

# In Situ Evaluation of Peroxide Treatments Applied to HABs

## USACE Harmful Algal Bloom Research & Development Initiative



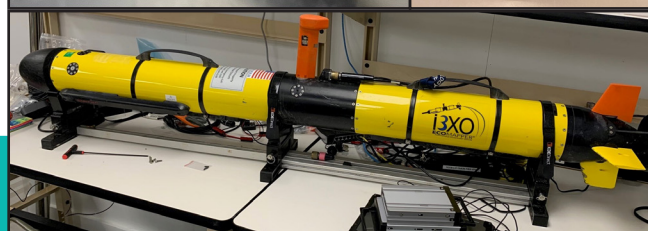
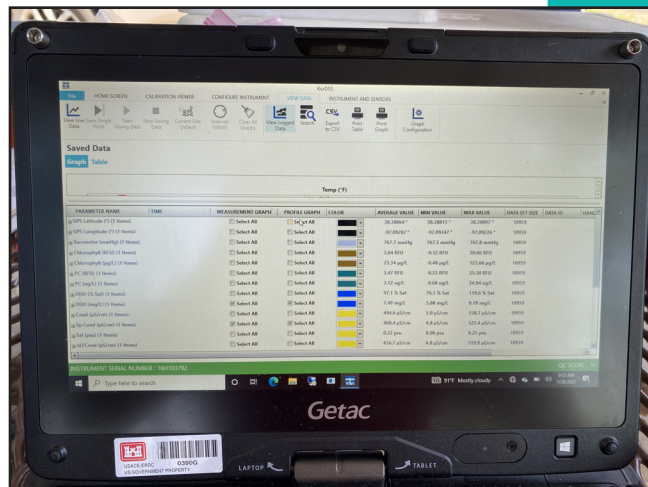
Delivering scalable freshwater HAB prevention, detection, and management technologies through collaboration, partnership, and cutting-edge science.

Lead: Richard Johansen, ERDC, Richard.A.Johansen@usace.army.mil  
Co-Lead: Alan Katzenmeyer, ERDC, Alan.W.Katzenmeyer@usace.army.mil

**Problem** Improved monitoring of rapid-response harmful algal bloom (HAB) treatments (i.e. peroxide-base algaecides) is needed because traditional methods do not provide the spatiotemporal coverage to evaluate the efficacy of these applications.

**Objective** Demonstrate a suite of complementary monitoring approaches for districts to incorporate into their HAB treatment efforts. Evaluate the efficacy and longevity (up to 72 h) of singular peroxide-based treatment for rapid response to HABs.

**Approach** Develop approaches for rapid response monitoring and treatments by applying multiple sensors with varying spatial and temporal resolutions (satellite imagery, sondes, grab samples, etc.) to better serve district personnel with varying expertise levels or financial limitations. Additionally, this work will evaluate the efficacy and longevity (up to 72 h) of Pak-27, a peroxide-based algaecide, for use as a rapid response to HABs.



**Figure 2.** Numerous technologies and approaches were utilized to intensively monitor the efficiency and longevity of a peroxide-based treatment. A monitoring screen (top) a YSI Sonde (Middle; Left is closeup of bulkhead, right is full device), and an Ecomapper (bottom).



**Figure 1.** Experimentation setup in the laboratory.

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### Major Milestones

Deliverable	Description
Publications	<p><b>Tech Note:</b> Katzenmeyer et al. In prep. “Conceptual Workflow for Data Collection and Field Plan for Deployment of Scaled In Situ Sensors.” ERDC TN.</p> <p><b>Special Report:</b> Johansen et al. In prep. “A Review of Sensor-Based Approaches for Monitoring Rapid Response Treatments of cyanoHABs.” ERDC SR.</p> <p><b>Tech Report:</b> Johansen et al. In prep. “Multimodal Approach to Monitoring a Peroxide-Based Rapid Response Treatment of a Harmful Algal Bloom.” ERDC TR.</p>
Products	<b>Data and Code Repository:</b> <a href="https://public.git.ercd.dren.mil/RJohansen/hab_peroxide_evaluation">https://public.git.ercd.dren.mil/RJohansen/hab_peroxide_evaluation</a>
Demonstrations	<b>Peroxide Treatment (Pak 27) of HAB:</b> July 2021. Marion Reservoir, Kansas.
Marketing Video	<b>Overview of ongoing HAB research at EL:</b> A high level overview of ERDC field-based sensor capabilities for water quality and HAB detection and monitoring.

### Partnership/Leveraging Opportunities

This work will leverage multiple collaborations and other work units, including the Kansas Department of Health and Environment (KDHE) and USACE district partners (Tulsa and Kansas City) will assist in peroxide-based treatment while also providing complementary species and toxins data collection. There is potential to collaborate with the project *UAS Survey to Support EPA Region 7 HAB Monitoring* (PI: Reif), as unmanned aircraft system (UAS) imagery collected at the same time/location could benefit both projects. Lastly, there is potential to leverage work done for the project *Comprehensive satellite-based algorithms for broadscale cyanoHAB detection and monitoring* (PI: Johansen) as water quality data and image products from the peroxide treatment monitoring work unit could be used to support regional algorithm assessment.

### Value to USACE Mission

This project is intended to lead to the development of improved monitoring for rapid-response HAB treatments as well as a singular peroxide-based treatment for HABs, which will better serve district personnel with varying expertise levels or financial limitations.



Figure 3. Field research



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