EPA and Barnstable, Massachusetts Collaborate to Study Dynamics of Harmful Algal Blooms

Research Plans

EPA scientists, in coordination with the Town of Barnstable, Mass. and the Barnstable Clean Water Coalition, are conducting field research on harmful algal blooms (HABs) using traditional and novel sampling approaches. The research focuses on investigating cyanobacterial HABs and is taking place in two ponds located in Barnstable: Shubael Pond and Hamblin Pond.

Research Methods

Research has shown that changes in nutrients and temperature can impact the water quality of freshwater systems such as lakes, ponds, and reservoirs, but how these changes occur over time and across space are not fully understood. EPA researchers are using several methods to assess HABs in the two ponds.

The researchers are deploying water quality buoys in Shubael and Hamblin Ponds to measure physical, chemical, and biological properties in the water every 15 minutes. The buoys are taking measurements of dissolved oxygen, chlorophyll, phycocyanin, and nitrate, as well as water temperature. This information helps researchers track changes in algal populations.

Additional lower-cost sensors are being added to the buoys to assess their potential for HABs forecasting. EPA scientists are also building a system that can generate detailed, spatially explicit, real-time observations of surface water quality. The system is
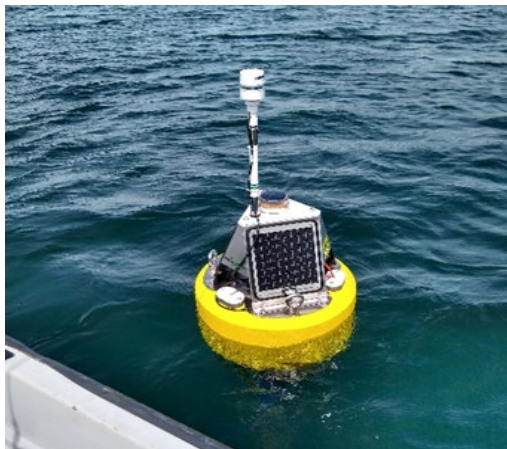
Left: Water quality buoys help researchers measure physical, chemical, and biological properties of water in Shubael and Hamblin Ponds. *Right:* EPA scientist Darryl Keith with the in-water HyperSAS profiling radiometer system which measures the spectrum of the underwater light field. The HyperSAS spectral signatures will provide in-water validation of remote sensing algorithms to map seagrass density and estimate phytoplankton and cyanobacteria concentrations derived from satellites, aircraft, and UAV data.

modeled after the Fast Limnology Automated Measurement (FLAMe)[1] platform developed at the University of Wisconsin. The EPA system is being used once or twice a month, taking measurements approximately every 20 meters across each pond, and is measuring the same physical, chemical and biological properties as the buoys to provide complementary data.

Researchers are also collecting and analyzing water samples 1-2 times a month for nutrients, cyanotoxins, and algal and zooplankton communities.

Additionally, the Barnstable Clean Water Coalition is flying an unmanned aerial vehicle (UAV), equipped with a hyperspectral sensor, over Shubael Pond to collect water-color data for HAB monitoring. These data are being analyzed by EPA researchers as part of this research.

Research Impact

The detailed spatial and temporal datasets gathered in this research are expected to provide insight into how nutrients, water temperature and other drivers of algal blooms change over time and, importantly, how potentially harmful algal bloom species, like cyanobacteria, respond to these changing drivers. This type of information is needed to guide water quality management efforts and to reduce the occurrence of future algal bloom events.

Related Links

1. https://flame.wisc.edu

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