



Phytoplankton and Harmful Algal Bloom dynamics in the Caloosahatchee Estuary and nearshore Gulf of Mexico

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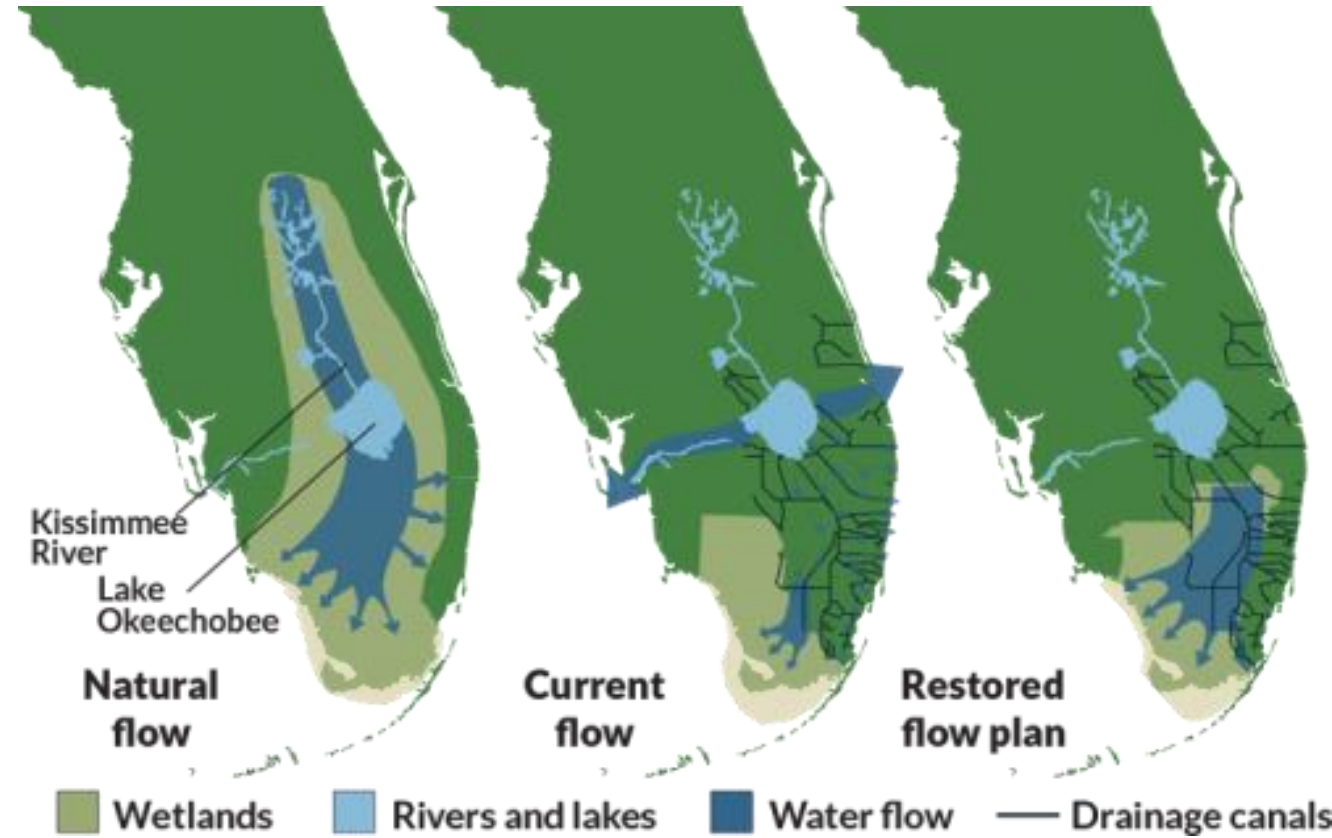
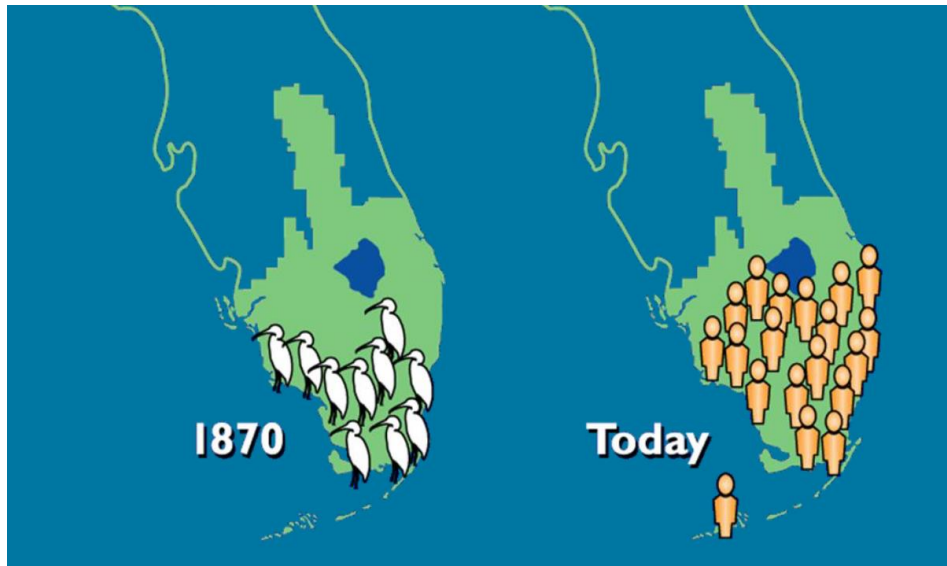
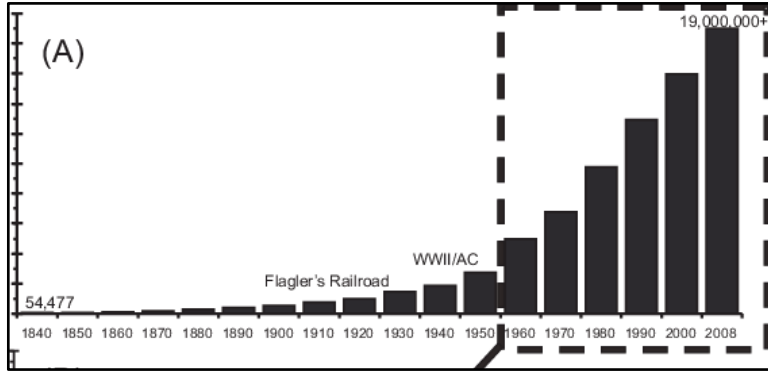
CHNEP Watershed Summit
06/21/2023



Water Quality and Algae Blooms are a big concern for Floridians



Population Growth and Flood Control





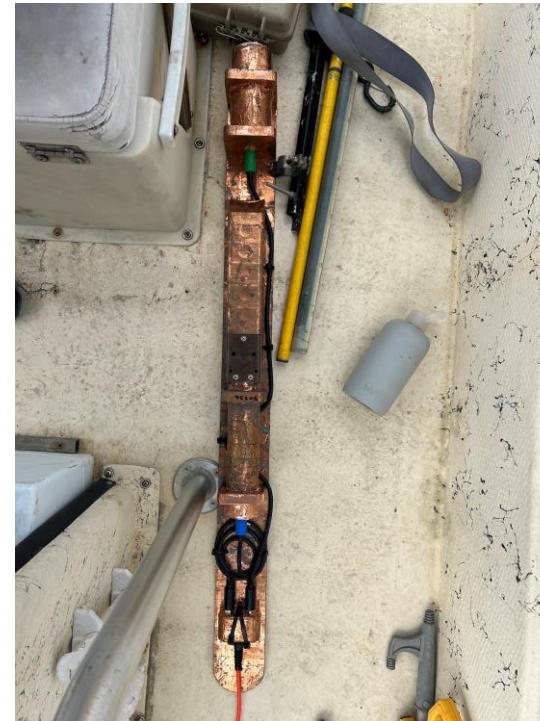
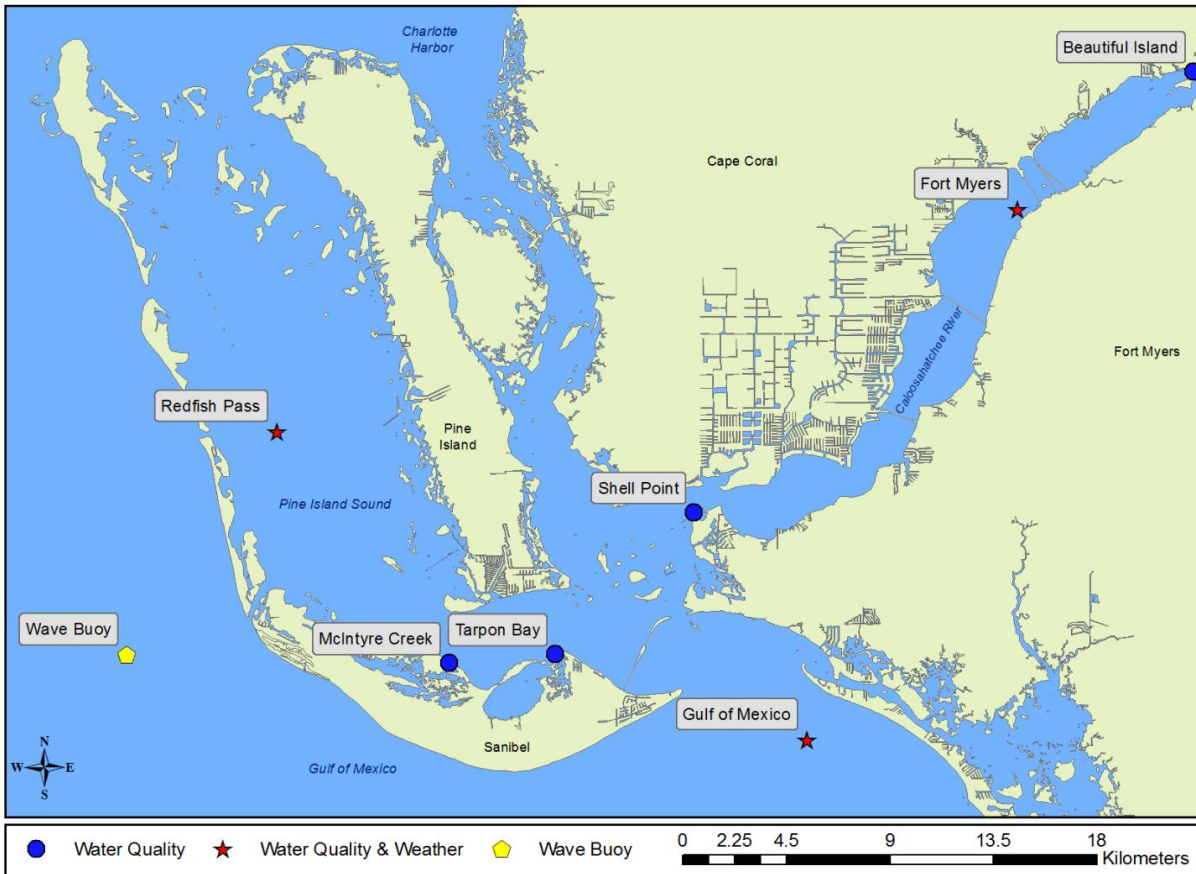
River, Estuary and Coastal Observing Network (RECON)

Designed for dynamic monitoring

Real-time, hourly samples

<http://recon.sccf.org>

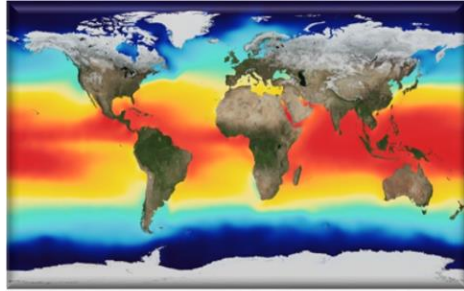
2008-present day



Water Quality Parameters



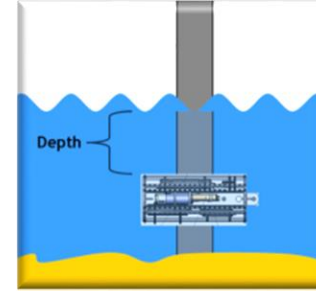
Salinity



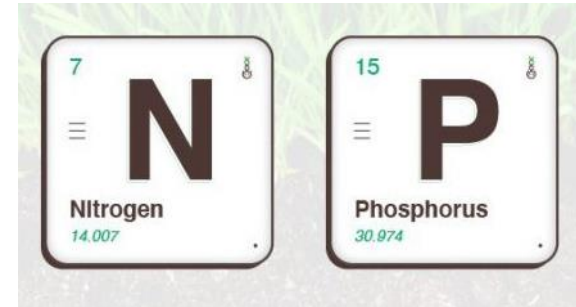
Water
Temperature



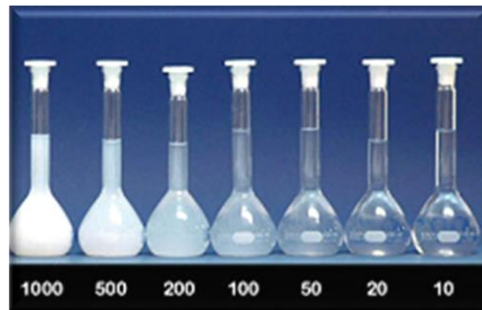
Dissolved
Oxygen



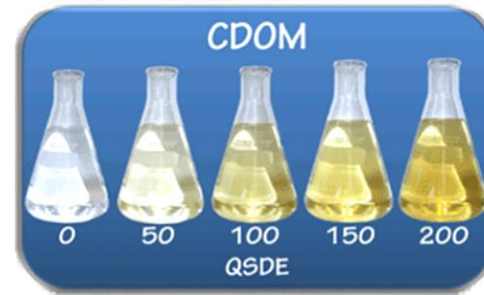
Depth



Chlorophyll



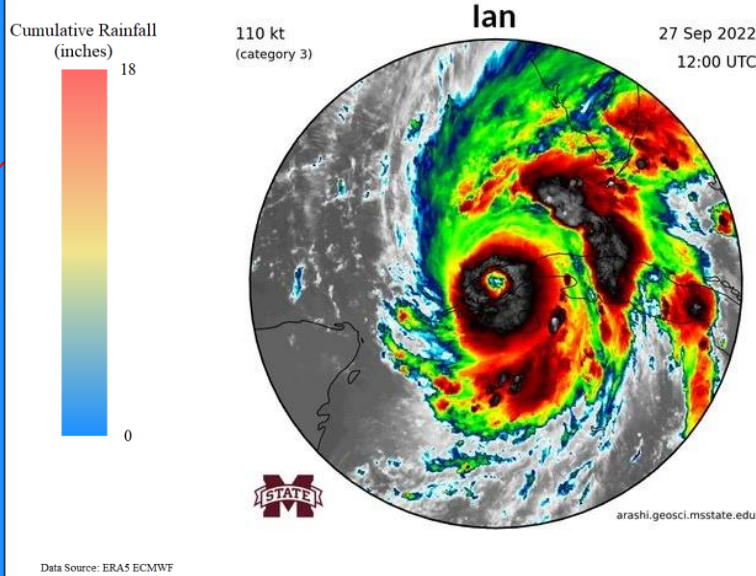
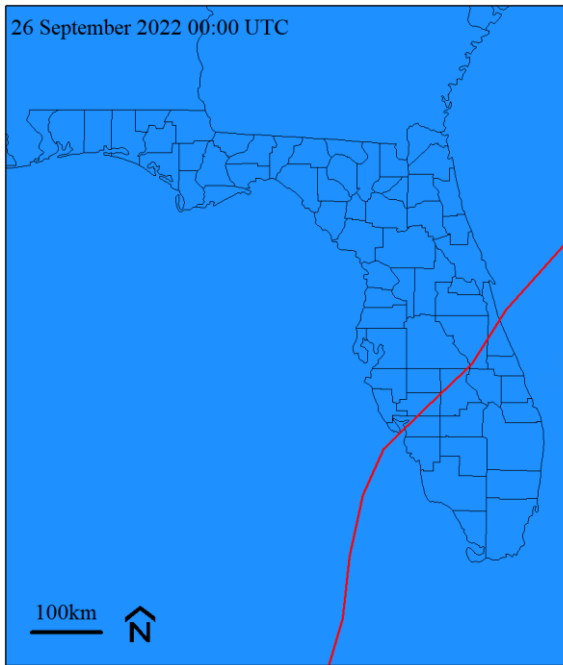
Turbidity



FDOM

A satellite image of Hurricane Ian, showing a well-defined eye and a dense, swirling cloud structure over the Caribbean Sea. The hurricane is positioned over the northern part of the island of Cuba. The surrounding ocean is a deep blue, and the landmasses of North and Central America are visible in shades of green and brown. The text "Water Quality and Hurricane Ian" is overlaid in white on the right side of the image.

Water Quality and Hurricane Ian



Hurricane Ian

Date: Wednesday September 28, 2022

Landfall: Cayo Costa, FL

Wind speed: Sustained ~150mph

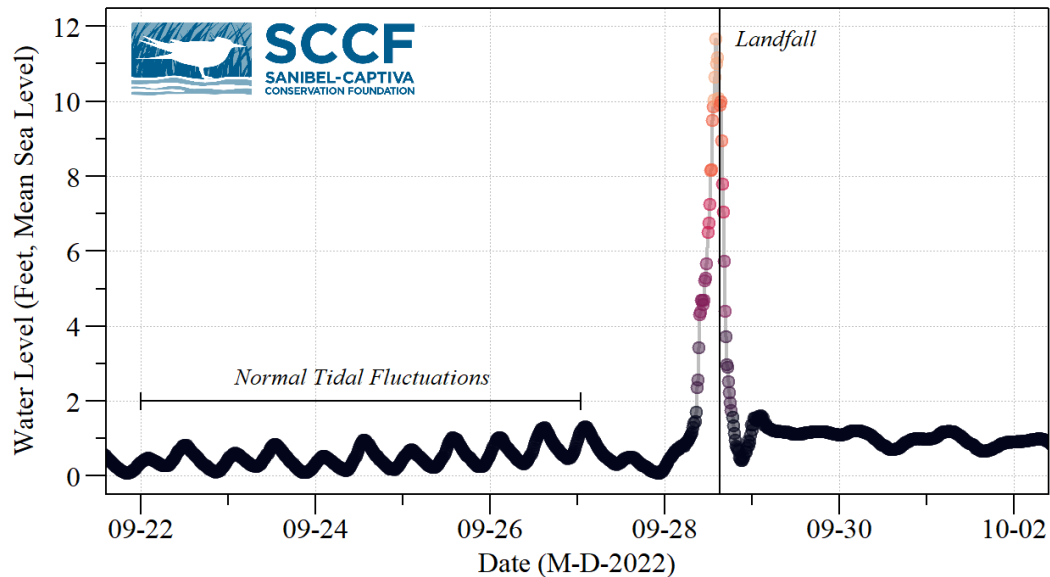
Storm Surge: 12 - 13 ft on Sanibel, 3 - 6 feet on Captiva

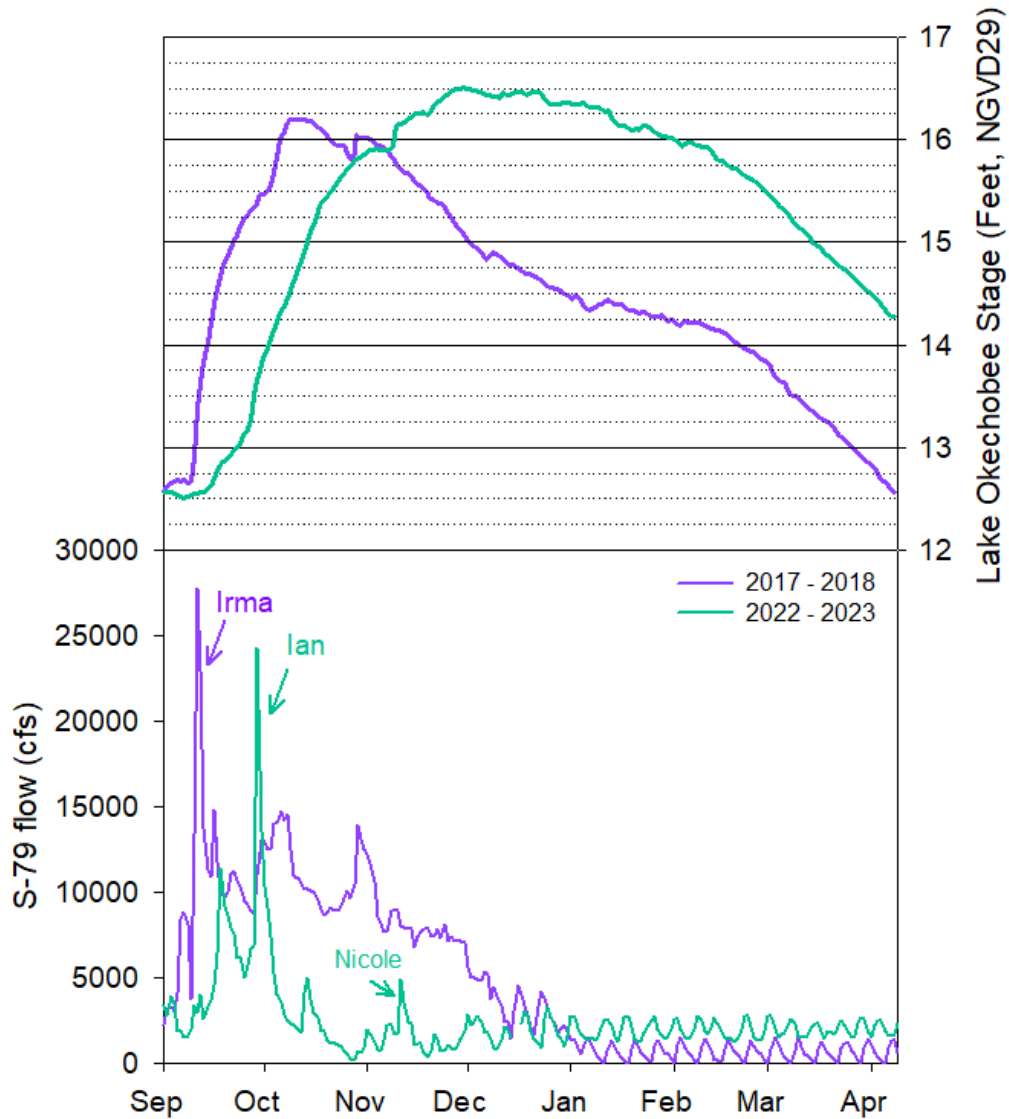
Wind field diameter (miles):

- Hurricane-force: 90
- Tropical storm: 350

Eye width (miles): 40

Speed (mph): 8-9, crossed state in ~24 hours



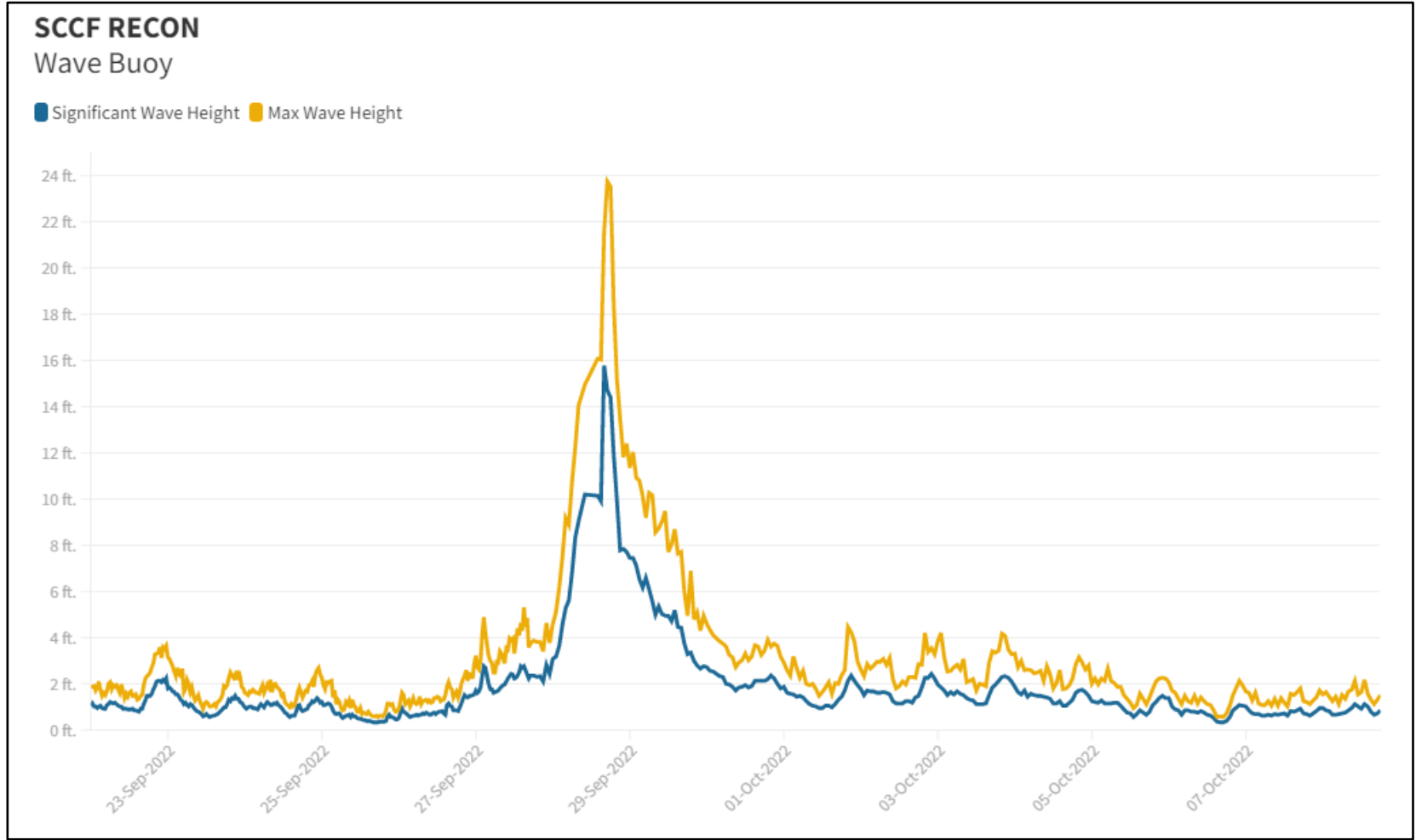


Irma versus Ian

- Lake levels rose quickly after each storm
- After Irma damaging releases were made for 4 months
- After Ian damaging releases were made for 6 weeks
- Receive nearly 3x as much water from S-79 after Irma than after Ian.
- This additional nutrient loading is thought to be a significant contribution to the harmful algal blooms that occurred in 2018.



Wave Height

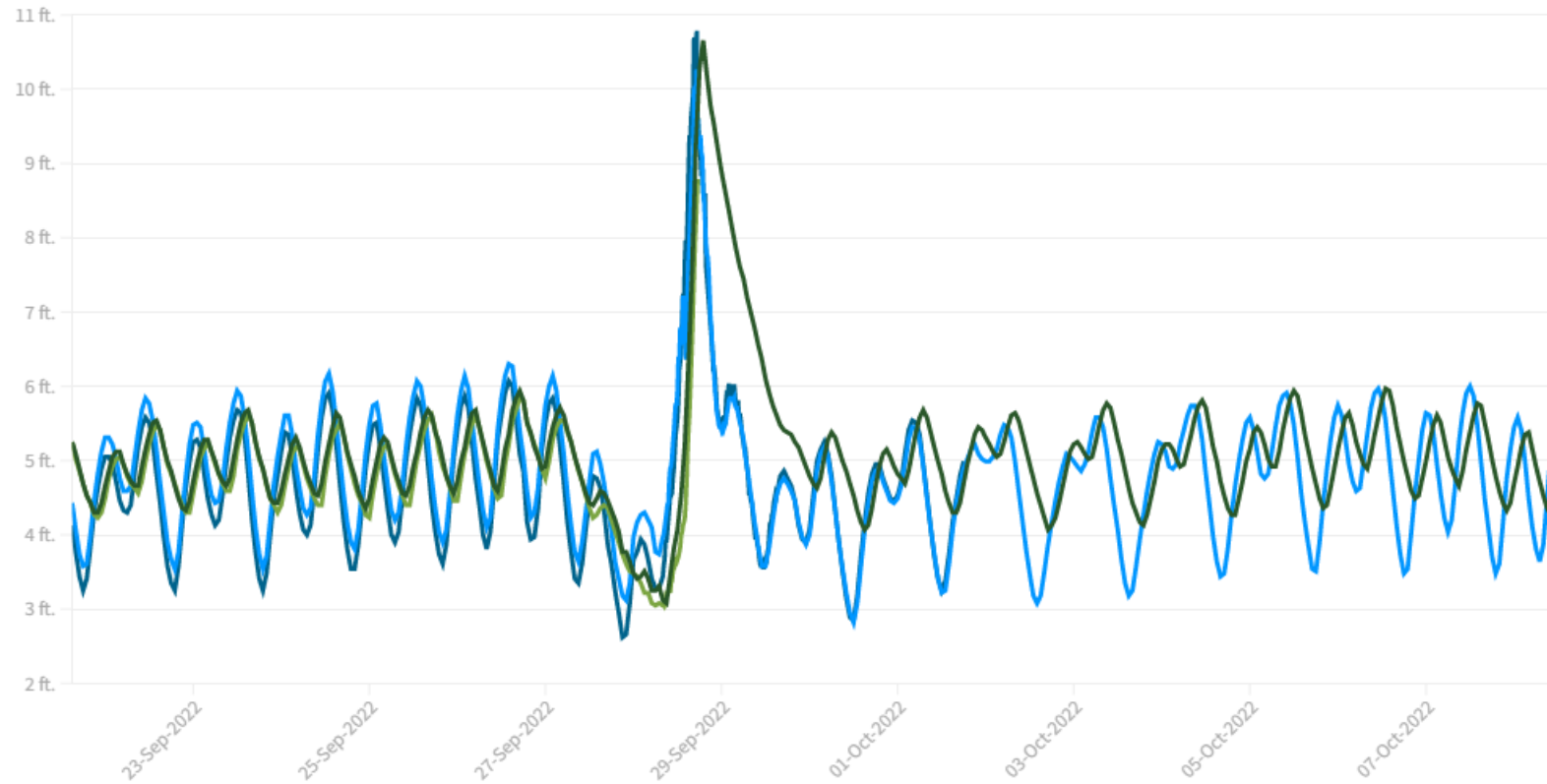




Water Level

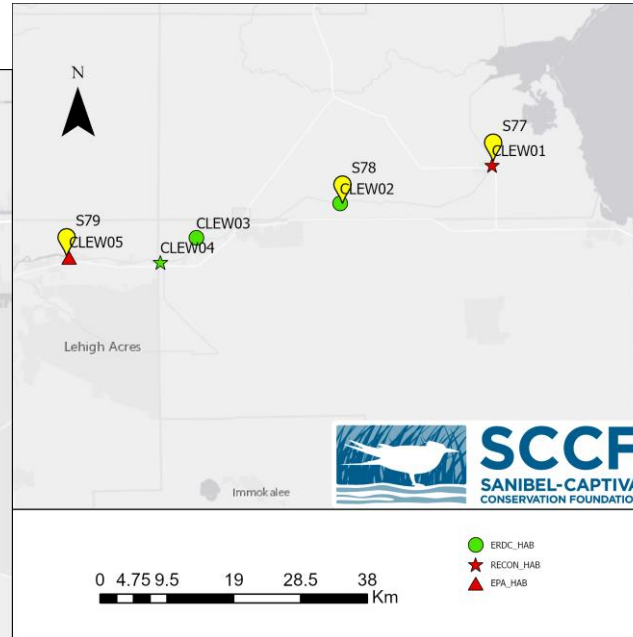
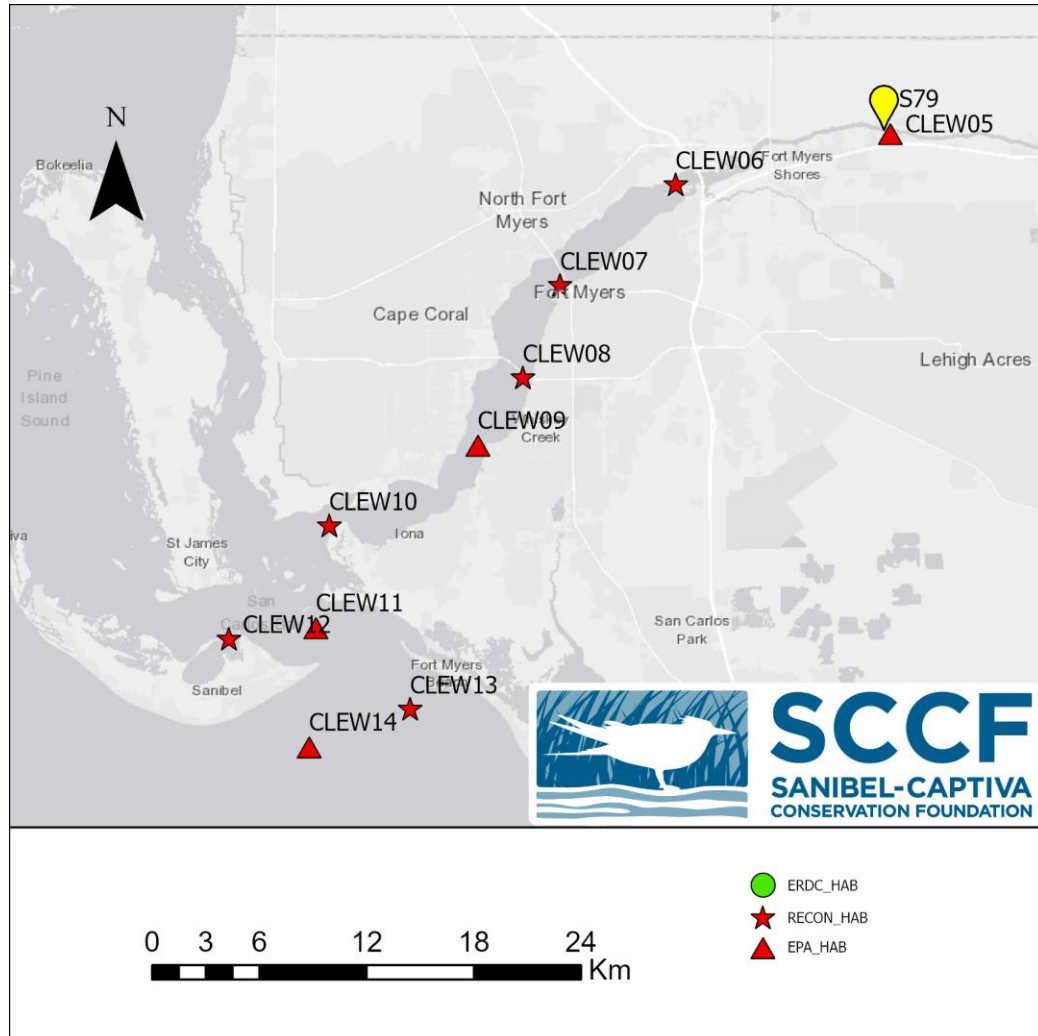
SCCF RECON Sensor Depth

■ Tarpon Bay ■ McIntyre Creek ■ Beautiful Island ■ Yacht Basin





Harmful Algal Bloom (HAB) Research

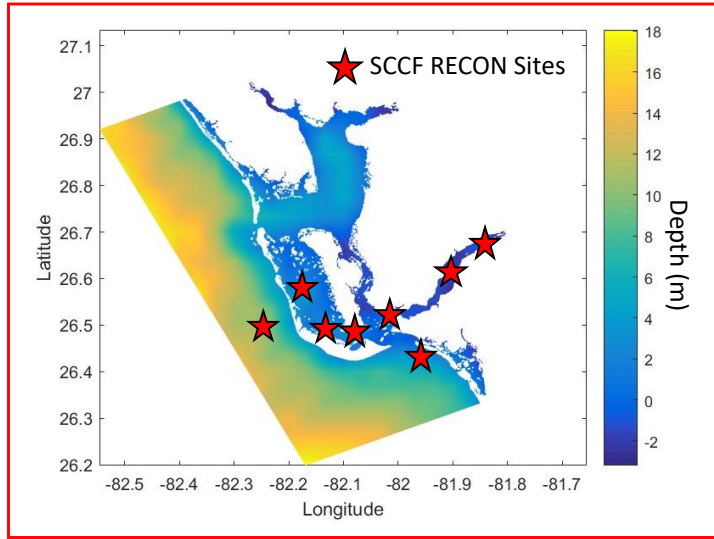


Stars-RECON sites
RECON expansion to the C43 Canal (2)
Red-EPA
Green-ERDC

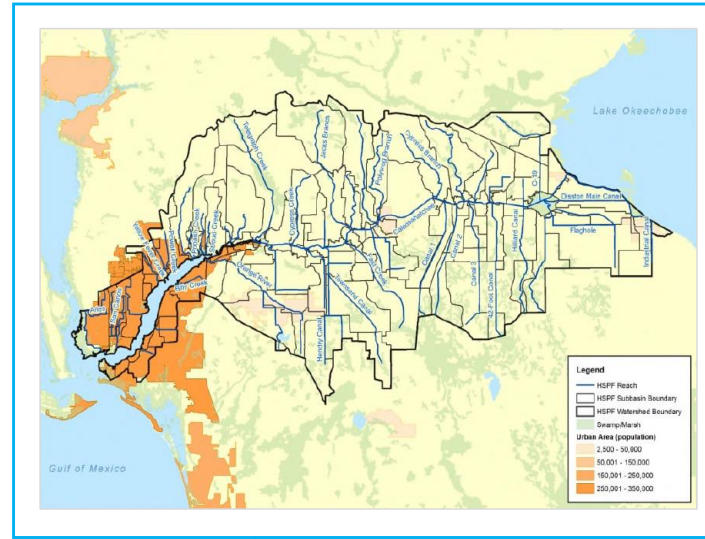


Multiple Drivers of Water Quality

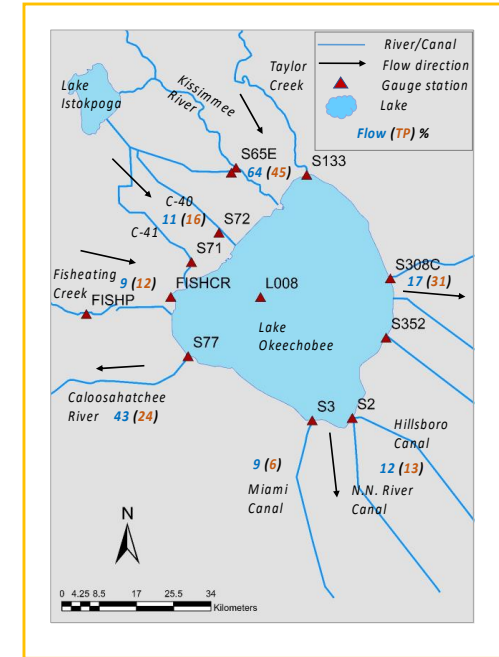
Charlotte Harbor COAWST Model



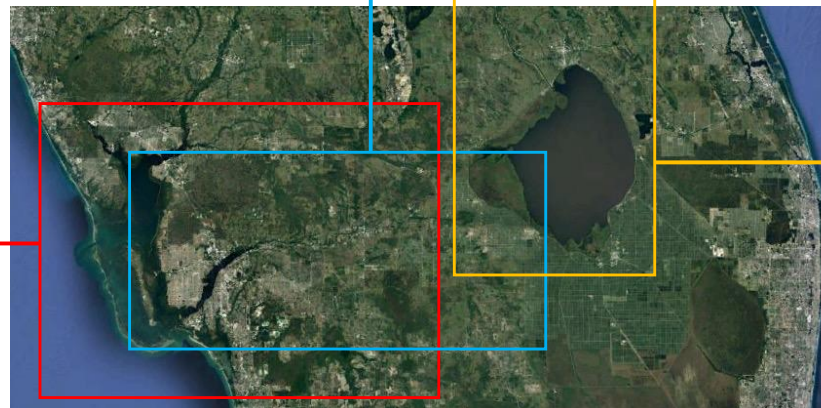
C-43 Watershed HSPF Model



Lake O Hydrology/Nutrient Model



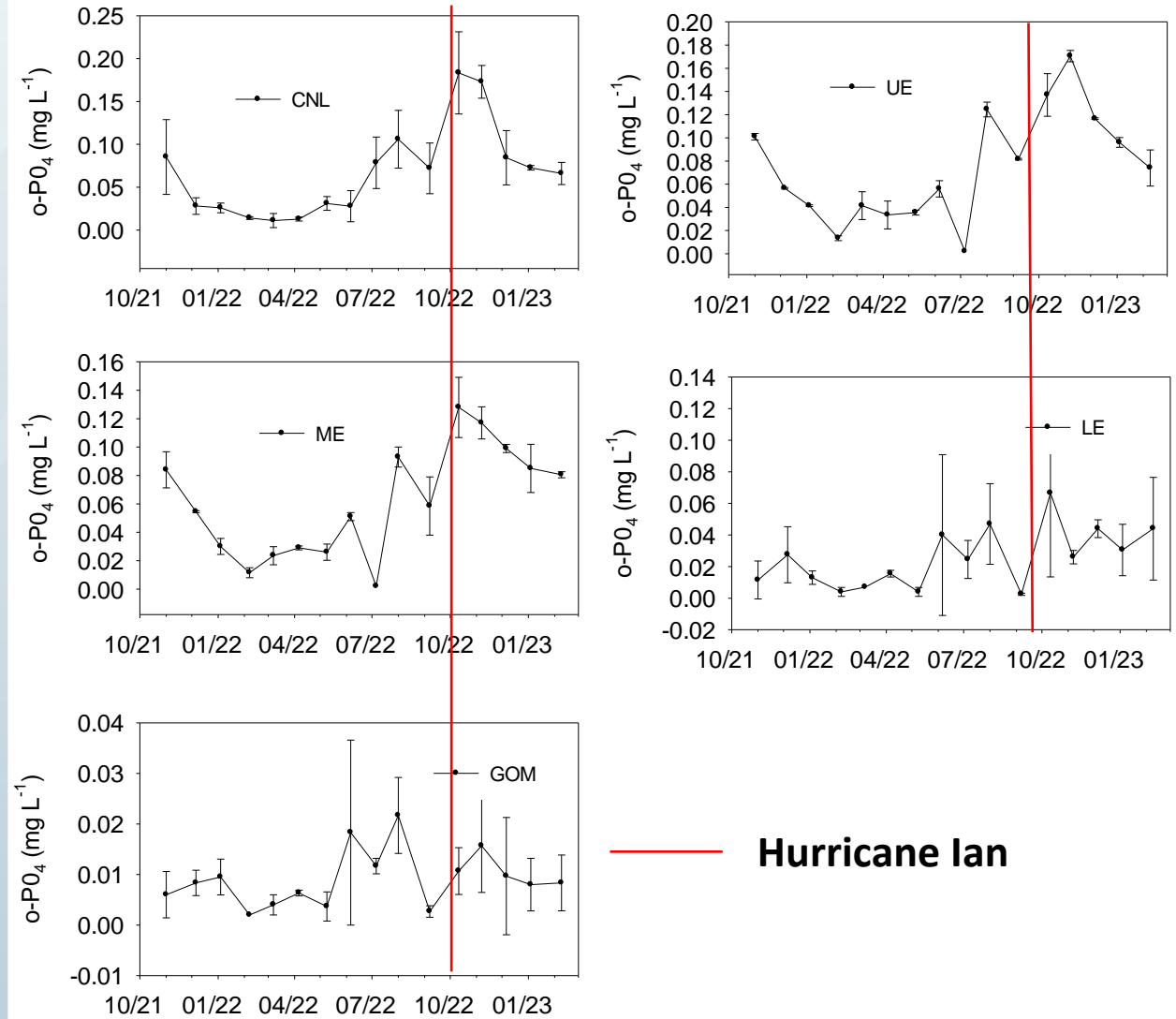
Collaboration with UF and USF to monitor and model all parts of the system; Lake, watershed and coastal drivers



O-PO₄

RESULTS

- Higher in the winter (dry) for CNL, UE and ME, low in the winter (wet)
- Marine segments show a weaker seasonal pattern and opposite of the more FW segments (low in dry; high in wet)
- All sites show increases after Hurricane Ian

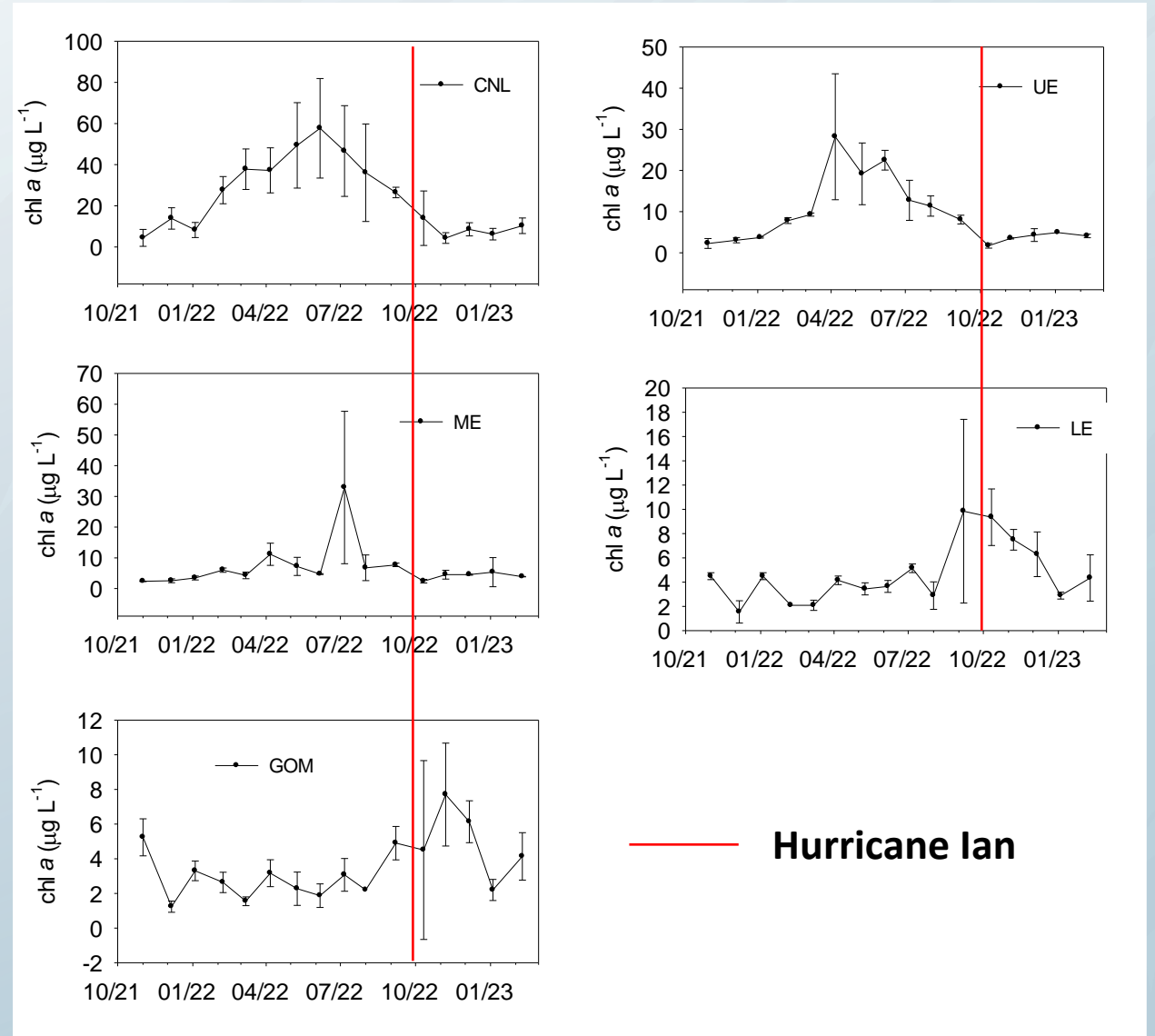


— Hurricane Ian

Chlorophyll *a* (corrected)

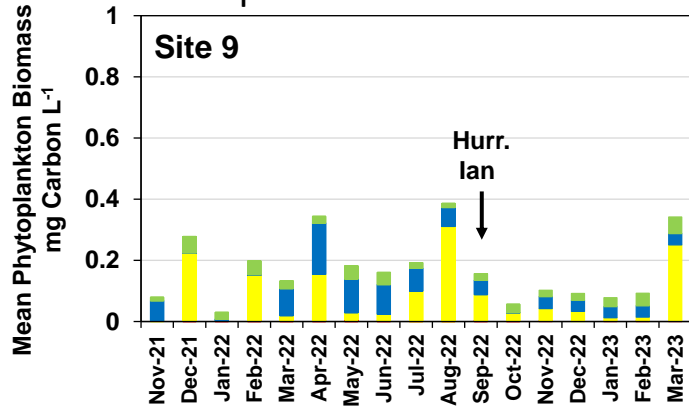
RESULTS

- Summer bloom in the canal (FW)
- Fall bloom in the LE and GOM (K. brevis driven)
 - Hurricane Ian occurred at the beginning of the fall bloom and preceded the K. brevis bloom)

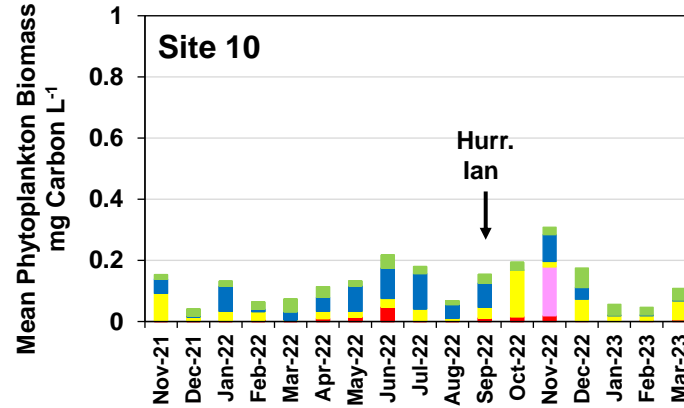


HAB Monitoring Network

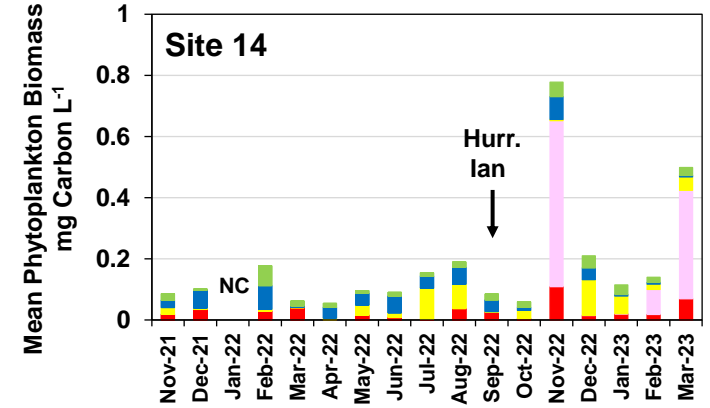
Cape Coral Yacht Club



Shell Point



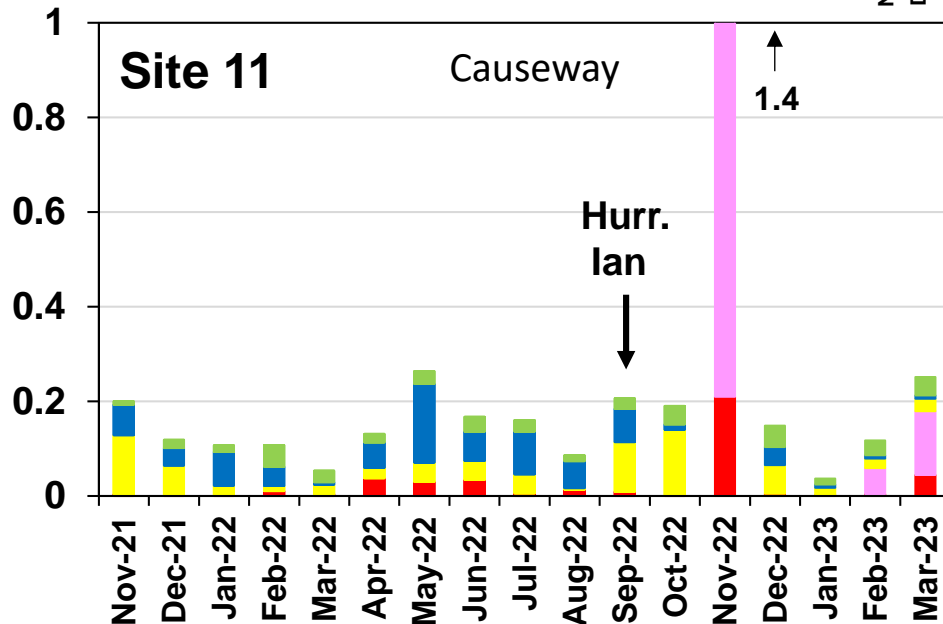
Gulf of Mexico



Mean Phytoplankton Biomass
mg Carbon L⁻¹

Site 11

Causeway



- The bloom was first detected October 18, 2022 near Venice, FL
- It is typical for red tide to start in the late fall with records dating to 1878
- Hurricane Ian provided excess nutrients for the bloom to expand over a greater area



Post-Ian Oceanographic Research

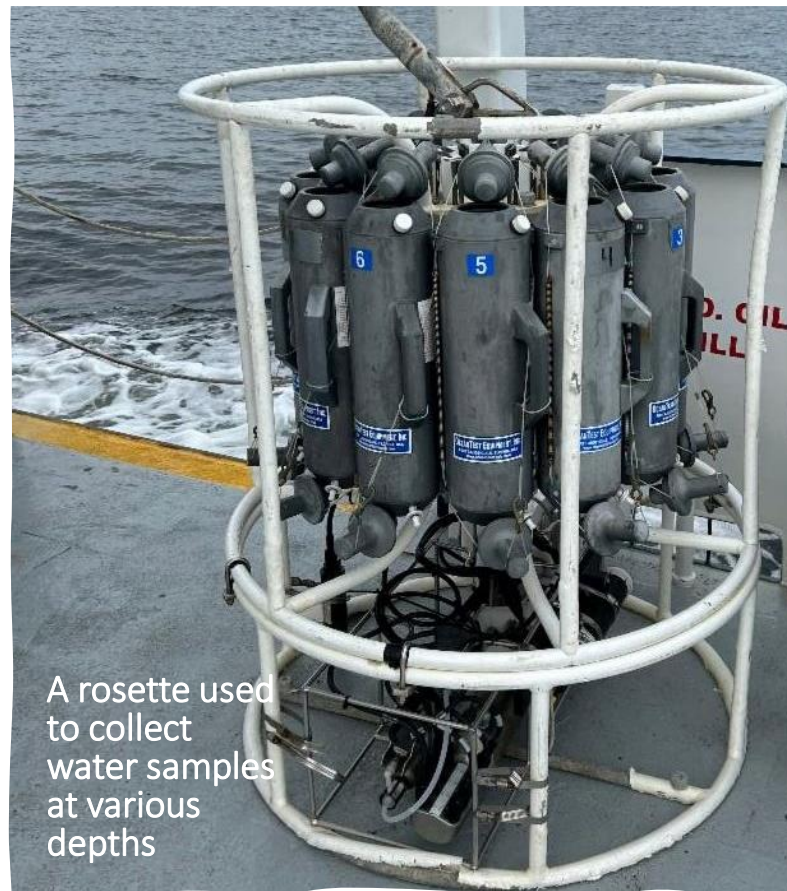


Cruise #1: 10/18-10/23/22
Cruise #2: 01/06-01/11/23
Cruise #3: April 2023





NASA/European Space Agency's Sentinel-2 mission



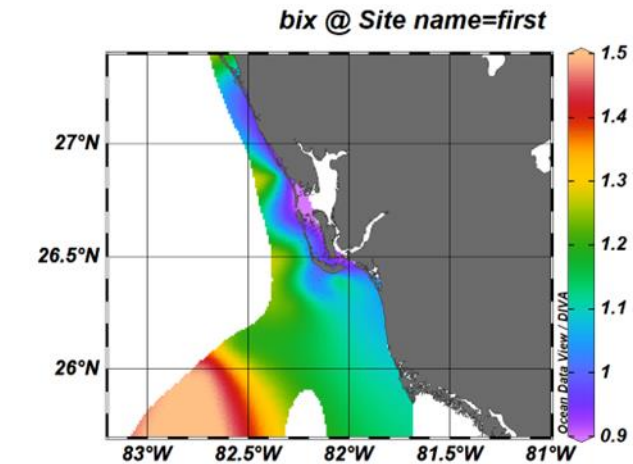
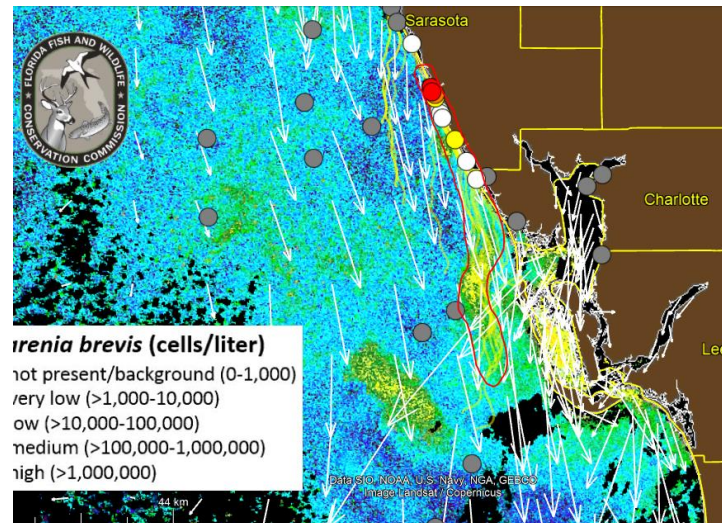
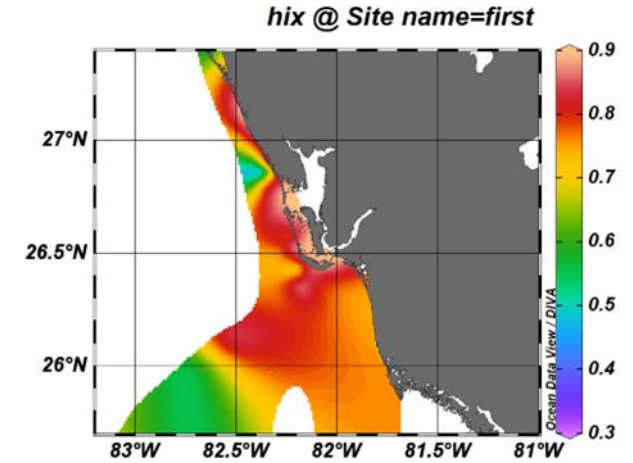
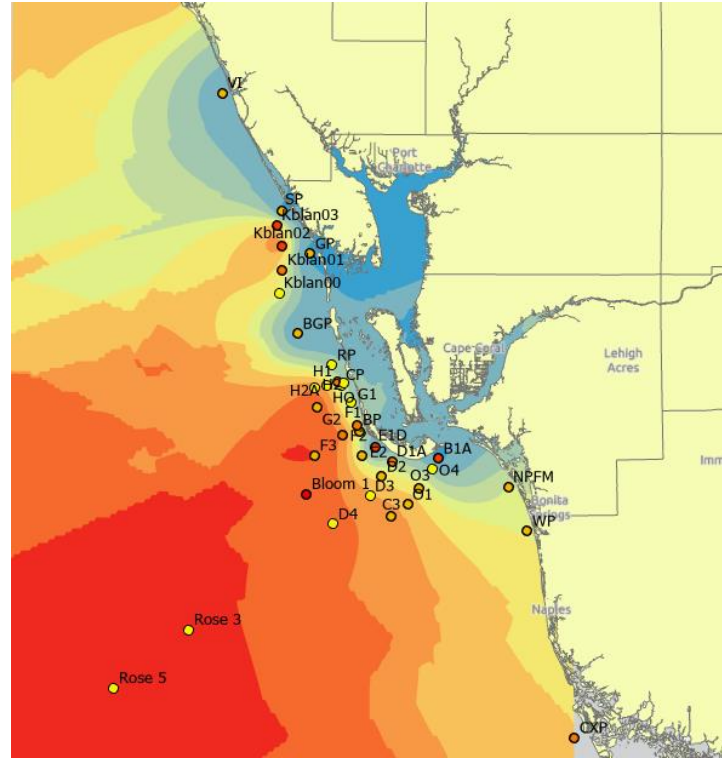
A rosette used to collect water samples at various depths



- Collaborative research cruise with Florida Institute of Oceanography
- 78 foot R/V Hogarth
- 7 Days, 50 sites from St. Pete to Marco Island

Results

- There were areas of low dissolved oxygen around the tidal passes where the water column was stratified (Venice Inlet, Gasparilla Pass)
- Along a salinity front there were patches of *Karenia brevis*
- FDOM (fluorescent dissolved organic matter) analysis indicated a transition from terrestrial production to marine production along the front





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<https://sccf.org/>



SCCF Marine Laboratory Facility in partnership with J.N. "Ding" Darling NWR
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