

## OVERVIEW OF U.S. EPA OFFICE OF RESEARCH AND DEVELOPMENT'S RESEARCH ON ANALYSIS AND MONITORING OF FRESH WATER AND COASTAL/ESTUARINE ENVIRONMENTS

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Several factors contribute to the increased frequency and magnitude of harmful algal blooms (HABs). Elevated temperatures, changes in precipitation, population demographics, agricultural land use linked to nitrogen loading increases, and an aging water treatment infrastructure all combine to increase the probability of toxins being present in consumers' tap water. Several notable HAB events have impacted a number of states. In 2014, a HAB event on Lake Erie contaminated the city of Toledo's drinking water supply with elevated levels of microcystins. In 2015 an algal bloom occurred along the Ohio River spanning over 680 miles. In 2016 Lake Okeechobee experienced an algal bloom that impacted the Caloosahatchee and St. Lucie River systems. As a result of the human, ecological, and economic impacts of HABs, the U.S. EPA has established a research program to address issues related to the detection, quantification, and monitoring of algal blooms. This research has several objectives: develop new or refine existing chemical, instrumental, and biological methods for detection of HABs and their toxins; test such methods in field studies; determine method(s) best used as early warning systems for detection of HABs and their toxins. This presentation focuses on the non-targeted analysis of algal products by mass spectrometry, but will also summarize current research on molecular detection methods of HAB species and genes responsible for toxin production, in vitro methods for detection of toxicity, multiple approaches for phyto/zooplankton identification, phone apps for HABs early warning and cyanobacterial and algal identification, and advanced instrumental and hyperspectral image analysis approaches.