

# CyanoHAB Nowcast/Forecast for Lake Okeechobee

## USACE Harmful Algal Bloom Research & Development Initiative



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

**Lead:** Rick Stumpf, NOAA National Centers for Coastal Ocean Science, richard.stumpf@noaa.gov

### Problem

Lake Okeechobee is critical to the USACE Jacksonville District's (SAJ) Central and South Florida Project, which provides flood control, acts as a public water supply, prevents saltwater intrusion, protects fish and wildlife, and supports agriculture. In recent years, large toxic cyanobacteria blooms have complicated lake management. Effective and timely lake management decision-making relies on easy-to-use tools that quickly communicate information about bloom location, movement, and intensity.

### Objective

NOAA will provide cyanobacteria predictive models for Lake Okeechobee for use in lake management. Satellite data will be used to identify bloom intensity, extent, and location to enhance monitoring and provide forecasts. Nowcasts (1–5 days) will show likely bloom movement, while long-term forecasts (approximately 1 month) will provide guidance on the likely timing and development of more intense blooms. The models will be easy to run and allow SAJ to apply management strategies that reduce the impacts of blooms on the lake and receiving waters.

### Approach

Satellite data will be used to provide detailed information on bloom location for a 20+ year time series and be used for routine monitoring and developing forecasts. The satellite data will be used to initialize a model to forecast bloom location for several days forward. Satellite data will be combined with environmental and water sample data to identify conditions that favor bloom intensification, and lead to more, or less, intense blooms. The resulting models will be designed for easy operation, with the intended long-term implementation at SAJ. A consistent satellite data set will allow for future observations to be added to the time series.

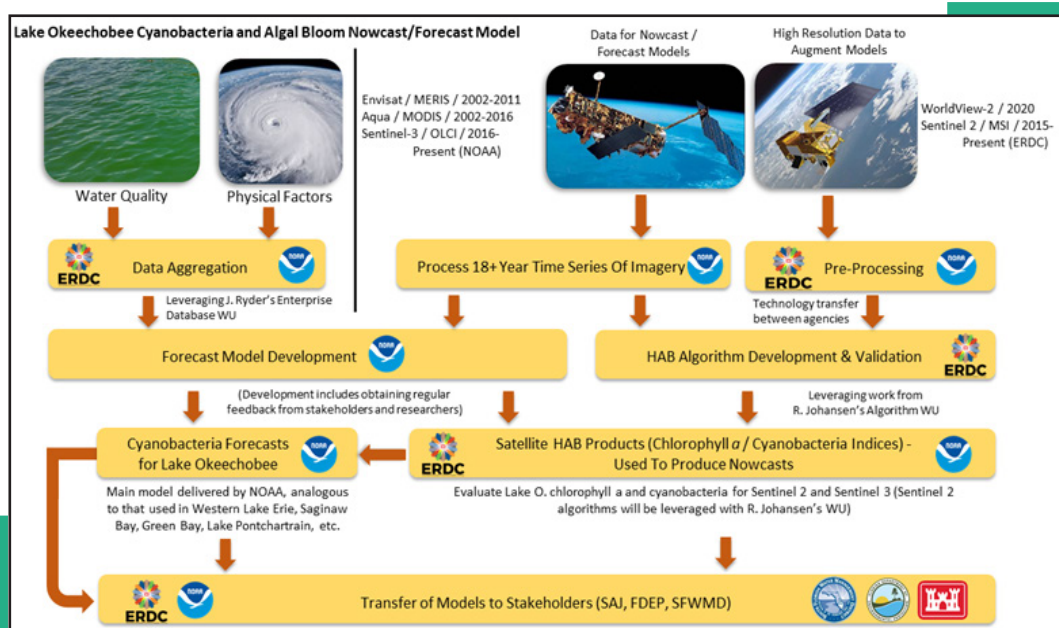


Figure 1. Project concept diagram.

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## Major Milestones

Deliverables	Description
Publications	<p><b>Journal article:</b> Mishra, S., R. P. Stumpf, and A. Meredith. 2023. "Constructing a Consistent and Continuous Cyanobacteria Bloom Monitoring Product from Multi-Mission Ocean Color Instruments." <i>Remote Sensing</i> 15 (22): 5291. <a href="https://doi.org/10.3390/rs15225291">https://doi.org/10.3390/rs15225291</a>.</p> <p><b>Literature review</b> of key environmental forcing factors that drive cyanobacterial blooms in Lake Okeechobee</p> <p><b>Development and validation</b> of the cyanobacteria nowcast and forecast models</p>
Technology Development	<p><b>Intercomparison and evaluation</b> of satellite algorithms for cyanobacteria and chl a</p> <p><b>Nowcast model (1–5 days)</b> based on satellite imagery, transferable to SAJ</p> <p><b>Forecast model</b> (for weeks to seasonal), transferable to SAJ</p>
Other	<p>Identification of Lake Okeechobee data and existing models relevant to stakeholder priorities</p> <p>Demonstration and training of models with stakeholder feedback</p>

## Partnership/Leveraging Opportunities

This project establishes a partnership with ERDC researchers for applying satellite technology to cyanoHAB monitoring. In addition, the project utilizes the South Florida Water Management District (SFWMD) Lake Okeechobee Ecosystem Model to create a forecast tool, which likewise uses their DBHydro database for retrospective and real-time data. While SAJ and SFWMD are key partners, they are also end-users of the products. National Centers for Coastal Ocean Science resources have provided the satellite data processing system and includes a partnership with the University of Florida to understand the environmental factors.

## Value to USACE Mission

The models will provide USACE resource managers and regional partners with a critical new decision support tool for cyanoHAB monitoring, providing the capacity to track bloom development, timing, size, and distribution in Lake Okeechobee. Not only will it be a nationally relevant tool adaptable to reservoirs across USACE but also will accommodate a broad range of end-users with limited modeling experience. Furthermore, the partnership helps build interagency capabilities, joining unique scientific approaches and experience, for developing value-added products that increase efficiency and decision-making in routine cyanoHAB monitoring programs.



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