Harmful Algal Bloom Interception, Treatment, and Transformation System (HABITATS)

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USACE Harmful Algal Bloom Research & Development Initiative

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

Problem

Removing harmful algae from waterbodies is not scalable due to logistical challenges associated with managing the large volumes of potentially toxic algal biomass.

Objective

Develop a scalable, rapidly-deployable system that removes harmful algae from waterbodies and efficiently manages the resulting biomass.

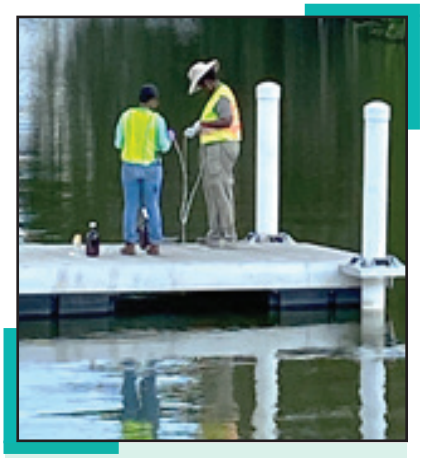

Figure 1. *Researchers in the field.*

Approach

HABITATS integrates high-throughput, energy-efficient technologies for interception, treatment, and transformation of HABs. It employs resource recovery to increase physical and economic scalability of HAB removal from large waterbodies. The removed biomass is converted into fuel and fertilizer feedstocks, resulting in a more sustainable solution that can generate more energy than it uses. The system destroys cyanotoxins, both in the treated water and in the removed biomass, while removing intracellular nutrients from the water, decreasing total phosphorus and nitrogen levels in the processed water by up to 93% and 55%, respectively. A rapidly deployable system has been developed that is now undergoing optimization and validation in field settings.

Figure 2. *Researchers in the lab.*

Major Milestones

Date	Milestone
FY21, Q4	Development of technology transfer documentation, updating scalability and economic impact models, and technical publication.
FY21, Q4	Field assessments of in situ microflotation to increase economic scalability of HABITATS (initial assessment completed; redesign and optimization ongoing).
FY21, Q4	Field demonstration of onshore treatment system in Florida, including on-site fuel generation (completed; system optimization ongoing).
FY22, Q3	Assembly and installation of a deployable onshore system that can treat 2 million gallons per day (10-fold higher treatment capacity than previously-tested systems, validation ongoing).
FY22, Q3	Awarded contract for the world's largest deployable hydrothermal liquefaction system for transforming algal biomass into fuel (completed).
FY23, Q3	Assemble final deployable prototype and establish HAB mitigation test bed at Lewisville Aquatic Research Facility.
FY23, Q4	Complete prototype optimization testing.
FY24, Q2	Complete training videos and manuals to support technology transfer.

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Partnership/Leveraging Opportunities

Ongoing field studies within USACE's Aquatic Nuisance Species Research Program have included collaboration with academic, industrial, and government partners, such as the University of Illinois, AECOM, Ecologix, and Elastec, and the Department of Energy's Pacific Northwest National Laboratory. Field studies have been coordinated with state regulatory agencies, including the Florida Department of Environmental Protection, the New York Department of Environmental Conservation, and the Ohio Department of Natural Resources. Regional USACE field support has included members from Jacksonville, New England, and Buffalo Districts.

Figure 3. *Representatives from AECOM and Genefuel discuss hydrothermal liquefaction with University of Illinois partners at the ERDC HABITATS field demonstration in Florida (2022).*

Value to USACE Mission

HABITATS can be deployed at key locations, such as spillways and canals, to reduce transport of algae, intracellular nutrients, and potential toxins through critical waterways, reducing environmental impacts on downstream waterbodies and communities.

Figure 4. *Various images taken during research field deployment.*