



Oh Bloomin' Algae Are HABs Here to Stay?



HARBOR BRANCH

FLORIDA ATLANTIC UNIVERSITY

*Jim Sullivan, Ph.D., Executive Director
FAU Harbor Branch*

WHAT ARE HARMFUL ALGAL BLOOMS OR HABs?

OCCURRENCES OF PHYTOPLANKTON THAT CAUSE NEGATIVE ECOSYSTEM
(OR HUMAN) IMPACTS



WHAT ARE PHYTOPLANKTON?

MICROSCOPIC PLANTS, COMMONLY CALLED ALGAE
MANY SPECIALIZED ADAPTATIONS

50 μm



HOW DO PHYTOPLANKTON & HABs GROW?

HARMFUL PHYTOPLANKTON (LIKE ALL PLANTS) TYPICALLY NEED THREE MAIN CONDITIONS TO BLOOM (GROW):

OPTIMAL LIGHT

HIGHER LIGHT PROMOTES FASTER GROWTH

OPTIMAL TEMPERATURE

WARMER TEMPERATURES PROMOTE FASTER GROWTH

OPTIMAL NUTRIENTS

MORE NUTRIENTS = MORE BIOMASS



HOW ARE ALGAL BLOOMS HARMFUL?

TOXINS (SAXITOXIN, MICROCYSTINS, BREVETOXIN, DOMOIC ACID...)

HIGH BIOMASS (HYPOXIA/ANOXIA, SHADING)

MECHANICAL DAMAGE (MUCOUS, SURFACTANTS, SERRATIONS)

ECONOMICS (TOURISM, RECREATION, PROPERTY VALUES, FISHERIES...)



FL HABs: AN ECOLOGICAL & ECONOMIC CRISIS

THESE ARE NOT THE HEADLINES WE WANT TO SEE, BUT THIS PROBLEM IS NOT GOING AWAY ANY TIME SOON...

Florida Tourism Not Seeing Green as Toxic Algae Chokes Business

FLORIDA TREND REAL ESTATE

Water releases, algae threatening home values



U.S. » Crime + Justice | Energy + Environment | Extreme Weather | Space + Science

Live TV • U.S. Edition + 🔍 ☰

A toxic algae bloom in Florida is slaughtering marine life by the masses

Supercharged by Pollution, Florida's Toxic Algae Crisis Continues Unabated

By Julie Dermansky • Thursday, August 16, 2018 - 15:57

Florida's algae crisis: How is it affecting tourism and other businesses?

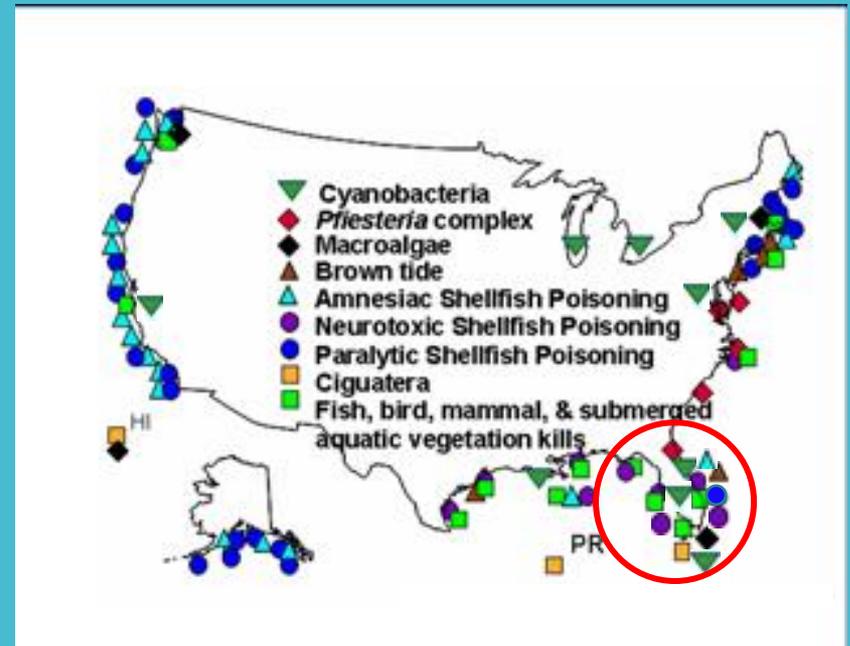
Are the toxic algae blooms along Florida's coasts making people sick?

WORLDWIDE, HABs ARE INCREASING NOT ONLY IN GEOGRAPHICAL LOCATIONS, BUT ALSO IN TYPE, FREQUENCY, DURATION AND SEVERITY

REPORTED HAB OCCURRENCES



~1972



NOW

FLORIDA IS ONE OF THE MOST IMPACTED STATES IN THE US

WHY ARE HAB EVENTS INCREASING?

1. EUTROPHICATION (NUTRIENT POLLUTION)

2. GLOBAL WARMING & CLIMATE CHANGE

WARMING- INCREASING RANGES AND GROWTH RATES

CHANGING PRECIPITATION - INCREASED STORMS, RAIN & RUNOFF, DROUGHT

3. HUMAN ECOSYSTEM MODIFICATIONS

LAND USE PRACTICES, WATER MANAGEMENT, INCREASED RUNOFF, DREDGING,
TRANSPORT OF SPECIES, FOOD CHAIN EFFECTS...

IT IS FORECAST TO GET EVEN WORSE...

 U.S. Global Change
Research Program

Fourth National Climate Assessment

Government Report On Climate Change Says Red Tide Will Become More Common In Florida

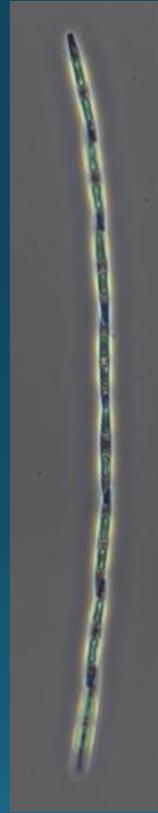
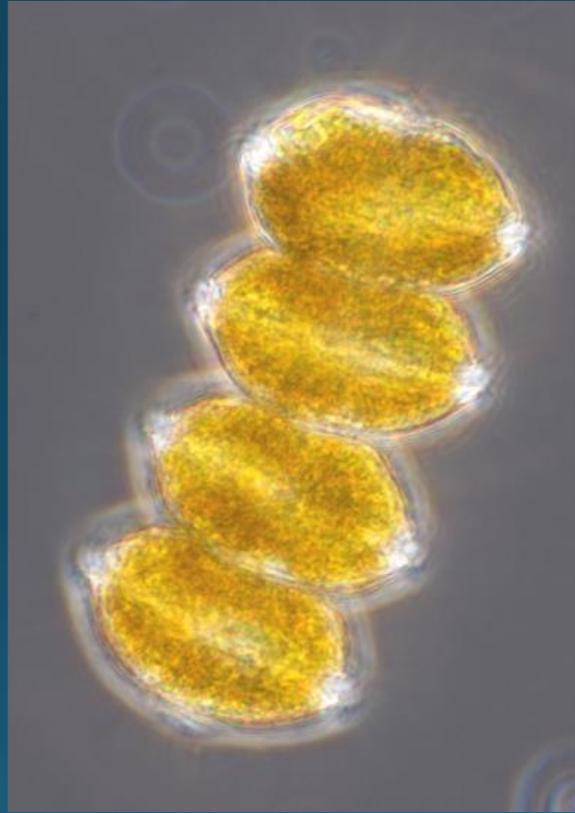
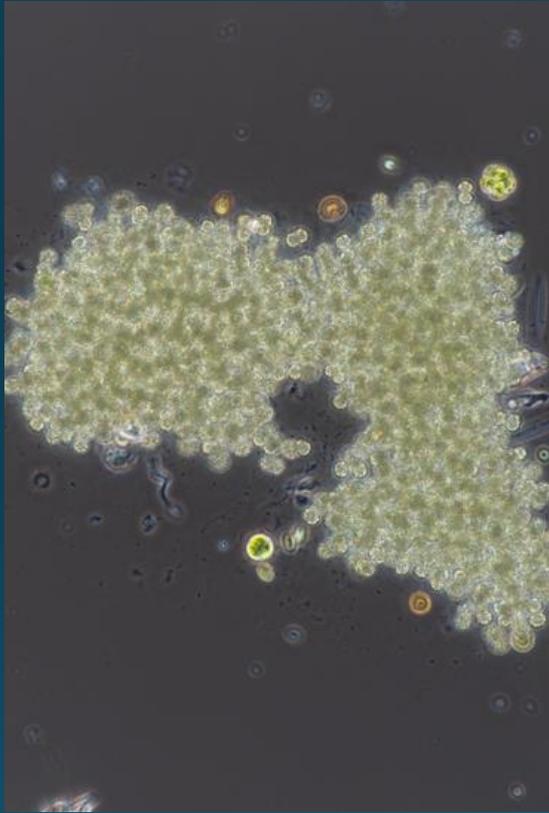
November 23, 2018 at 4:50 pm Filed Under: [Climate change](#), [Florida](#), [Government Report](#), [Red Tide](#), [Sea Life](#)

Toxic Algae May Thrive as Climate and Oceans Warm, Study Says

Volume II

Impacts, Risks, and Adaptation in the United States
Report-in-Brief

MANY DIFFERENT TYPES OF HARMFUL ALGAE



MANY DIFFERENT HAB TOXINS & EFFECTS

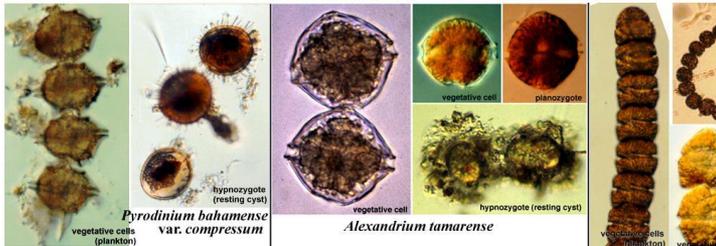
Toxic Microalgae

WESTPAC/IOC/UNESCO

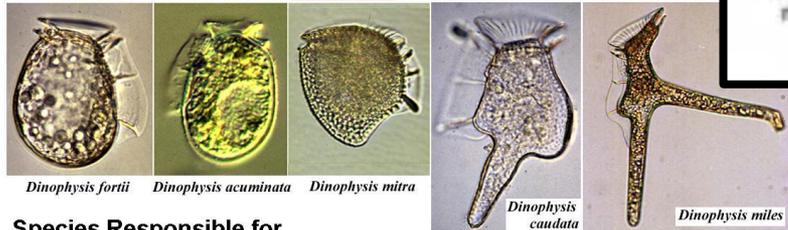
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ed. by Yasuwo Fukuyo (ufukuyo@mail.ecc.u-tokyo.ac.jp)

Species Responsible for Paralytic Shellfish Poisoning



Species Responsible for Diarrhetic Shellfish Poisoning



Species Responsible for Neurotoxic Shellfish Poisoning



Species Responsible for Amnesic Shellfish Poisoning

Species Responsible for and implicated in Ciguatera Fish Poisoning



IMPACTS OF TOXIC ALGAE



Contaminated drinking water can make people and wildlife sick.



Algae blooms emit noxious fumes.



Eating contaminated fish or seafood can cause illness.



Recreational exposure can make people and pets sick.

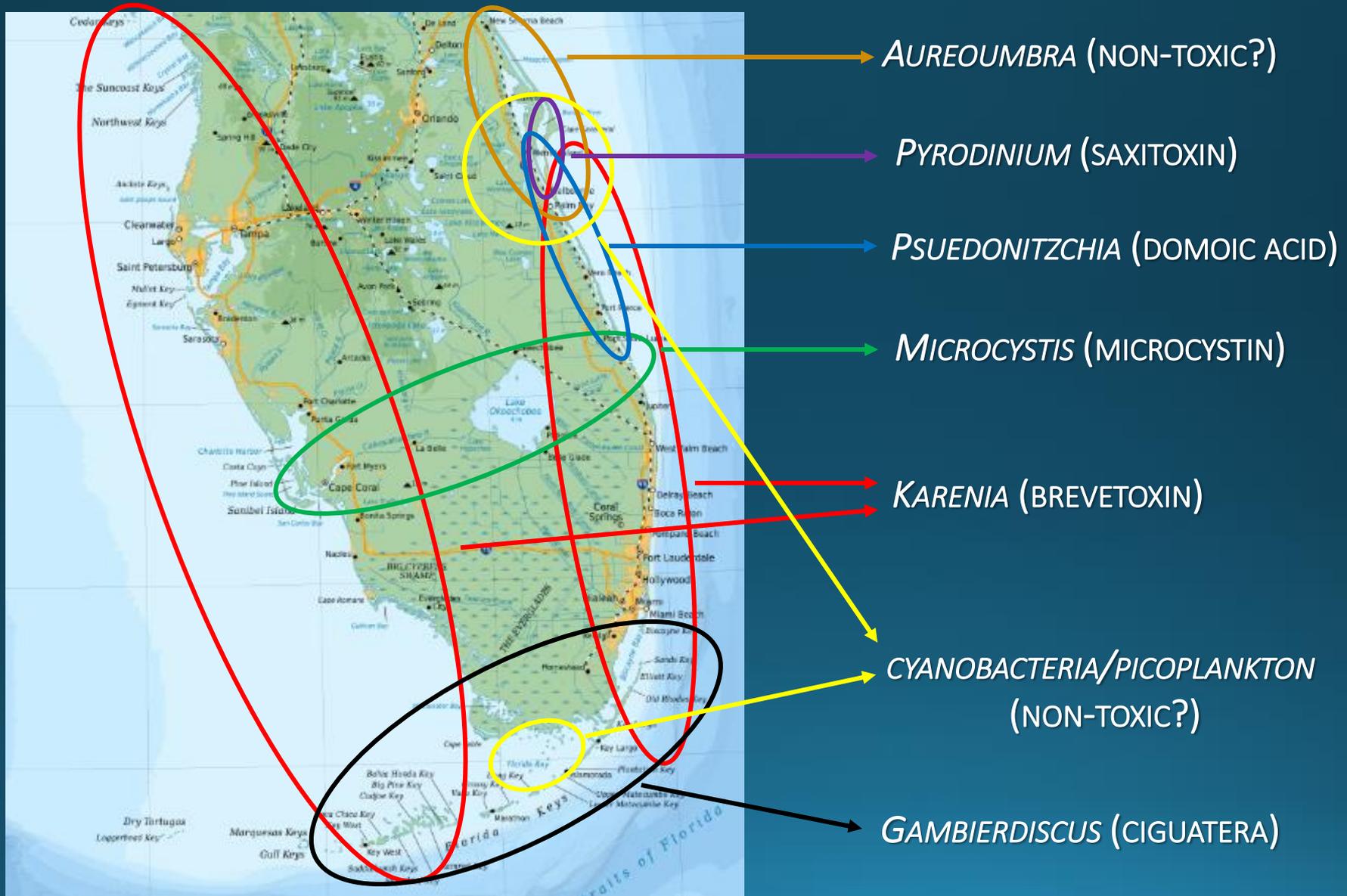
ACUTE IMPACTS:

IMMEDIATE AND TYPICALLY SEVERE RESPONSE TO TOXINS

CHRONIC IMPACTS:

RESPONSE TO TOXIN ONLY REALIZED OVER LONGER TIMES AND/OR EXPOSURE

CURRENT HAB THREATS IN SOUTH FLORIDA



MICROCYSTIS (BLUE-GREEN ALGAE) HABs ARE TRANSPORTED TO THE EAST AND WEST COASTS OF FLORIDA FROM LAKE OKEECHOBEE DISCHARGES



ST. LUCIE ESTUARY & INDIAN RIVER LAGOON
(MARTIN COUNTY)



MICROCYSTIS (BLUE-GREEN ALGAE) PRODUCE THE DANGEROUS HEPATOTOXIN MICROCYSTIN WHICH CAN CAUSE LIVER FAILURE IN HUMANS AND ANIMALS.

THESE WARNINGS DO NOT ONLY APPLY TO HUMANS...



Toxic algae suspected in acute liver failure that nearly killed two dogs in Martin County

Tyler Treadway, Treasure Coast Newspapers Published 2:41 p.m. ET Sept. 4, 2018



toxins



Article

Diagnosing Microcystin Intoxication of Canines: Clinicopathological Indications, Pathological Characteristics, and Analytical Detection in Postmortem and Antemortem Samples

Amanda J. Foss ^{1,*}, Mark T. Aubel ¹, Brandi Gallagher ², Nancy Mettee ³, Amanda Miller ³ and Susan B. Fogelson ⁴



WATCH LIVE NEWS WEATHER

NEWS

A warning to pet owners: toxic algae kills three dogs in matter of hours

AND IT IS NOT JUST FLORIDA...

Toxic Blue-Green Algae Found In 7 Rhode Island Waterbodies

The Rhode Island Department of Health has advised the public to avoid contact with the bodies of water.

Mississippi Beaches Have Been Vacant For Two Months As A Toxic Algae Bloom Lurks Offshore

Research News

Lake Erie's toxic algae blooms: Why is the water turning green?

Across U.S., Eruptions of Toxic Algae Plague Lakes, Threatening Drinking Water and Recreation

OR LAKE OKEECHOBEE...

Blue-green algae at Indian River County's Headwaters Lake has low but persistent toxicity

NOT ONLY ARE BLUE-GREEN ALGAE HABs CAUSING ECONOMIC AND ENVIRONMENTAL DAMAGE, IT APPEARS THAT THERE COULD BE A DIRECT HUMAN COST:



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Report: 4 Counties Part Of Liver Disease, Algae Bloom Cluster

By THE ASSOCIATED PRESS • MAY 30, 2017

Four counties along Florida's Treasure Coast make up a cluster with high rates of both deaths from liver disease and algae blooms.

[TCPalm](#) reported Sunday that the cluster in Indian River, Martin, St. Lucie and Okeechobee counties is the only one of its kind in the state.

WHAT IS THE STATE DOING?

Ron DeSantis names Florida blue-green algae task force

“The toxic algae has been a massive problem. It’s been a problem on the southwest coast of Florida and may very well have been a contributor to why the red tide was so bad,” DeSantis said.



State of Florida Revives Its Red Tide Task Force

From News Service of Florida

There are now two task forces studying algae in Florida – one looking at inland blue-green algae and a newly revived and funded group studying coastal red algae.

WHAT IS THE STATE DOING?

Blue-Green Algae Task Force

<https://floridadep.gov/Blue-GreenAlgaeTaskForce>

MISSION: TO GUIDE AND EXPEDITE IMPROVEMENTS IN FDEP'S REGULATORY AND POLICY STRUCTURE TO IMPROVE FLORIDA'S DEGRADED WATERBODIES (WATER QUALITY STANDARDS, NUTRIENT REDUCTION, REMEDIATION, RESTORATION, PUBLIC HEALTH, NEW TECHNOLOGY, ETC.)

ESTABLISHED BY EXECUTIVE ORDER 19-12

REGULAR PUBLIC MEETINGS (SUNSHINE LAW)

FIRST TASK FORCE RECOMMENDATIONS TO FDEP IN SEPTEMBER

WHAT IS THE STATE DOING?

Algal Bloom Sampling Status

Best experienced with Google Chrome or Microsoft Edge browsers

Dashboard Help Dashboard Details

Algal Bloom Monitoring and Response Quick Links

- VIEW/SUBSCRIBE TO WEEKLY UPDATES
- REPORT ALGAL BLOOMS
- FIELD AND LAB DETAILS
- FRESHWATER ALGAL BLOOM FAQs
- HEALTH QUESTIONS / CONCERNS
- CURRENT RED TIDE STATUS
- PROTECTING FLORIDA TOGETHER

Areas of Interest

Add

- Caloosaha...
- Lake Okee...
- St. Lucie R...
- St. Johns R...

30-Day Algal Bloom Observations

Observations of algal bloom-like conditions at sampling locations visited in the last 30 days. Hover over graphic for values.

Statewide *Karenia brevis* concentrations 10/04/2018 - 10/11/2018

Karenia brevis (cells/liter)

- not present/background (0-1,000)
- very low (>1,000-10,000)
- low (>10,000-100,000)
- medium (>100,000-1,000,000)
- high (>1,000,000)

BLUE-GREEN ALGAL BLOOM WEEKLY UPDATE

Reporting August 30 - September 5, 2019

SUMMARY

There were only three reported site visits in the past week (8/30 - 9/5) due to Hurricane Dorian, with all three site visits resulting in samples collected. Algal bloom conditions were not observed by the sampler at any of those sites.

The most recent NOAA satellite imagery for Lake Okechobee that is not obscured by cloud cover is from 8/30/19. It indicated that the bloom potential was patchy and was reduced to approximately 20% of the lake. Imagery also indicated that estuaries remained free of bloom potential. South Florida Water Management District collected samples at the 578 and 579 structures on 9/4 and at the 5303C structure on 9/5. Toxins were not detected in the 578 or 579 samples and neither had a dominant algal species. The 5303C sample results are pending. South Florida Water Management District had to postpone this week's on-lake sampling to next week due to the hurricane.

From last week's update for the reported events were still pending, no toxins were detected in the sample collected on 8/29 at the C44580 structure that was dominated by *Microcystis aeruginosa*. The sample collected by the St. Johns Water Management District staff collected samples at Sator-East South Fork WMA in Broward County was dominated by *Microcystis aeruginosa* and had 0.45 ppb total microcystin and 0.16 ppb anatoxin-a. The cyanobacterium results for Falmers Water Management Area 1 was also dominated by *Microcystis aeruginosa* and is still pending.

Only four bloom reports were received on DEP's Report Algal Blooms webpage this past week. Bloom surveillance by DEP and SFWMD staff will return to normal next week.

This is a high-level summary of the sampling events for the reported week. For all field visit and analytical result details, please refer the complete algal bloom map with data table by clicking the "Field and Lab Details" Quick Link from the Algal Bloom Dashboard. Different types of blue-green algal bloom species can look different and have different impacts. However, regardless of species, many types of blue-green algae can produce toxins that can irritate you or your pets and possibly cause skin and/or eye irritation due to contact. We advise to stay out of water where algae is visibly present as green, black or water is abnormally pale-green, blue-green or brownish-red. Additionally, pets or livestock should not come into contact with the algal bloom impacted water, or the algal bloom (ester) or fish in the shoreline.

LAKE OKEECHOBEE OUTFLOWS

Weekly outflow	Week	Outflow
Week of 8/27/19	Week	43,494
Week of 8/20/19	Week	80
Weekly outflow	Year	1,837
Year	Year	188

SITE VISITS FOR BLUE-GREEN ALGAE

Satellite imagery provided by NOAA - Images are impacted by cloud-cover

REPORTS FROM HOTLINE

33 August 29

REPORT PUBLIC HEALTH ISSUES

HUMAN ILLNESS

Florida Poison Control Centers can be reached 24/7 at 800-222-3322. (DOH provides grant funding to the Florida Poison Control Centers)

OTHER PUBLIC HEALTH CONCERNS

CONTACT DOH (DOH county office)

FloridaHealth.gov/all-county-locations.html

CONTACT FWC 800-436-0311 (fish kills) 888-406-3322 (invertebrate Alert) MyFWC.com/RedTide

CONTACT DEP 888-308-3902 (to report freshwater blooms) FloridaDEP.gov/AlgalBloom

Learn more about Florida's Algal Bloom Monitoring and Response at FloridaDEP.gov/AlgalBloom

WHAT IS HBOI DOING?

HARBOR BRANCH OCEANOGRAPHIC INSTITUTE
FOUNDATION

FLORIDA CENTER FOR COASTAL & HUMAN HEALTH

Est. August 2018 at FAU Harbor Branch

FAU/HBOI & Partner
Expertise



Florida HAB Crisis



Population Health
Impacts



Healthy Environment &
Population



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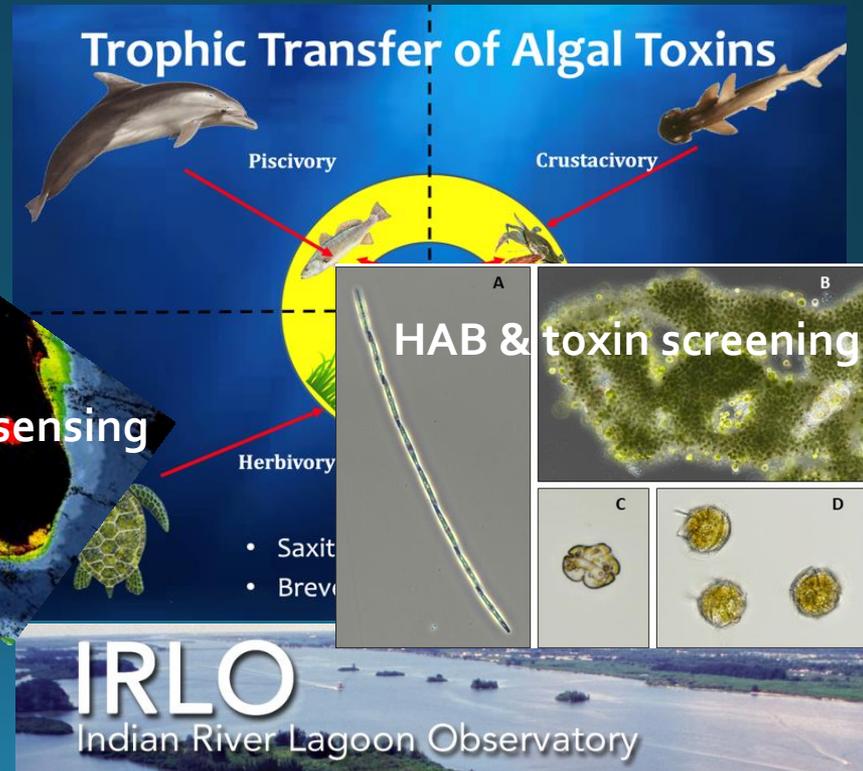
RECRUITING STAKEHOLDERS & STRATEGIC PARTNERS



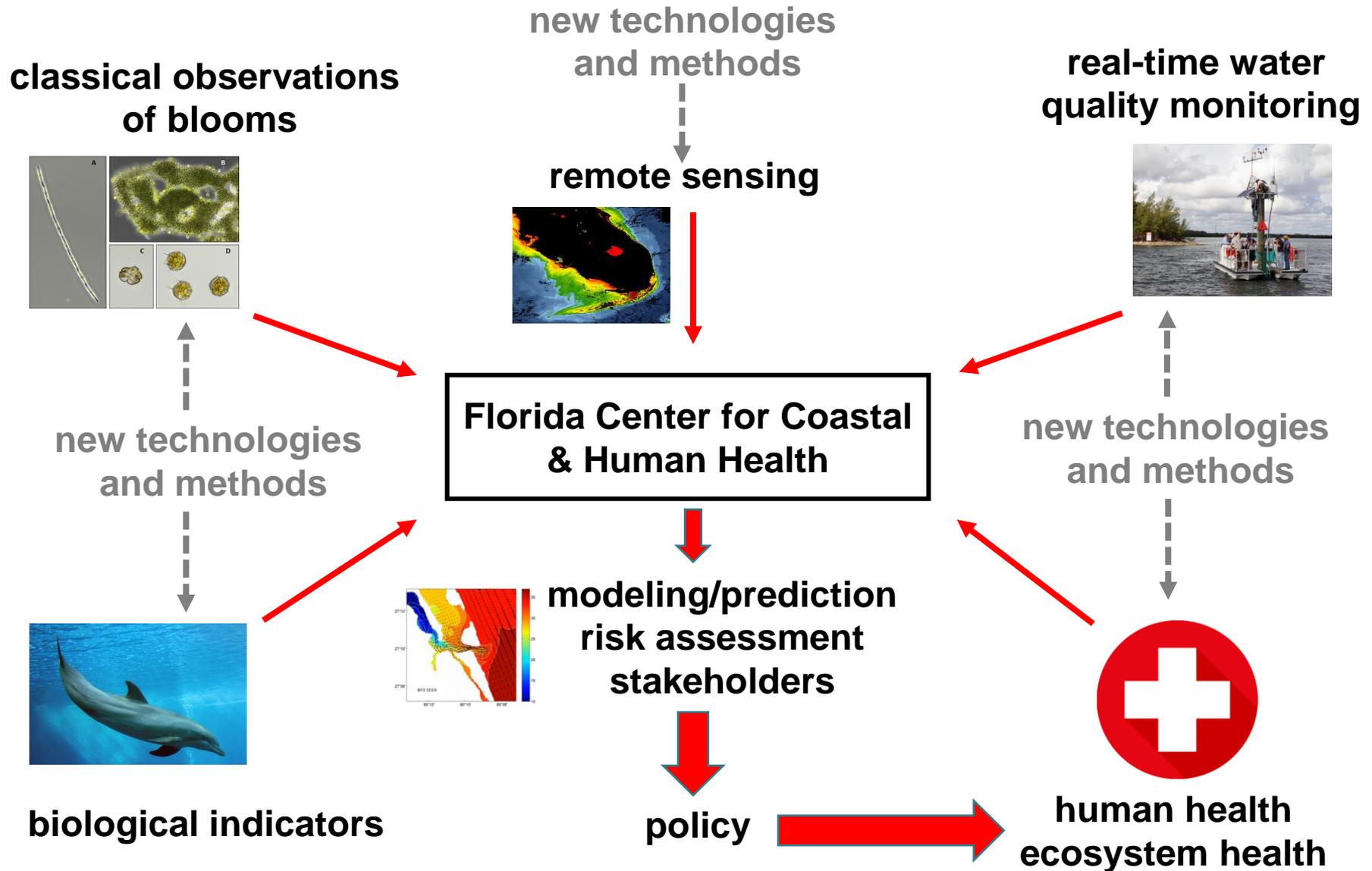
FAU BRAIN INSTITUTE

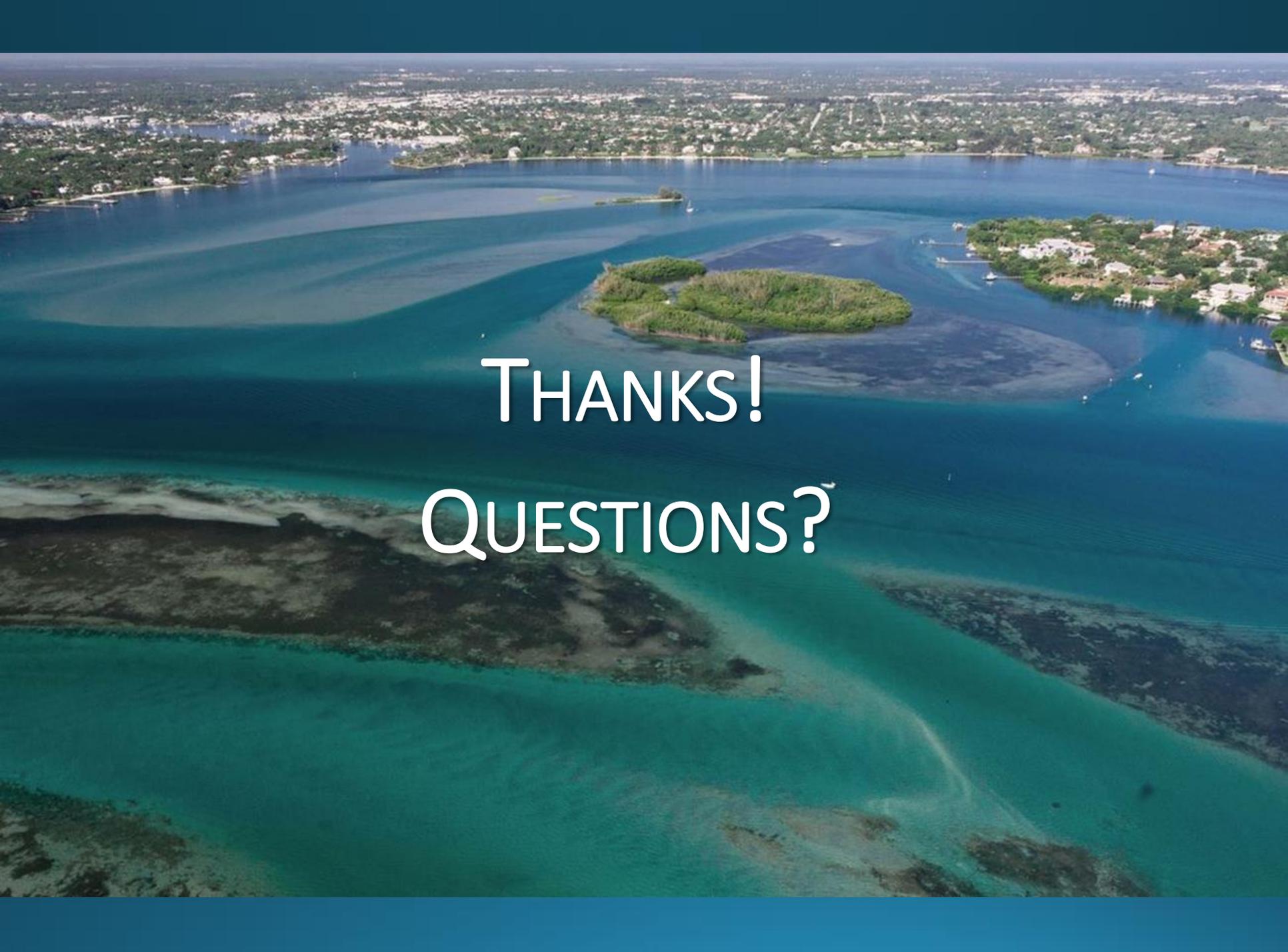
CONDUCTING CRITICAL RESEARCH

FAU Harbor Branch tests people for levels of toxin released from blue-green algae



SCIENCE BASED POLICY & MANAGEMENT



An aerial photograph of a large, irregularly shaped body of water, possibly a bay or lagoon. The water is a deep blue-green color, with lighter, sandy or silty areas visible near the shorelines. In the center of the water is a small, lush green island. The surrounding land is densely populated with residential buildings, trees, and roads. The sky is clear and blue. The text "THANKS! QUESTIONS?" is overlaid in white, bold, sans-serif font in the center of the image.

THANKS!
QUESTIONS?