**Product Description for SSWR Nutrients Topic Research Area 1:**

**Assessment and Management of HABs**

To: Nick Dugan (NRMRL-WSD) and Blake Schaeffer (NERL-EMMD-SSAB) Research Leads

From: Jeff Hollister (NHEERL-AED), Stephen Shivers (ORISE, NHEERL-AED), Betty Kreakie (NHEERL-AED), Bryan Milstead (NHEERL-AED), Blake Schaeffer (NERL-EMMD-SSAB)

1. **Applicable Output in RA1**Output 3: Tools for HABs risk characterization and assessment
2. **Product Title**

High frequency spatial and temporal dynamics of freshwater cyanobacterial HABs

1. **Product Description (500 words max)**It is generally accepted that algal blooms are mostly controlled by varying nutrient loads and temperature; however, those drivers usually only describe the broad spatial and temporal patterns of blooms. Furthermore, most accessible existing datasets (e.g. National Lake Assessment) are snapshots or have relevant data at limited spatial and temporal resolutions. While these resources have proved useful for understanding HABs, they raise several questions about bloom dynamics such as: 1) at what spatial and temporal scales within freshwater lakes and ponds do bloom drivers and indicators vary; 2) how does cyanotoxin production and presence vary in space and time within freshwater lakes; and 3) how do phyto- and zooplankton community dynamics within HABs vary over the course of a bloom? To answer questions about the spatial and temporal dynamics of HABs requires different approaches than have been typically used in field studies.   
     
   We propose to use two separate tools, fixed buoys for fine temporal scale data and an on-board flow through system (e.g a FLAMe - https://flame.wisc.edu/) for fine-scale spatial data. With the two different platforms, we would explore different field data collection strategies. Fixed buoys can provide us very detailed information but from fewer locations. We would deploy buoys in a small number of local lakes and ponds that have existing data but have not been sampled at high frequency. The buoys would provide physical, biological, and chemical data taken at short time steps (e.g. hourly) over the course of a growing season. We would augment buoy data collection with frequent field collection of water samples for detailed nutrient and toxin analysis. The on-board flow through system would allow us to rapidly assess the full spatial variation of HABs within lakes and ponds. This system would be used in the locations with the fixed buoys as well as in lakes and ponds throughout Rhode Island and southern New England.   
     
   The proposed work also has great potential for other research efforts in EPA. For instance, a FLAMe would be useful for algorithm development and accuracy assessments of remotely sensed cyanobacteria data products. Also, collaborators on the Southern New England Project (SNEP) have indicated an interest in better understanding freshwater HABs on Cape Cod. Lastly, given the volume of data that would be collected by this proposed product, our efforts would overlap with other computational ecology efforts and we would use computational approaches for analyzing these data as well as provide our data for other computational intensive HABs projects.
2. **Lead PI and Co-PIs**

Lead: Jeff Hollister (NHEERL-AED)

Co-PIs: Betty Kreakie (NHEERL-AED); Bryan Milstead (NHEERL-AED); Stephen Shivers (ORISE and NHEERL-AED), Blake Schaeffer (NERL-EMMD-SSAB)

**Partners**

Rhode Island Department of Environmental Management

US EPA – New England Regional Laboratory

US EPA – Region 1

Cape Cod Commission

Barnstable Clean Water Coalition

1. **Regulatory Relevance**

EPA Goal 1: CWA section 304a CWA 33 U.S. Code § 1254. Research, investigations, training, and information; The Harmful Algal Bloom Hypoxia Recovery and Control Act of 2014 (Public Law [113-124]) and the Drinking Water Protection Act of 2015 (Public Law [ 114-45])

1. **Product Type**The products from this work would include publications on characteristic spatial and temporal scales of freshwater HABs, open source software used to analyze and process the collected data, and open data products making the collected data available for others to use.