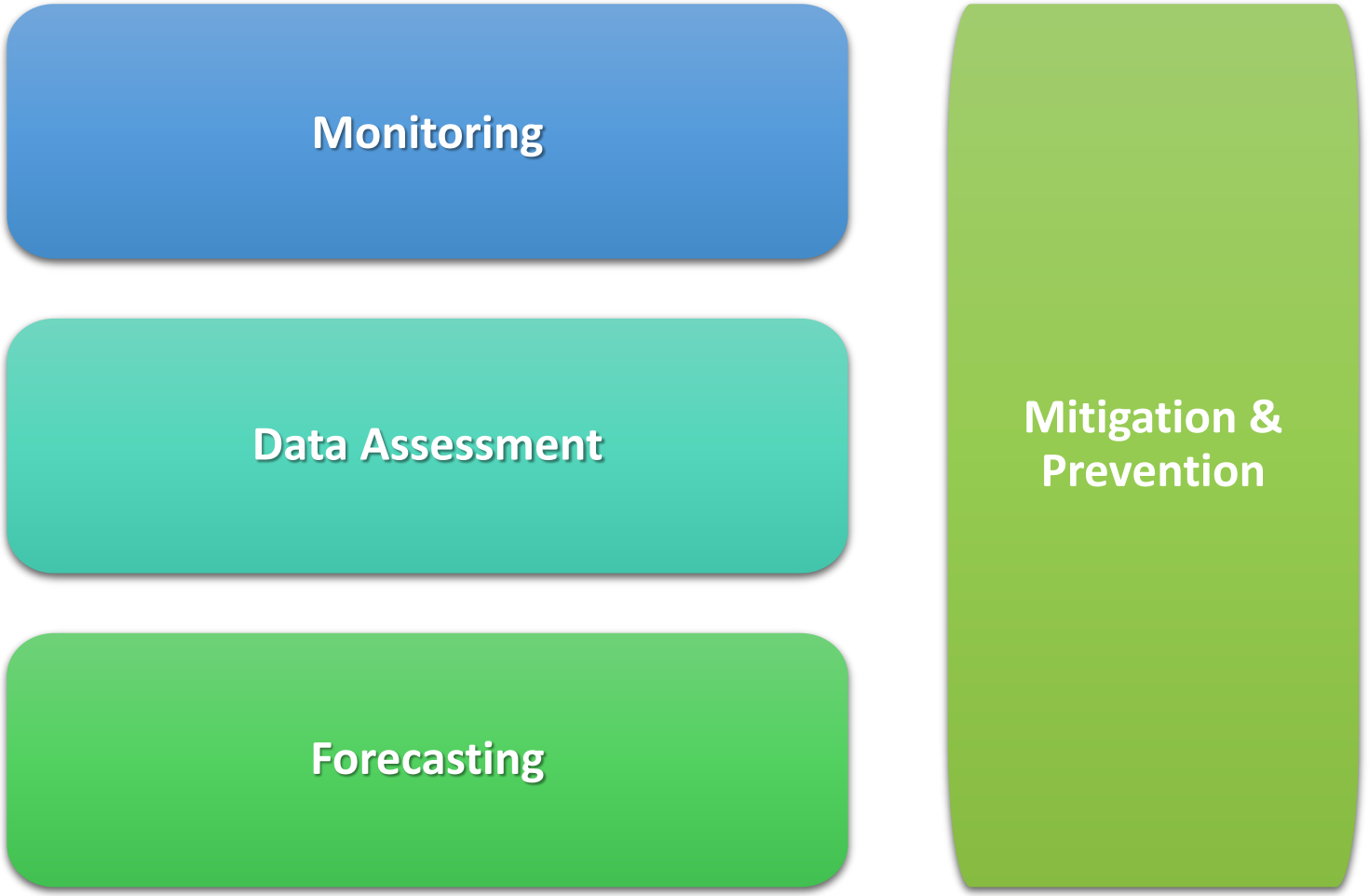
Blue-Green Algae Task Force Meeting
Innovative Technologies in South Florida
June 23, 2021

Seán Sculley, PE, Applied Sciences Bureau Chief
Rory Feeney, Land Resources Bureau Chief

Lake Okeechobee Harmful Algal Bloom (HAB) Monitoring and Management Strategies

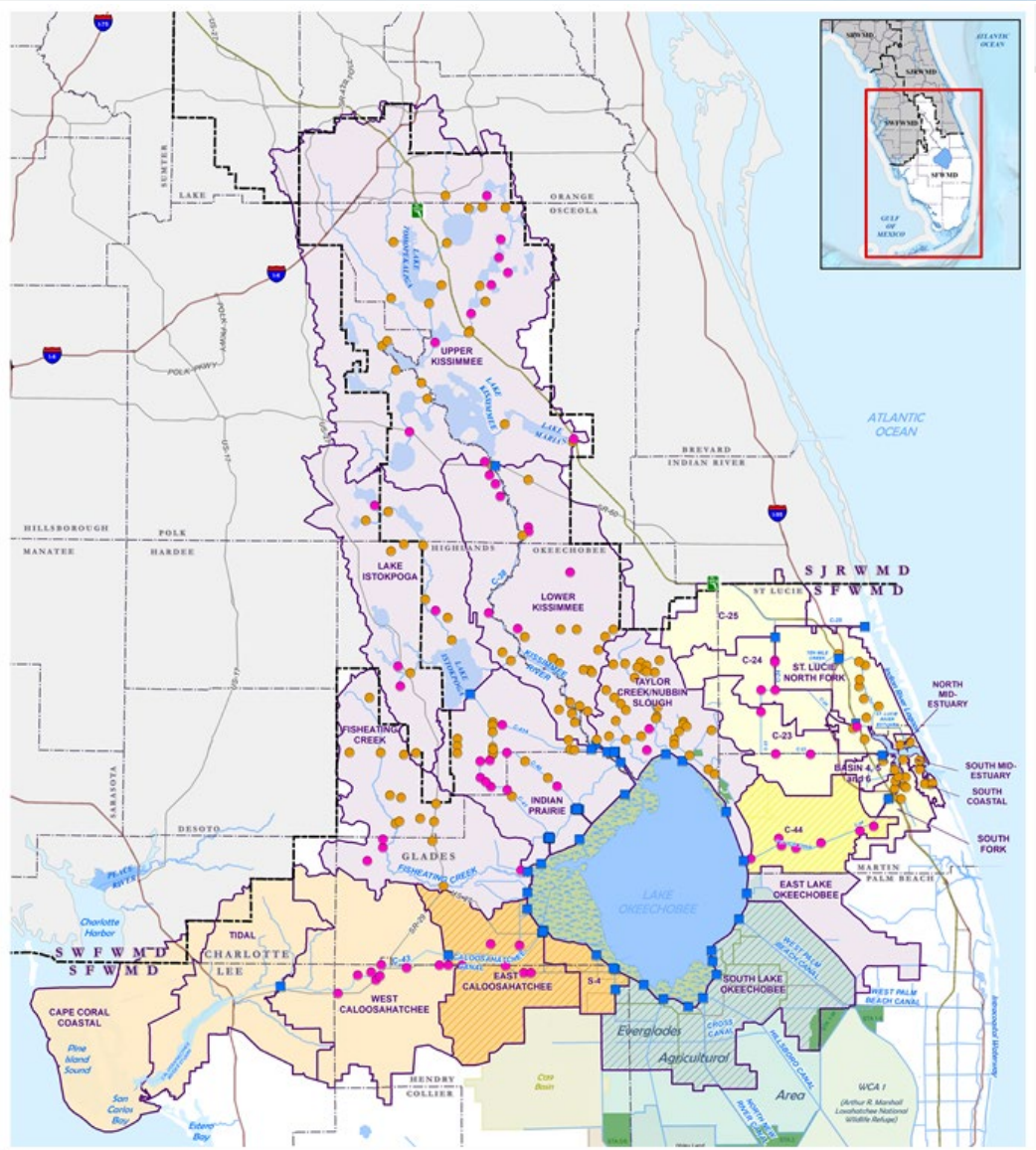


Presenter: Seán Sculley

Expanded Watershed Monitoring

Elements	Basin Level	Upstream Level
# of sites	47	211
Frequency	Biweekly or Weekly	Biweekly
Monitored Parameters	TP, OPO4, TN, NH4, NOx, pH, Temperature, Dissolved Oxygen, Conductivity	

- Basin sites
- New sites
- Existing sites

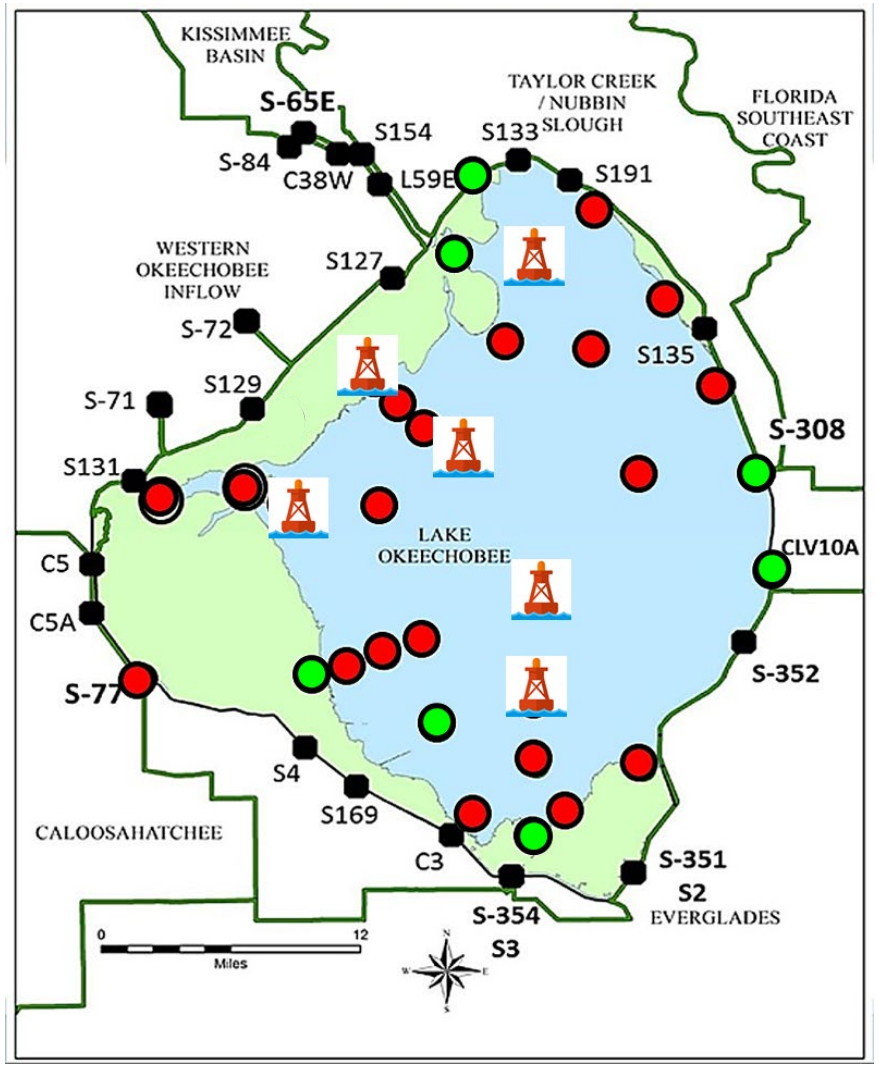


Presenter: Seán Sculley

Expanded Lake Okeechobee Monitoring

Parameter	Wet Season May-October Twice monthly	Dry Season November-April Once monthly
Water quality	9 sites, 23 sites	9 sites, 23 sites
Comprehensive algal ID	9 sites, 23 sites	9 sites
Dominant algal taxa ID	9 sites, 23 sites	9 sites
Algal toxins	9 sites, 23 sites	9 sites

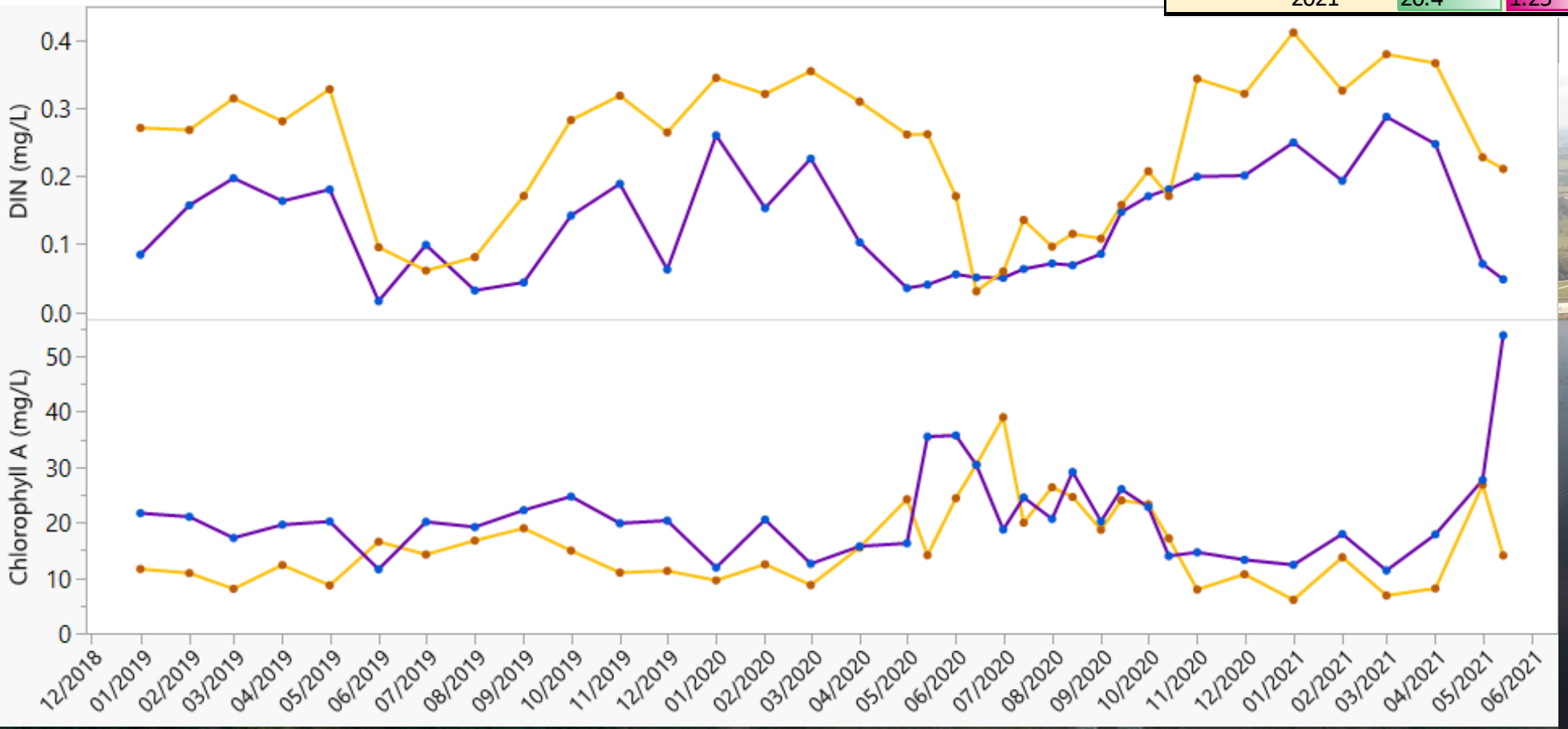
6 near real-time water quality and chlorophyll *a* / blue-green algae (cyanobacteria) monitoring sites

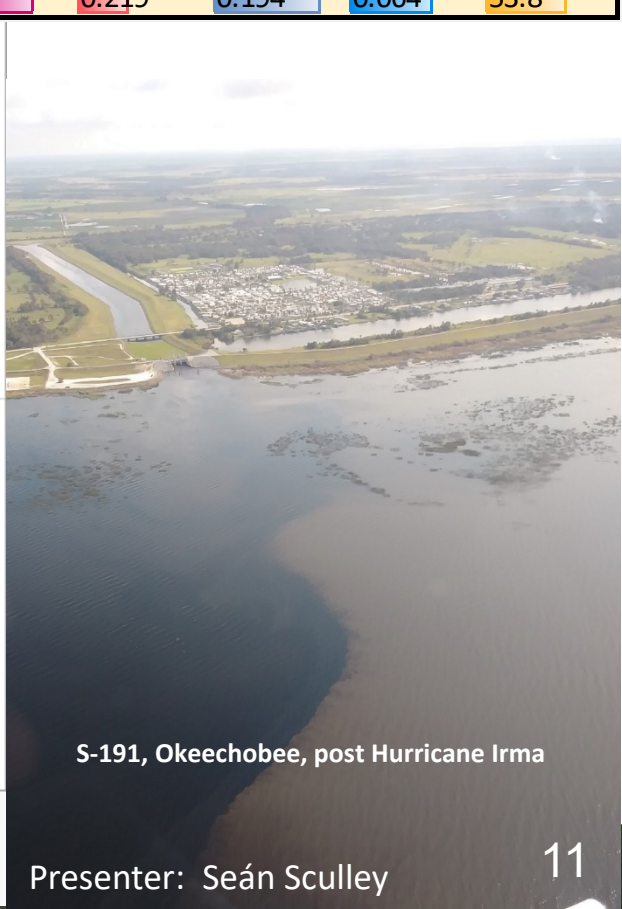


Water Quality

- Nearshore and pelagic dissolved inorganic nitrogen decreased after algal bloom observations
- Nearshore chlorophyll *a* is increasing

May	Year	Chl-A	TN	DIN	TP	SRP	Turbidity
Nearshore	2017	22.7	1.19	0.042	0.086	0.020	13.6
	2018	18.6	1.61	0.306	0.178	0.067	38.3
	2019	20.2	1.26	0.181	0.113	0.042	17.9
	2020	25.1	1.17	0.038	0.076	0.016	10.2
	2021	40.7	1.45	0.060	0.134	0.029	23.2
Pelagic	2017	12.5	1.64	0.330	0.193	0.067	61.3
	2018	6.8	1.77	0.557	0.238	0.100	86.6
	2019	8.7	1.30	0.328	0.154	0.069	43.3
	2020	19.1	1.42	0.262	0.160	0.066	36.4
	2021	20.4	1.25	0.219	0.194	0.064	53.8





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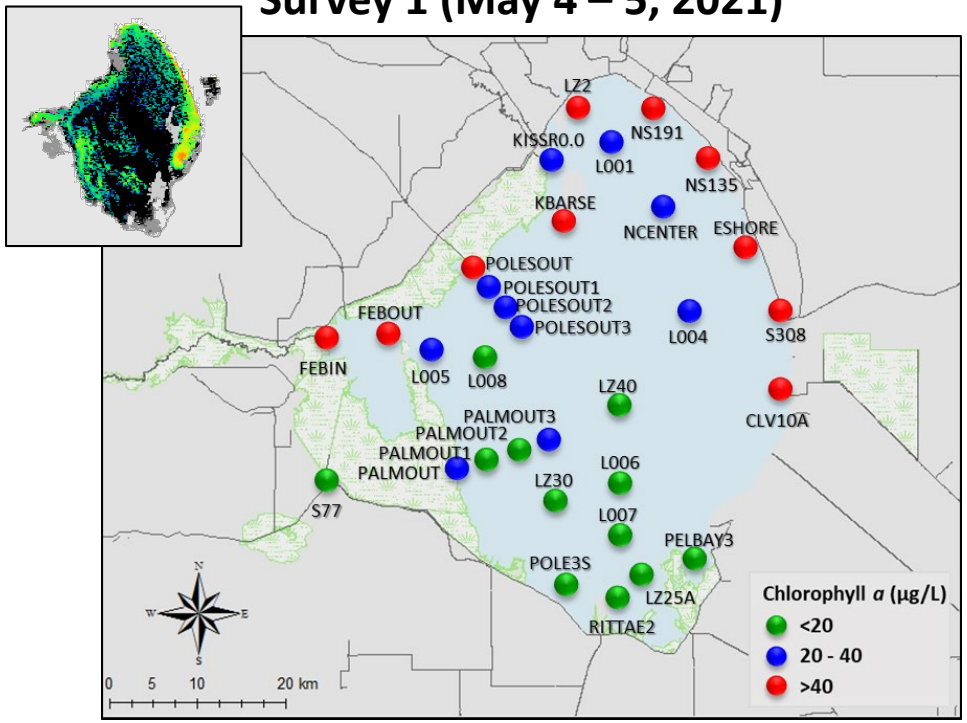
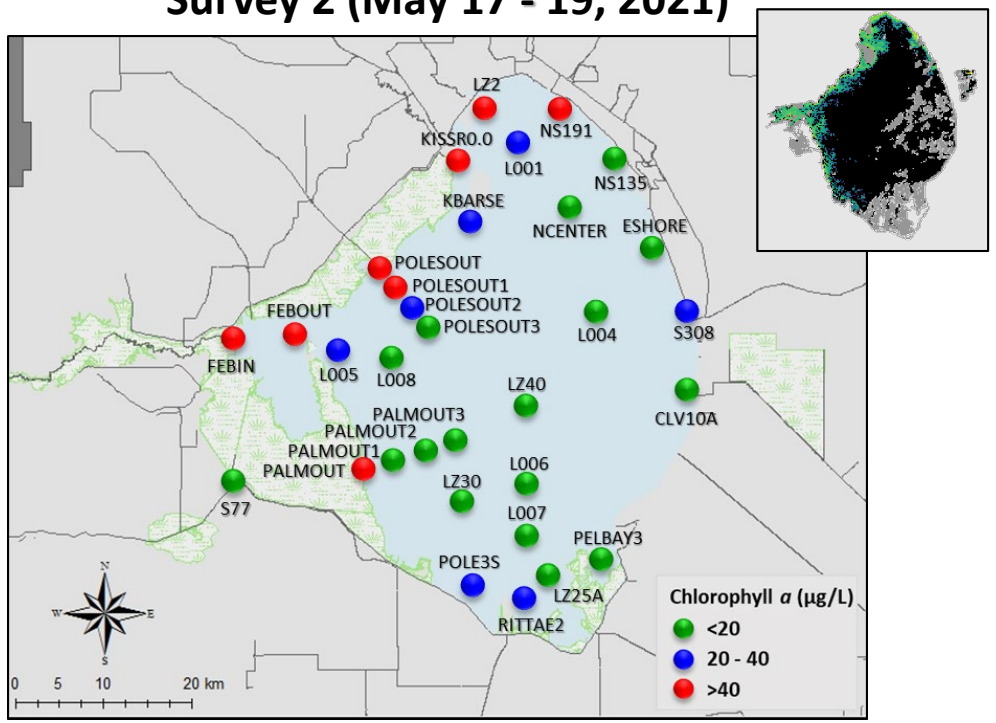
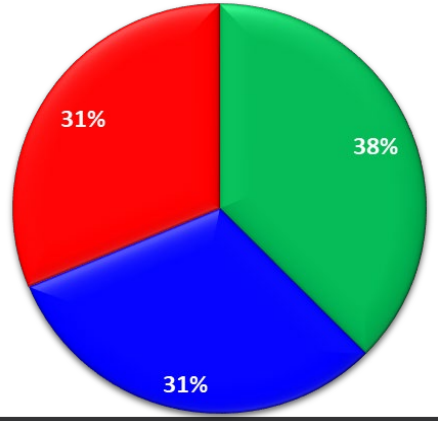
May Surveys - Differences in Phytoplankton Biomass

Survey 1 (May 4 – 5, 2021)



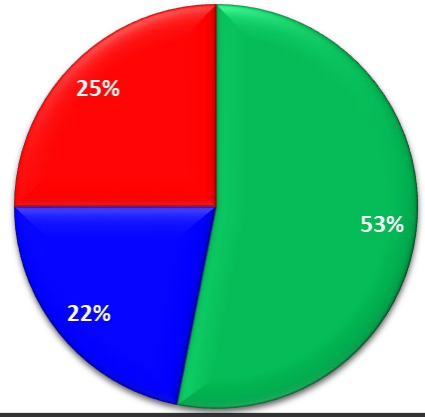
Survey 2 (May 17 - 19, 2021)





Chlorophyll *a* Concentration (µg/L)

- < 20
- 20 - 40
- > 40

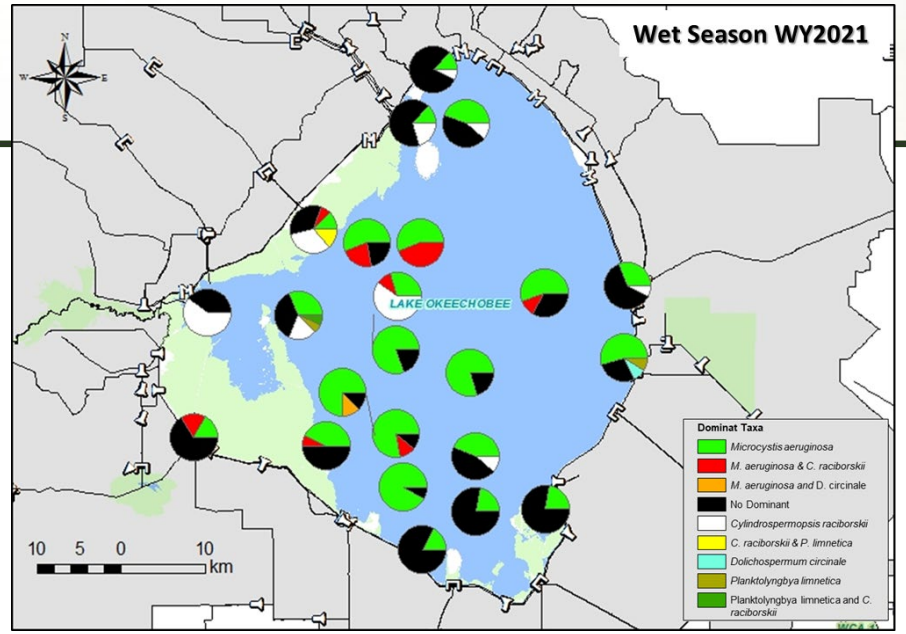


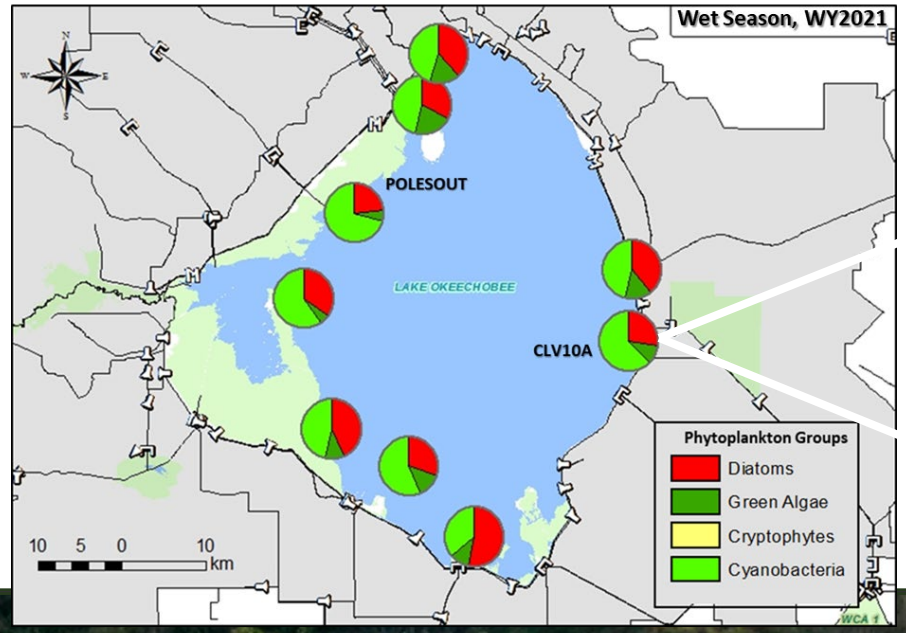
Chlorophyll a (µg/L)
(*Provisional Data)

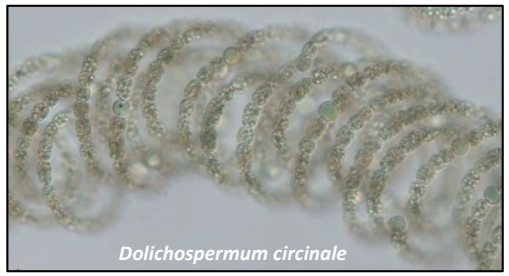
Station	Survey 1 (May 4 - 5)	Survey 2 (May 17 - 19)
FEBIN	77.3	187
FEBOUT	44.3	60.6
KISSR0.0	33.6	119
L005	23.1	28.9
LZ2	87.7	99.0
KBARSE	69.9	28.9
RITTAE2	15.8	31.8
PELBAY3	3.8	18
POLE3S	9.6	38.6
LZ25A	7.3	7.94
PALMOUT	23.5	60.7
PALMOUT1	14	14.3
PALMOUT2	8.3	7.66
PALMOUT3	36.5	12
POLESOUT	44.5	79.7
POLESOUT1	20.3	51.2
POLESOUT2	25.8	27.3
POLESOUT3	18	13.5
EASTSHORE	92.2	14.1
NES135	76.1	19.4
NES191	58.5	56.7
L001	27.3	37.9
L004	22.8	16.6
L006	6.2	8.44
L007	5.9	9.79
L008	12.9	15.8
LZ30	8.2	7.83
LZ40	10.7	11.8
CLV10A	104	4.18
NCENTER	26.7	16.1
S308C	116	27.5
S77	9.8	17.3

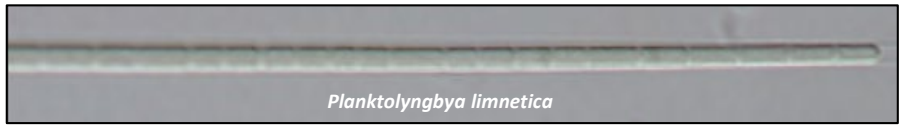
Presenter: Seán Sculley

Dominant Phytoplankton Taxa in the WY21 Wet Season

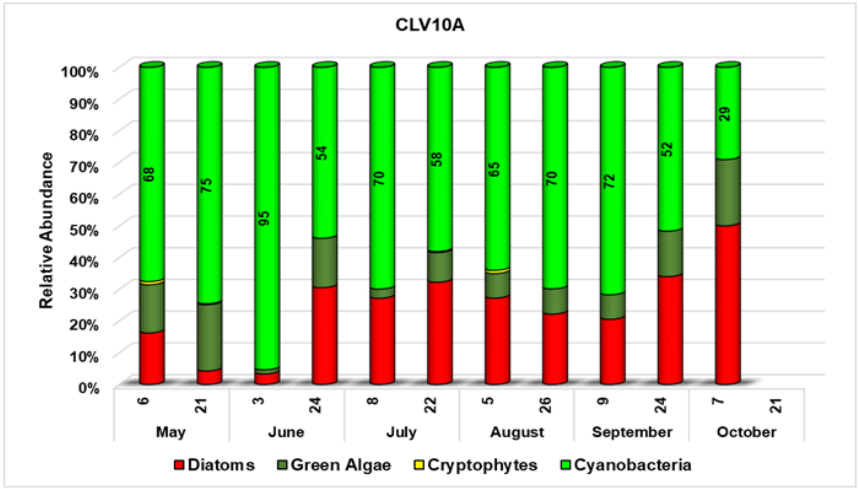






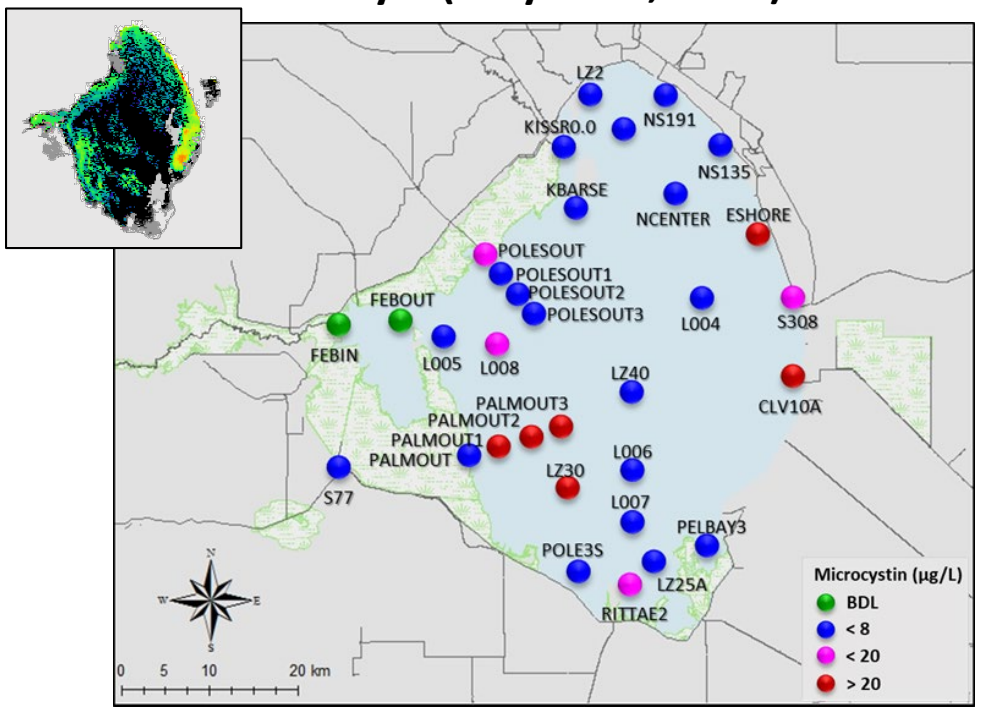


- **33% of the monitoring sites had samples with communities dominated by *Microcystis aeruginosa* in WY2021 wet season**

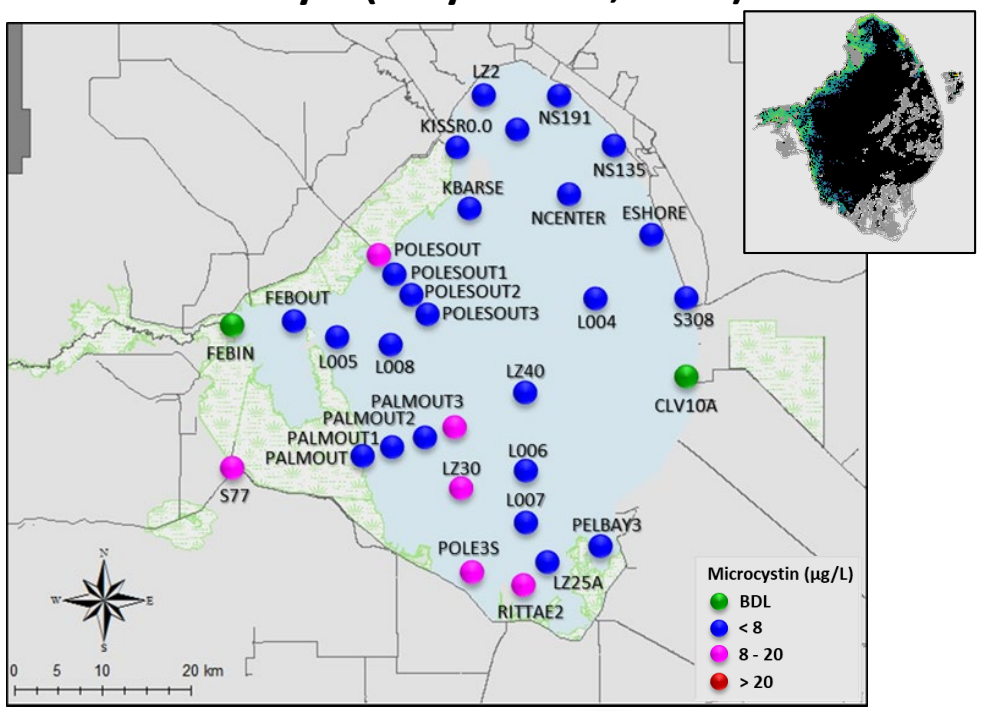


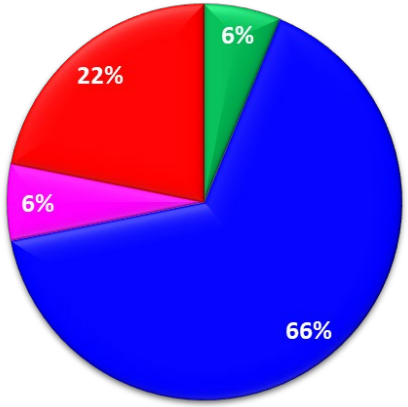
May Surveys - Differences in Toxin Concentration

Survey 1 (May 4 – 5, 2021)



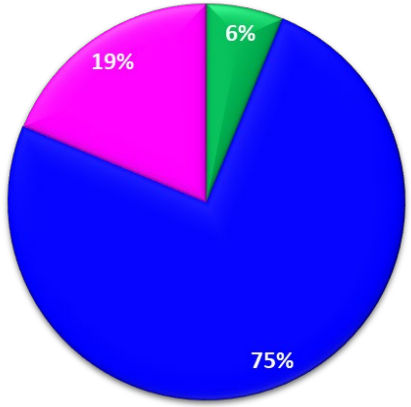
Survey 2 (May 17 - 19, 2021)





Microcystin Concentration (µg/L)

- Below Detection Level (BDL)
- < 8
- 8 - 20
- > 20

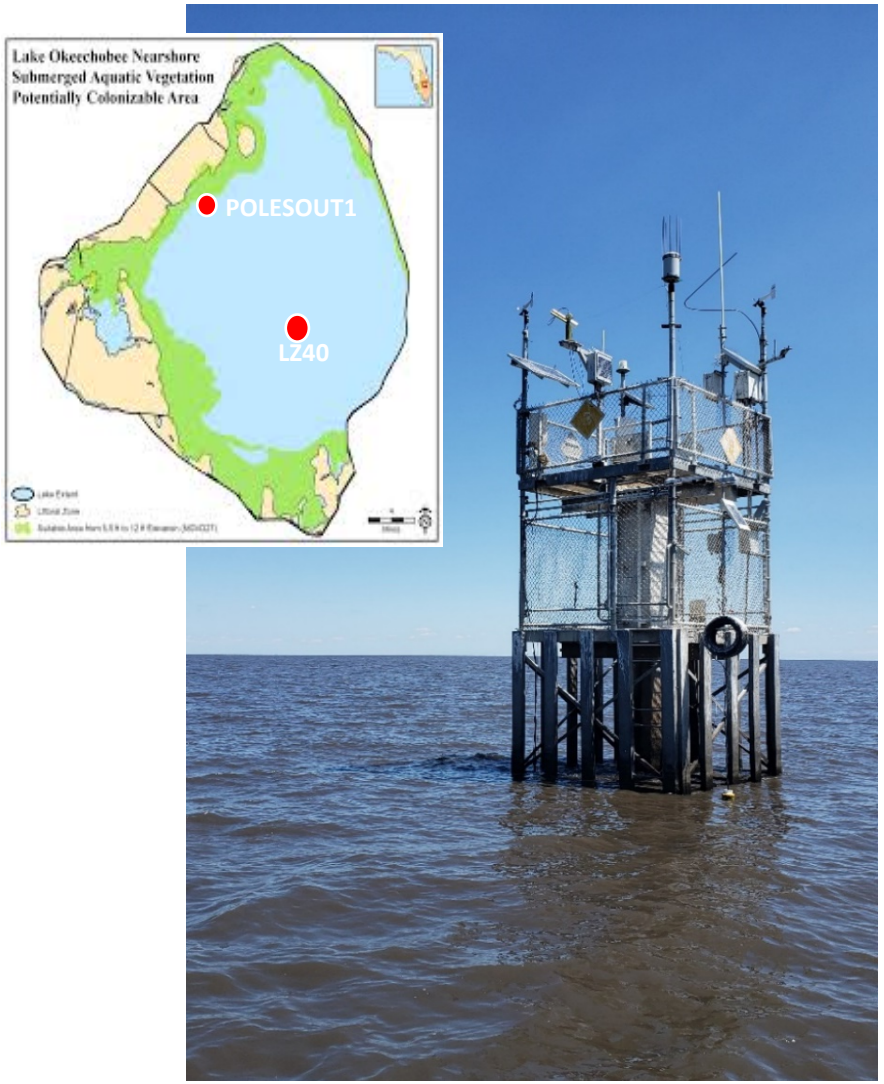


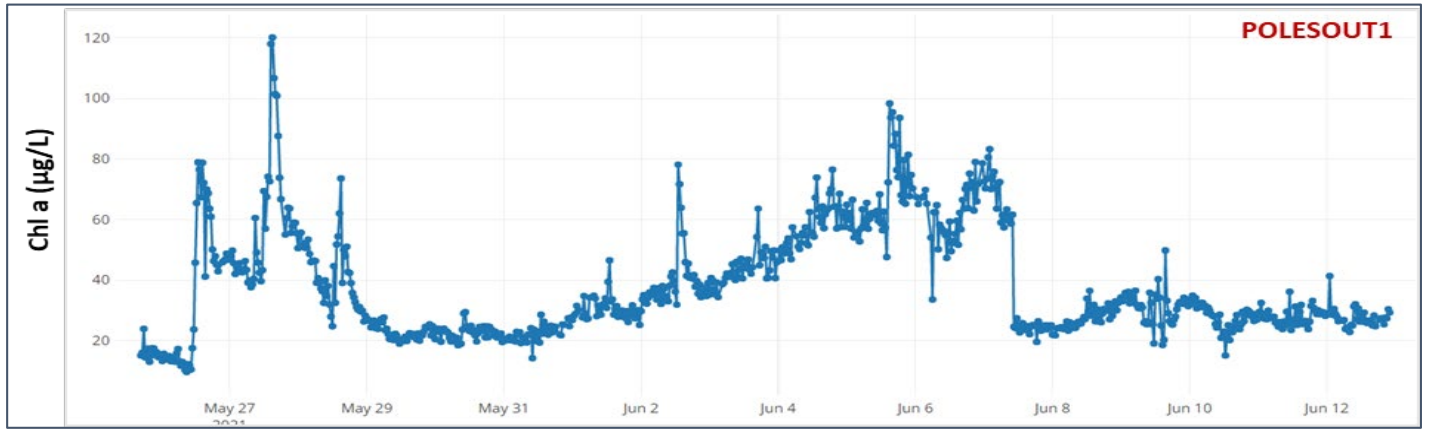
Microcystin (µg/L)
(*Provisional Data)

Station	Survey 1 (May 4 - 5)	Survey 2 (May 17 - 19)
FEBIN	BDL	BDL
FEBOUT	BDL	0.9
KISSR0.0	0.29	1
L005	3.8	3
LZ2	0.26	1.3
KBARSE	0.48	4.5
RITTAE2	9.1	9.1
PELBAY3	0.95	2.8
POLE3S	2.2	11
LZ25A	0.68	0.9
PALMOUT	7	1.6
PALMOUT1	47	7.3
PALMOUT2	53	1.7
PALMOUT3	440	9.3
POLESOUT	1.6	19
POLESOUT1	3.8	5
POLESOUT2	7.3	7.6
POLESOUT3	7.8	3
EASTSHORE	84	1.4
NES135	5.8	2.9
NES191	1.3	0.9
L001	0.74	3.3
L004	6	3.2
L006	6.6	1.4
L007	0.98	1.5
L008	17	5.5
LZ30	26	16
LZ40	1.6	4.3
CLV10A	57	BDL
NCENTER	3.3	1.2
S308C	16	2.2
S77	0.52	11

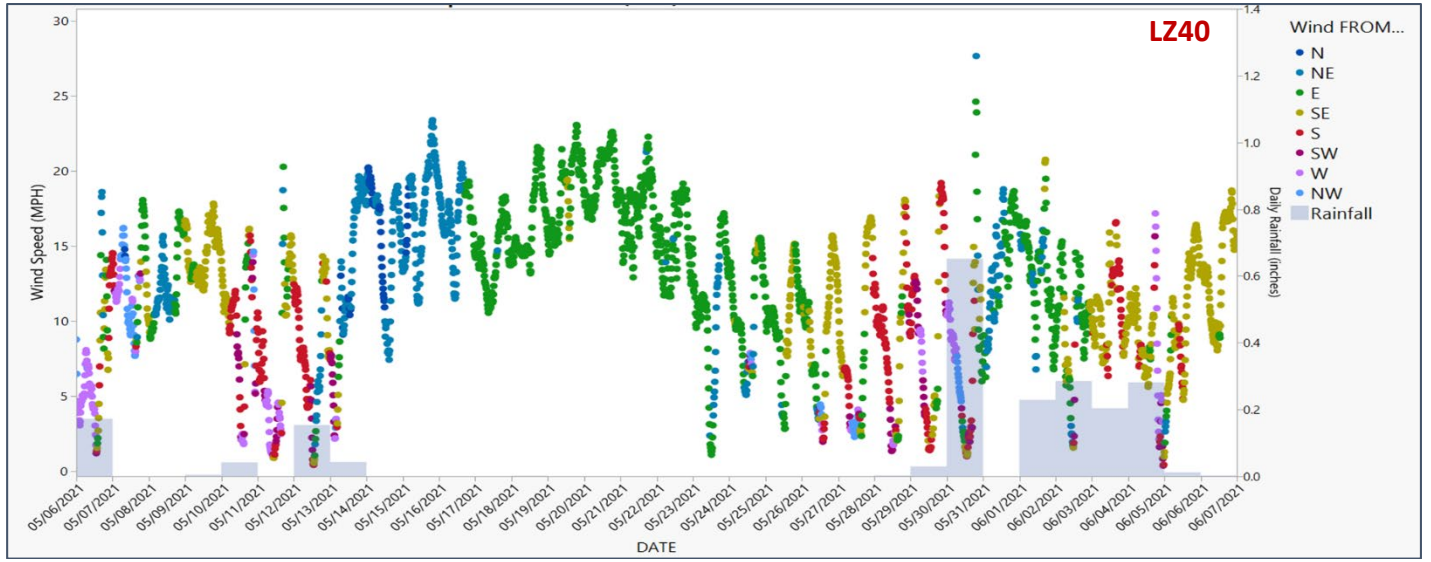
Presenter: Seán Sculley

Near Real-Time Monitoring



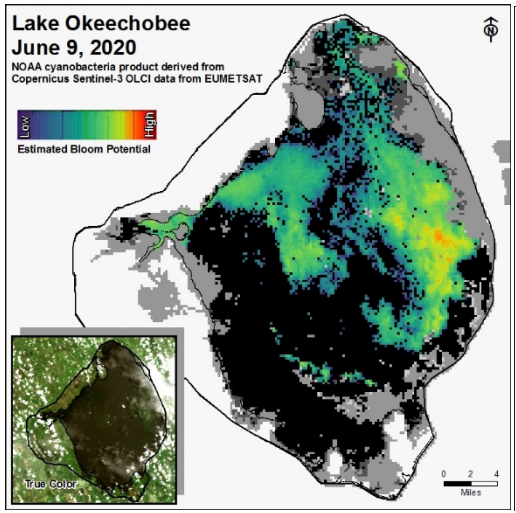


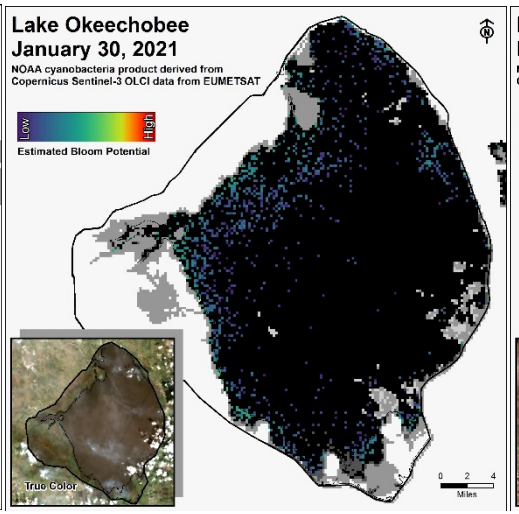
- ***In-situ***: (Surface and bottom) Chlorophyll *a*, phycocyanin, temperature, turbidity, dissolved oxygen, pH

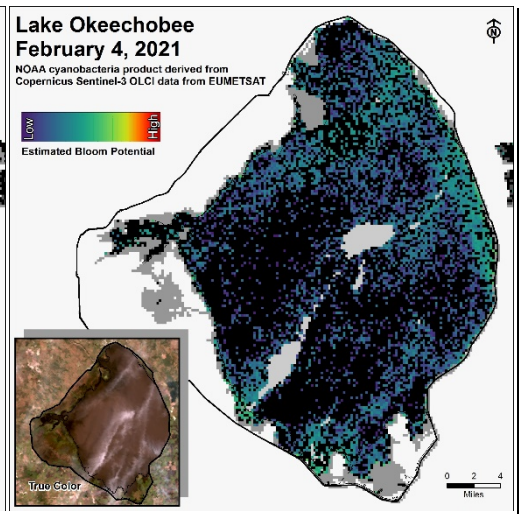


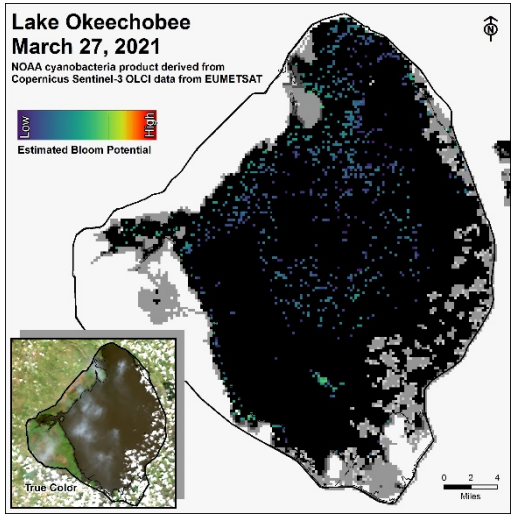
Presenter: Seán Sculley

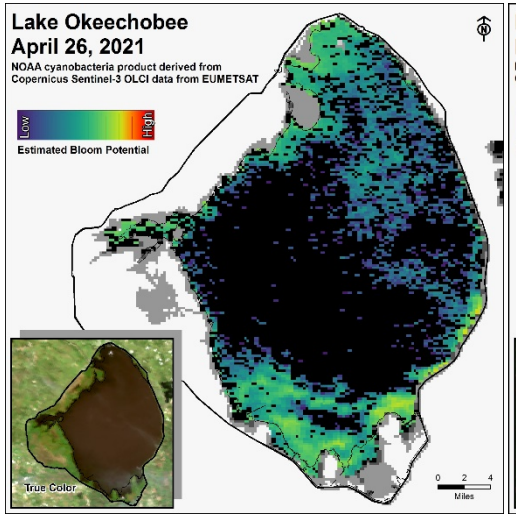
Lake Okeechobee
Cyanobacteria Bloom Potential

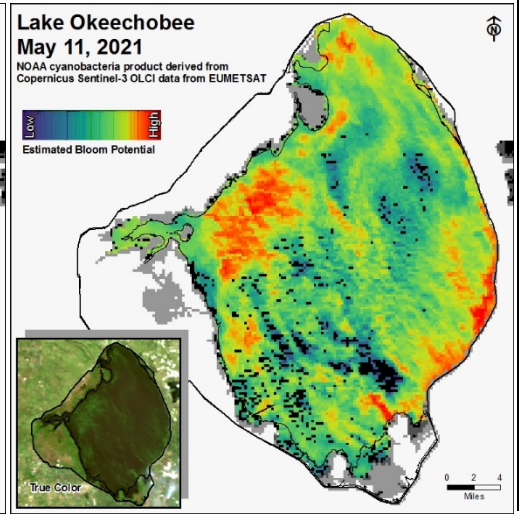


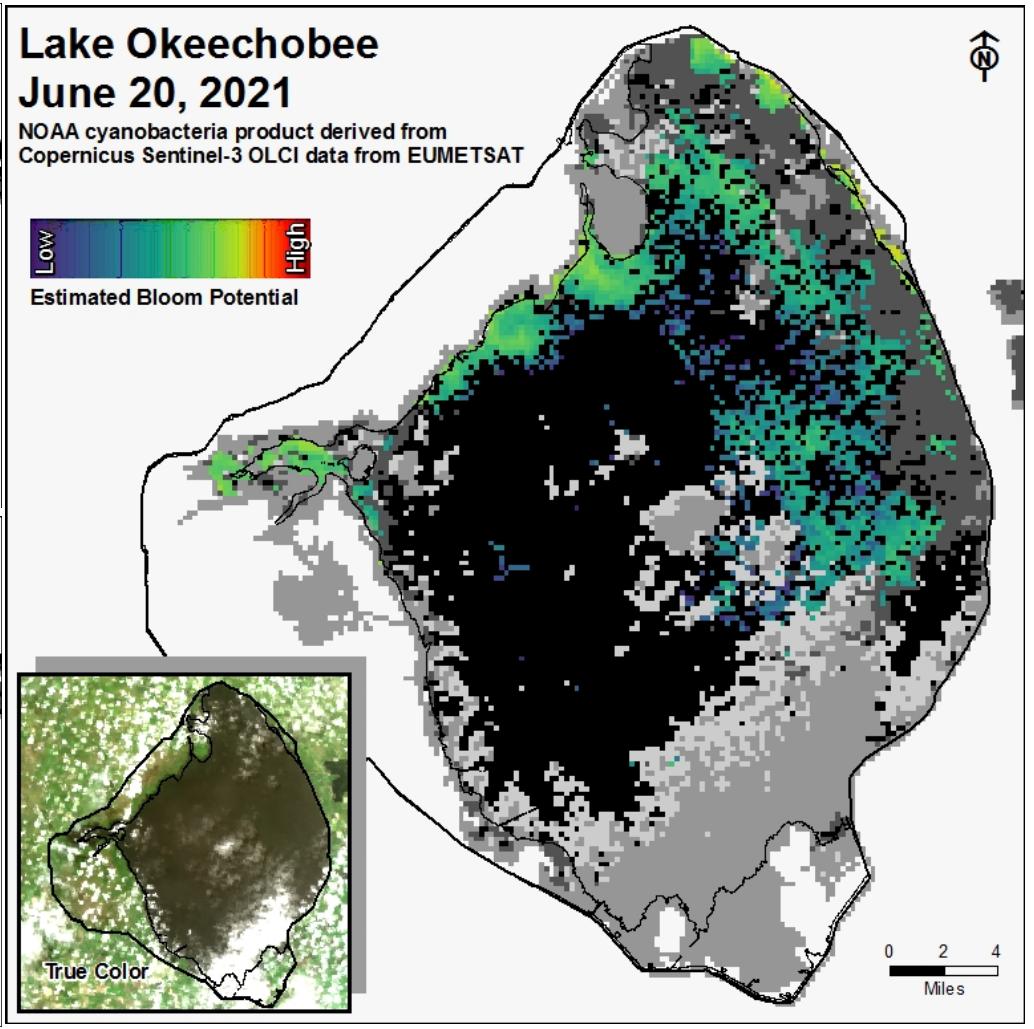












NOAA cyanobacteria product derived from Copernicus Sentinel-3 OLCI data from EUMETSAT

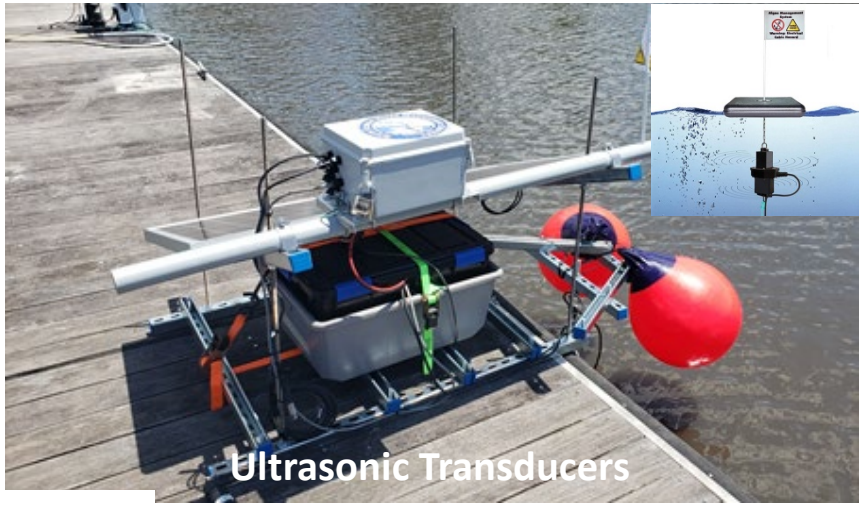
Using Science to Take Action, in Partnership with DEP

Pahokee Marina - April 29, 2021

Pahokee Marina - May 24, 2021

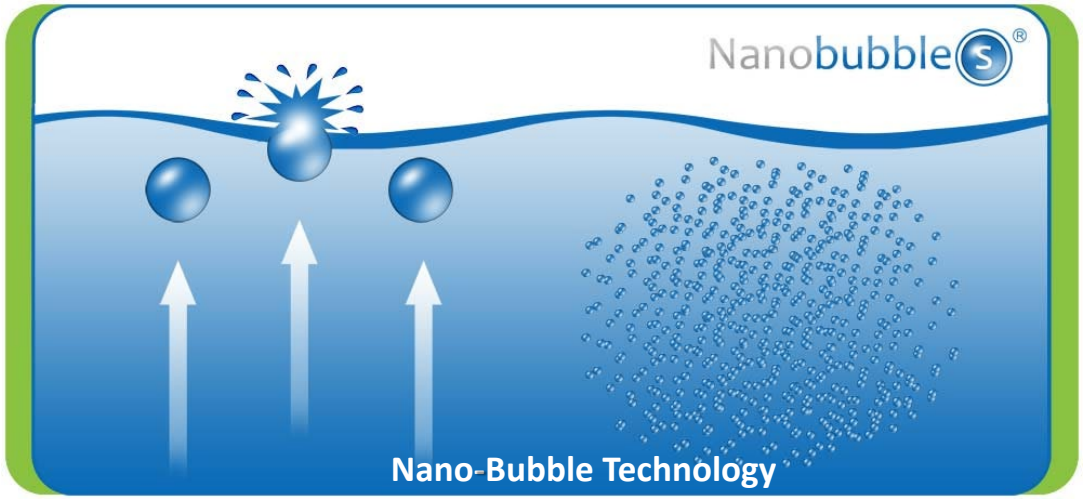
Controlling BGA Blooms Using Innovative Technologies


Hydrogen Peroxide


Ultrasonic Transducers


Aerators/Circulation Pumps


Vacuum Services



Nano-Bubble Technology

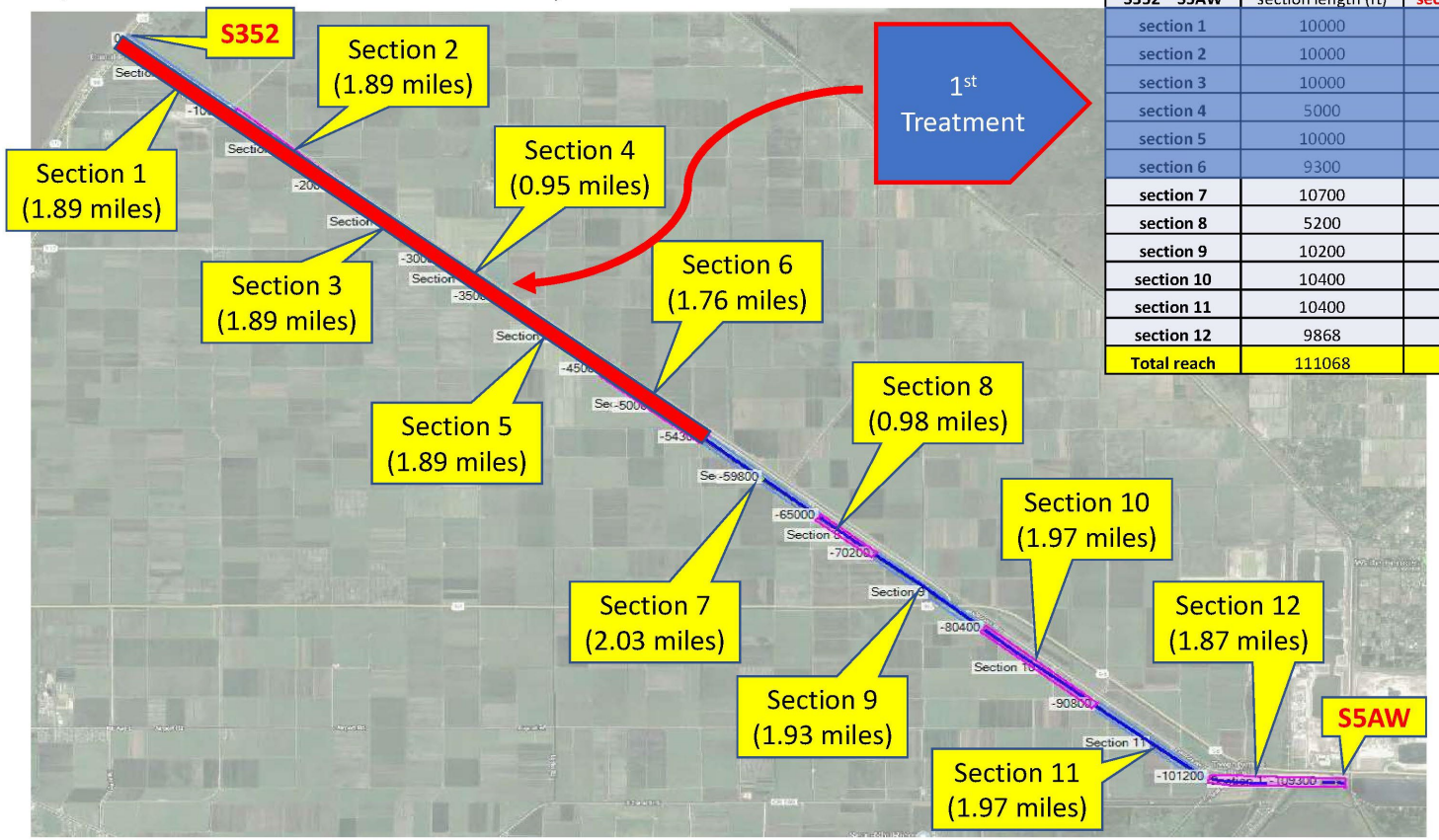
Innovative Technologies – Pahokee Marina

- Physical Removal
- Algicide – PAK27, Phycomycin
- 6” temporary pump
- 4 Ultrasonic units
- 5 water quality sondes
  - Dissolved Oxygen Chlorophyll a Phycocyanin Turbidity
- Drone imagery

Presenter: Rory Feeney

Innovative Technologies – L10/L12 Canal

L10/12 Canal sections: 12 sections, 21.04 miles.

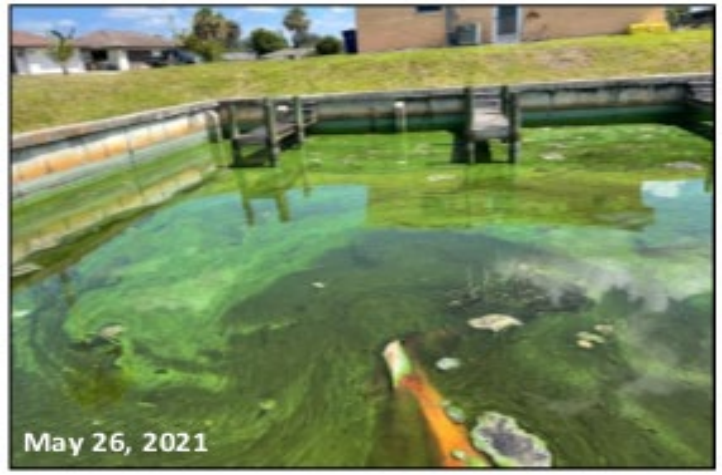


S352 ~ S5AW	section length (ft)	section (miles)
section 1	10000	1.89
section 2	10000	1.89
section 3	10000	1.89
section 4	5000	0.95
section 5	10000	1.89
section 6	9300	1.76
section 7	10700	2.03
section 8	5200	0.98
section 9	10200	1.93
section 10	10400	1.97
section 11	10400	1.97
section 12	9868	1.87
Total reach	111068	21.04

- Granular Algaecide – PAK27
- Water quality monitoring
  - Before/During/After
- Microcystin
  - 5/23 – 24 ppb
  - 5/24 – 6.3 ppb
  - 5/26 – 1.8 ppb

Presenter: Rory Feeney

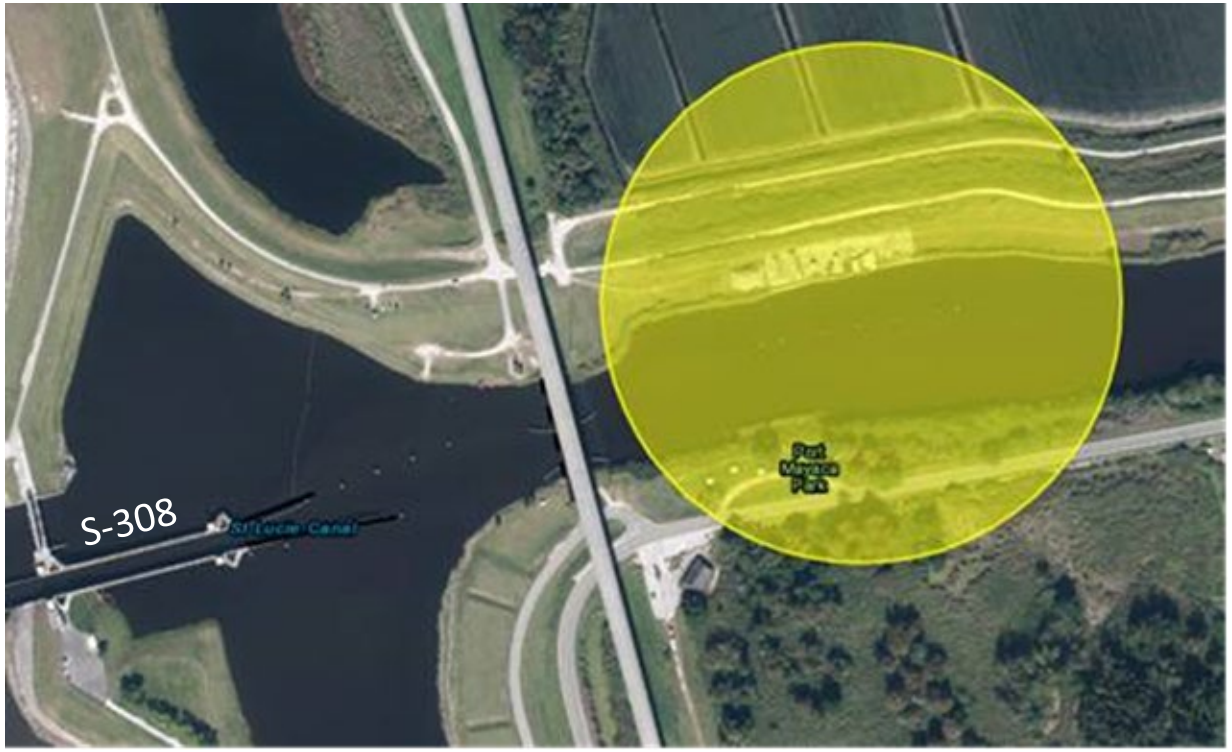
Innovative Technologies – Caloosahatchee River



- Blue Green Water Technologies
- Lake Guard Oxy (granular algaecide)
- Consistent Water Quality Monitoring
- Treated and maintained over 20.8 miles
- 81 treatments to 42 different locations

Presenter: Rory Feeney

Innovative Technologies – St. Lucie Canal (S-308)



- Ultrasonic Unit Deployed
- Water Quality Monitoring

Presenter: Rory Feeney

Monitoring Algae Blooms Coverage and Intensity Using Drones

“All Hands on Deck for Water Quality”