

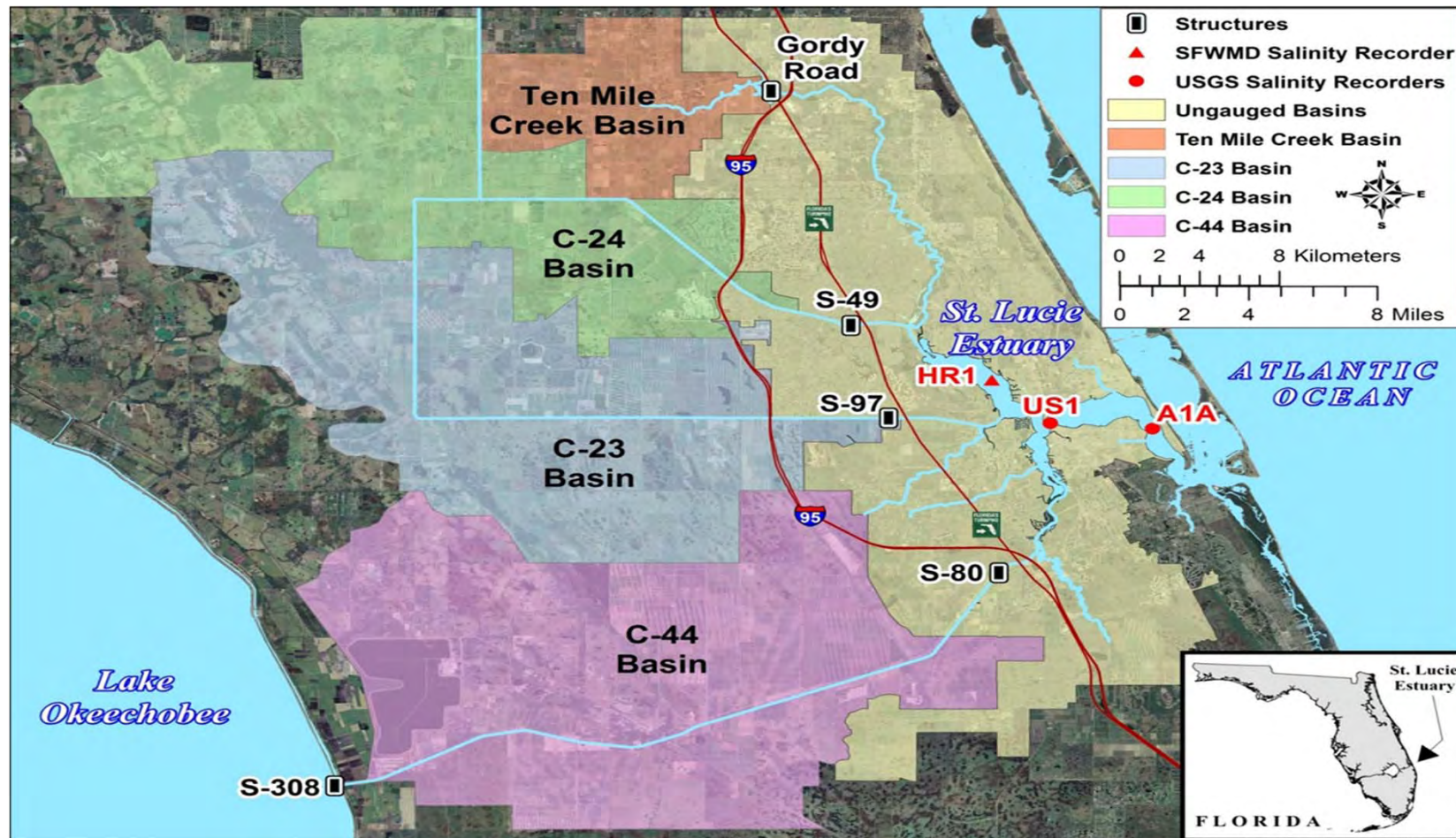
# PROGRESSION OF HARMFUL ALGAL BLOOMS IN MARTIN COUNTY

Florida Stormwater Association  
Annual Conference  
June 2019

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Martin County Public Works Department



# ST. LUCIE ESTUARY DRAINAGE BASINS



# WHY IS WATER QUALITY IMPORTANT?



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## WHAT DOES A HARMFUL ALGAL BLOOM (HAB) LOOK LIKE?

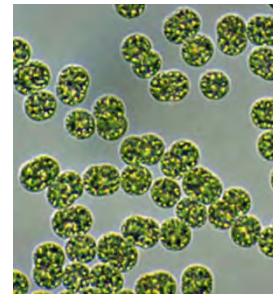


*Microcystis aeruginosa* – 2005, 2013, 2016 and 2018



# 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...

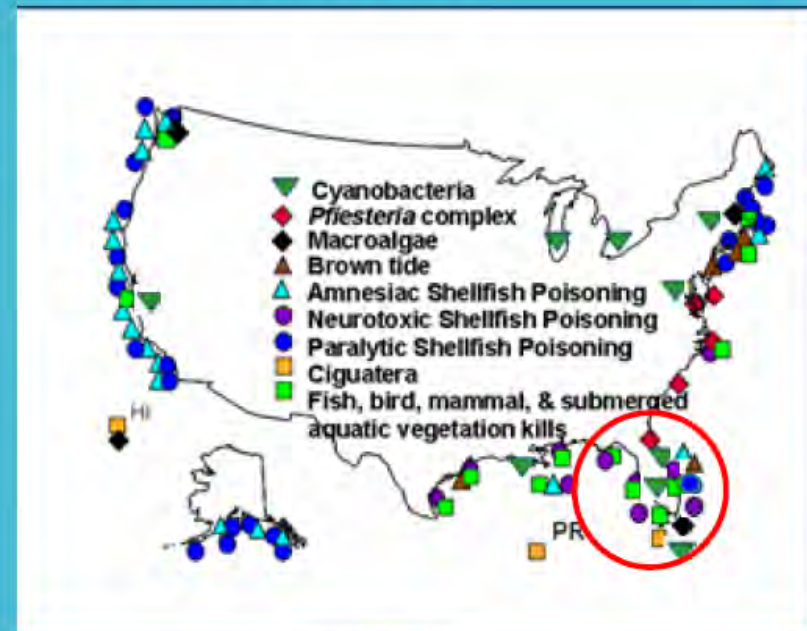


# WORLDWIDE HAB INCREASES – FL A HOT SPOT

## REPORTED HAB OCCURRENCES



~1972



NOW

## 2013 – HOW DID THE BLOOM FORM?

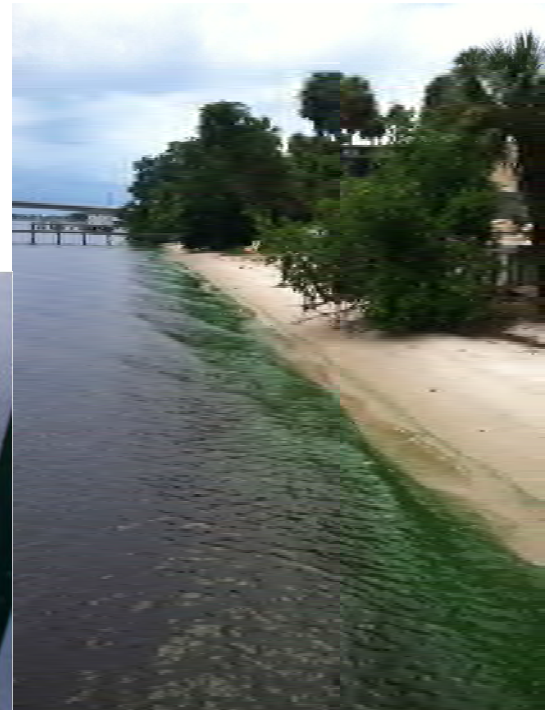
- Impaired waterbody due to high levels of nutrients
- Lake Okeechobee elevation of 13.6 feet on May 6
- Significant portion of the lake covered in bloom





## 2013 - “THE LOST SUMMER”

- Lake discharged from May 8 – October 21
  - 218 billion gallons of polluted water
  - 15.5 million pounds of suspended sediment
  - 1.4 million pounds of TN
  - 157,000 pounds of TP
  - Toxic blue green algae



## 2013 - WHAT DID WE DO?

- Martin County DOH sampled and issued advisories to avoid contact with visible blue green algae
- Periodic scientist calls with USACE, FDEP, SFWMD
- Began advocacy for full completion of IRL-South
- Speak up for the St. Lucie advocacy campaign



### **\*\*MEDIA ADVISORY\*\***

#### **Senate Select Committee on Indian River Lagoon and Lake Okeechobee Basin to Hold First Workshop in Stuart**

Stuart, Fla. – The Florida Senate Select Committee on Indian River Lagoon and Lake Okeechobee Basin (IRLLOB) will meet on Thursday, August 22, 2013, from 1:00 p.m. to 9:00 p.m. at the Charles and Rae Kane Center in Stuart. Chaired by Senator Joe Negron (R-Stuart), the select committee is charged with investigating policies, spending, and any other governmental activities affecting water management in the Indian River Lagoon and Lake Okeechobee Basin. Over the next few months, the select committee will conduct workshops and prepare a report to be submitted by November 4, 2013, to the Senate Committees on Appropriations, Environmental Preservation and Conservation, and Agriculture.

## 2016 – HOW DID THE BLOOM FORM?

- Impaired waterbody due to high levels of nutrients
- A very wet dry season
- Water temperatures 87 – 91° F
- May 9 a 33-square mile algal bloom documented in Lake Okeechobee close to Port Mayaca
- Prevailing southeast winds pushed bloom into basins



## 2016 - “THE TOXIC SUMMER”

- Lake discharged from January 29 – November 4
  - 273 billion gallons of polluted water
  - 54 million pounds of suspended sediments
  - 3.5 million pounds of TN
  - 433,000 pounds of TP
  - Toxic blue green algae



# 2016 - MARINAS IN NORTH CENTRAL ESTUARY



## 2016 - UNPRECEDENTED HAB EVENT

- June 24 - a dense blue-green algal bloom occurred at Bathtub Beach
- Additional beaches experienced blooms and were all closed to swimming



**JUNE 26 - 3 MILES NORTH OF ST. LUCIE INLET  
OFFSHORE IN ATLANTIC OCEAN**




# NASA PHOTO OF THE DAY – JULY 6, 2016





## 2016 - WHAT DID WE DO?

- Periodic scientist calls with USACE, FDEP and SFWMD
  - Martin County HAB reconnaissance
  - Coordinate with FDEP on reporting blooms
    - Representative samples
  - June 29 - Governor declared state of emergency
  - Strong advocacy for full completion of IRL - South
  - County hired a contractor to perform air, water and sediment samples
    - Worst case scenario samples
  - Private remediation companies
- 

# AMBIENT AIR RESULTS - JULY 11, 2016

Location	Temp (F)	Relative Humidity (%)	Dew Point (F)	Hydrogen Sulfide (ppm)	TVOC (ppb)	Comments
Central Marine	93	55	74	0.033-0.081	ND	Agitating Water 2.5' above water
				0.081-0.113		
				0.21-1.39		
Outboards Only	93	51	71	0.19-0.32	ND	4.5' above water 40 feet From pilot treatment discharge hose
				0.11-0.45		
				1.3-4.3		
Residence 1976 NE River Ct Jenson Beach	88	65	75	0.001-0.11	ND	6' from water fish kill observed
				0.006-0.013		
Dock Basin 762 NW Sunset Drive	86	80	78	0.11-0.29	ND	2.5' above water

**Hydrogen Sulfide** - Levels were discernable at levels which may be objectionable for individuals with respiratory conditions and asthmatics.



# TOXINS & MICROCYSTIS CELLS - JULY 11, 2016

Location	Microcystins in water (ug/L)	Microcystins in air <sup>a</sup> & <sup>b</sup> (ng/m <sup>3</sup> )	Microcystis Cells in air*
Central Marine	33100	0.6361 <sup>a</sup>	ND
Outboards Only	Not collected	0.0311 <sup>a</sup>	ND
Residence 1976 NE River Ct Jenson Beach	Not collected	0.0132 <sup>b</sup>	ND
Dock Basin 762 NW Sunset Drive	13700	0.0813 <sup>b</sup>	ND



# RESPIRABLE PARTICLES

Location	0.3 um	0.5 um	1.0 um	2.0 um	5.0 um	10 um	Comments
Central Marine	55,369	10,764	5,138	2,420	123	1	
Outboards Only	36,921	14,254	7,337	3,535	293	12	
	<b>142,511</b>	<b>52,832</b>	<b>18,112</b>	<b>7,554</b>	<b>929</b>	<b>40</b>	<b>By Water Pump Discharge</b>
	<b>23,429</b>	<b>11,572</b>	<b>6,073</b>	<b>2,977</b>	<b>440</b>	<b>31</b>	<b>Upwind of Water Pump</b>
1976 NE River Ct	43,286	12,033	5,946	2,451	140	2	
762 NW Sunset Dr	23,884	9,042	4,130	1,719	100	3	

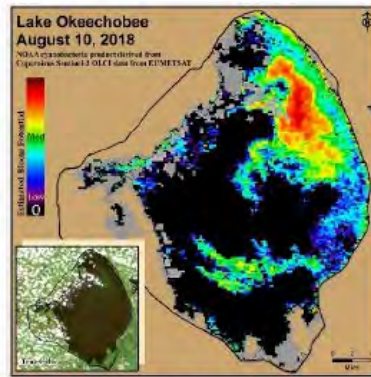
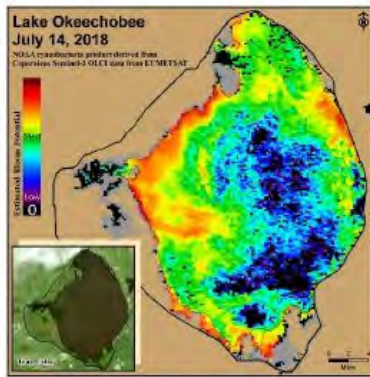
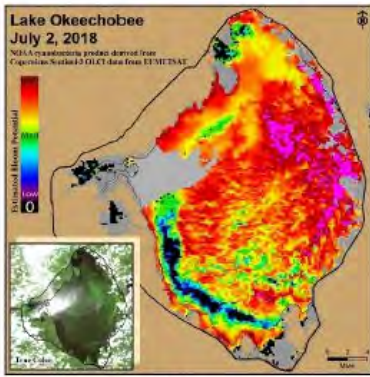
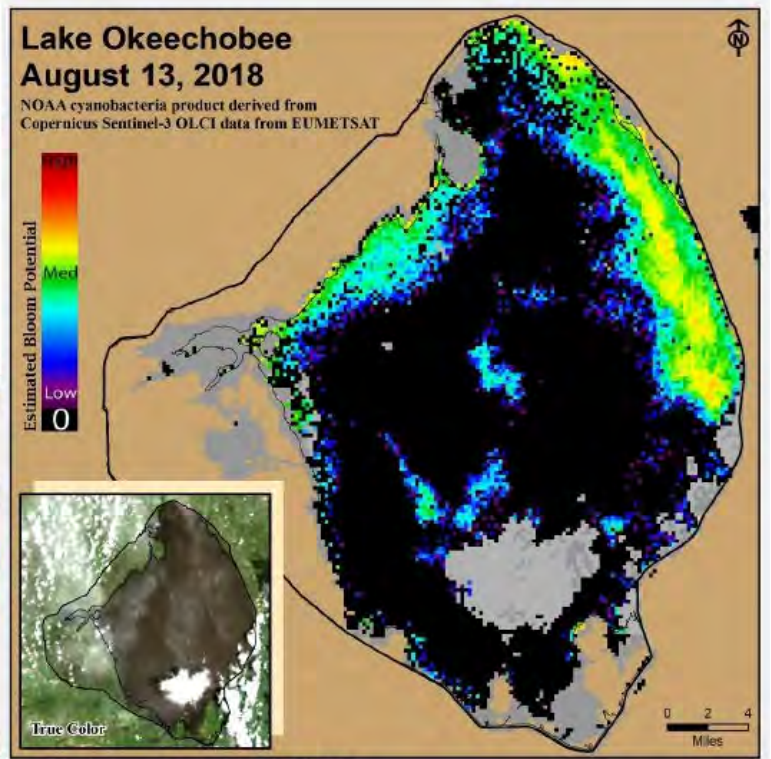
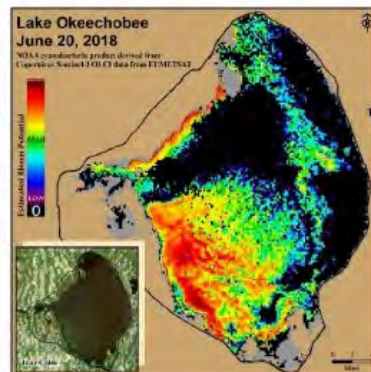
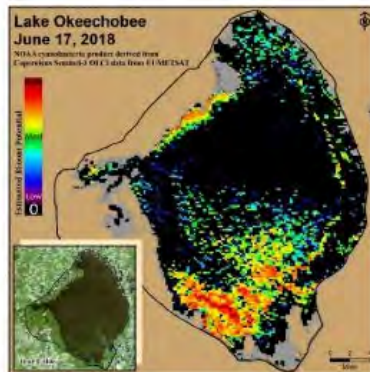
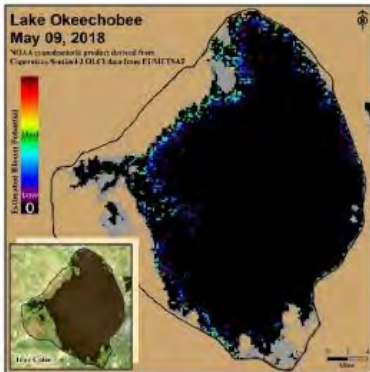


## 2018 - HOW DID THE BLOOM FORM?

- May - Martin County receives 25 inches of rain
- July 9 - Governor declares state of emergency order to combat HABs
- Algae crisis goes viral on Facebook and debuted on the Daily Show with Trevor Noah



# Lake Okeechobee Cyanobacteria Bloom Potential



Gray = Cloud Cover

NOAA cyanobacteria product derived from Copernicus Sentinel-3 OLCI data from EUMETSAT

Unvalidated and Experimental Data

## 2018 - #TOXIC18

- Lake discharged from June 1 – October 5
  - 87 billion gallons of polluted water
  - 32 million pounds of suspended sediment
  - 1.3 million pounds of TN
  - 147,000 pounds of TP
  - Toxic blue green algae



## 2018 – WHAT DID WE DO?

- Periodic scientist calls with USACE, FDEP and SFWMD
- Martin County HAB reconnaissance
- Continued advocacy for IRL-S and more storage
- Drone surveys
- FDEP grant for HAB Remediation Services
- Pilot demonstrations – Pond Lift, Solaris Cybermetrics
- Development of water quality webpage
- FAU Harbor Branch tests people for toxins






# 2018 – VACUUMING ALGAE



## 2019 AND FUTURE STRATEGIES

- Collaborative research efforts with Harbor Branch Oceanographic Institute
  - Developed an Algae Response Communications Team to collaborate local stakeholders
  - Lake Okeechobee Schedule and Operating Manual revisions
  - National Algae Association HAB Remediation Workshop
  - Collaboration with our west coast partners
  - Water Ambassador Program
- 

## 2019 - WHERE DO WE GO FROM HERE?

- April - Governor DeSantis appointed members to Harmful Algal Bloom Task Force
- May - EPA issued Final Human Health Recreational Water Quality Criteria for Swimming Advisories for Microcystins and Cylindrospermopsin
  - For microcystins the value is 8 µg/L
  - For cylindrospermopsin the value is 15 µg/L
- Alternative Treatment Technologies



# Questions?

