

US EPA ARCHIVE DOCUMENT



**Florida Department of Environmental Protection**

# **State of Florida Response to 2016 South Florida Algal Bloom**

**October 20, 2016**

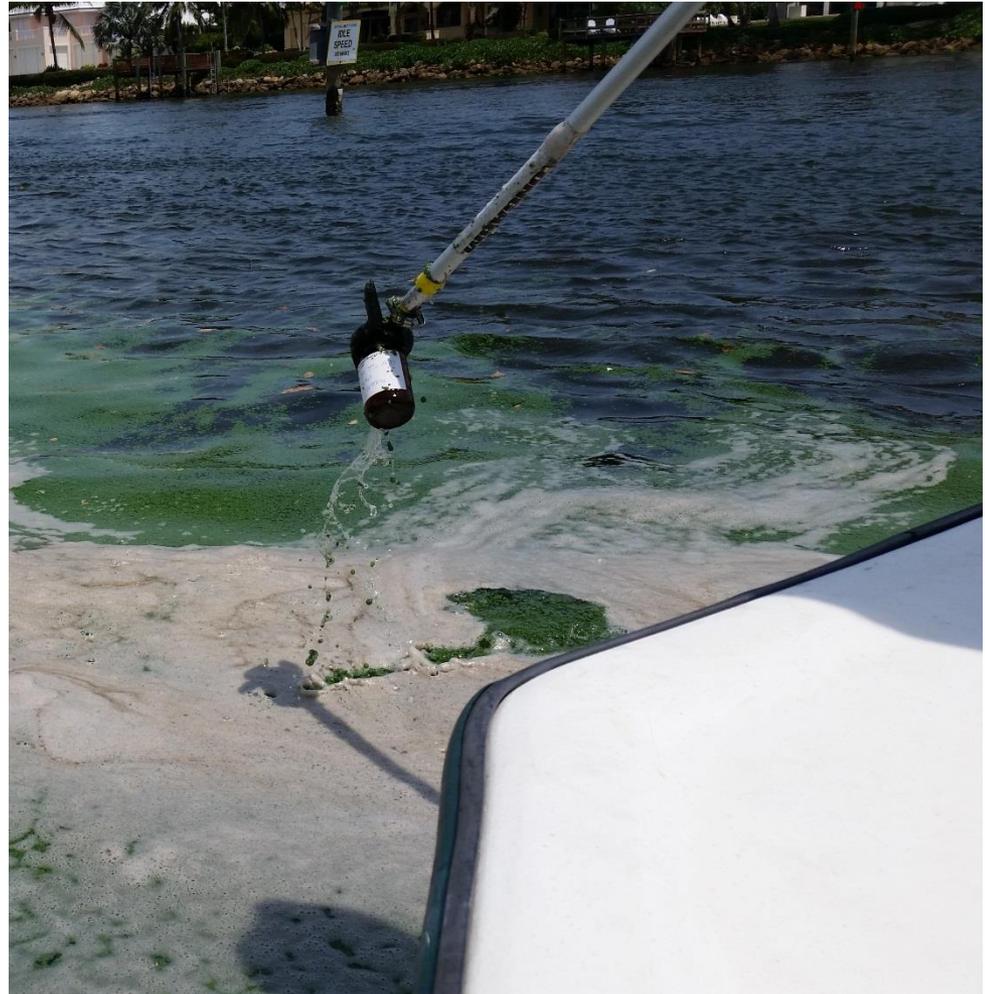
**Inland HABs Discussion Group Webinar**





# Florida's Multi-Agency Approach

- Florida does not have an agency specifically tasked to monitor for freshwater harmful algal blooms
- Surveillance for freshwater HABs is done while field staff are performing other field sampling, monitoring, and reconnaissance work
- FDEP provides its field staff with bloom sampling kits to take with them in case they observe a bloom while in the field



Jordan Skaggs, St. Lucie River near St. Lucie Inlet, June 27, 2016



# Florida's Multi-Agency Approach

- FDEP
  - Sampling, analysis, and dissemination of results
  - Water quality protection
- FDOH
  - Issues health advisories
  - Investigates reports of illness related to HAB exposure
  - Online information sharing through their CyanoHAB tracking module in Caspio
- FWC
  - Addresses fish kills and sick wildlife
  - Principle agency for marine HABs
  - Sampling and analysis
- WMD
  - Sampling and reconnaissance
- County Governments
  - Sampling, reconnaissance, advisories



FDEP Biology Laboratory

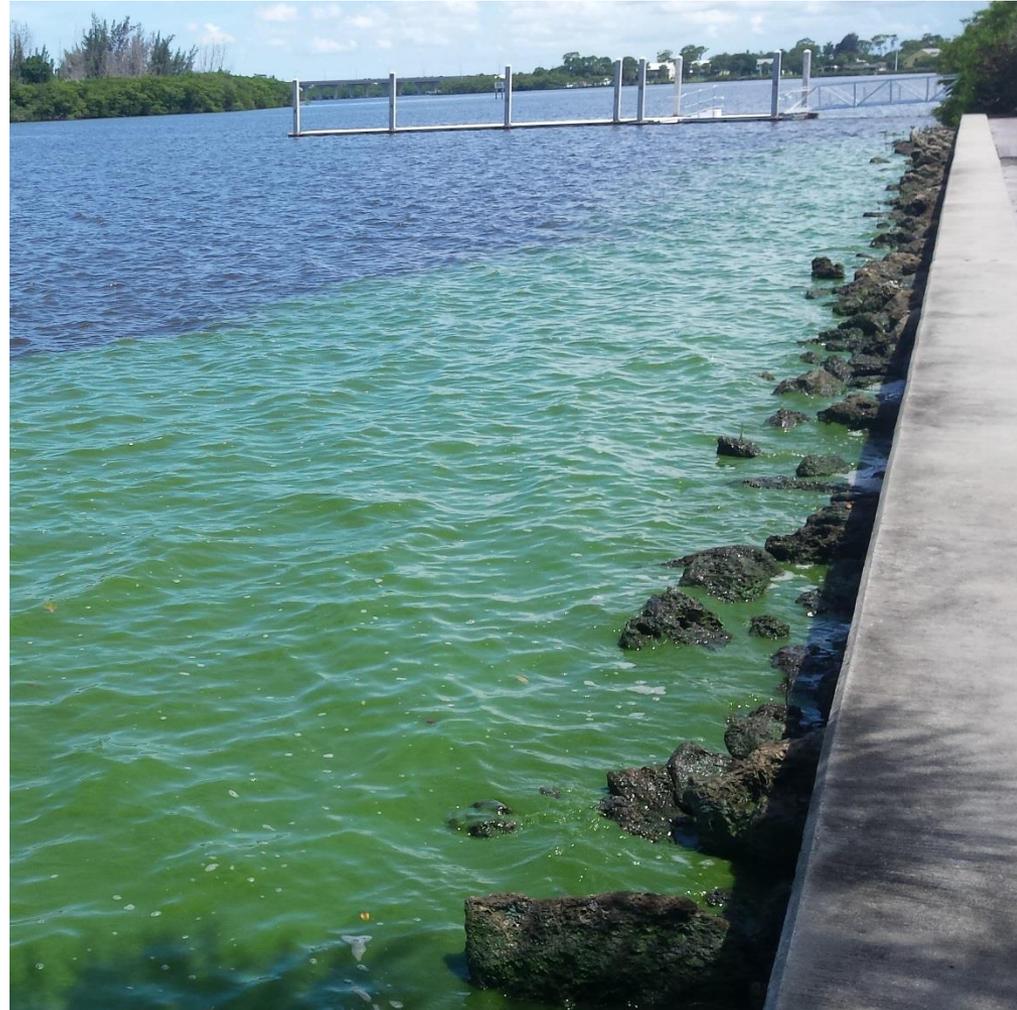


Kalina Warren, June 23, 2016 Leighton Park



# Florida's Multi-Agency Approach

- Starting in Late February or early March, FDEP staff send out a request to other state agency staff to update our Cyano HAB Contact List
- Each agency typically has a primary and one or more secondary contacts
- When a significant bloom is report, the Cyano HAB contacts coordinate agency response principally through emails, phone calls, and teleconferences



Kalina Warren, June 23, 2016 Leighton Park



# Florida's Multi-Agency Approach

- FDOH's Caspio web tool allows CyanoHAB contacts to keep up to date with reconnaissance, sampling and analysis efforts
- Generates an email to each CyanoHAB contact when a record is added or updated
- Can append maps, tables, and photos to the record

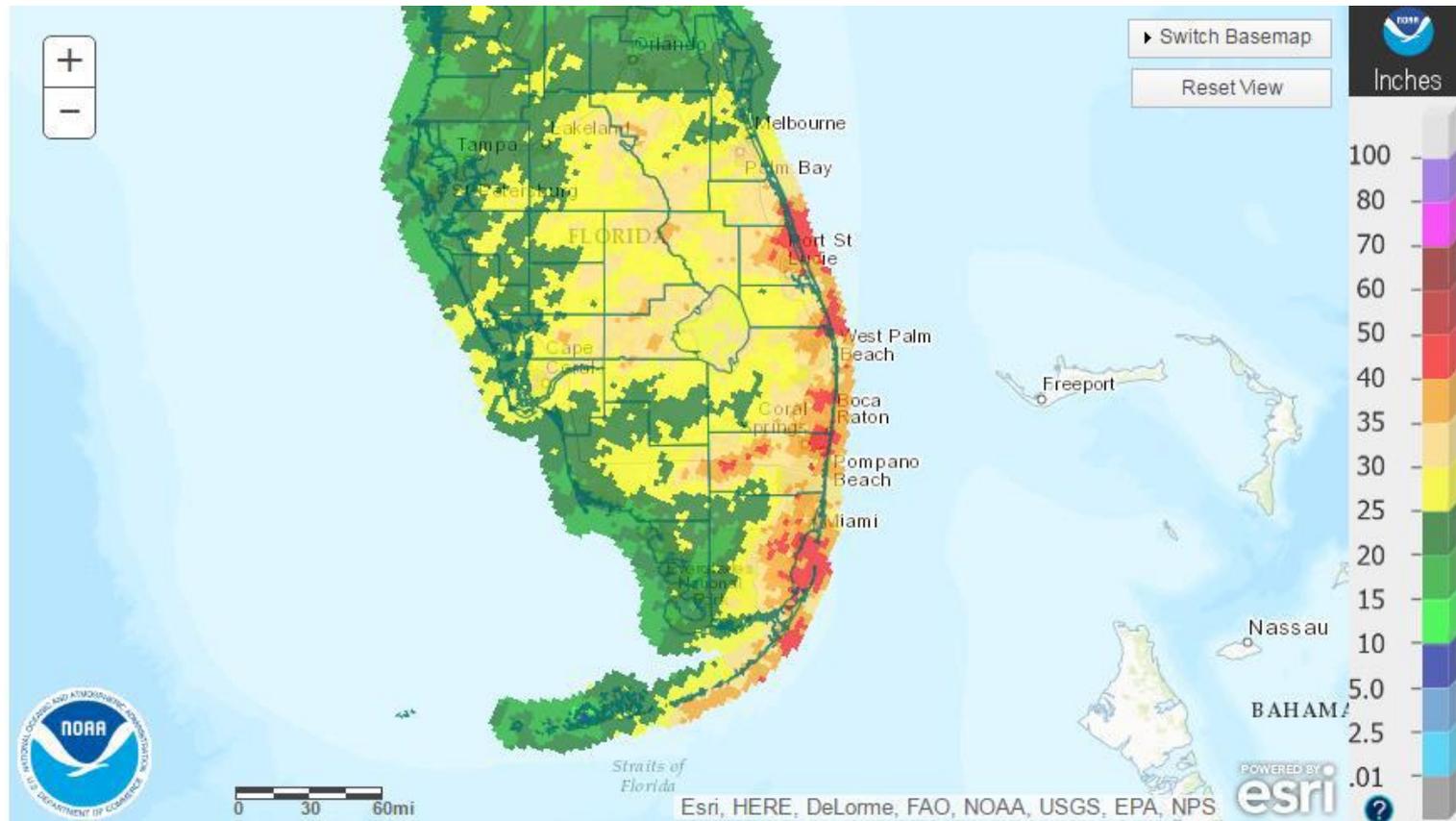
Bloom Notification  
 Auto Generated Bloom Contact ID: 371  
 Descriptive Bloom ID: FDEP\_2016-06-14\_StLucieRiver  
 Name of Water Body: St. Lucie Canal  
 Date Received:  
 Date First Seen:  
 Location: S80 upstream of St. Lucie Lock  
 Nearest Town:  
 County: Martin  
 Bloom Description:  
 Health Effects:  
 Environmental Impacts:  
 Recorder's Name: Cheryl Swanson  
 Recorder Agency: FDEP (HQ)  
 Recorder Phone Number 8502458171  
 Recorder Email [cheryl.swanson@dep.state.fl.us](mailto:cheryl.swanson@dep.state.fl.us)  
 Agency Assigned for Follow-Up: FDEP (HQ)  
 Agency Person Contacted:  
 Comments:  
 Other Comments:  
 Site Visit  
 Site Visit Conducted: Yes

Waterbody Name: St. Lucie Canal  
 Response Date: 06/14/2016  
 Location: S80 upstream of St. Lucie Lock  
 Nearest Town:  
 Lat Degrees:  
 Lat Minutes:  
 Lat Seconds:  
 Lon Degrees:  
 Long Minutes:  
 Long Second:  
 Visit Type: Initial  
 Visit Team: SFWMD  
 Agency: WMD  
 Fish Kills:  
 Warnings or Advisories:  
 Lab Results Available: Yes  
 Comments on Lab Results:The dominant taxon was Planktolyngbya limnetica.  
 Please login to the Florida HAB Online Tracking Module for more information about this record. If you need further assistance, please email [andy.reich@flhealth.gov](mailto:andy.reich@flhealth.gov) or [Joseph.Higginbotham@flhealth.gov](mailto:Joseph.Higginbotham@flhealth.gov) Thank you.



# 2016 Bloom Season

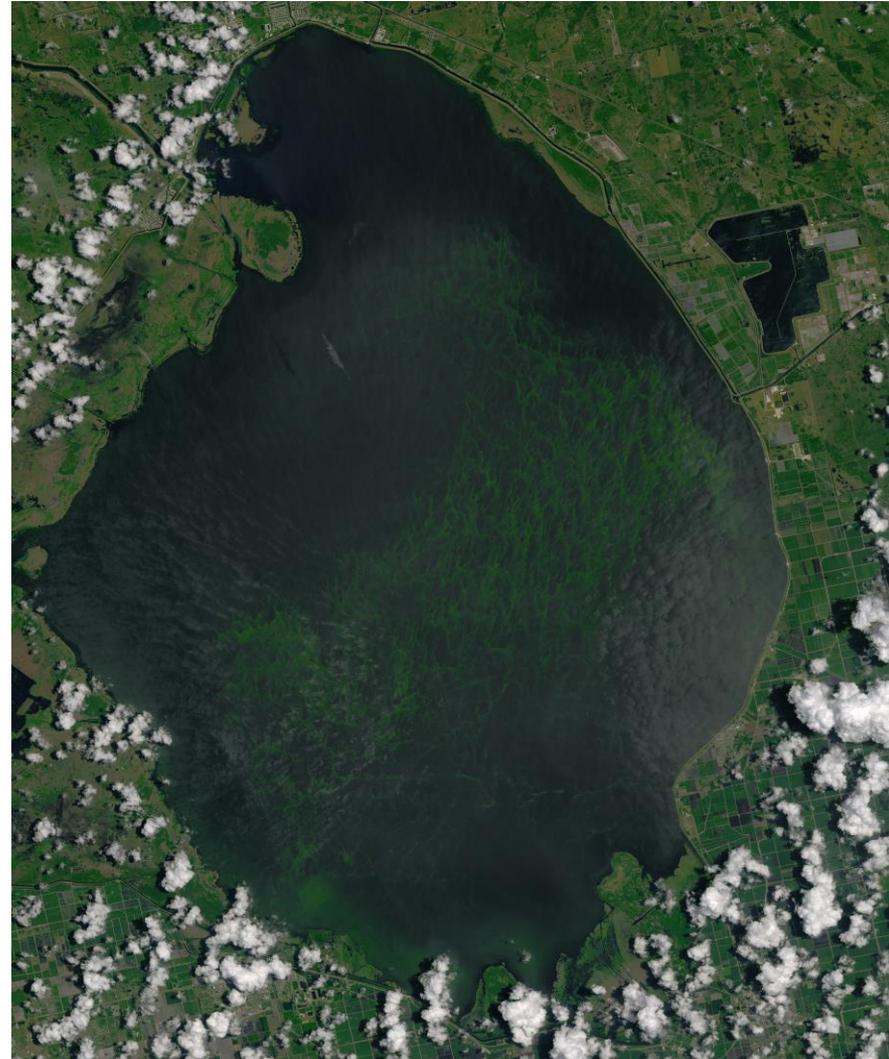
South Florida experienced a wetter than normal dry season (November – May) during 2015/2016, with the wettest winter on record for multiple cities





# 2016 Bloom Season

- FDEP was notified by the U. S. Army Corps of Engineers about an algal bloom on Lake Okeechobee on May 13, 2016.
- Lake Okeechobee is Florida's largest lake (730 square miles) that averages only 2.7 meters deep
- Lake Okeechobee is classified as a Class I potable drinking water source



NASA Earth Observatory images by Joshua Stevens, using Landsat data from the [U.S. Geological Survey](https://www.usgs.gov/centers/eros/data-and-sciences/eos).

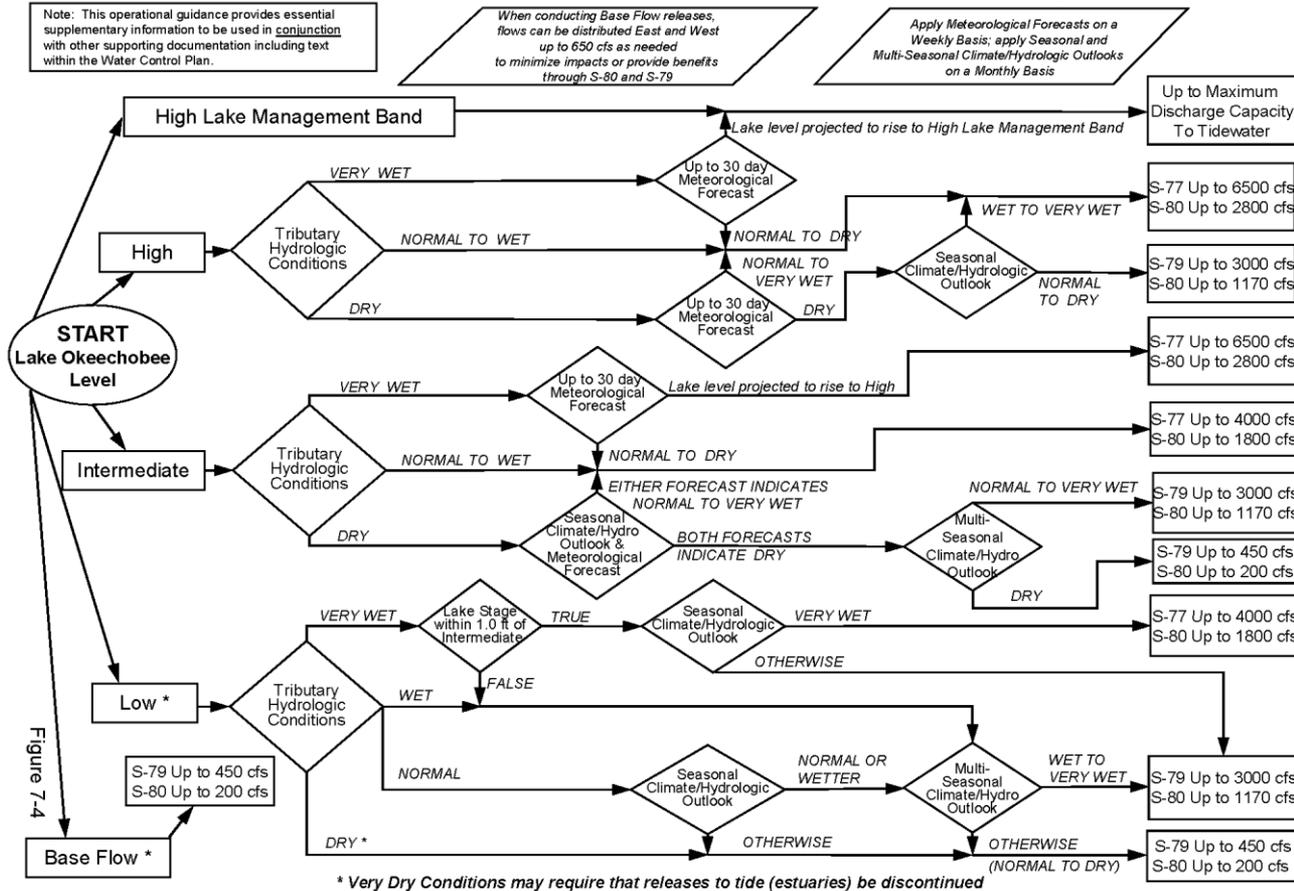


# Lake Okeechobee Releases

Due to concerns about the structural integrity of the Herbert Hoover Dike, the USACE must maintain the lake level according to a prescribed schedule

## 2008 LORS

### Part D: Establish Allowable Lake Okeechobee Releases to Tide (Estuaries)

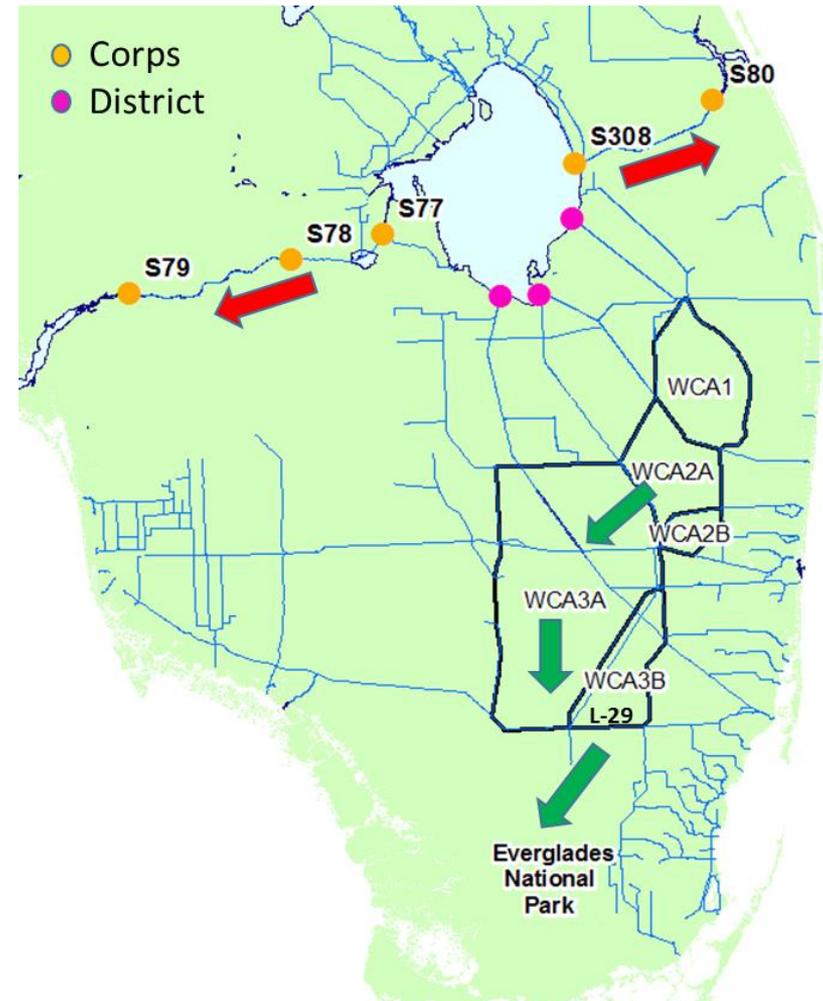


[http://www.saj.usace.army.mil/Portals/44/docs/h2omgmt/LORSdocs/2008\\_LORS\\_WCP\\_mar2008.pdf](http://www.saj.usace.army.mil/Portals/44/docs/h2omgmt/LORSdocs/2008_LORS_WCP_mar2008.pdf)



# Lake Okeechobee Releases

- Majority of the water is released to the Caloosahatchee and St. Lucie River systems, which lead to the Caloosahatchee and St. Lucie Estuary systems
- Past high volume releases have resulted in seagrass and shellfish die offs in the estuaries and contributed to significant algal blooms in these systems
- Smaller volumes of water are released to the south to the Water Conservation Areas



<https://content.govdelivery.com/accounts/FLDEP/bulletins/1389c24>



# Lake Okeechobee Releases

The Lake Okeechobee algal bloom and releases to the estuaries were well covered by the media



**Johann Hoffend** @Chopper5WPTV · Jun 21

This shows the Flow from The Lake to the St Lucie lock To the St Lucie River THIS CANT BE GOOD



13



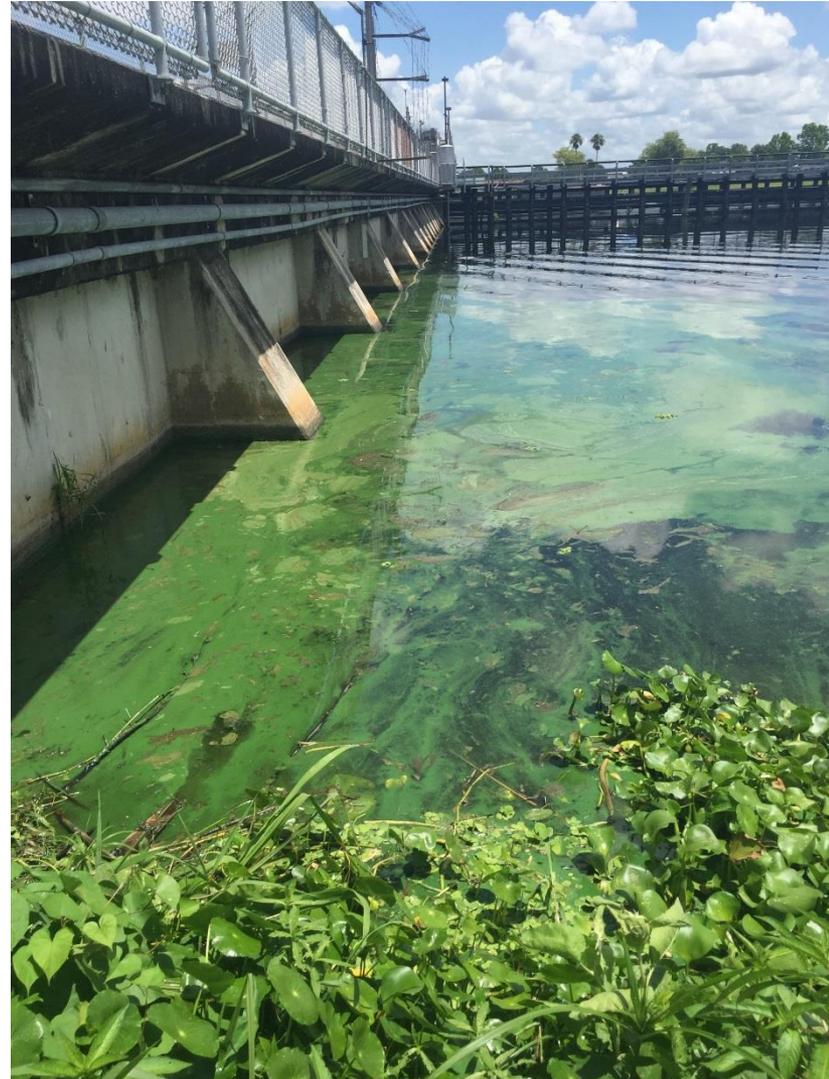
6





# Lake Okeechobee Releases

- Caloosahatchee River bloom impacts occurred predominantly in June, 2016
- Despite getting more than twice the amount of water that the St. Lucie River received, significant sustained algal blooms were not common on the Caloosahatchee
- Prevailing winds pushed the bloom on Lake Okeechobee to the east, away from the S77 lock and towards the S308 lock



Chase Conley, Franklin Lock, June 22, 2016



# FDEP Response

FDEP set up an algal bloom information page that provided:

- An algal bloom reporting hotline and webpage where citizens could report a bloom
- CyanoHAB FAQs
- Sampling results
- Information on innovative algal bloom clean-up technology evaluations
- Beach closure Information
- Human health and wildlife impact information
- Algal Bloom Response Team information

The screenshot shows the FDEP News website page for 'Algal Bloom Monitoring and Response'. The page features a navigation bar with 'DEP 101', 'HOT TOPICS', 'ARTICLES', 'DEP RESOURCES', 'CONTACTS', and 'DEP HOMEPAGE'. The main content area includes a 'REPORT ALGAL BLOOMS' call to action with the phone number 855-305-3903 and a 'CLICK HERE' link. Below this, there are sections for 'Freshwater Algal Bloom Frequently Asked Questions', 'South Florida Algal Bloom Sampling Results', 'Algal Bloom Innovative Clean-Up Technology Evaluation', 'Beach Closures', 'Health Concerns and Wildlife Impacts', and 'Algal Bloom Response Team'. A photograph of a blue-green algal bloom is shown with a caption: 'This is an example of what blue-green algae can look like, however, it is impossible to determine algal identification and toxicity simply by sight. All bloom observations should be reported to DEP.' The page also includes a 'Contact DEP Press Office' section with an email address and phone number, and a 'Sign Up For News & Info' button. Social media links for Twitter and Facebook are provided, along with a 'Who to Contact' section at the bottom.



# FDEP Response

- Algal bloom response updates were provided to the public via the DEP webpage
- Majority of calls into the Algal Bloom Reporting Hotline were asking about beach conditions rather than to report a bloom

The screenshot shows the DEP News website with the following content:

- DEP News** Florida's Environmental News Now
- Navigation: DEP 101, HOT TOPICS, ARTICLES, DEP RESOURCES, CONTACTS, DEP HOMEPAGE
- South Florida Algal Bloom Monitoring and Response**
- Two call-to-action boxes:
  - REPORT ALGAL BLOOMS:** Call 855-305-3903 or [CLICK HERE](#)
  - ALGAL BLOOM INNOVATIVE TECHNOLOGY REVIEW PORTAL:** [CLICK HERE](#)
- Latest Actions**
  - On June 29, Governor Rick Scott issued an Executive Order declaring a state of emergency in Martin and St. Lucie counties following the presence of algal blooms in local waterways. That Order was amended on June 30 to include Lee and Palm Beach counties. On July 1, it was announced that DEP has quickly implemented two directives outlined in the Order.
  - Residents statewide will now have the ability to easily report information to the department 24 hours a day, 7 days a week when observing algal blooms.
    - Information can be reported online through at [www.reportalgalbloom.com](http://www.reportalgalbloom.com)
    - Reports can be called in to a new toll-free number at 1-855-305-3903
  - The department is also working expeditiously to implement the other two directives in the Order.
    - DEP is deploying additional staff to rapidly survey and sample areas impacted by algal blooms. The department trained additional staff from DEP's aquatic preserves to augment sampling already being conducted by DEP, the FWMD and FWC. Additionally, these aquatic preserves will provide boats as needed for sampling efforts.
    - DEP staff have begun using On-Site Microsystin Testing Kits that provide preliminary toxin information. Samples are still sent for a full evaluation to DEP's laboratory.
- Sampling Schedule**

Today, Aug. 29, the South Florida Water Management District will be conducting routine water-quality sampling on the St. Lucie side of Lake Okeechobee at Port Mayaca (Se80C) and on the Caloosahatchee side of the lake at Moore Haven and Franklin Lock. They will collect samples if algal blooms are present.
- Contact DEP Press Office**

Depnews@dep.state.fl.us  
850.245.2112
- Sign Up For News & Info**
- FLDEP News**
  - @FLGovScott & Cabinet honored Keith Morin as Resource Manager of the Year - [goo.gl/H6gRjX](https://t.co/9htGgVROTB) <https://t.co/9htGgVROTB>  
18 hours ago
- Florida Department of Environmental Protection**

Florida Department of Environmental Protection
- Florida State Parks**
  - RT @brookefleming: What a lovely day for photographing #BigLagoonStatePark! 📷🌳🌴  
#LoveFL @FLStateParks  
<https://t.co/dFdl1jH0xf> 49 minutes ago
- Florida State Parks**

Florida State Parks



# FDEP Response

- Contact information was provided for each of the responding state agencies as well as for affected counties
- Providing local links and phone numbers for beach condition information helped us manage the hotline call volume

natural resources.

## Who to Contact

The state's bloom response team encourages residents to report algal blooms so that we can respond quickly and effectively.

- Florida Department of Environmental Protection collects and analyzes algal bloom samples.
  - To report a bloom, call the toll-free hotline at 855-305-3903 or report online at [www.reportalgalbloom.com](http://www.reportalgalbloom.com).
  - Freshwater Algal Bloom Frequently Asked Questions
- Florida Department of Health issues health advisories when toxin levels present a risk to human health.
  - To report illnesses or symptoms, contact the Florida Poison Control Center at 1-800-222-1222.
  - Florida Department of Health Blue-Green Algae Frequently Asked Questions
  - For information on health advisories, contact your local county health department.
- Florida Fish and Wildlife Conservation Commission (FWC) responds to reported fish kills and collects algae samples at nearshore sites.
  - To report a fish kill, contact the Fish Kill Hotline at 800-636-0511.
  - To report any other wildlife injuries, call FWC's Wildlife Alert at 1-888-404-3922.
- County governments issue public beach closures. For more information, contact:
  - Martin County: 772-320-3112
  - St. Lucie County: 772-229-2850
  - Palm Beach County
    - North Palm Beach County (Juno Beach and north): 561-624-0065
    - South Palm Beach County (Riviera Beach and south): 561-629-8775
  - Lee County
  - State park beach closures

## Monitoring and Testing

DEP and Florida's water management districts frequently monitor Florida's water quality, and routinely collect algal bloom samples as soon as they are observed as part of this effort. In addition, staff can be deployed to take additional samples in response to reported blooms – whether from a citizen, other response team agencies or other sources.



Share this:



Be the first to like this.

SEAFAN.net. <https://t.co/3hradCGrAL>  
34 minutes ago

Follow @Aquatric\_FL

## FLDEP Alert

- RT @FLGovScott: There will also be a lot of debris, including uprooted trees and fallen limbs. Do not travel unless absolutely necessary. 2 weeks ago

Follow @FLDEPAlert



# Sampling and Reporting Effort

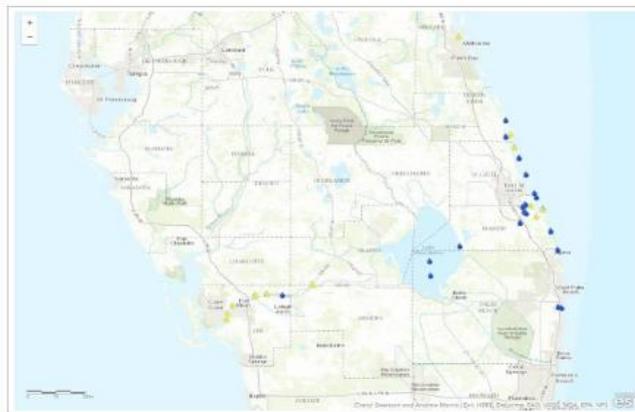
- FDEP reported sampling and analysis results up to twice per week
- Microscopic analysis performed to determine dominant species present in the sample and whether potential toxin-producing cyanobacteria were present
- Analyzed for microcystins, cylindrospermopsin, and anatoxin-a

## Sampling Results

To date, a majority of the results continue to indicate low to extremely low levels of toxins. All results are reported to the Florida Department of Health (DOH), the Florida Fish and Wildlife Conservation Commission (FWC) and the Florida Department of Agriculture and Consumer Services (DACS).

On August 16-17, DEP and FWC staff were deployed to survey and collect samples on the St. Lucie river and estuary and nearshore marine locations. A total of 9 samples were collected. **All sample results were non-detect for toxins.**

Since May 13, 2016, when the South Florida Water Management District (SFWMD) first observed an algal bloom on Lake Okeechobee during their routine sampling, DEP and the SFWMD have regularly responded to and sampled observed and reported algal blooms on Lake Okeechobee, in the St. Lucie River and Estuary and the Caloosahatchee River and Estuary.



Click on the image to access interactive map.

Sample Date	Samples Collected By	Samples Analyzed By	Sampling Location (Latitude and Longitude)	Sample Depth (meters)	Algae ID	Microcystin Toxin (measurement in micrograms per liter)
8/17/2016	FDEP	FDEP	Martin County St. Lucie River (docks just east of Dyer Pt. Rd.) (-80.2676254, 27.2014)	0.3	mixed algae; no dominant species in sample	not detected
8/17/2016	FDEP	FDEP	Martin County St. Lucie River	0.3	mixed algae; no dominant species in	not detected

### Florida Coastal Office (FCO)

- Keep an eye out for vessel grounding or anchor damage to our reefs and report it to SEAFAN.net. <https://t.co/1hradCGrAL>
- 36 minutes ago

Follow @Aquatic\_FL

### FLDEP Alert

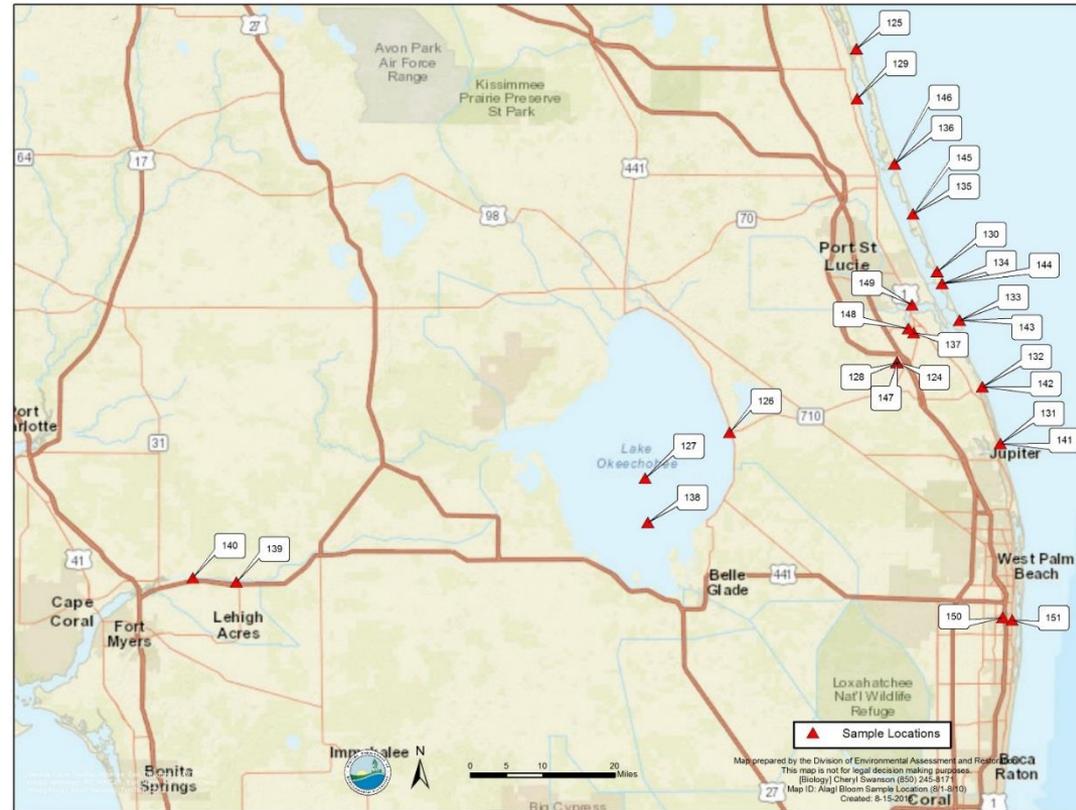
- RT @FLGovScott: There will also be a lot of debris, including uprooted trees and fallen limbs. Do not travel unless absolutely necessary. 2 weeks ago

Follow @FLDEPAlert



# Sampling and Reporting Effort

- Samples collected by multiple agencies (FDEP, FDOH, SFWMD, FWRI, Lee County)
- Toxin samples collected for informational purposes only
- Advisories currently based on visual observation
- Precautionary principle – if it's green, avoid contact or use



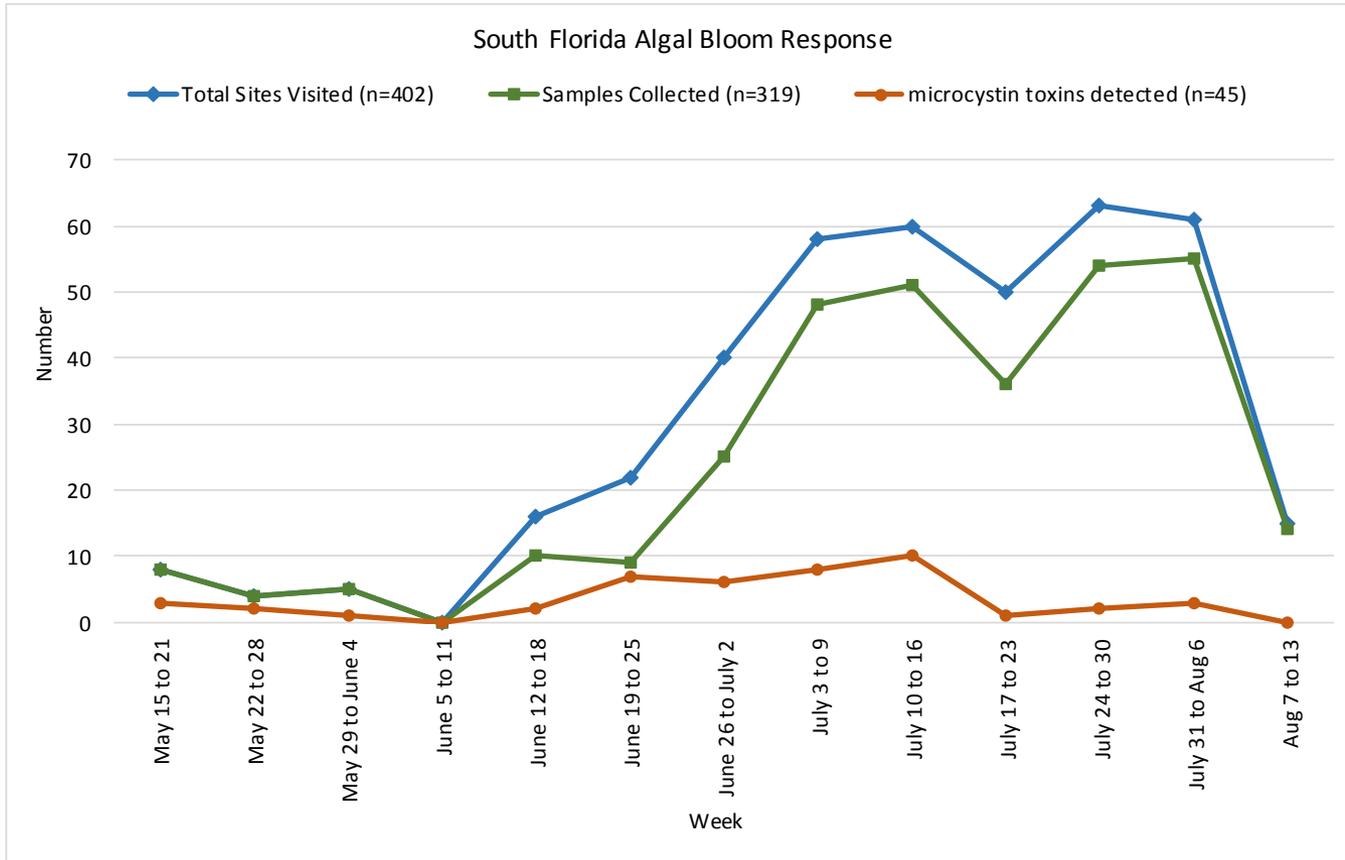


# Sampling and Reporting Effort

Sample # website	Sample Date	Samples Collected By	Samples Analyzed By	Sampling Location	County	Depth	Algae ID	Microcystin Toxin	Cylindrospermopsin Toxin	Anatoxin Toxin
152	8/10/2016	FDEP	FDEP	Indian River Lagoon, Port St. John boat ramp (-80.766446, 28.475095)	Brevard	0.3	not collected	not detected	not detected	not detected
151	8/10/2016	SFWMD	FDEP	C51S155 (N 26° 38' 41.2000", W -80° 03' 17.9800")	Palm Beach	0.25	mixed algae; no dominant species in sample	not detected	not detected	not detected
150	8/10/2016	SFWMD	FDEP	Lake Clarke Shores (N 26° 38' 58.8", W -80° 04' 27.2")	Palm Beach	0.25	mixed algae; no dominant species in sample	not detected	not detected	not detected
149	8/10/2016	FDEP	FDEP	S. Fork St. Lucie River - Central Marine (N 27° 12' 55.0332", W -80° 15' 18.6444")	Martin	0.3	mixed algae; no dominant species in sample	not detected	not detected	not detected
148	8/10/2016	FDEP	FDEP	S. Fork St. Lucie River - Leighton Park (N 27° 10' 20.9028", W -80° 15' 46.1808")	Martin	0.3	mixed algae; no dominant species in sample	not detected	not detected	not detected
147	8/9/2016	SFWMD	FDEP	C44 S80, St. Lucie Canal (N 27° 6' 37.442", W -80° 17' 7.095")	Martin	0.3	mixed algae; no dominant species in sample	2.3 I	not detected	not detected
146	8/9/2016	FWC	FWRI - algal ID; FDEP -toxins	Ft. Pierce Inlet Beach (N 27° 28.165', W -80° 17.425')	Martin	0.5	mixed algae; no dominant species in sample	not detected	not detected	not detected

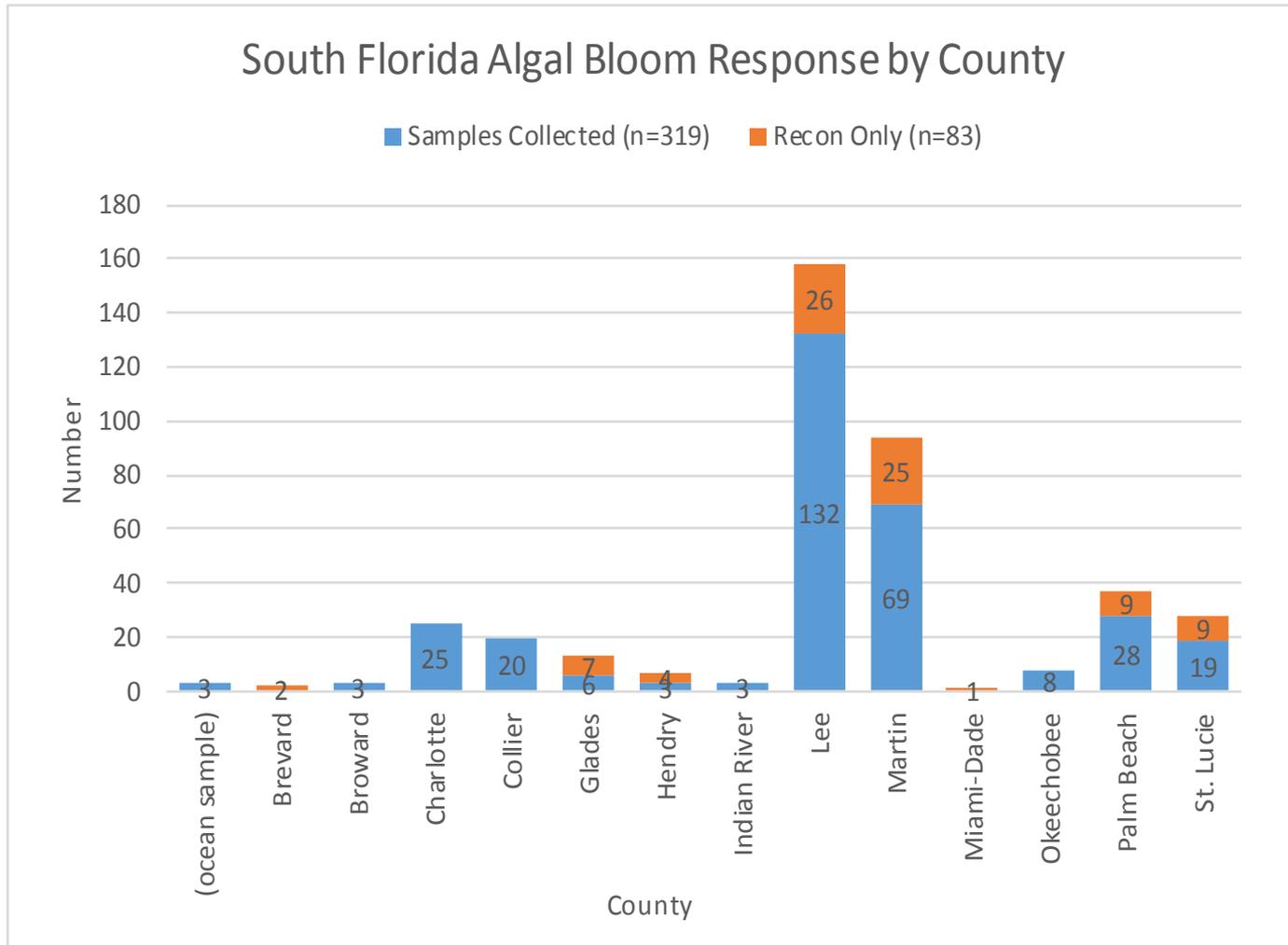


# Sampling and Reporting Effort





# Sampling and Reporting Effort





# June, 2016



Eric Hasert, Treasure Coast Newspapers, St. Lucie River Estuary, June 24, 2016



# June, 2016

Due to the scale of the algal bloom on Lake Okeechobee (> 300 square miles at times), the volume of water that had to be released, and runoff from the rest of the St. Lucie River watershed, intense algal blooms were observed throughout the St. Lucie estuary and out several miles into the Atlantic Ocean



Brian Ingram, June 26, 2016, Atlantic Ocean off St. Lucie Inlet



# Highly Variable Conditions





# June, 2016

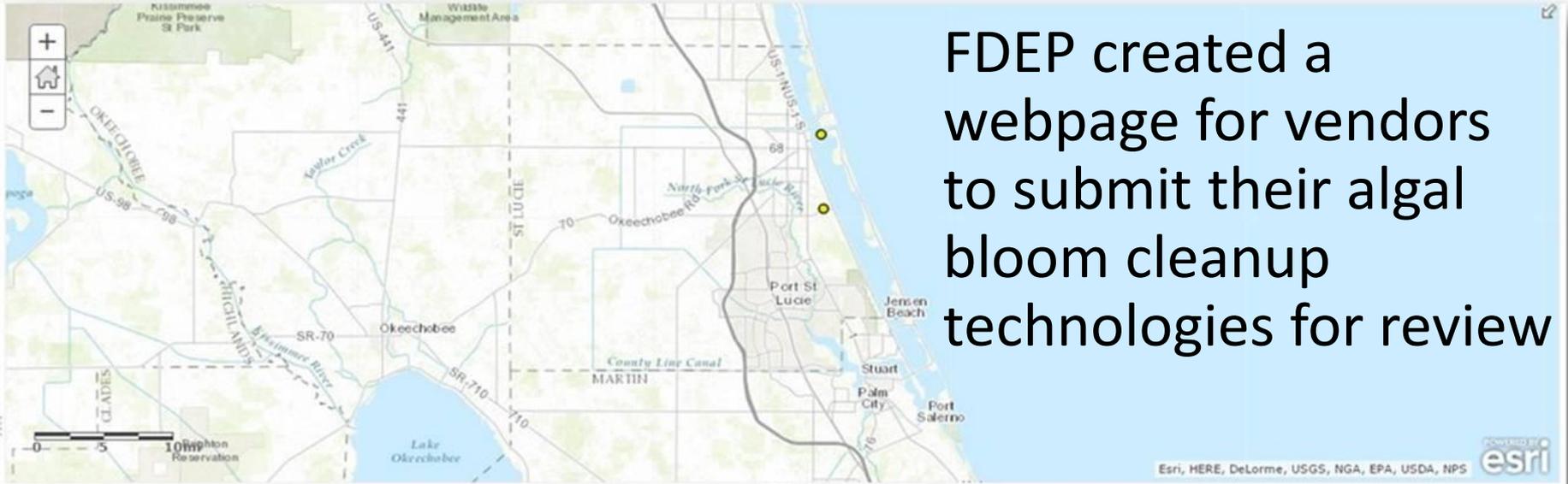


Greg Lovett, The Palm Beach Post via AP, June 29, 2016, Central Marine, Stuart, FL



# Innovative Algal Bloom Cleanup Technology Portal

FDEP created a webpage for vendors to submit their algal bloom cleanup technologies for review



**Innovative Technology Demo Proposals (3 features, 0 selected)** Table Options

CONTACT NAME	CONTACT PHONE	EMAIL	BUSINESS NAME	ADDRESS	WEBSITE	TECHNOLOGY TYPE	TECHNOLOGY DESCRIPTION	SCALE OF USE	STATEWIDE DEPLOYMENT	AREA OF DEPLOYMENT	DEMONSTRATED AT OWN COST	TIME TO MOBILIZE	SCI REV
Jane Doe	850-245-5555	Janedoe@gmail.com	Green Stuff inc.	123 Main Street Jupiter FL 55555	http://www.greestuff.com	MECHANICAL	Description of the mechanical way we remove green stuff.	EXPERIMENTAL	Y	All counties in the State of Florida	N	1 MONTH	N
Kim Jackson	850-245-8296	cleanit@gmail.com	Clean It Inc.	55 oak Street St Lucie FL 55555	www.cleanit.com	BIOLOGICAL	Describe my technology	BENCH	N	St Lucie County	Y	LESS THAN SEVEN DAYS	Y
Joe Doe	850-555-1212	JoeDoe@yahoo.com	Doe Cleaners	1234 Pine Street St Lucie FL 32301	http://DoeCleaners.com	COMBINATION	A combinations of technologies gets the job done.	LARGE SCALE	N	St Lucie County only.	Y	1 WEEK	N



# Innovative Algal Bloom Cleanup Technology Portal

- Portal was created as a result of two unpermitted algal clean up projects that were initiated at affected marinas
- A review committee was created with representatives from FDEP, DOH, FWC, SFWMD, U. S. EPA, U. S. ACE, U. S. Geological Survey, and Martin County
- Wide range of technologies submitted, which the committee broke into several groups
  - Mechanical (16)
  - Biological (15)
  - Chemical (7)
  - Combination (14)
- Committee reviewed submitted technologies with an eye towards applicability, human and environmental health concerns, scalability, mobility, and deployment time requirements



# Innovative Algal Bloom Cleanup Technology Portal

- Mechanical technologies included:
  - Autonomous or manned skimmers, both stationary and mobile
  - Autonomous algae-harvesting “robot” that converted algae into paraffin
  - Suction / vacuum pumps, stationary and mobile
  - Aerators
  - Floating barriers
- Biological technologies included:
  - Biopolymers
  - Microbial mixes
  - Fertilizers to boost microbial community



# Innovative Algal Bloom Cleanup Technology Portal

- Chemical technologies included:
  - Polymers
  - Flocculants
  - Chlorine dioxide
  - Algaecide/bactericide
- Combination technologies included:
  - Pumping on both mobile and stationary platforms with:
    - Polymers/flocculants
    - Filtration
    - Ozonation
    - Cavitation
    - Oxidation
  - Electro-Chemical Oxidation to aerate and mineralize nutrients



# Innovative Algal Bloom Cleanup Technology Portal

- Committee members expressed a strong preference for technologies that did not require chemical or biological agents to be added directly to surface waters
- Technologies that removed algal biomass from the surface water would need a disposal plan if the algal biomass was not being used as feedstock for the production of a product (e.g., bioplastic products, paraffin, syngas)
- Potential worker and resident exposure to cyanotoxins needs to be addressed if aerosols could be created by technology



# Innovative Algal Bloom Cleanup Technology Portal

- Algal bloom in Caloosahatchee and St. Lucie River and estuary systems dissipated before pilot projects could be set up through the technology portal
- Current plan is to review the submitted technologies and add those technologies that appear to be safe and efficacious to our Innovative Technologies Library
- These technologies would then be available for use in future CyanoHAB events if appropriate
- Use of these clean up technologies would require human and environmental safety precautions as well as monitoring and disposal plans



# Lessons Learned

Size matters!





# Lessons Learned

## Scale of the Event

- Coordination and communication tools that worked fine for past smaller scale bloom events were inadequate for this summer's South Florida blooms
- In order to expedite the reporting of reconnaissance and sampling results, new tools were deployed
  - Geoforms
  - Surveygismo.com
  - webinars
- Clean up technologies span all size ranges and timelines
  - Some technologies were developed for pools or ponds, while others were geared towards large open water applications
  - Some technologies would require weeks to months to see an effect, while others would be more immediate



# Lessons Learned

The public is highly interested in a “one-stop shop” for information about HABs and local conditions

- CyanoHAB response is handled by multiple agencies in Florida; however, FDEP included links and contact information for all of the responding state agencies and affected counties

Educating the public and the media about HABs is an ongoing process

- Just because you provide information on a webpage doesn't mean the everyone has found it, looked at it, or understood it



# Lessons Learned

Bloom conditions can be highly variable

- Beach conditions near St. Lucie Inlet were highly depended on the tide, with toxin concentrations ranged from non-detect to hundreds of micrograms per liter within hours
- Dead end canals and marinas can be severely impacted for a much longer timeframe than more open water areas

Have an algal clean up technology review and approval plan before the bloom season starts

Algal clean up technologies need to be selected and implemented in a manner that minimizes their potential for adverse health or environmental impacts while still being effective



# Contact

David Whiting, Deputy Director

Florida Department of Environmental Protection

Division of Environmental Assessment and Restoration

2600 Blair Stone Road

Tallahassee, FL 32399-2400

(850) 245-8191

[david.d.whiting@dep.state.fl.us](mailto:david.d.whiting@dep.state.fl.us)