

Cyanobacteria Blue-Green Algae (Part II)

To see Part I of the Harmful Algal Blooms (HABs)
in Ohio Waters 2010 presentation visit:

<http://www.odh.ohio.gov/~media/ODH/ASSETS/Files/eh/HABs/HAB2010prespart1.ashx>



Photo: Grand Lake St. Marys
St. Marys, Ohio 2010



ODH Involvement (cont.)

In the Summer of 2009 there was a microcystin (Planktothrix) bloom ~82 ppb.

**In June of 2010 new toxins were detected that were associated w/ different species of cyanobacteria
Saxitoxin -
Cylindrospermopsin
& Aphanizomenon**



Photo: Grand Lake St. Marys
St. Marys, Ohio 2010



ODH Involvement (cont.)

July 2010: Highest levels of microcystin detected (>250 ppb up to 2,000 ppb).

The initial community concerns and complaints centered on unpleasant odors, dead fish and the appearance of scums on the lake.

**July – August 2010:
1st reported illness
persons and animals.**

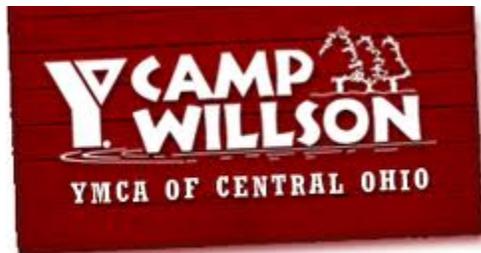


Photo: Grand Lake St. Marys
St. Marys, Ohio 2010



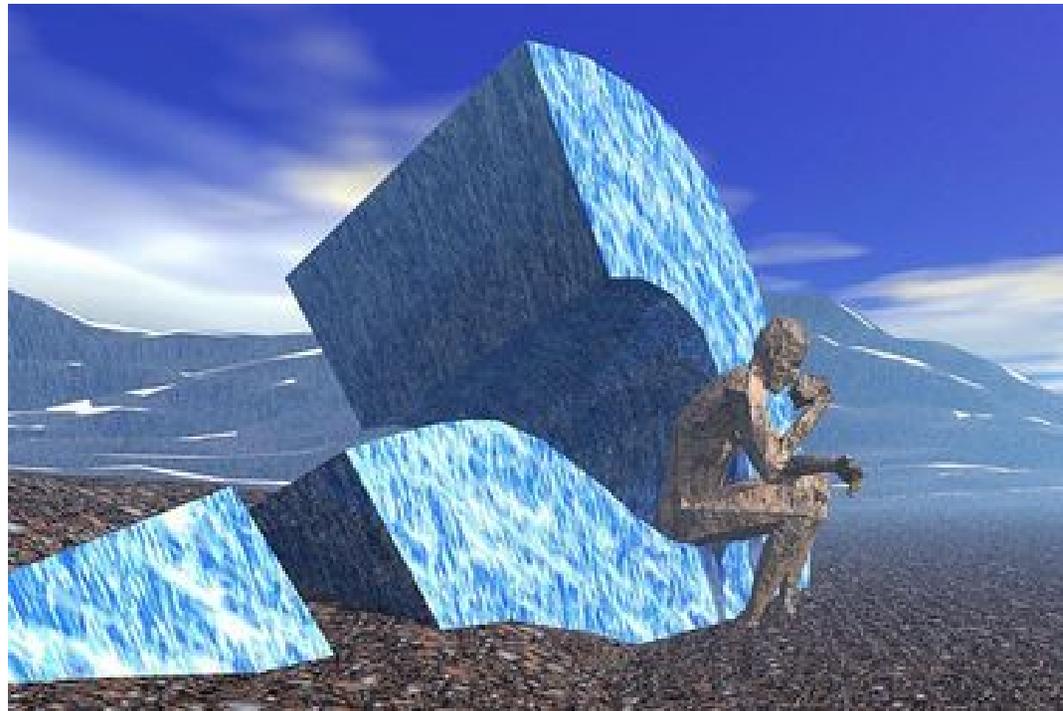
ODH Involvement (cont.)

Camp Wilson, Silver Lake - YMCA camp near Bellefontaine, OH also reported an illness event of staff and campers who recreated in the camp lake. Microcystin levels >1,000 ppb and 19 confirmed cases of staff/kids who presented at local ER with gastrointestinal-type illness as well as rashes.



What we discovered:

We discovered that there was very little information available and that the information that was available, there were a lot of variability and uncertainty.



A multi-agency workgroup was established with representatives from the ODH, Ohio EPA, Ohio Dept. of Natural Resources (ODNR), Ohio Dept. of Agriculture.

ODH contacted the following national/ international HAB experts and requested their assistance:

- ❖ **CDC/NCEH : Lorraine Backer**
- ❖ **USGS: Keith Loftin**
- ❖ **Wright State University Professor (retired): Wayne Carmichael**
- ❖ **CDC/ATSDR Michelle Watters**



ODH Web Site/Documents

<http://www.odh.ohio.gov/odhprograms/eh/HABs/HABDocumentsResources.aspx>

General fact sheet on Cyanobacteria and HABs

 <p>Bureau of Environmental Health Health Assessment Section</p> <p>"To protect and improve the health of all Ohioans"</p>	Blue-Green Algae/Cyanobacteria Harmful Algal Bloom (HABs)
What are Blue-Green Algae? <p>Cyanobacteria, often called blue-green algae, are bacteria that are naturally found in Ohio lakes, ponds, and slow-moving streams. Although many species of algae do not produce toxins, some species of blue-green algae can cause Harmful Algal Blooms (HABs). HABs can produce neurotoxins (which affect the nervous system) and hepatotoxins (which affect the liver). These toxins can potentially impact the health of people who come into contact with water where HABs are present in high numbers.</p>	Can you get sick from exposure to Blue-Green Algae (cyanobacteria toxins)? <p>Yes, you can get sick from exposure to cyanobacteria toxins. But getting sick will depend on the type of cyanobacteria, the levels in the water and the type of contact you had with this "algae." Read more about this on the next page.</p>
Why does massive growth of Blue-Green Algae occur in the environment? <p>Under the right water conditions, which usually occur in the warmer months, the number of these blue-green algae can dramatically increase, or "bloom." Some blooms can be visible as thick mats or scum on the surface of the water, while others can be present without visible surface scum. The mats or scum can vary in color and could be bluish-green to red in color.</p>	Can the cyanobacteria toxins be released to the outside air and pose a health hazard? <p>The chemical toxins produced by these blue-green algae do not volatilize (change from a liquid to a gas) and they are not released as vapors to the outside air. However, recreational activities like power boating, water-skiing, jet-skiing and tubing can whip up the surface of the water and create aerosols – toxin-containing water droplets – that can be inhaled or ingested, potentially resulting in negative health effects. Other activities that have the potential to aerosolize the lake water include using the lake water to irrigate (spray) lawns/gardens and golf courses.</p>
<p>It is important to note that not all "blooms" produce toxins. Scientists do not fully understand what causes the same species of algae to trigger toxin production during one bloom and not produce toxin during the next.</p> <p>Blue-green algae need warm temperatures, sunlight, phosphorus, and nitrogen to reproduce. Phosphorus and nitrogen are commonly found in animal and human waste and in fertilizers. Some common ways for phosphorus and nitrogen to enter lakes and streams are from agricultural and residential lawn runoff, improperly functioning septic systems, and erosion of nutrient-rich soil.</p>	Are the odors associated with Blue-Green Algae hazardous to my health? <p>Some of the blue-green algae produce an odor-generating byproduct, named geosmin. The human nose is extremely sensitive to geosmin and is able to detect it at concentrations at very low levels. These odors are not chemically toxic but do have a very unpleasant smell which can cause sensitive individuals to become nauseated (upset stomach, vomiting) and have headaches.</p>
	<p>For more information about how odors can impact health, visit the ODH HAS program Web site at www.odh.ohio.gov/odhPrograms/eh/htn_as/Htn_As2.aspx and choose the menu item "Health Assessment Section Fact Sheets" and select the "Odors and your Health" fact sheet.</p> What is the safe level for algal toxins in water? <p>The World Health Organization set guidelines for microcystin toxin (a toxin produced by cyanobacteria) at 1 part per billion (ppb) in drinking water and 20 ppb for recreational waters. Currently, no similar guidance exists for the other toxins produced by cyanobacteria.</p>

How do you come in contact with Blue-Green Algae and HABs?

- Ingestion (drinking) untreated water or incidentally swallowing water during recreational activities that comes from a lake or reservoir with HABs.
- Dermal (skin) contact by swimming and other recreational activities in HAB-contaminated waters.
- Inhaling aerosolized water droplets (misting) from water-related activities such as jet-skiing, power boating, tubing, or water skiing.
- The incidental swallowing or inhalation of aerosolized water droplets when watering lawns, gardens and golf courses with contaminated water.

What types of health problems can people and pets experience from exposure to HIGH concentrations of HABs?

- **Skin contact:** Contact with the skin may cause rashes, hives, or skin blisters (especially on the lips and under swimsuits).
- **Inhalation of (breathing) water droplets:** Breathing aerosolizing (suspended water droplets-mist) from the lake water-related recreational activities and/or lawn irrigation can cause runny eyes and noses, a sore throat, asthma-like symptoms, or allergic reactions.
- **Swallowing water:** Swallowing HAB-contaminated water can cause:
 - Acute (immediate), severe diarrhea and vomiting
 - Liver toxicity (abnormal liver function, abdominal pain, diarrhea and vomiting)
 - Kidney toxicity
 - Neurotoxicity (weakness, salivation, tingling fingers, numbness, dizziness, difficulties breathing, death)

Is it safe to eat fish caught from HAB-contaminated water?

Some studies have shown that cyanotoxins can accumulate in fish in waters with high toxin levels. While there have been no confirmed reports of cyanotoxin-related human health effects related to fish consumption, there are few data on cyanotoxins on which to base judgments about health risk. Should you decide to consume fish, you would do so at your own risk, and should remove intestines, fat and skin, consuming only the fillet.

How to protect yourself, your family, and your pets from exposure to HABs:

- Don't swim, water-ski, or boat in areas where the blooms are occurring – avoid direct contact with the lake water or aerosolizing the water.
- Don't water lawns, gardens, or golf course with water from HAB-impacted lakes or ponds.
- Report unpleasant tastes or smells in your drinking water to your local water utility.
- Follow posted water body closures announced by state agencies or local public health authorities.

How to treat people or animals that have been exposed to HAB toxins:

- If you do come into contact with the HAB – contaminated water, rinse off with clean, fresh water as soon as possible.
- Pets that have been swimming in an area with an algae bloom may ingest significant amounts of toxins by licking their fur after leaving the water. Thoroughly rinse of your pets with clean, fresh water.
- Seek medical treatment ASAP if you think you, your pet, or your livestock might have been poisoned by toxic HABs.
- Remove people from the exposure and treat the symptoms.

For additional information:

This ODH fact sheet is intended to be a simplified and shorter version of the available information on HABs. For more in-depth analysis and documentation, visit the following information on the CDC and Wisconsin web sites listed in the below reference section.

References:

CDC Facts About Cyanobacteria and Cyanobacterial Harmful Algal Blooms (electronic July, 2010)
www.cdc.gov/hab/cyanobacteria/pdfs/facts.pdf

CDC, Environmental Hazards & Health Effects, Harmful Algal Blooms (HABs), (electronic July, 2010)
www.cdc.gov/hab/cyanobacteria/facts.html#reat

Wisconsin Division of Public Health, Human Health Hazards, Algae Blooms: Blue-Green Algae/Cyanobacteria (PPH 45069 06/2004). Hazards, Algae Blooms: Blue-Green Algae/Cyanobacteria (PPH 45069 06/2004).

Wisconsin Department of Health Services, Blue-Green Algae (electronic July, 2010)
www.dhs.wisconsin.gov/eh/bluegreenalgae/

ODH HAB Physician Reference

 **Bureau of Environmental Health Health Assessment Section**
"To protect and improve the health of all Ohioans"

Blue-Green Algae/Cyanobacteria Harmful Algal Bloom (HABs) Physician Reference

The Public Health Issue:
This summer Ohio's local health departments, local physician offices, Poison Control Centers and the state health department have received reports of illness from people who have claimed to have had contact with HAB-contaminated water. Several of Ohio's inland lakes have experienced cyanobacteria blue-green algae blooms, commonly referred to as Harmful Algal Blooms (HABs). Depending on the genera, water conditions, and other factors, neurotoxins, hepatotoxins, cytotoxins, dermatotoxins and gastrointestinal toxins can be produced by cyanobacteria. These toxins are released to the water as the bacteria die. Water samples from various Ohio lakes have detected the presence of microcystin, anatoxin-a, cylindrospermopsin and saxitoxin. Both humans and animals can experience illness from exposure to these toxins during recreational activities and other water uses.



Exposure and Clinical Presentation:

Route of Exposure	Symptoms/Signs	Time to symptom onset*	Differential Diagnosis
Swallowing water contaminated with cyanobacteria or toxins	Hepatotoxins (microcystins, cylindrospermopsin) Elevated AST/ALT, GGT Gastroenteritis Acute hepatitis Kidney damage Malaise Headache Anorexia	Minutes to hours	Other hepatotoxin poisoning, other microbial infections/toxins Viral hepatitis Viral Gastroenteritis Hepatotoxic drug ingestion (acetaminophen)
Swallowing water contaminated with cyanobacteria or toxins	Neurotoxins (anatoxin-a, anatoxin-a[ps], saxitoxin) Paresthesia Tremor Fasciculations Hypersalivation Diarrhea Ataxia Motor weakness Respiratory and muscular paralysis	Minutes to hours	Pesticide poisoning, other toxin poisoning
Skin contact with water contaminated with cyanobacteria or toxins or contact with animals contaminated with cyanobacteria	Dermal toxins (Lyngbyatoxins, lipopolysaccharide endotoxins) Rash, hives Skin blistering Allergic reactions	Minutes to hours	Other dermal allergens, non-allergic urticaria, photosensitivity reactions
Inhaling aerosolized droplets contaminated with cyanobacteria or toxins	Upper respiratory irritation Rhinitis Possible allergic reaction	Unknown, but likely an acute reaction	Other airborne allergens, upper respiratory infection, flu

* Symptom onset times are primarily extrapolations from laboratory animal data and events.
be found at: <http://odhiojin.sso.odh.ohio.gov/LHDdirectory/NetMgr/ODHList.aspx>

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ODH, with assistance from the Centers for Disease Control and Prevention, has developed case definitions and the following human illness reporting form for HAB-related illnesses:

HAB-related human illness report:
www.odh.ohio.gov/ASSETS/73AB58EA30EB4F28944F86211E0E6905/HAB-Related%20Human%20Illness%20Form-%2008-08-2010.pdf

Animal Illness:
Reports of suspected domestic animal illness associated with exposure to HAB should be reported to the Local Health District. Local health districts receiving reports from veterinarians should contact the ODH Zoonotic Disease Program (ZDP) at 614-752-1029, select option two (2). Completed animal illness report forms can be faxed to the ODH ZDP at 614-644-1057.



HAB-related animal illness report:
www.odh.ohio.gov/ASSETS/F142B8DF087B4B56B71650082F4F72C6/Animal%20HAB-Related%20Illness%20Form.pdf

Diagnosis and Lab Testing:

Currently there is no laboratory diagnostic testing which can confirm the presence of cyanotoxins in human clinical specimens. In the absence of laboratory confirmation, presumptive diagnosis can be made based upon exposure history, clinical signs and symptoms, and ruling out other diagnoses. In cases where exposure to hepatotoxins is suspected, a standard liver panel is recommended (AST (SGOT), ALT, ALP, GGT, albumin and bilirubin). Tests for ruling out other diagnoses should also be performed.

Case Definition:

CDC case definition summary for selected toxins (for complete description see CDC Proposed Case Definitions for Algal Toxin-related Diseases)

- **Suspect Case** Exposure to water with a confirmed algal bloom AND onset of associated signs and symptoms within a reasonable time after exposure AND without identification of another cause of illness.
- **Probable Case** Meets criteria for Suspect Case AND there is laboratory documentation of a HAB toxin(s) in the water.
- **Confirmed Case** Meets criteria for a Probable Case combined with professional judgment based on medical review.

Freshwater Cyanotoxins	Type of Toxin	Cautative organism	Vector
Anatoxins	Neurotoxin	Anabaena spp. Aphanizomenon spp. Phormidium spp.	Contaminated fresh water
Anatoxin-a(s)	Neurotoxin	Anabaena flos-aquae	Contaminated fresh water
Cylindrospermopsin	Hepatotoxin	Cylindrocapsa raciborskii Aphanizomenon ovalisporum	Contaminated fresh water and possibly fish
Lyngbyatoxin	Dermal toxin	Lyngbya spp.	Contaminated fresh or marine waters
Microcystins	Hepatotoxin	M. aeruginosa Anabaena spp. Phormidium spp.	Contaminated fresh water
Saxitoxins	Neurotoxin	Anabaena circinalis Lyngbya water	Contaminated fresh water

Treatment and Patient Management:

Symptomatic, supportive care. There are currently no known antidotes for exposures to the group of toxins associated with cyanobacteria. Follow-up laboratory testing as indicated.



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- Wisconsin Department of Health Services, Blue-Green Algae
www.dhs.wisconsin.gov/eh/bluegreenalgae/
- Florida
http://www.doh.state.fl.us/environment/medicine/aquatic/pdfs/BG_algae_FAQ.pdf
http://research.mvfw.com/support/view_faqs.asp?id=45
- Wisconsin Department of Natural Resources
<http://www.wisconsin.gov/dnr/wisconsinlakes/ecology/Blue-green%20FAQ%202010.pdf>
<http://dnr.wi.gov/lakes/bluegreenalgae/WisconsinLakesBGA.pdf>

Where can I get more information?
Ohio Department of Health
Bureau of Environmental Health
246 N. High Street
Columbus, Ohio 43215
Phone: (614) 466-1350
Fax: (614) 466-4556

ODH HABs Campground Operators & Privately-Owned Lakes/Ponds

 **Bureau of Environmental Health Health Assessment Section**
Harmful Algal Bloom (HABs) Ohio's Campground Operators and Privately-Owned Lakes and Ponds
 "To protect and improve the health of all Ohioans"

What are Blue-Green Algae?

Cyanobacteria, often called blue-green algae, are bacteria that are naturally found in Ohio lakes, ponds, and slow-moving streams. Although many species of algae do not produce toxins, some species of blue-green algae can cause Harmful Algal Blooms (HABs). HABs can produce neurotoxins (affecting the nervous system), hepatotoxins (affecting the liver) and dermatotoxins (affecting the skin). These toxins can potentially impact the health of people and pets that come into contact with water where HABs are present in high numbers.



Can you get sick from exposure to Blue-Green Algae (cyanobacteria toxins)?

Yes, you can get sick from exposure to cyanobacteria toxins. But getting sick will depend on the type of cyanobacteria, the levels in the water and the type of contact you had with this "algae."

What types of health problems can people and pets experience from exposure to HABs?

- **Skin contact:** Contact with the skin may cause rashes, hives, or skin blisters (especially on the lips and under swimsuits).
- **Inhalation of (breathing) water droplets:** Breathing aerosolized (suspended water droplets) mist from the lake water-related recreational activities and/or lawn irrigation can cause runny eyes and noses, a sore throat, asthma-like symptoms, or allergic reactions.
- **Swallowing water:** Swallowing HAB-contaminated water can cause:
 - Acute (immediate), severe diarrhea and vomiting
 - Liver toxicity (abnormal liver function, abdominal pain, diarrhea and vomiting)
 - Kidney toxicity
 - Neurotoxicity (weakness, salivation, tingling fingers, numbness, dizziness,
 - Difficulties breathing, death

To read more about Cyanobacteria Harmful Algal Bloom (HABs) and how they impact health, visit the ODH home page at www.odh.ohio.gov and select "Harmful Algal Blooms."

How do you know if you have a cyanobacteria (HAB) bloom or a harmless algae/aquatic plant bloom?

Algae blooms can look like foam, scum, or mats on the surface of fresh water lakes and ponds. They can also make the water look green, blue-green without a scum. However, HAB blooms can be blue, blue/green, bright green, brown, or red and may look like paint floating on the water.

To see the photographic difference between HABs and non-toxic common algae blooms, visit the ODH home page and select the "Photos of Algae Blooms" document.

How do I report a HAB?

Ohio EPA is collecting reports of algal blooms in Ohio waters. The Ohio EPA HAB report form is available at: www.epa.ohio.gov/dsw/HAB.aspx.

Note you will need Microsoft Excel to complete the electronic form. If you do not have Excel or if you have any questions about reporting an algal bloom, please contact the Ohio EPA Public Information Center at (614) 644-2160.

When should you sample?

- Privately-owned lakes and ponds should sample their water if they meet the following criteria:
- The private body of water is used for swimming, boating or fishing.
 - The private body of water is used as a drinking water source for people or livestock.
 - The private body of water is located in a residential camp or a licensed campground.

Who conducts sampling? What is the sampling protocol/safety procedures?

The private owner/operator can either hire a consultant or conduct the sampling themselves. If you decide you want to conduct the sampling yourself, it is **very important** you do it in accordance with the sampling protocol established by the Ohio EPA. When sampling, use appropriate safety precautions including wearing rubber gloves and avoid contact with the water and/or scum. For information regarding the Ohio EPA sampling protocol, contact Ohio EPA HAB Coordinator Linda Merchant-Masonbrink at (614) 644-2135 or 644-2001.

Who pays for the sampling?

All costs associated with the testing of a privately-owned lake/pond would be incurred by the owner/operator. Costs may range from \$45 to \$250 per sample depending upon the type of test.

What should you test for?

- The water sample should be tested for the following:
- Identification (ID) of the type of cyanobacteria present (genera).
 - The type of cyanotoxin produced by the type of cyanobacteria identified (microcystin, anatoxin-a, cylindroperomopsin and saxitoxin).

What laboratories are available to conduct the analysis?

When choosing a laboratory, it is important to make sure the lab can identify the different genera of cyanobacteria present and provide an analysis of the individual cyanotoxins detected. The below list of labs are currently used by the Ohio EPA. Please note that the below list is not a comprehensive listing of the available labs and that the Ohio EPA does not offer an endorsement of any particular lab.

BSA Environmental Services, Inc. (Dr. John Beaver)
 23400 Mercantile Rd., Suite 8
 Beachwood, OH 44122
 (216) 765-0582
 (Algae ID and toxin analyses, not anatoxin-a)

Green Water Laboratories/CyanoLab (Dr. Mark Auel)
 205 Zeagler Dr., Suite 302
 Palatka, Florida 32177
 386-328-0882
 (Algae ID and toxin analyses, including anatoxin-a)

Celina Utilities-Water Department (Mike Sudman)
 714 S. Sugar Street
 Celina, OH
 (419) 586-2270
 (microcystin analysis)

Should you post a caution or warning sign?

ODH is recommending that public access waters in Ohio be posted with a caution sign as soon as there is visual evidence of a HAB. ODH recommends that a sign be posted which alerts swimmers/boaters/fishers to "avoid contact with the water." For examples of signs, please contact ODH at (614) 466-1390.

Is it safe to eat fish caught from HAB-contaminated water?

Some studies have shown that cyanotoxins can accumulate in fish in waters with very high toxin levels. While there have been no confirmed reports of cyanotoxin-related human health effects related to fish consumption, there are few data on cyanotoxins on which to base judgments about health risk. Should you decide to consume fish from HAB-contaminated waters, you would do so at your own risk, and should remove internal organs, fat and skin, consuming only the fillet.

For additional information:

This fact sheet is intended to provide basic HAB information to Ohio's Campground Operators and to Landowners of Privately-Owned Lakes and Ponds. For a more detailed discussion of HABs and their impact to public health, visit the hyperlinked references listed below.

Ohio Department of Health
 Bureau of Environmental Health
 246 N. High Street
 Columbus, Ohio 43215
 Phone: (614) 466-1390



References:

- Ohio Department of Health Blue-Green Algae /Cyanobacteria HABs (electronic August, 2010) www.odh.ohio.gov/odhPrograms/eh/hth_as/chemfs1.aspx
- Ohio Department of Health HAB Provider Reference (electronic August, 2010) www.odh.ohio.gov/odhPrograms/eh/hth_as/chemfs1.aspx
- Ohio Department of Health Photos of Algae Blooms (electronic August, 2010) www.odh.ohio.gov/odhPrograms/eh/hth_as/chemfs1.aspx
- Ohio EPA Harmful Algal Blooms (HABs) and Algal Toxins (electronic August, 2010) www.epa.state.oh.us/dsw/HAB.aspx
- Ohio Department of Natural Resources (ODNR) HAB Website (electronic July, 2010) <http://www.ohiodnr.com/tabid/22957/Default.aspx>
- CDC Facts About Cyanobacteria and Cyanobacterial Harmful Algal Blooms (electronic July, 2010) www.cdc.gov/hab/cyanobacteria/pdfs/facts.pdf

ODH Pond Water - Drinking Water Treatment

 <p>Private Water Systems Bureau of Environmental Health <i>"To protect and improve the health of all Ohioans"</i></p>	<p>Pond Water - Drinking Water Treatment of Blue-Green Algae</p>
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The Public Health Issue:

Algae growth has always been regarded as a problem for ponds. Algae in ponds can especially be a problem if the pond is used as a drinking water source or other household uses. Cyanobacteria, often called blue-green algae, are bacteria that are naturally found in Ohio lakes, ponds, and slow-moving streams. Although many species of algae do not produce toxins, some species of blue-green algae can cause Harmful Algal Blooms (HABs). HABs can produce neurotoxins (which affect the nervous system), hepatotoxins (which affect the liver) and dermatotoxins (which affect the skin). These toxins can potentially impact the health of people and pets that come into contact with water (including drinking water) where HABs are present in high numbers.

For more information about HABs and what you need to do if you own a private water body, visit the Ohio Department of Health web page at www.odh.ohio.gov and select the "H" in the A through Z index. In the "H" section, choose Health Assessment Section and then select the Health Assessment Section Fact Sheets menu choice. In the fact sheet section you will see Cyanobacteria – Harmful Algal Blooms (HABs) with four fact sheet choices. We encourage you read HABs Campground Operators – Privately Owned Waters to learn more about HABs in your privately-owned pond and view the Photos of Algae Blooms to see if your bloom is a HAB or the common, non-harmful algal bloom.



Water Treatment Systems for Private Water System Ponds:

The water treatment system for a pond is designed to work in stages to maximize the effectiveness and make the water potable and safe for drinking. During extended periods of warm weather and increased nutrient enrichment, algae blooms in ponds may overwhelm the disinfection and filtration treatment system and may not be as effective at reducing higher levels of the different types of blue-green algae toxins.

Reduction of blue-green algae and the toxins in a pond drinking water system can be accomplished using the following combination of pond management and water treatment:

- > watershed management
- > pond preemptive algae control
- > pond intake placement
- > continuous filtration
- > oxidation with disinfectants such as chlorine or ozone
- > granular activated carbon (GAC) or powdered activated carbon (PAC).

It is important to keep ahead of the common-type algae formations in your pond. It is the responsibility of the homeowner to control their watershed that recharges the pond (Ohio Administrative Code 3701-28-15 (B) (1)). The watershed should be covered with grass or other vegetation. Do not apply fertilizers or other chemicals on the watershed area and do not use the watershed as a pasture. Do not install on-site wastewater treatment systems in the upstream portion of the watershed area. If the watershed is not currently under your control, you should use diversion ditches and swales to make sure the pond water recharge is not originating off of your property. Contact your local Soil and Water District for assistance with any changes you may need to make for watershed control.

A variety of algicides, including copper sulfate, can be used in private water system ponds. Algicides that meet NSF/ANSI Standard 60 must be used and can be found at www.nsf.org. However, it is **very** important to note that using algicides to treat blue-green algal blooms once they have occurred can actually cause more harm because as the blue-green algae die, their cell walls can burst and release more toxins into the water. Therefore, use of algicides for blue-green algae blooms once they have occurred **are not** recommended.

Steps for reducing blue-green algae and toxins from your finished pond water:

Water Intake:

Since the levels of toxins in water usually decrease with depth, the water intake should be placed at lower depths.

- > A floating filter intake should draw water in at between 18 to 36 inches below the surface in the deepest part of the pond. *If algae are still prevalent at this depth consider using another source of water.*

A cased pond intake relies on the bank to filter water and can filter out some the algae before entering the treatment system.

- > If the water appears green in the cased intake, then the filtration that is taking place through the bank is inadequate.

Filtration:

A slow sand filter, pressurized rapid sand filter, or pre-coat filter is the next step in treatment to filter out as many of the blue-green algae cells as possible before the water enters the disinfection system.

- > Pressured rapid sand filters are the most common filters used for drinking water ponds. There is concern that toxins can be released during the back wash cycle as the algae cells burst. If backwashing pressurized sand filters are used in the treatment process, they should be preceded by a coagulation step with a final filter that must be an absolute 1 or 2 micron sized cyst reduction filter. The cyst reduction filter is designed to remove protozoans but can also remove some of the algae cells. (An absolute filter is capable of removing 99% of cells or particles 1 or 2 microns in size or larger)
- > Slow sand filters work simply by gravity and do not have a back wash cycle.
- > Pre-coat (sometimes called diatomaceous earth filters) can filter out very small particles but require extensive maintenance to ensure proper operation.

Disinfection and Oxidation:

The next step is disinfection and oxidation. Chlorine both disinfects and oxidizes. Under normal conditions chlorine residual levels for disinfection are set at 0.2 PPM after 20 minutes of contact time. Note that higher chlorine doses are required to remove many of the blue-green algae toxins.

- > The recommended dose for chlorine in order to remove some of the toxins is 3 mg/l for 30 minutes of contact time with the water. Some of the remaining toxins have to be removed from the water by using granular activated carbon (GAC) or powdered activated carbon (PAC) filter units.

Ultraviolet Light (UV) for Disinfection:

If you are using ultraviolet light (UV) for disinfection it is unlikely that your UV device can provide the high doses required to remove the toxins produced by the blue-green algae. If you have a UV unit, you will need to add a chemical oxidizing stage that uses chlorine, ozone, or other strong oxidizer in order to accomplish removal of the toxins.

Granular Activated Carbon (GAC) or Powdered Activated Carbon (PAC) Filter Units:

For whole house water treatment of the water, use GAC or PAC filters with a bed depth of at least two feet.

- > The three primary types of GAC and PAC filters are coal-based, coconut hull-based, and wood-based. Although all GAC and PAC filters can remove some of the blue-green algae toxins, wood-based GAC filters have been shown to be the most effective.
- > The GAC or PAC filters will also remove other chemicals like tannic acids, chlorine and chlorine by-products.

Sizing the PAC or GAC filter treatment device for removing contaminants should be done by an experienced professional water treatment dealer. Remember that carbon filters only last a certain period of time and the GAC or PAC will need to be replaced. If they are not replaced in a timely manner, the GAC or PAC will cease to work and also could release toxins that had previously been removed.

Any work done on the pond and treatment system must be done by a Private Water System contractor registered with the Ohio Department of Health. You can review a list of Private Water System Contractors at www.odh.ohio.gov/odhPrograms/sh/water/water1.aspx

If you are unsure your pond treatment system is capable of removing the blue-green algae and the toxins from your drinking water, you should consider using an alternative drinking water source or use bottled water during times of increased algal growth. If your choices for alternative water are limited because public water is unavailable or if groundwater is insufficient for water wells, then a hauled water storage tank system should be installed.

Ponds, wells, springs, rainwater cisterns, and hauled water storage tanks used as private drinking water systems are regulated under Ohio Administrative Code Chapter 3701-28 by the local health department. The regulations for ponds include requirements for the watershed management, pond construction, and continuous disinfection and filtration systems. If you have additional questions about ponds as water supplies call your local health department or the Ohio Department of Health (614)-465-1390.

ODH Photo Example of HABs

Examples of Cyanobacteria (Blue-Green Algae)



Examples of Cyanobacteria (Blue-Green Algae)



Examples of Common-Harmless Algae and Aquatic Plants



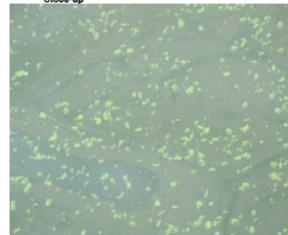
Examples of Common-Harmless Algae and Aquatic Plants



Examples of Blue-Green Algae *Microcystis* Bloom

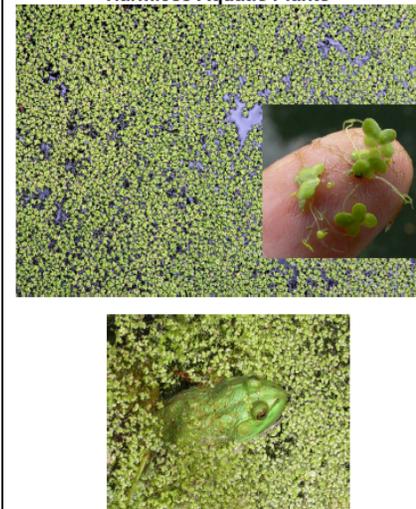


Ohio River *Microcystis* bloom, 8/22/08 Photo by: Jim Crawford, Ohio EPA Emergency Response
Close-up



Ohio River *Microcystis* bloom, 8/22/08 Photo by: Jim Crawford, Ohio EPA Emergency Response

Examples of Duckweed Harmless Aquatic Plants



Revised 08/18/10

Ohio EPA Web Site (2010 web page view)

Translate this Web Site

Ohio.gov | Environmental Protection Agency

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▲ ▲ ▲

Division of Surface Water Harmful Algal Blooms

Division Links

- Division Forms and Publications
- Division Rules and Laws
- Policies and Guidance
- Surface Water Programs
- Related Sites
- Interactive Maps
- Do Business Online
- What's New (October 26, 2010)
- DSW Intranet (OEPA staff only)
- About Us
- Division Contacts
- Division Home

Agency Links

- Divisions and Offices
- Topic Index
- Regulatory Ombudsman
- Rules and Laws
- Pollution Prevention
- Funding Sources
- Publications
- Public Records
- Public Participation
- Resources for Citizens
- Jobs
- Ohio EPA Home

Learn More About

Harmful Algal Blooms (HAB) and Algal Toxins

- Ohio Department of Natural Resources Algae Advisory Update web page - Includes the current advisory levels for state owned bodies of water
- Ohio Department of Health Harmful Algal Blooms web page
 - Managing Harmful Algal Blooms in Private Ponds [PDF]
- Ohio EPA News Releases

Background Information

- Harmful Algal Blooms in Ohio Waters
 - Fact Sheet [PDF 746K]
 - Poster [PDF 5,291K]
- Ohio HAB Initiative [PDF 30K]
- Harmful Algal Blooms - Protect Your Pets and Livestock [PDF 407K]
- Information for Veterinarians [PDF 142K]
- Photo Gallery of Ohio HABs [PDF 767K]
- Algae - Graphic Renderings of Microscopic Appearance [PDF 1,273K]
- Toxin and Taste-and-Odor Producing Cyanobacteria [PDF 68K]
- References of Algal Toxin Impacts on Animals



Algal Toxin Sampling Data for Grand Lake St. Marys Area

All documents are in PDF*

- Grand Lake St. Marys
 - 2009 microcystin data
 - Other GLSM data
- St. Marys River and Beaver Creek
- Miami and Erie Canal

Grand Lake St. Marys Web Page - summary information other than data

Algal Toxin Sampling Data for Other Inland Lakes

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Ohio EPA Web Site (2013 web page view)

<http://epa.ohio.gov/habalgae.aspx>



- Home
- About
- Divisions and Offices
- Do Business
- Citizens and Educators
- News
- How Do I?
- Contact

Ohio Algae Information for Recreational Waters

Algal blooms have become more noticeable in Ohio's lakes, streams and rivers during the last few years.



WATCH VIDEO
Published on June 21, 2012
Watch this video to learn more about harmful algal blooms and state park beach advisories.

Although most blooms are green algae and not harmful, there are some that are actually a type of cyanobacteria that have the ability to produce toxins – called harmful algal blooms (HABs).

Remember, you can still boat, fish and recreate in Ohio's lakes, streams and rivers. Just be aware that HABs exist. **→ WHEN IN DOUBT, STAY OUT!**
We hope the information here will give you a better idea of what HABs can look like and provide you with the information you need to safely enjoy Ohio's waterways.

- Basics
- Advisories
- Publications and Helpful Links
- Training

What is a harmful algal bloom?

A harmful algal bloom (HAB) is a large growth of bacteria that can produce toxins. These toxins may affect the liver, nervous system and/or skin.

What causes HABs to form?

Some factors that can contribute to HABs include sunlight; low-water or low-flow conditions; calm water; warmer temperatures; and excess nutrients (phosphorus or nitrogen). The primary sources of nutrient pollution are runoff of fertilizers, animal manure, sewage treatment plant discharges, storm water runoff, car and power plant emissions and failing septic tanks. The State of Ohio is currently working on a statewide nutrient reduction strategy that will document ongoing nutrient reduction activities and identify areas where more work is needed.

How dangerous are HABs?

If you touch HABs, swallow water with HAB toxins or breathe in water droplets, you could get a rash, have an allergic reaction, get a stomach ache, or feel dizzy or light-headed. HABs also are toxic to pets.

- ### QUICK LINKS
- HAB ADVISORY MAP**
This map identifies state park beaches and public drinking water systems with active harmful algal bloom advisories.
 - Response Strategy**
State of Ohio Harmful Algal Bloom Response Strategy for Recreational Waters
 - Ohio EPA**
Division of Drinking and Ground Waters
Assist public water system operators with preventing, identifying and responding to HABs
 - Ohio Department of Health**
Identify types of health problems people and pets may experience from exposure to HABs
 - Ohio Department of Natural Resources**
Keeping state park lake beach goers informed
 - Monitoring Network**
Grand Lake St. Marys and Buckeye Lake

ALGAL TOXIN RESULTS

From Lake Erie, Ohio state park beaches and public water supplies:
[Excel file](#) or [PDF file](#)

REPORT A BLOOM

If you see surface scum or something that looks like blue-green algae at a state park lake beach, report it to Ohio EPA by completing the [Bloom Report Form](#)

Algae Advisory Update

Updated Nov 5, 2010

Cyanobacteria, often referred to as blue-green algae, are bacteria naturally found in Ohio lakes, ponds and slow-moving streams. While not harmful by itself, blue-green algae has the potential to grow toxins that could be harmful to both human and pet health.

If ODNR recognizes an algal bloom in a state body of water, cautionary signs will be posted indicating if harmful algae may be present and individuals and their pets should avoid contact with the algae and the water until the state can confirm that blue-green algae bloom is present.

If you notice blue-green algae, please be advised to avoid direct contact with it and the water that it is in. Also, similar to any other untreated open water body, avoid ingesting any water.

Blue-green algae grows into "blooms" through photosynthesis when the weather is hot and there is enough sunlight. Hotter weather and more sunlight allow the "blooms" to grow larger and more rapidly. These "blooms" are of highest concern because they can produce neurotoxins (which affect the nervous system) and hepatotoxins (which affect the liver).

If it is confirmed as a blue-green algal bloom, the body of water will be tested for the presence of toxins. If toxins are present, ODNR will post stricter signs advising users not to contact the water for various activities, including swimming, fishing, and boating.

Here are the current advisory levels for state owned bodies of water:

No Contact Advisory

An algal bloom has made this area unsafe for recreational activities. You are strongly advised to avoid any & all contact with or ingestion of the lake water. This includes the launching of any watercraft on the lake.

Toxin Advisory

[Wings Lake](#)

An algal bloom has made this area potentially unsafe for water contact. Avoid direct contact with the water.

~ Lake Erie Bloom

Bloom Advisory

An algal bloom has made this area potentially unsafe for water contact. Avoid direct contact with visible surface scum.

~ Lake Erie Bloom

Not surprisingly, given that this summer has been hot with many sunny days, blue-green algae has grown at a number of waterbodies throughout the state. Regardless of the body of water you are considering using for recreation, everyone is encouraged to avoid blue-green algae if you see it on the water. If you do see blue-green algae, or what you think may be blue-green algae, Ohio EPA has a harmful algae bloom report form that can be submitted on where and when the algae was witnessed so that further investigation can be taken.

Additional information and data on Harmful Algal Blooms is online at:

[OhioSEA](#)

[Ohio Harmful Algal Blooms](#)

QUICK LINKS

ODNR Program List
Fishing Licenses
Hunting Licenses
Parks Reservations
Soil Registrations
License Plates

RECREATION

Wildlife
Parks
Boating
Nature Preserves
Scenic Rivers
Forests
Ohio Trails

CONSERVATION

Geology
Lake Erie Coastal
Mineral Resources
Recycling
Soil & Water
Water Resources
Water Well Logs

EMPLOYMENT

About ODNR
Public Records Requests
Publications
Educational Resources
Grant Opportunities
Ohio Jobs
GIS



ODNR Web Site

(2010 web page view)

Stormwater Links

Amherst and Land Development Manual
Ranges Under Consideration for RLD Manual
Current Working Issues
Local Storm Method (Urban Stormwater)
Links to Other Stormwater Partners

Home

News & Publications
Offices/SWCDs
Soils
Water
Programs & Projects
Education & Training

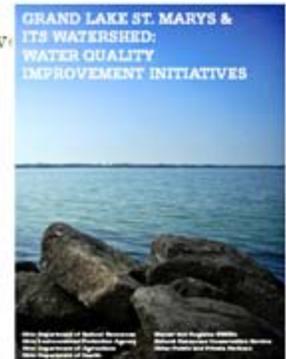
Administrative Assistant Development Program
Agricultural Pollution Abatement Program
Conservation Reserve Enhancement Programs
Rainwater and Land Development Manual
Source Water Environmental Education Teams (SWEET)
Technician Development Program
Watershed Coordinator

Grand Lake St. Marys Water Quality Improvement Initiative

The Ohio Department of Natural Resources (ODNR), Ohio Department of Agriculture (ODA) and Ohio Environmental Protection Agency (OEPA) and partners announced a cooperative plan to help curb the nutrient loading that has contributed to declining water quality at Grand Lake St. Marys.

The plan encourages partnerships between the area residents and other private and public entities, including Mercer and Auglaize Soil and Water Conservation Districts and the Natural Resources Conservation Service, to minimize pollution sources within the watershed.

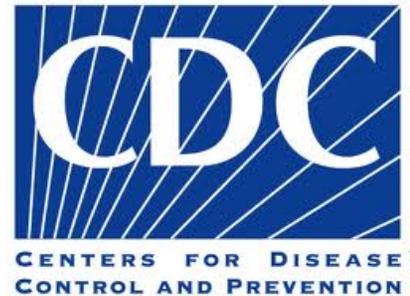
Below are Documents Regarding the Water Quality Improvement Initiatives



Updates:

- 6/21/2010 Alum Treatment Pilot Project begins at Grand Lake St. Marys Alum treatment will begin Thursday, September 23 and be completed by late Friday, September 24 at demonstration areas around Grand Lake St. Marys. [\(Download this 3 page Q&A fact sheet about the treatment. 172Kb PDF\)](#)
- 7/30/2010 State Actions for Water Quality Improvement at Grand Lake St. Marys On July 30, Ohio Governor Ted Strickland, joined by several state agency directors, announced both short- and long-term action plans to help restore Grand Lake St. Marys, Ohio's largest inland lake. [\(Download this 8 page Action Plan now. 76Kb PDF\)](#)
- 7/22/2010 Frequently Asked Questions About Algal Toxins [\(Download this OEPA four page fact sheet. 40Kb PDF\)](#)
- Progress Report Highlights [\(Download this 2 page report now. 92Kb PDF\)](#)
- 05/20/2010 Full Progress Report - March 2010 [\(Download this 8 page report now. 220Kb PDF\)](#)

Collecting Human and Animal Illness Reports



CDC/NCEH developed the Harmful Algal Bloom-related Illness Surveillance System (HABISS). This system collects data on human and animal health of harmful algal blooms (HABs).

ODH worked with our CDC partners to develop a case definition of suspected, probable and confirmed cases for Ohio human and animal illness.

Human and Animal Illness Reporting Forms

<http://www.odh.ohio.gov/~media/ODH/ASSETS/Files/eh/HABs/HABhumanillnessreportingform.ashx>

<http://www.odh.ohio.gov/~media/ODH/ASSETS/Files/eh/HABs/HABanimalillnessreportingform.ashx>

HAB-RELATED HUMAN ILLNESS REPORT

ODH Use Only
HABISS # _____
Date of this report _____

Fresh water: Anatoxin-a poisoning, Anatoxin-a(s) poisoning, microcystin poisoning...
Marine: Ciguatera fish poisoning, domoic acid (amnesic shellfish poisoning - ASP), saxitoxin (paralytic shellfish poisoning - PSP)...

Identifying information for suspected case:
Name _____
Phone _____
Address _____
County _____
ZIP code _____
Other contact information _____

Source of report:
 Citizen
 Healthcare Provider
 State Agency
 County Agency
 Poison Control Center
 Other
Address _____
Phone number _____

Demographics
Date of birth _____ Of Age _____
Sex Male Female
Race American Indian
 Asian/Pacific Islander
 Black
 White
 Unknown
 Other
Hispanic Yes No
Height _____ inches Weight _____ lbs.

Exposure information
Date of exposure _____
Time of exposure _____
Duration of exposure _____
Activity at time of exposure
 Occupational
 Recreational
Circle: Swimming, wading, boating, fishing, tubing/skiing, personal watercraft
 Unknown Other _____
Location
 At home
 Waterbody name _____
 Beach/shoreline location _____
 Other _____
Route
 Inhalation
 Dermal contact
 Ingestion
 Unknown
 Other _____
Source
 Food
 Brackish water
 Sea water
 Fresh water
 Drinking water
 Other _____
Areas in contact with water
 Head or Face
 Arms or Hands
 Legs or Feet
 Neck
 Trunk
 Other _____
 Unknown
Exposure associated with bloom:
 Yes
 No
If yes, HABISS # _____

Environmental conditions
Sick or dead animals
 No
 Dead fish count _____
 Sick fish count _____
 Other dead animals count _____ species _____
 Other sick animals count _____ species _____
 Unknown
Unusual odors
 No
 Yes
If yes, describe _____
 Unknown
Waterbody conditions
 Moving
 Stagnant
 Unknown
Color _____
Clarity _____
Scum present
 Yes
 No
 Unknown
Skip tidal questions for Ohio.
Tidal conditions
 High tide Flood tide
 Low tide Ebb tide
 Slack tide Unknown

If source was food
Type of food
 Shellfish
 Finfish
 Lobster/crab/shrimp
 Other _____
Preparation
 Cooked
 Raw
 Unknown
Store bought
 Yes, name _____
 No
 Unknown
Restaurant
 Yes, name _____
 No
 Unknown

HAB-RELATED ANIMAL ILLNESS EVENT REPORT

HABISS # _____
Poison Center # _____
Date of this report _____

Fresh water: Poisoning from anatoxin-a, anatoxin-a(s), cylindrospermopsis, microcystin, nodularin, pseudosaxitoxin, saxitoxin, or other cyanotoxin.
Marine: Ciguatera fish poisoning, poisoning from azaspiracids (azaspiracid shellfish poisoning - ASP), brevetoxin (neurologic shellfish poisoning - NSP), domoic acid (amnesic shellfish poisoning - ASP), okadaic acid (diarrhetic shellfish poisonings - DSP), saxitoxin (paralytic shellfish poisoning - PSP).

Identifying information for animal caller
Name _____
Phone _____
Address _____
County _____
ZIP code _____
Animal owner (if not caller) _____
Other contact information _____

Exposure/Mortality Information
Date of exposure _____
Time of exposure _____
Duration of exposure _____
Was the animal found dead?
 Yes No Don't know
Date carcass found _____
Condition of carcass
 Fresh Scavenged
Place of exposure
 Beach/shoreline
 Lake/Pond
 River
 Marsh/Swamp
 Other _____
Name of place of exposure _____
Route
 Inhalation
 Dermal contact
 Ingestion
 Don't know
 Other _____
Source
 Food
 Brackish water
 Sea water
 Fresh water
 Drinking water
 Air
 Other _____
Areas in contact with water
 Head
 Paws
 Legs
 Neck
 Trunk
 Other _____
 Don't know

Animal description
Does the case involve a domestic animal?
 Yes No Stray Don't know
If yes, species:
 Canine Pet's Name: _____
 Stray
Breed/Description _____
 Livestock, Type _____
 Bird/Number Affected _____
 Other Domestic _____
 Wild/Describe _____
Species (list if more than one) _____
Total number of carcasses observed _____
Sex Male Female
Age _____ months/years (circle one)
Neutered Yes No Don't know
Approximate height: _____
Approximate weight: _____
Was the exposure associated with a bloom?
 Yes
 No
If yes, HABISS # _____

Source of report
 Citizen
 Healthcare Provider
 State Agency
 County Agency
 Poison Control Center
 Biologist
 Veterinarian
 Other _____
Contact _____
Phone number _____

Environmental conditions
Other sick or dead animals
 No
 Dead fish count _____
 Sick fish count _____
 Other dead animals count _____ species _____
 Other sick animals count _____ species _____
 Don't know
Unusual odors
 No
 Yes
If yes, describe _____
 Don't know
Water body conditions
 Moving
 Stagnant
 Don't know
Color _____
Clarity _____
Scum or foam present
 Yes
 No
 Don't know
Tidal conditions:
 High tide Flood tide
 Low tide Ebb tide
 Slack tide Don't know

Unless a flock of birds, please fill out separate form per animal.

Human Illnesses Associated with Bodies of Water in Ohio

Body of Water	Toxin Reported?	County of Body of Water	Probable	Suspect	Lost to follow-up	Not a Case	Totals
Burr Oak	Yes	Athens	6		1		7
Grand Lake St. Marys	Yes	Auglaize & Mercer	8		1	12	21
Lake Erie	Yes	Multiple	2	7		1	10
Lake Mac O'Chee	Yes	Logan	19				19
Deer Creek	Yes	Pickaway & Madison	3				3
Berlin Lake Reservoir (US ACE)	No	Mahoning & Portage				1	1
Lake Alma	Yes	Vinton	2				2
Lake Hope	No (bloom only)	Vinton		1			1
Statewide totals			40	8	2	14	64

Domestic Animal Illnesses Associated with Bodies of Water in Ohio

Body of Water	Toxin Reported?	County of Body of Water	Under Investigation	Probable	Suspect	Not a Case	Totals
Grand Lake St. Marys	Yes	Auglaize & Mercer		4*			4
Lake Loramie	Yes (low microcystin)	Shelby		1			1
Burr Oak	Yes	Athens		2			2
Berlin Lake Reservoir (US ACE)	NO	Mahoning & Portage				1	1
East Harbor	Yes (low microcystin)	Ottawa				1**	1
Statewide totals				7		2	9

Dog Deaths and Bird Illnesses:

Between July 23 and August 11, 2010 Ohio received four reports of dog illnesses associated with contact in Grand Lake St. Marys. All four dogs were reported from Mercer County. Three of the four dogs died. Dates of death were between July 22 and July 28. Symptoms included: seizures, diarrhea, vomiting and jaundice. Samples from one dog were collected but the histopathology was inconclusive due to autolysis (decomposition of the specimen). Stomach contents were negative. This case was classified as Probable.*

On August 3 and August 11, 2010 two ill blue herons (Auglaize (1) and Mercer (1)) were reported and referred to the Ohio Department of Natural Resources (ODNR).

Dog Deaths and Bird Illnesses: (cont)

On August 20, 2010 Athens County Health Department reported two puppies died after an exposure to the Burr Oak Lake. Dogs displayed clinical signs 1-2 days after exposure with symptoms of lethargy, fever, excessive drooling, vomiting and diarrhea. Both dogs met probable case definition.

On August 26, 2010 an owner reported that her 6 yr old boxer was acutely depressed, anorectic and appeared in pain for 3 days after wading and gulping water from the lake at West Branch State Park. Dog had repeated exposure August 5 – 13. Owner also reported illness.

** On September 8, 2010 a report was received of a Labrador with water exposure at East Harbor, and subsequent decline including hemolytic anemia. The ODH/DNR report review showed no record of a reported bloom (or toxin testing) during the period of exposure (07/03/10), and this report was therefore assigned the classification of “not a case.”

Next Steps:

Establish agency protocols for responding to future HAB outbreaks.

ODNR and Ohio EPA are working to reduce the phosphorus levels in GLSM and other Ohio lake watersheds.

Ohio EPA and ODNR will work to establish recreational and drinking water numbers for the other toxins for which there are currently no established numbers.



Ohio EPA's May 2013 HABs drinking water strategy is available at:
<http://www.epa.ohio.gov/Portals/28/documents/HABs/PWS-HABResponseStrategy5-22-2013.pdf>

For More Information:

- **Robert Frey, Ph.D., Geologist, Principle Investigator**
- **Laurie Billing, MPH, Epidemiologist**
- **John Kollman, MS, RS, CIH, Toxicologist**
- **Greg Stein, BS, Community Involvement/Health Ed.**

<http://www.odh.ohio.gov/odhprograms/eh/HABs/HABDocumentsResources.aspx>



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