

Abstracts

Wednesday, April 30

Session F4: Harmful Algal Bloom and Cyanotoxin Reconnaissance

8:00 – 9:30 am | Room 237

Harmful Algal Bloom Monitoring by Citizen Scientists to Protect Human Health and Strengthen Stewardship

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Abstract

Harmful Algal Blooms (HABs) have recently emerged as a human health issue in the United States. In 2011, the Citizen Lake Awareness and Monitoring (CLAM) program, sponsored by the Ohio Lake Management Society (OLMS), developed and field tested monitoring protocols for citizen volunteers to collect cyanobacteria and HAB toxin information on Ohio lakes. For three seasons, CLAM Lake Keepers have collected composite water samples from beach areas along a transect using modified Ohio EPA procedures twice a month, July through September. 'Hot spot' areas identified by Lake Keepers are also targeted for sampling. Samples are cooled with ice packs and sent through the mail for analysis within 48 hours to BSA Environmental Services, Inc., Beachwood, Ohio. CLAM Lake Keepers gather additional water quality data, such as seasonal Secchi transparency, nutrients, and Chlorophyll a. This water quality information is submitted into an innovative and interactive online database that can generate immediate graphs and lake summary reports; www.eyesonthewater.org/olms. HAB toxin data are shared weekly with project collaborators to protect lake communities from potentially harmful situations for human health. Cyanobacteria cell counts are used to determine which toxin should be measured based on species present. Side-by-side testing with Lake Keepers by CLAM staff occurs regularly to ensure quality assurance. Lessons learned have led to improvements in sampling protocols for citizen scientists and in overall program delivery. Monitoring done by local residents provides a cost effective means of watching Ohio's water resources for HABs. Strong multi-agency partnerships have emerged from program objectives, while citizen participation in the CLAM program has cultivated local stewardship yielding more effective water management efforts.

Indiana's Cyanobacteria Monitoring Program: Analyzing Cyanobacteria and Cyanotoxins

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Abstract

Cyanobacteria or blue-green algae are a common constituent of algal communities in lakes and rivers. Many common cyanobacteria are known to produce potent toxins under certain environmental conditions, particularly during blooms, die-offs and other stressful conditions. The Indiana Department of Environmental Management (IDEM) developed a targeted monitoring program for cyanobacteria and toxins. Public swimming beaches owned or managed by the Indiana Department of Natural Resources (IDNR) were the focus of this project. Water column integrated composite samples were collected once per month from June until Labor Day unless the cyanobacteria cell count exceeded 100,000 cells/mL, then the sampling frequency increased to biweekly. Sampling frequency increased to weekly if toxins were present at or above 6.0 parts per billion (ppb). Cyanobacterial density was determined through microscopic identification and enumeration for cell counts. Each sample was analyzed for microcystins and cylindrospermopsin hepatotoxins using the Abraxis Enzyme-Linked Immunosorbent Assay test kits. Samples were also analyzed for nutrient constituents including orthophosphate, total phosphorus, nitrate plus nitrite, ammonia nitrogen and total Kjeldahl nitrogen. We will present an overview of results from cyanobacteria

counts and cyanotoxin determinations, explore nutrient relationships, discuss lessons learned along the way, and program modifications.

Cyanobacteria and Associated Toxins in Illinois

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Abstract

A study by the U.S. Geological Survey and the Illinois Environmental Protection Agency identified potentially harmful levels of cyanobacteria and associated toxins in over half of the lakes and rivers sampled in Illinois during the drought of 2012. Multiple reports and observations of algal blooms identified ten lakes and two rivers in Illinois that were sampled once from August to October 2012 to determine the concentrations and changes in distribution of cyanobacteria and associated cyanotoxins. Illinois EPA field screening for cyanotoxins earlier in 2012 and in previous years detected few concentrations of concern. An extended drought in 2012 and accompanying high temperatures might have provided conditions facilitating cyanobacterial dominance and associated cyanotoxin production.

Sample results indicated that concentrations of both total cyanobacterial cells and Microcystin were commonly at levels likely to result in adverse human health effects, according to World Health Organization guidance values. Results from the October 2012 samples indicated that both Microcystin concentrations and total cyanobacterial cell counts decreased approximately one order of magnitude from late August or early September to October following precipitation events and lower temperatures. Additional samples are being collected and analyzed in the fall of 2013.

Determination of Algal Toxin Concentrations in Surface Waters at Isle Royale National Park (ISRO), Sleeping Bear Dunes National Lakeshore (SLBE), and Pictured Rocks National Lakeshore (PIRO)

Joseph Duris

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Abstract

The Laurentian Great Lakes are an important ecological, recreational, and economical resource in the United States. Cyanotoxins are an emerging lacustrine water quality issue, not only in the Great Lakes region but throughout the country, and these toxins are capable of causing illness and even death in humans, domestic animals, and wildlife. Michigan's Northern Lower Peninsula and Upper Peninsula are home to three units of the National Park Service (NPS): ISRO, SLBE, and PIRO. These parks serve more than 1.6 million visitors annually; many of whom swim, canoe, and camp in the backcountry where the most common source of drinking water is filtered surface water. Recent research performed outside of park boundaries in Michigan found detectable levels of algal toxins in 22 out of 41 lakes sampled, yet no data exists regarding the presence and types of cyanotoxins within these three National Parks. For this study, a total of 214 samples were collected at 16 inland lakes and 4 sites on Lake Michigan during the recreational seasons in 2012 and 2013. Sites were selected based on proximity to recreational activities, locations where water is commonly filtered for drinking, or where cyanobacterial blooms have been observed. Samples were analyzed for the presence of microcystin, cylindrospermopsin, and saxitoxin using ELISA, and a subset of samples was analyzed by LC/MS/MS for a suite of cyanotoxins. Preliminary results from the ELISA method revealed microcystin levels greater than the detection limit (0.10 µg/L) in at least one sample at 9 out of 16 inland lakes and at 2 out of 4 beaches on Lake Michigan. Multiple detections occurred at both SLBE and PIRO above the World Health Organization maximum allowable concentration for microcystin in drinking water (1.0 µg/L). It is important to note that microcystin detections occurred in the absence of a visible bloom of cyanobacteria. There were no detections of cylindrospermopsin (detection limit 0.05 µg/L) and saxitoxin (detection limit 0.02 µg/L). This project has provided insight into the types and levels of cyanotoxins present at the three National Parks, and informed NPS managers of lakes or beaches that may need more frequent monitoring for cyanotoxins.