

Region 1 Cyanobacteria Monitoring & Bloom Watch Program

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Background: Cyanobacteria and their associated toxins are a looming issue in New England and are of particular concern from a human and ecological health perspective. Increasing intensity and duration of precipitation events along with development and land use pressures are resulting in increasing nutrient loads to aquatic systems. These inputs set the stage for recurring algal blooms that affect recreational activities such as swimming and water sports, as well as incurring additional costs in public water supply treatment investments and more oversight and monitoring of public beaches. Cyanobacteria and their associated toxins have been responsible for human and animal deaths worldwide, and wildlife and pet deaths have occurred in the region from ingestion of these algal toxins. A recent example of the potential impacts was the shutdown of the Toledo water system in 2014 due to cyanotoxins from Lake Erie blooms found in the public water supply.

Despite these risks, monitoring and understanding this unique form of bacteria has been elusive. Cyanobacteria concentrations can vary enormously in space and time and their level of toxicity can be equally as variable. In addition to their heterogeneity, regional monitoring efforts historically have been equally inconsistent, with every entity utilizing a different sampling approach and methodology. These inconsistencies make it extremely difficult to aggregate data at larger spatial and temporal scales to help understand the characteristics and behavior of this bacteria, or to share information across a region that benefits everyone.



A cyanobacteria bloom in New England

Approach: Since 2013, the New England Regional Laboratory has convened a region-wide (including NY) cyanobacteria monitoring and “bloom watch” workgroup that consists of state environmental water quality and beach monitoring programs and departments of public health, tribes, public water suppliers, NGOs, citizen monitoring groups, and academics, to collaboratively establish a uniform and consistent regional approach to monitoring cyanobacteria. This workgroup initiated a pilot monitoring project during the summer of 2014 with great success, sampling over 100 waterbodies across all of the New England States. The summer of 2015 continued this trend, with more waterbodies being sampled and more active participants in the program including several public water suppliers from around the region, and a significant new influx of lake associations and citizen scientists. The program has recently been implemented by the EPA Mid-Continent Ecology Division in Duluth, MN to pilot the program in the Great Lakes this summer. Phone apps have been developed for the cyanobacteria monitoring component and implemented this past summer to directly send data from the field to a central database, and a phone app is currently in development for tracking the occurrence of algal blooms across the region and the Midwest.

Cyanomonitoring kits have been developed to provide consistent methods in sample collection and data output, while providing real time data submission from the field accompanied by microscope smartphone images of waterbody cyanobacteria. The kits have been designed to provide all the tools necessary for collection of near shore or open water samples, separation of cyanobacteria from algae and zooplankton, and the concentrating of samples for microscopic evaluation. Handheld fluorometers to measure cyanobacteria and chlorophyll-a pigment levels in the field have been group calibrated to ensure data integrity and consistency throughout the program, and workgroup members continue to meet regularly to discuss enhancements to the program and make continued refinements. The program recently received an EPA Office of Research and Development grant to further its efforts in promoting the citizen science component of the program and provide support for additional equipment and training needs. Interest in the program is growing quickly and requests to participate have come from all across the country.



The Region 1 CyanoScope Kit

The program was invited to provide an article to Lakeline magazine, a national publication, so that other citizen scientists, water suppliers, and others might be informed and able to apply the approach in their waterbodies. The article appeared in the 2015 Summer issue of the magazine. Posters, presentations, and webinars have been given at the National Water Quality Monitoring Conference, The North American Lake Management Society, The Canadian Provincial Government, The New England Chapter of the North American Lakes Management Society, and others.

Next Steps: 2016 will showcase on-site program trainings utilizing the Region's new biology mobile laboratory, completion of smart phone apps for documenting bloom occurrences, a training webinar on our tiered monitoring approach, and submitting cyanobacteria images to public crowd sourced databases. Additional advancements and participation will be dependent on program funding.



Region 1 new Mobile Laboratory

The architecture of this program has been designed to be flexible enough to be easily incorporated into existing monitoring and educational programs, yet rigorous enough to ensure uniformly consistent monitoring methods and protocols so that data can be aggregated across the region and utilized by many different entities. The simple fact that it can easily be implemented by citizen scientists and volunteer monitoring groups to advanced drinking water programs with limited investments of funds or labor provides the foundation for its success. We hope the trend continues while the program provides an educational component, and the data necessary to responsibly manage our water resources.

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