

Red Tide and HAB Mitigation

Florida Red Tide Mitigation and Technology Development Initiative

US Harmful Algal Bloom Control Technologies Incubator

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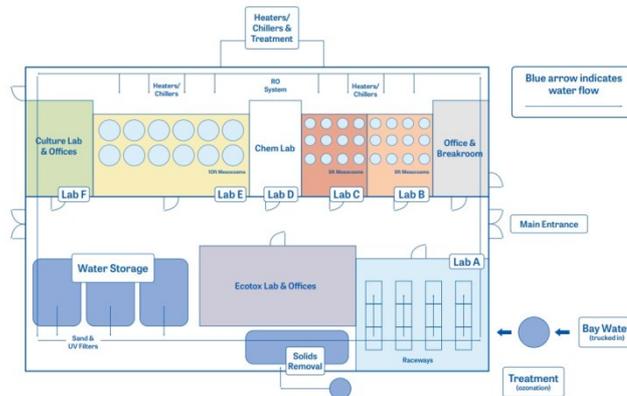
Red Tide Initiative Overview

- Signed by Governor DeSantis in June 2019
 - 379.2273 Florida Statutes
 - Mote partnership with Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute
- \$18 million over 6 years (\$3 million per year)
 - In Year 4, Sunsets March 2025
- Numerous Reporting requirements
- Legislative intent:
 - develop **mitigation** technologies and approaches to address the impacts of red tide on coastal environments and communities in Florida
- General Structure:
 - Lab space, *Karenia brevis* culture, raceways and mesocosms for:
 - Projects leading to red tide mitigation tools
- Regulatory Oversight and Commercialization



Mitigation and Technology Development Facility

- Mote Aquaculture Research Park
- 150K gallons treated and recirculated seawater
- Tiered safe setting research through lab-based, large-scale 5ft and 10ft mesocosms, and raceways
- Large volumes of *K. brevis*
- Ecosystem-based testing of mitigation compounds in a controlled setting to prepare for field implementation
- Enhanced air treatment, PPE provided, and air testing
- Do no additional health or environmental harm
- No charge for facility use, culture, and assistance as part of Initiative



Research Mesocosms



Research Raceways



Red Tide Culture



Facility Grand Opening



Partnership Signage



Requests For Proposals

- 379.2273(2)(c)(1) Florida Statutes: Mote may use a portion of awarded funds to facilitate additional engagement with other pertinent marine science and technology development organizations...
- Open to any/all interested parties to **bring international best/brightest ideas**
- **Conducted 4 Requests for Proposals**
- **Coordinated effort** through partnerships and to **avoid duplication**
- Support not to exceed 1 year – **several continuing** via subsequent RFP/award
- Use of Mote facilities/infrastructure is **available at no charge**
- Partner Led Proposal Review Process:
 - **Diverse reviewer expertise** from NOAA, EPA, FWC, DEP, Universities, Estuary Programs, private consultants, and Mote
- Next Request For Proposals in March 2023 – focusing on deployment



Thanks to All Our Red Tide Initiative

Research Partners



Red Tide Initiative Progress



FLORIDA RED TIDE MITIGATION AND TECHNOLOGY DEVELOPMENT INITIATIVE 379.2273(2)(d)

ACCOMPLISHMENTS AND PRIORITIES REPORT

JANUARY 2023

Red tides, or red tide harmful algal blooms, are a higher-than-normal concentration of microscopic alga that occur in ocean and coastal waters. Red tides in Florida have been documented since the 1700's and their likely impacts date back to records from Spanish explorers. In Florida, the toxin producing *Karenia brevis* is the species causing most red tides. These blooms can harmfully affect sea life, lead to massive fish kills, cause human respiratory problems, close beaches, and determinately impact shellfish, fishing, hotel, restaurant, recreational, and tourism industries. This report is being provided to meet the requirement of 379.2273(2)(d) Florida Statutes, which states: "Beginning January 15, 2021, and each January 15 thereafter until its expiration (2025), the initiative shall submit a report that contains an overview of its accomplishments to date and priorities for subsequent years to the Governor, the President of the

Senate, the Speaker of the House of Representatives, the Secretary of Environmental Protection, and the Executive Director of the Fish and Wildlife Conservation Commission."

MITIGATING RED TIDE IMPACTS FOR FLORIDA

The Florida Red Tide Mitigation & Technology Development Initiative is a partnership between Mote Marine Laboratory (Mote) and the Florida Fish and Wildlife Conservation Commission (FWC) codified under 379.2273 Florida Statutes that establishes an independent and coordinated effort among public and private research entities to develop prevention, control and mitigation technologies and approaches that will decrease the impacts of Florida red tide on the environment, economy and quality of life in Florida.

- ✓ 200+ Potential Mitigation Compounds Examined for Tiered Testing
- ✓ 4 RFP's and 4 Webinars
- ✓ 6 TAC Meetings
- ✓ 100+ Proposals Reviewed
- ✓ 35+ Projects Underway
- ✓ 20+ Funded External Partners
- ✓ Research Facility Constructed
- ✓ Private/Federal Funding Leveraged
- ✓ Public Website
- ✓ Science to Commercialization Workshop
- ✓ 3 Reports to Governor, Legislature, and Agencies on Accomplishments/Priorities
- ✓ Approximately a dozen promising tools and technologies for commercialization

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Available on Mote's Red Tide Initiative Website



MOTE.ORG

Promising Mitigation Tools

- encapsulated macroalgae compounds
- (ozonation)/cavitation/oxidation treatment process
- UV-C radiation from LEDs
- quaternary ammonium compounds on platform
- Microb-Lift, Xtreme, and De-Oil-It
- polymer-coated nanoparticles
- autonomous robot technologies
- clay
- curcumin, luteolin, or other natural or EPA approved compounds into flocculants, carbon, clay, or biochar
- commercializing removing and composting dead fish
- biosensor scanner for seawater and shellfish
- updates to Beach Condition Reporting System

PROJECT	TIER 1	TIER 2	TIER 3	TIER 4
QUAT	Complete	Planned for 2023	Planned for 2023	Planned for 2023
Macroalgal algicides	Complete	Planned for 2023	Planned for 2023	Planned for 2023
Bacterial algicides	Complete	Planned for 2023	Planned for 2023	Planned for 2023
Curcumin	Complete	Planned for 2023	Planned for 2023	Planned for 2023
Clay	Complete	Complete	Planned for 2023	Planned for 2023
Clay w/ Curcumin or Luteolin	Planned for 2023	Planned for 2023	Planned for 2023	Planned for 2023
Clay/Biochar	Complete	Planned for 2023	Planned for 2023	Planned for 2023
RemRx™ Oxidant	Complete	Planned for 2023	Planned for 2023	Planned for 2023
Activated Carbon/Luteolin	Complete	Planned for 2023	Planned for 2023	Planned for 2023
Microbe-Lift	Complete	Planned for 2023	Planned for 2023	Planned for 2023
Nanotechnology Enabled	Complete	Planned for 2023	Planned for 2023	Planned for 2023
Flocculation/Algicide	Complete	Planned for 2023	Planned for 2023	Planned for 2023
De-Oil-It	Complete	Planned for 2023	Planned for 2023	Planned for 2023
Xtreme	Complete	Planned for 2023	Planned for 2023	Planned for 2023
Humic Compounds	Planned for 2023	Planned for 2023	Planned for 2023	Planned for 2023
UV-C	Complete	Complete	Planned for 2023	Planned for 2023
EVIE Robot	Complete	Planned for 2023	Planned for 2023	Planned for 2023
Ozonix	Complete	Planned for 2023	Planned for 2023	Planned for 2023
Plasma	Planned for 2023	Planned for 2023	Planned for 2023	Planned for 2023
Electromagnetic Energy	Planned for 2023	Planned for 2023	Planned for 2023	Planned for 2023
BCRS Upgrades	Complete	Complete	Complete	Planned for 2023
BloomZoom	Complete	Planned for 2023	Planned for 2023	Planned for 2023
Brevetoxin Toxicity Testing	Planned for 2023	Planned for 2023	Planned for 2023	Planned for 2023
Shellfish/Water Biosensor	Complete	Planned for 2023	Planned for 2023	Planned for 2023
Fish Carcass Use	Complete	Complete	Planned for 2023	Planned for 2023
Deployment Platform	Complete	Planned for 2023	Planned for 2023	Planned for 2023
PHySS Upgrades	Complete	Complete	Complete	Planned for 2023

For more information, please see the Appendix for Project Summaries



Complete



Partially Complete
or improvements to
technology being tested



Planned for 2023



Initiative Reporting

- **379.2273(2)(d) Florida Statutes:**

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- **FWC-FWRI Contract Reports**

Technical and Financial

Regular partnership interactions

- **Project Interim and Final Reports**

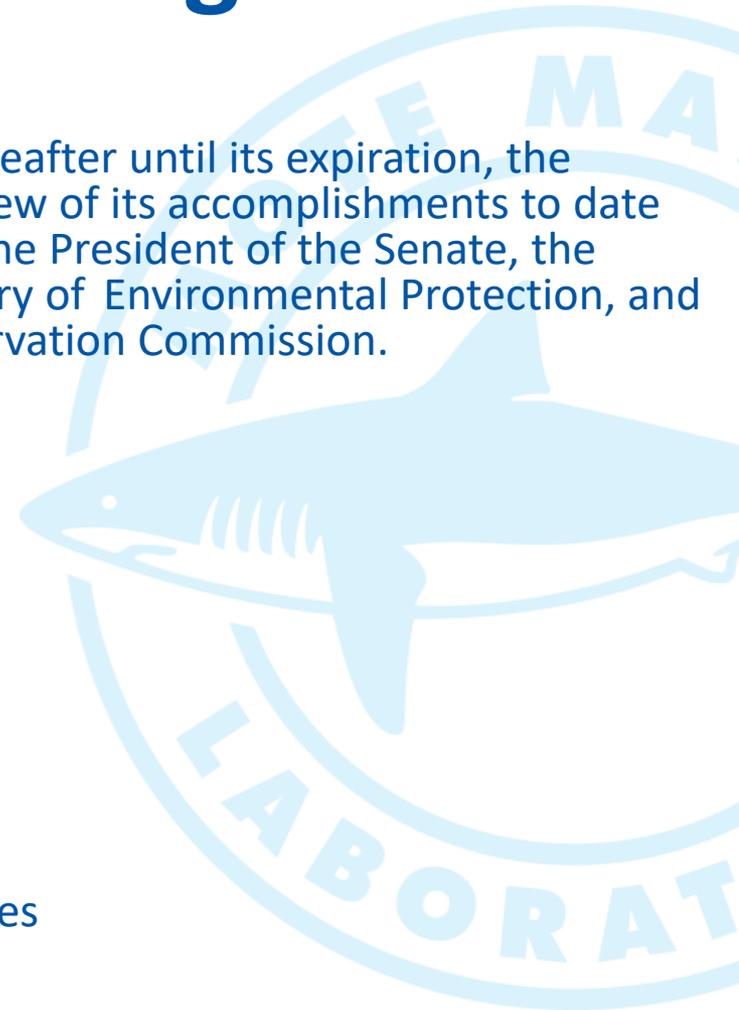
Required by subaward contracts from Mote

- **Mote Red Tide Initiative Website**

Technology Advisory Council Presentations and Minutes

Regular Updates

Project Summaries



Red Tide Initiative – Looking Ahead

- Moving Projects to Tier 3 and 4
- Socialize Research Progress
- Build Off Aug 2022 Workshop
 - Deployment/Monitoring
 - Scalability
 - Economic Feasibility
 - Permitting/Compliance
 - Commercialization
 - 2023 Workshop
- US HAB Control Technologies Incubator



Red Tide Initiative Workshop

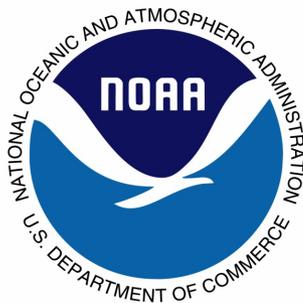


US HAB Control Technologies Incubator (US HAB CTI)



- Partners:

- National Oceanic and Atmospheric Administration
- University of Maryland, Institute of Marine and Environmental Technology
- Mote Marine Laboratory



Institute of Marine and Environmental Technology





US HAB CTI Objective

- Fund US extramural lab/tank-based proof of concept, innovative **freshwater and marine** Harmful Algal Bloom (HAB) control tool and technology projects to assess their real-world feasibility.
- Development and implementation of **scalable, environmentally acceptable, cost-effective** HAB control strategies.
- Provide guidance to end users and stakeholders on **navigating the relevant licensing and permitting processes** (e.g., state water and pesticide/device requirements, Environmental Protection Agency, National Environmental Protection Act, and Federal Insecticide, Fungicide, and Rodenticide Act requirements) via a Clearinghouse Website.
- **Archive tool and technology project data** for use/dissemination to the broader HAB and resource management community.



US Harmful Algal Bloom Control Technologies

Incubator Research Process



----- Incubator Funding -----

----- Other Funding -----

----- Phase I ----- Phase II ----- Phase III -----

Tier 1



Tier 2



Tier 3



Tier 4

**Laboratory
Experiments &
Literature Search**

**Mesocosms
Raceways
Collaborations**

**Canals/Marinas
Limnocorrals
Nearshore/Offshore**

**Commercialize
Monitor**

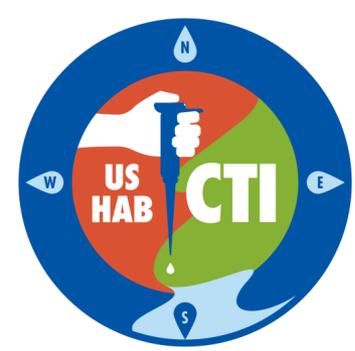


- Effects on the Cells and Toxins in the Lab
- Previous Uses Worldwide
- Existing Regulatory Approvals

- Effective with Natural Communities
- Ecological Impacts
- Human Health Concerns
- Logistical Issues
- Economically Feasible

- Pilot Studies
- Field Demonstrations
- Federal/State/Local Regulatory Approvals
- Engineering Needed
- Public Interactions

- Customers
- Intellectual Property
- Efficiency Scaling
- State/Local Budgets
- Deployment Contractors



US HAB CTI

Advisory and Review Board

Role: advise and make recommendations on the overall US HAB CTI processes and progress as well as serving as liaisons to the segments they represent, membership includes representatives from:

- National Oceanic and Atmospheric Administration
- Environmental Protection Agency
- Army Corps of Engineers
- United States Geological Survey
- State Agency
- Industry
- Academic Institution
- Non-Governmental Institution





US HAB CTI Timeline



Jan 31 (11:59pm EST): Letter of Intent Deadline

April 10 (11:59pm EST): Request For Proposals Deadline

June: Award notification

July 1, 2023 – June 30, 2024: Subaward Project Period



Thank You

Questions?

Mote Red Tide Initiative Website
US HAB CTI Website

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