canoe paddles or boat hooks are not easily distinguished below the boat.



Cyanobacteria

a. Particles are easily seen throughout the water. They may resemble tiny hairs, pinheads, or globs. Though not in a clear layer, there are visibly more particles near the surface or along the shoreline.



Cyanobacteria

b. Particles are present in a thick layer at the surface or along the shoreline. The accumulated material may be pale green, greenish-blue or blue in color.



Appendix C: BGA Health Alert Template

Blue-green algae blooms have recently been observed in areas near _____ . (If toxin testing performed then: Samples from toxin tests indicated levels of toxin which/did not exceeded Vermont beach health guidelines. Based on conditions in these areas the following recommendations to residents and lake users have been advised:

- Avoid contact with algae contaminated water (swimming, bathing etc.). Pay close attention to children as they are at higher risk.
- Monitor water intakes for private residences, if algae are present near intake switch to alternate known safe source of water. Do not use algae contaminated water to prepare meals or brush teeth. Note that boiling water will not remove toxins.
- Do not allow pets in algae contaminated water.

Public water suppliers in the area are monitoring water supplies closely. (if appropriate)

Skin contact with algae contaminated water can cause irritation or rashes. If people or pets come into contact with water, promptly shower or rinse off in uncontaminated water. Swallowing algae contaminated water can result in diarrhea, vomiting, or nausea. Seek medical attention if you feel you have been exposed to blue green algae and are having adverse health effects.

The Vermont Department of Health Laboratory can test for blue green algae toxins call at 1-800-660-9997 to purchase a kit. (Kit BGA-2A and Kit ANA Drinking Water Supplies or BGA-3 and Kit ANA for Private Swimming Waters)

For photos, information visit the Vermont Department of Health's website at: http://healthvermont.gov/enviro/bg_algae/bgalgae.aspx.

Also contact the _____ for more information.

Appendix D: Recreational (Public) Beach Guidance

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

- Visible known blue-green algae bloom/scum or an unknown, potentially blue-green algae (*i.e.*, **not** pollen), bloom/scum
- Microcystin-LR (equivalents) concentration greater than or equal to 6 ug/L (ppb)
- Anatoxin-a concentration greater than or equal to 10 ug/L (ppb)

Reopen beach only if **all** three of these conditions are met:

- No visible blue-green algae bloom/scum
- Microcystin-LR (equivalents) concentration is less than 6 ug/L (ppb)
- Anatoxin-a concentration is less than 10 ug/L (ppb)

Stipulations:

A.) If the type of blue-green algae bloom at the beach can be identified and the toxin(s) produced by the identified type(s) is (are) known, laboratory testing and criteria for toxins may be narrowed to those specific toxins. (For instance, UVM and/or DEC staff personnel identify species in the field/laboratory)

For example, a blue-green algae bloom is identified as containing only algae that produces microcystins (no anatoxin-a). Anatoxin-a criteria for reopening will be assumed to be met and not need to be sampled/analyzed. Only the other two conditions will need to be met.

That is:

- No visible blue-green algae scum **and**
- Microcystin-LR (equivalents) concentration is less than 6 ug/L (ppb)

B.) For instances where both Microcystin-LR and Anatoxin-a are found greater than the reporting limit, but less than their respective individual guidance value, a case-by-case evaluation can be performed by the State Toxicologist to determine if the concentrations of the toxins poses a threat to the public's health at the beach.

Any questions regarding blue-green algae beach closings can be directed to Environmental Health section of the Vermont Department of Health at 1-800-439-8550.

For information on Laboratory testing and kits call the Vermont Department of Health Laboratory at (800)-660-9997 (VT only) or (802)-863-7335.

Information, photos and answers to Frequently Asked Questions can be found at the Vermont Department of Health website:
http://healthvermont.gov/enviro/bg_algae/bgalgae.aspx

Appendix E: Template Signs for Postings:

HEALTH ALERT

**Keep children and pets
away from**



ALGAE



Water may be green, blue, brown, red or appear cloudy. A thick foam or mat may be on the shoreline. Some algae may cause illness.

To report algae or for more information call

1-800-439-8550

or visit healthvermont.gov

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



Appendix F: Sample Data Sheet

Monitoring Data Sheet For Cyanobacterial Blooms in Vermont

Date of Assessment:_____

Weather Conditions (sunny, rainy, approximate temperature):

Name of Waterbody and Owner:

Location (as specific as possible, town, beach name or other easily identifiable landmarks nearby):

Category of Bloom (1, 2, or 3):_____

Previous Occurrences of Blooms?

- Never
- Occasional (short periods of blooms, not on annual basis)
- Occasional (short periods of blooms, annually)
- Frequent (blooms annually)

Usage at this location.

➤ Number of people (approximate) who use water daily:_____

➤ Number of animals (approximate) who use water daily:_____

➤ Type of water usage (check all that apply):

- Swimming or other full body contact activities (posted as a beach)
- Swimming or other full body contact activities (not a posted beach area, i.e., swimming hole)
- Boating (non-motorized)
- Boating (motorized)
- Drinking Water (Private Intake)
- Drinking Water (Public Intake)
- Fishing

Appendix G: References

Centers for Disease Control

Harmful Algal Blooms (HABs)

<http://www.cdc.gov/nceh/hsb/hab/default.htm>

Integrated Environmental Assessment and Management

Addressing Public Health Risks for Cyanobacteria in Recreational Freshwater:
The Oregon and Vermont Framework, 2006

<http://www.ncbi.nlm.nih.gov/pubmed/17283602>

Interagency Working Group on Harmful Algal Blooms, Hypoxia, and Human Health of the Joint Subcommittee on Ocean Science and Technology.

Scientific Assessment of Freshwater Harmful Algal Blooms, 2008

http://www.cop.noaa.gov/stressors/extremeevents/hab/habhrca/FreshwaterReport_final_2008.pdf

Lake Champlain Committee

Blue Green Algae

<http://www.lakechamplaincommittee.org/lcc-at-work/algae-in-lake/>

Providence of Quebec

Procedure to follow if blue-green algae blooms are detected

http://www.mddep.gouv.qc.ca/eau/algues-bv/procedure2008_en.pdf

Scottish Executive Health Department

Blue-Green Algae (Cyanobacteria) in Inland Waters: Assessment and control of Risks to Public Health, 2002

<http://www.scotland.gov.uk/Publications/2002/05/14852/5339>

Vermont Department of Environmental Conservation

Cyanobacteria in Vermont

http://www.vtwaterquality.org/lakes/html/lp_cyanobacteria.htm

Vermont Department of Health

Cyanobacteria, Blue-Green Algae

http://healthvermont.gov/enviro/bg_algae/bgalgae.aspx

World Health Organization

Guidelines for drinking-water quality, 2008

http://www.who.int/water_sanitation_health/dwq/gdwq3rev/en/

World Health Organization

Guidelines for Safe for Safe Recreational Waters, 2009

http://www.who.int/water_sanitation_health/bathing/srwe1/en/

World Health Organization

Toxic Cyanobacteria in Water, 1999

http://www.who.int/water_sanitation_health/resources/toxicyanbact/en/

Appendix H: Abbreviations

BGA	Blue-green Algae
CDC	Centers for Disease Control
DEC	Department of Environmental Conservation
LCBP	Lake Champlain Basin Program
LCC	Lake Champlain Committee
LPS	Lipopolysaccharide
USEPA	United States Environmental Protection Agency
UVM	University of Vermont
VDH	Vermont Department of Health
WHO	World Health Organization

Appendix I: Vermont Contacts

To report blooms, health effects or for questions about test results:

The Vermont Department of Health Environmental Health
108 Cherry Street
PO Box 70; Drawer 30
Burlington, VT 05402-0070

Toll-free in Vermont: 1-800-439-8550
Outside Vermont: 1-802-863-7220

To Purchase Laboratory Kits:

The Vermont Department of Health Laboratory
195 Colchester Ave.
PO Box 1125
Burlington, VT 05402-1125

Toll-free in Vermont: 1-800-660-9997
Outside Vermont: 1-802-863-7335

Website: http://healthvermont.gov/enviro/bg_algae/bgalgae.aspx

For Technical Assistance with Identification:

Vermont Department of Environmental Conservation:
Watershed Management Division www.vtwaterquality.org
1 National Life Drive, Main 2
Montpelier, VT 05620-3522
802-828-1535

For Technical Assistance for Public Water Suppliers:

Vermont Department of Environmental Conservation:
Drinking Water and Groundwater Protection Division www.vermontdrinkingwater.org
1 National Life Drive, Main 2
Montpelier, VT 05620-3522

Toll-free in Vermont: 1-800-823-6500
Outside Vermont: 1-802-828-1535