

## 2017 March to Lake Day symposium attendee questions and answers

### 2017 March to Lake Day symposium attendee questions directed to David Matthews, PhD., CEO of the Upstate Freshwater Institute

1. The DEC maintains that the phosphorus levels in Owasco Lake are below the 20 parts per billion threshold. This criteria was developed for aesthetic and recreational uses – not for drinking water. What do you consider an acceptable threshold or target goal for phosphorus levels for a waterbody used primarily for drinking water?

Answer: Total phosphorus concentrations in Owasco Lake have remained below levels typically associated with poor aesthetics and limitations of recreational uses. However, blooms of cyanobacteria have been a recurring feature in Owasco Lake in recent years despite total phosphorus concentrations consistently below the guidance value of 20 parts per billion. These blooms and the associated high levels of cyanotoxins are detrimental to aesthetics, recreational uses, and the drinking water supply. Clearly, the total phosphorus guidance value is no longer protective of these uses in Owasco Lake. Although lower phosphorus levels would be expected to reduce the frequency and severity of blooms, the available information doesn't support a specific threshold that would eliminate their occurrence. Application of an appropriate water quality to Owasco Lake could provide critical guidance for levels of phosphorus that would likely be protective.

2. It was said that cyanobacteria cannot be seen and grows down into depths of the lake. Does that mean toxins are there too?

Answer: Cyanobacteria are adapted to grow at various depths in the lake. Some are typically found at the surface of the lake, others favor the low-light conditions in deeper water, and certain forms migrate between shallow and deeper water. All of these forms are capable of producing toxins. Therefore, the absence of a conspicuous surface bloom doesn't eliminate the possibility of cyanobacteria and cyanotoxins in deeper water.

3. Doesn't the spike in HABs in 2016 indicate that the levels of nitrogen and phosphorus (caused by wet years in 2014 and 2015) are sufficient to cause blooms without the higher input from precipitation events in 2016?

Answer: In my opinion, the perceived connection between high runoff years and the occurrence of cyanobacterial blooms is not compelling. Additional investigation is required to understand the potential linkages between the timing of nutrient loads and the development of cyanobacterial blooms.

4. If the intake pipe for drinking water is at 30 ft or 60 ft, does the presence of microcystin toxin in drinking water indicate deep water and not surface water is the container of toxins?

Answer: The specific source of microcystin in the drinking water intake is not known at this time. It is possible that microcystin originated from cyanobacteria that were growing at the depth of the intake. It is also possible that microcystin originated from a surface bloom and was transported to deeper water by natural mixing processes. Vertically detailed monitoring of cyanobacteria and cyanotoxins in the vicinity of the drinking water intake would provide useful information on the source of microcystin. Application of a hydrothermal transport model to Owasco Lake could provide additional insights into the most likely source of microcystin to the drinking water intake.

5. Increased atmospheric CO<sub>2</sub> should be causing more acidic water. Are you finding lower pH in the lake? If yes, could lower pH cause lake sediment-bound phosphorus to be released into the water column and become more bioavailable?

Answer: Acidification of oceans as the result of increased levels of CO<sub>2</sub> in the atmosphere has been well documented. I am unaware of similar findings in lakes. Lake acidification is commonly associated with atmospheric deposition of sulphuric and nitric acids. Lakes in our region, including Owasco Lake, are typically well buffered against decreases in pH. Owasco Lake is an alkaline system with pH values above 7 and often higher than 8. pH levels in this range would not be expected to cause the release of phosphorus from the sediment. Sediment phosphorus release is more often caused by anaerobic conditions in the deep waters of lakes, which is not an issue in Owasco Lake. Recycling of nutrients by quagga and zebra mussels living on the lake bottom is likely an important source of bioavailable phosphorus.

**2017 March to Lake Day questions directed by attendees to Doug Kierst, Director, Cayuga County Soil and Water Conservation District (SWCD)**

1. Does aquatic vegetation harvesting spread weed growth to other areas when it is being taken out?

Answer: There are many variables that factor into what facilitates the growth of aquatic vegetation including the availability of nutrients and suitable growing substrate to support the plants. Some common lake vegetation species may propagate from fragments, while others will grow from roots. The method of harvesting vegetation is important. For example, if the type of plant that can spread via fragments are cut (harvested) and not immediately collected, the fragments have the potential to drift into another area for establishment. The harvesting method utilized by the Cayuga SWCD involves cutting and simultaneous collection of the weeds which are removed from the waterbody and disposed of at upland sites.

2. With global warming, we have bigger and more frequent storms. Will manure management plans be updated to account for increased drain tile discharges?

Answer: Nutrient management planning takes many factors into consideration. The amount and frequency of storm events is a variable that unfortunately cannot be controlled. The new winter and wet weather guidelines, produced by Cornell University, are incorporated into the planning process. Our planning methods utilize precipitation intensity duration curves, such as a 5,10 or 25 year, 24 hour precipitation events. The volume of discharge that will result from a subsurface drainage system will be dependent upon several variables including the type of soil and its availability to drain surface or ground water through it. Frequent, heavy storms tend to accumulate on and consequently run off the land's surface, leading to a higher potential for erosion and soil migration from the landscape. Conversely, when rain events are smaller and more infrequent, the water absorbs into the soil and/or filters through it gradually, in turn, becoming available for uptake by plants and vegetation, or entering the subsurface drainage system.

**2017 March to Lake Day attendee questions directed to Drew Snell, Director, Cayuga County Water Quality Inspection Program.**

1. Is there a "hotline" to call to report possible sources of contaminants, blooms, plumes etc. by the general public?

Answer: Yes, there are four. Drew Snell (315) 427-5188, Tim Schneider (315) 237-2066, the NYS DEC's spill hotline 1-800-457-7362, and the New York State Department of Health at 1-800-458-1158

2. Are golf courses a source of nutrients? There are 2 by Sucker Brook and 1 by Dutch Hollow.

Answer: Absolutely! There are numerous studies indicating golf courses are a source of lost nutrients, particularly nitrogen. Grass isn't always the best consumer of nutrients, so golf courses tend have significant leaching through soils into underlying drainage tiles. In the Owasco Lake watershed, there is also a golf course in Groton and another in Locke.

## **2017 March to Lake Day symposium attendee questions directed to Eileen O'Connor, Cayuga County Director of Environmental Health**

Question 1: High concentrations of cyanotoxins are dangerous in drinking water. What about persistent low levels over a period of time? Is anyone studying? Is proximity to blooms dangerous or must it be ingested or touched to be a danger? Any increases in nerve, liver, or skin diseases in county?

Answer: The United States Environmental Protection Agency (EPA) issued Health Advisories for microcystin, a type of cyanotoxin, in May 2015 for populations based primarily on age and a 10-day exposure period. EPA recommends that pre-school age children (5 years old) and younger and other vulnerable populations not consume water above 0.3 microgram per liter for more than 10 days. The EPA recommends that school-age children (6 years old) through adults not consume water above 1.6 microgram per liter for more than 10 days. The NYSDOH recommends that the public not drink water with microcystin above those levels even for one day. The EPA does not have a value for long term exposure. It has been assumed that the Harmful Algal Blooms (HABs) are short lived, for just a few weeks a summer. Hopefully the EPA will realize the need to do additional research to answer the question regarding long term exposure if we are seeing blooms that tend to last longer.

The pathways for exposure is ingestion, inhalation, or skin contact.

In 2015, the Cayuga County Health Department participated in a health surveillance study with the New York State Department of Health (NYSDOH) to determine if exposure to harmful algal blooms were associated with any illnesses. The final report from that study is not yet available, but I have been told by the NYSDOH that there were very few if any health impacts noted that summer related to exposure to HABs in the counties that participated. In our County, we did not see health impacts. I have been told that the NYSDOH may do a similar study in 2017 and we have agreed to participate if they do.

Question 2: This past summer there were many reports of skin rashes after exposure to lake water. What should be done when these rashes occur?

Answer: The rashes experienced after the Great Race last year were not believed to be caused by exposure to HABs. The rash characteristics, as described by the people who contacted the Health Department, were similar to those associated with swimmer's itch, but rashes are often difficult to categorize. A professor from SUNY-ESF was able to identify the parasite responsible for swimmer's itch from snail samples collected in the area.

To minimize the risk of swimmer's itch, toweling off or showering after swimming or wading in recreational waters may be very helpful. Showering off after exposure is probably a good idea to minimize the risk of many irritants that may be present in recreational waters.

Question 3: The March to Lake Day Symposium has discussed agricultural runoff. What is the plan for enforcing the integrity of septic systems by individual homeowners on the lake? Are they being inspected and corrected? What is penalty if not done?

Answer: The Cayuga County Health Department requires the periodic inspection of all septic systems. Those on properties fronting Owasco Lake are required to be tested every even year. We do follow-up to be sure residents comply with this requirement. If they do not we summon them to a Board of Health hearing and can levy fines up to \$1000. We have a very good compliance rate. If there are failures found, the Health Department requires that the homeowner hire a professional engineer or registered architect to design a new system.

Question 4: How do we know that the Sept-Oct 2016 finding of cyanobacteria in the drinking water in Auburn was the first time it was in the water in the filtration plant? Was testing ever regularly done?

Answer: The Health Department has collected samples of raw and treated water since 2014. We typically began sampling when the Auburn water plant noticed algae floating on their slow sand filter. Toxins had been found in the raw water before, but not the finished water until 2016.

Question 5: Should swimming in the lake be a health issue during months of August and September? We know to avoid obvious blooms, but what you can't see concerns me.

Answer: The Health Department advises the public to avoid recreating in water that is discolored or has floating scum due to the potential exposure to harmful algal blooms. When we close a public bathing beach due to the presence of discolored water or floating scum, we sample the bathing beach water 24 hours after the discoloration and/or scum are gone. Typically, the levels of toxins in the area at that time are below the level set by the New York State Department of Health. People may want to avoid areas that have had blooms for at least 24 hours after the bloom has disappeared.

Question 6: What is the Department of Health responsibility to ensure a continued safe supply of drinking water for consumers of Owasco Lake water?

Answer: The Health Department regulates public water supplies and we work to ensure that the water provided meets all the requirements of Subpart 5-1 of the New York State Sanitary Code. If the water does not meet these requirements and the consumption of the water could cause health concerns, we can issue advisories/orders such as "Do Not Drink" orders or "Boil Water" Orders. We then require the public water supply to install whatever treatment is necessary to bring the water back into compliance.

**2017 March to Lake Day symposium attendee questions directed to John Halfman, Ph.D., Professor of Geolimnology & Hydrogeochemistry at Hobart and William Smith College**

1. Are golf courses a source of nutrients? There are 2 by Sucker Brook and 1 by Dutch Hollow.

Answer: Golf courses can be a source of nutrients just like any lawn can be a source of nutrients. It depends on the amount and type of fertilizer used on the grass and how the area deals with storm-water runoff/erosion of soil. Runoff over bare ground and the associated erosion of soil with its attached phosphorus would be a much greater source of nutrients because soil erosion is intensified over bare ground, the grass in lawns and golf courses retards runoff erosive properties, and the lawn and/or golf course fertilizer is supposed to be phosphate free by law because we're located in the Lake Ontario watershed. Remember, the lake is phosphorus limited, thus nutrient loading control measures must emphasize the reduction of phosphorus loading to the lake.

2. The DEC maintains that the phosphorus levels in Owasco Lake are below the 20 parts per billion advocated threshold. This criteria was developed for aesthetic and recreational uses – not for drinking water. What do you consider an acceptable threshold or target goal for phosphorus levels for a waterbody used primarily for drinking water?

Answer: Annual mean total phosphorus concentrations were near 20 ug/L in 2014 and 2015. Individual sample dates since 2011 detected total phosphorus concentrations above this threshold in the open water as well, and they were always higher near the mouth of the Owasco Inlet. I do not believe there is a drinking water concentration limit for phosphorus like there is for nitrate and other compounds. The 20 ug/L limit is associated with water aesthetics, as excess phosphorus promotes excessive algal growth, decreases water clarity, and degrades water quality. The total phosphorus boundary concentration between mesotrophic and eutrophic lakes is 20 ug/L.

3. During the Symposium, it was said that cyanobacteria cannot be seen and grows down into depths of the lake. Does that mean toxins are in the lower depths too?

Answer: Not a simple question to answer. Cyanobacteria typically migrate on a daily basis up and down the water column. The migrations are associated with their photosynthesis and respiration activities. When blue-green algae (BGA) photosynthesize, they produce carbohydrates. Once they photosynthesize an excess of carbohydrates, the BGA tend to sink because carbohydrates are more dense than water. When BGA consume their stores of carbohydrates through respiration, they produced carbon dioxide that can be trapped in their cells and so provide buoyancy to the BGA cell. Thus, BGA typically have a daily migration, typically floating near the surface in the early morning hours and sinking later in the day. The migrations are limited in nearshore locations because the lake floor gets in the way.

When photosynthesizing, algae need light and light intensities are largest at the lake surface and decrease exponentially with water depth. The water is effectively dark below a depth of 60 to 100 feet (the exact depth depends on the water clarity and light penetration). Thus, the surface layer typically has enough light for photosynthesis, whereas the deeper layer is typically too dark for photosynthesis. Therefore, the light intensity dictates that BGA must be near the surface to photosynthesize organic matter like any algae. As an aside, when humans and other organisms cannot “see” anything in the water, specialized instrumentation such as connectivity/temperature/depth sensors, fluoroprobes, and transmissometers can still detect algae, and for fluoroprobes, differentiate classes of algae, at any depth in the water column.

Finally, when and for how long BGA generate toxins is not completely understood. Thus, when and at what depth they have toxins is also not clear.

4. Are farms the main source of phosphorus entering the lake?

Answer: Farms, plant and animal, are a major source of nutrients, but other sources also are critical including storm water runoff, roadside ditches, streambank erosion, lawns and golf courses, municipal wastewater treatment facilities, and onsite septic systems. I cannot give an exact percentage because my data are too limited in scope to determine this detail and each watershed is unique. However, it is clear in my mind that everyone must do their share to reduce nutrient loading to the lake, and no one should point a finger signaling out any one culprit. I’ll also point out that municipal waste water treatment facilities are doing a great job at reducing nutrient loads, and properly inspected, routinely pumped, properly sized (never overloaded with too many people), and properly functioning onsite septic systems also do a great job.

5. If the intake pipe for Auburn’s drinking water is at 30 ft or 60 ft, does the presence of microcystin toxin in drinking water indicate deep water and not surface water is the container of toxins?

Answer: The largest toxin and blue green algae concentrations in Owasco Lake have always been detected in nearshore locations, especially but not exclusively, shorelines along the northern end of the lake. Smaller concentrations have been detected in the open water at all depths. These open water concentrations probably are intensified when strong winds mix any existing nearshore BGA blooms into the surface layer of the lake. This layer extends from the surface down to 60 feet, the exact depth limit depending on the depth of the thermocline.

6. Increased atmospheric CO<sub>2</sub> should be causing more acidic water. Are you finding lower pH in the lake? If yes, could lower pH cause lake sediment-bound phosphorus to be released into the water column and become more bioavailable?



Answer: The change in pH of the lake due to changing atmospheric CO<sub>2</sub> concentrations is minimal, a few tenths of a pH at most. Photosynthesis by algae (consumers of CO<sub>2</sub>) and respiration by algae and other organisms (producers of CO<sub>2</sub>) have a slightly larger impact on pH in any lake, but the change is typically localized. Thus, pH does not have an impact on sediment phosphorus loading. As far as I know, large changes in water column acidity do not have a large impact on P loading either. In contrast, the dissolved oxygen concentrations do have an impact. When eutrophic lakes turn the lower depth (the hypolimnion) anoxic (remove all of the dissolved oxygen from bacterial respiration), then some forms of sediment particulate phosphate can dissolve and be released into the water column. This routinely happens in Honeoye and other eutrophic lakes (e.g., Otisco, Conesus, Green). Anoxia initiates an internal loading of phosphorus, that can be larger than watershed based external loading to the lake on an annual basis.

**March to Lake Day attendee questions directed to Rick Nelson, Member, OWLA Board of Directors**

1. Are any of the laws being considered and/or changed at the federal level of importance to our region?

Answer: Yes, primarily rescinding the EPA's "Waters of the United States" rule and the proposed sharply reduced spending for the Great Lakes Restoration Initiative.

The EPA rule defines the "waters" that are under jurisdictional control of the Clean Water Act.

Recently, President Trump issued an executive order requiring a review and rewrite of this rule. The likely effect on the Finger Lakes is further delay and possible permanent loss of protection for the streams and tributaries flowing into the lakes.

President Trump's 2018 budget proposes cutting the Great Lakes Restoration Initiative by 97%; from the current \$300 million to \$10 million. Since Owasco Lake and the other Finger Lakes are part of the Great Lakes watershed, the proposed funding cut, if enacted by Congress into the 2018 federal budget, will have significant impact on the funds available to protect and restore the Finger Lakes and their sub-watersheds.

**2017 March to Lake Day symposium attendee questions directed to Seth Jensen, City of Auburn, Director of Municipal Operations**

1. Do we still use the slow filtration plant? How often is the sand changed in both systems?

Answer: We do still use our slow sand plant. Sand is cleaned in each filter on a bi-annual basis.

2. Is there any way to tie into OCWA (Onondaga County Water Authority) which uses Skaneateles and Lake Ontario?

Answer: OCWA does not use Skaneateles Lake for its water supply. Skaneateles Lake is used by the City of Syracuse. We are currently looking into possible interconnect with Skaneateles, but the preliminary costs are much higher than extending the Auburn intake deeper into Owasco Lake. OCWA does serve some Northern Cayuga County communities. Studies were completed in the past looking at extending a water supply main to Auburn from the OCWA service to the north. This cost, much like the Skaneateles main, is a very costly endeavor.

3. Any taste impacts from powder activated carbon or an ozone system? Any long term health problems with either?

Answer: Powder Activate Carbon (PAC) is used in many communities to effectively improve taste and odor. It is a proven system and to my knowledge has no impacts on long term health. Ozone treatment does not specifically target taste and odor, but like PAC, to my knowledge, has no impacts on long term health.