A PROPOSAL

A State of Ohio Initiative to Address Cyanobacterial Harmful Algal Blooms in Ohio's Inland Lakes and Lake Erie

Ohio Department of Health, Ohio Department of Natural Resources and Ohio Environmental Protection Agency

Introduction

The purpose of this proposal is to outline how State agencies can collaborate on an initiative to address Cyanobacterial Harmful Algal Blooms (CyanoHABs) in Ohio. Cyanobacteria are photosynthesizing bacteria, commonly called blue-green algae that are capable of producing toxins (cyanotoxins) that affect the skin, liver or nervous system. They can also cause water quality deterioration associated with excessive biomass production (such as depleted dissolved oxygen levels, fish kills, taste and odor problems in drinking water, and elevated THM levels.)

The harmful affects of these blooms are well documented in scientific literature and are recognized by the U.S. Environmental Protection Agency (U.S. EPA), the Center for Disease Control (CDC) and the World Health Organization (WHO) as causing chronic or acute impacts in human and animal populations. U.S. EPA recognizes that CyanoHABs are increasing in spatial and temporal prevalence in the U.S. and worldwide and that "their highly potent toxins are a significant hazard for human health and ecosystem viability." Cyanobacteria and their toxins are on U.S. EPA's Office of Water Unregulated Contaminant Monitoring Regulation List 3 and Contaminant Candidate List.

All of the Region V states except Ohio have taken some kind of action to address CyanoHAB issues in their states.

Incidences of cyanobacteria blooms are increasing in Ohio and have been reported in the news media. For example, over the last ten years *Lyngbya* sp., *Microcystis* sp., and *Cylindrospermopsis* sp. blooms have appeared in Lake Erie. Each of these species has the potential to produce cyanotoxins. There are a number of inland lakes that have cyanobacteria issues including a chronic cyanobacteria problem in Ohio's largest lake, Grand Lake St. Marys which is a drinking water reservoir for the city of Celina. However, because we do not have a tracking and reporting program for CyanoHABs in Ohio, we are not aware of the full extent of the problem.

The Ohio Environmental Protection Agency initiated several meetings with Ohio Department of Health (ODH), Ohio Department of Natural Resources (ODNR) and United States Geological Survey (USGS), U.S. Army Corps of Engineers

(U.S. ACOE), National Oceanic and Atmospheric Association (NOAA) Ohio Sea Grant (OSG), Ohio Lake Management Society (OLMS) and researchers from Bowling Green State University, the Ohio State University, and Wright State University, to discuss ideas for developing a CyanoHAB initiative in Ohio. There is significant interest, enthusiasm and expertise available to address this problem. We propose to emulate cooperative efforts developed in other states. In light of limited resources, a joint initiative with state and federal agencies will address the problem without taxing the resources of any particular agency. This is also an opportunity to utilize volunteer-collected data to help track transient bloom events and to possibly field check some remotely sensed tracking data.

The proposal includes the four main themes of: outreach and education; advisories; tracking/reporting/verification; predicting/surveillance. These themes will be addressed in phases as discussed below.

Proposal
Phases 1, 2, 3, & 4

Phase 1 - Outreach and Education (short-term goal)

Proposal:
Inform the public about CyanoHABs by providing identification information and state contact information for reporting blooms. This information would include basic instructions for avoidance and what to do if people, domestic animals or livestock come in contact with HABs. It would also include information about what can be done to minimize HAB blooms by improving runoff in the watershed. We are seeking grants to cover the cost of development and distribution of outreach materials.

Methods:

Fact Sheet: Develop Fact Sheets using examples from other states and federal agencies adapting them to Ohio.

Web Page: Develop a web page with information about CyanoHABs. Link to other agency web pages. Basic anecdotal tracking would be facilitated by a standardized on-line reporting form to collect reports from volunteers and other agencies.

Posters/Brochures: Develop posters and brochures for posting or distribution at veterinary offices, state park kiosks, public events like the Farm Science Review and water festivals and regattas, sailing/boat clubs, park offices, dog license and fishing license bureaus, dog parks and anywhere public contact with the water is anticipated. This information would contain general information about HABs and a contact phone number.

Presentations/Training: Develop a canned PowerPoint presentation that can be forwarded to lake owner associations and other organizations that want to learn about CyanoHABs. State agency personnel may provide presentations to other organizations as requested.

Resources:
There is significant information available from many states and other agencies that will be helpful when developing Ohio's outreach information. The Fish Consumption Advisory outreach program will be used as a model.

Ohio EPA is exploring grant opportunities in partnership with Ohio Sea Grant to develop and print outreach materials. Options include Ohio Sea Grant, Lake Erie Protection Fund, and OEEF. Signage at state owned public beaches may be coordinated with Ohio DNR Parks Department which has sign-making equipment. Web page development will be initiated at Ohio EPA and linked to the existing Ohio EPA Lake Erie and Inland Lakes web sites. The state CyanoHAB contact would be the Inland Lakes Program Coordinator in the Division of Surface Water.

Phase 2 - Advisories (mid-term goal that will require multi-agency coordination on mechanisms to issue an advisory)

Proposal:
Develop protocols for issuing advisories that alert the public about verified CyanoHAB blooms in inland lakes and along the Lake Erie coast in the vicinity of public beaches, major recreational areas, and public water supplies.

Methods:
There are two basic approaches other states use to issue CyanoHAB advisories: cyanobacterial cell counts or toxin level. Ohio needs to decide which approach we will take. The less expensive alternatives are less accurate and more conservative. However we have to proceed in light of current resources available.

We want to provide information to the public about taking precautions without being alarmist. We propose to model our approach after the Ohio EPA Fish Consumption advisories.

We need to determine what criteria or benchmarks we would used to make decisions. In addition a procedure for posting needs to be developed.

Resources:
The Ohio Department of Health (ODH) has the authority to issue advisories for *E. coli* at public beaches along Lake Erie. ODH has preliminarily offered to issue advisories for CyanoHABs if resources are available. ODH may post the CyanoHAB advisories on their existing beach advisory page. Ohio DNR would assist by posting advisories for inland lakes at state parks. The protocols for determining how these advisories will be released and advertised needs to be determined.

Phase 3 - Tracking/ Reporting/ Verification (long-term goal that will require additional resources to develop tools to track/report//verify HAB blooms.)

Tracking bloom sightings is important to understand the extent and frequency of cyanobacteria blooms. We anticipate we will begin receiving reports from the public once outreach materials are distributed. It will be important to verify and identify the types of cyanobacteria being reported as much as possible and make this information available to the public.

Proposal:
Establish a tracking mechanism to document CyanoHAB sightings. Create a web-based reporting form. Identify resources for verifying blooms using field test kits and/or lab analyses.

Methods:
Ohio EPA would set up a simple database to track CyanoHAB sightings. This database may be linked to a GIS database so that sightings could be mapped and tracked. Reported points could be differentiated between confirmed reports (field/lab confirmed) and unconfirmed reports.

Initial screening, especially for the most prevalent CyanoHAB, *Microcystis*, may be possible by volunteers and agency personnel using simple field test kits. Identification to species would require microscopic analysis that is available through an Ohio-based USGS contract lab.

Resources:
Algal blooms can be very transient, appearing and disappearing in a matter of days to weeks. We want to encourage those in frequent contact with inland lakes and Lake Erie to report their observations of cyanobacteria blooms. Some agencies such as Ohio DNR and the U.S Army Corps of Engineers, and volunteer organizations such as the Ohio Lake Management Society (OLMS) have a regular presence on many Ohio lakes and Lake Erie and their reports would be included in the tracking database. In addition, the Emergency Response personnel at Ohio EPA would route algal bloom reports to the state CyanoHAB contact for tracking.

Ohio EPA and USGS will review opportunities to apply for grants to fund periodic identification, especially in the event of an emergency. Individual analysis currently costs $400.00/sample. We also need to look for funds to purchase field test kits for use by agencies and volunteers.

Phase 4 – Predicting/ Surveillance (long-term goal that will require additional resources to develop tools to predict and monitor HAB blooms)

The tools to predict blooms will help the state focus limited resources on areas where impending blooms are noted. Ongoing statewide surveillance through satellite imagery would be helpful in understanding statewide trends.

Proposal:
Use remote sensing technology to aid in predicting and tracking algal blooms across the state.

Methods:
Use of satellite data is one way to predict and track algae blooms by looking at a large portion of the state at one time and on a regular basis throughout each month and year round. Algorithms have been developed to normalize this data for Ohio. These algorithms can be tested and applied with minimal ground truth data that water quality monitoring personnel from Ohio DNR, Ohio EPA and the U.S. Army Corps of Engineers and volunteers can collect.

Resources:
We propose to look for grant funding to test and utilize algorithms designed for Ohio satellite data. This may involve a joint grant proposal to U.S. EPA or YSI. In addition, we may investigate the possibility that Ohio could participate in a pilot project for LANDSAT phycocyanin readings.

Conclusion

CyanoHABs can adversely impact the health, social and economic welfare of Ohioans. Instead of reacting to an emergency, we have an opportunity to be proactive in developing an initiative to inform the public, issue advisories, track/report/identify, predict and monitor. It would be reasonable to focus initially on those lakes that have persistent algae problems with public beaches and /or public drinking water intakes where there is the most potential for human impacts. Ohio has many resources upon which to draw support for developing a CyanoHAB initiative. These resources include numerous interested state and federal agencies, researchers and volunteers. Similar to what has been done in many other states, we propose to harness this energy and focus it in a unified initiative.