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# Center for Coastal Solutions at the University of Florida

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# Coastal hazards are on the rise

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Harmful algae blooms



Pathogen Outbreaks



Macroalgae blooms

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These biological events & other water quality hazards are

**unpredictable & increasing in frequency**

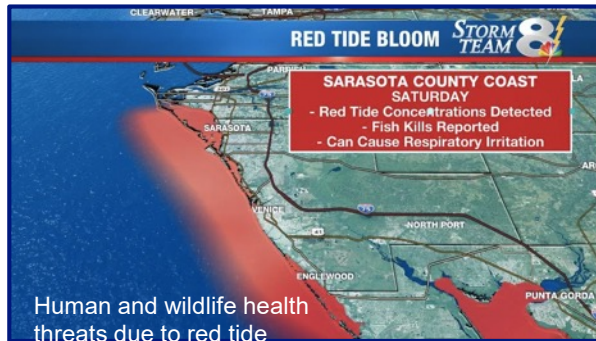
due to climate change and population growth

# Consequences of Coastal Water Quality Hazards for Florida & Floridians



Dead oyster reefs in Cedar Key, Florida

Environmental & Natural Resource Declines



Quality of Life & Public Health Challenges

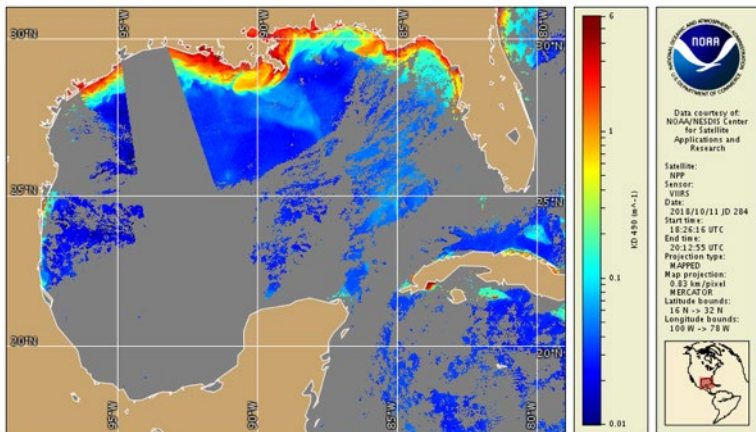


Empty beaches and reduced rental revenue on Labor Day '18 due to red tide

Economic Uncertainty and Revenue Losses

# Local, state, and federal agencies making major investments in collecting data

Satellites: NOAA CoastWatch, others



Monitoring: FDEP, FWC, NERRs, local entities

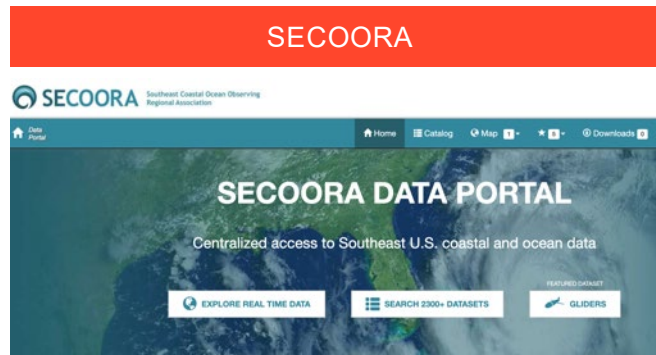
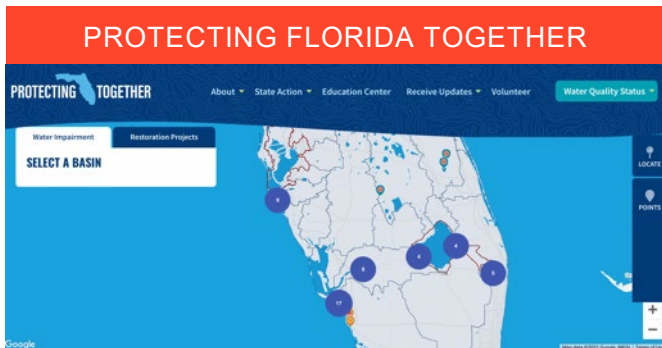


Mote, USF, others operating gliders; FWC FWRI leading water sampling

Sanibel-Captiva  
Conservation  
Foundation's  
RECON system



# And in Databases that Centralize Data & Websites that Display Data



Statewide Ecosystem Assessment of Coastal and Aquatic Resources (SEACAR)

Home • Regions • Office of Resilience and Coastal Protection • Florida Coastal Management Program • Statewide Ecosystem Assessment of Coastal and Aquatic Resources (SEACAR)

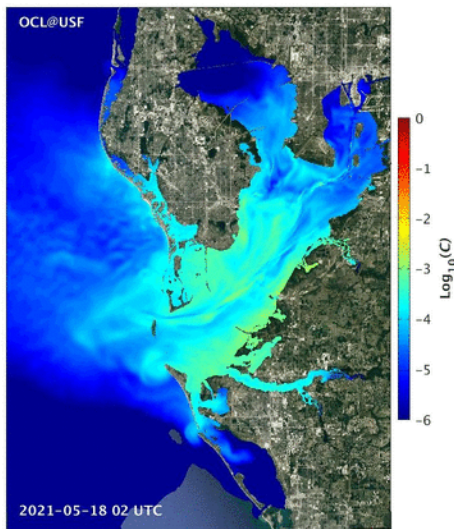
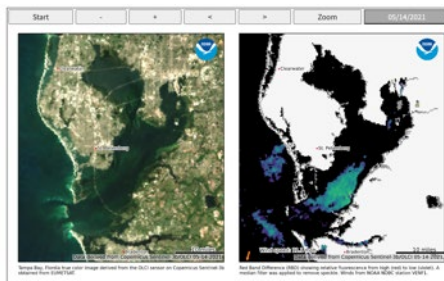
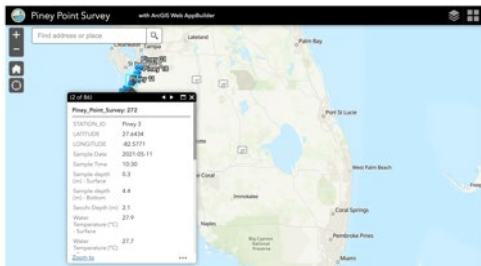
# Are current resources enough to inform disaster response and long-term strategies?



Not yet... users can view data, but it is not yet integrated into useful and actionable 'intelligence'

# An Example: Piney Point

## Where to measure the potential environmental impacts?



- Data from different sources not integrated: cannot fully 'see' current conditions
- Cannot 'rewind' to learn how conditions evolved
- Models unable to forecast bio-chemical changes
- Unable to rapidly simulate short or long-term responses

Where to invest in monitoring and how to proactively respond remain uncertain

Turning the tide to build an integrative and immediately useful coastal water quality planning and response system requires:

- (1) Major **innovation in data analytics & AI** to draw ‘intelligence’ from heterogeneous and currently disjointed databases
- (2) World-class **expertise** (e.g. hydrology, ecology, biogeochemistry, oceanography, public health) to guide analytics
- (3) Deep understanding of how to **translate science into management actions, infrastructure investments, and policy**



# Center for Coastal Solutions at University of Florida

# CCS MISSION

***Provide the State of Florida the real-time and predictive intelligence critical to improving the condition and health of coastal waters***

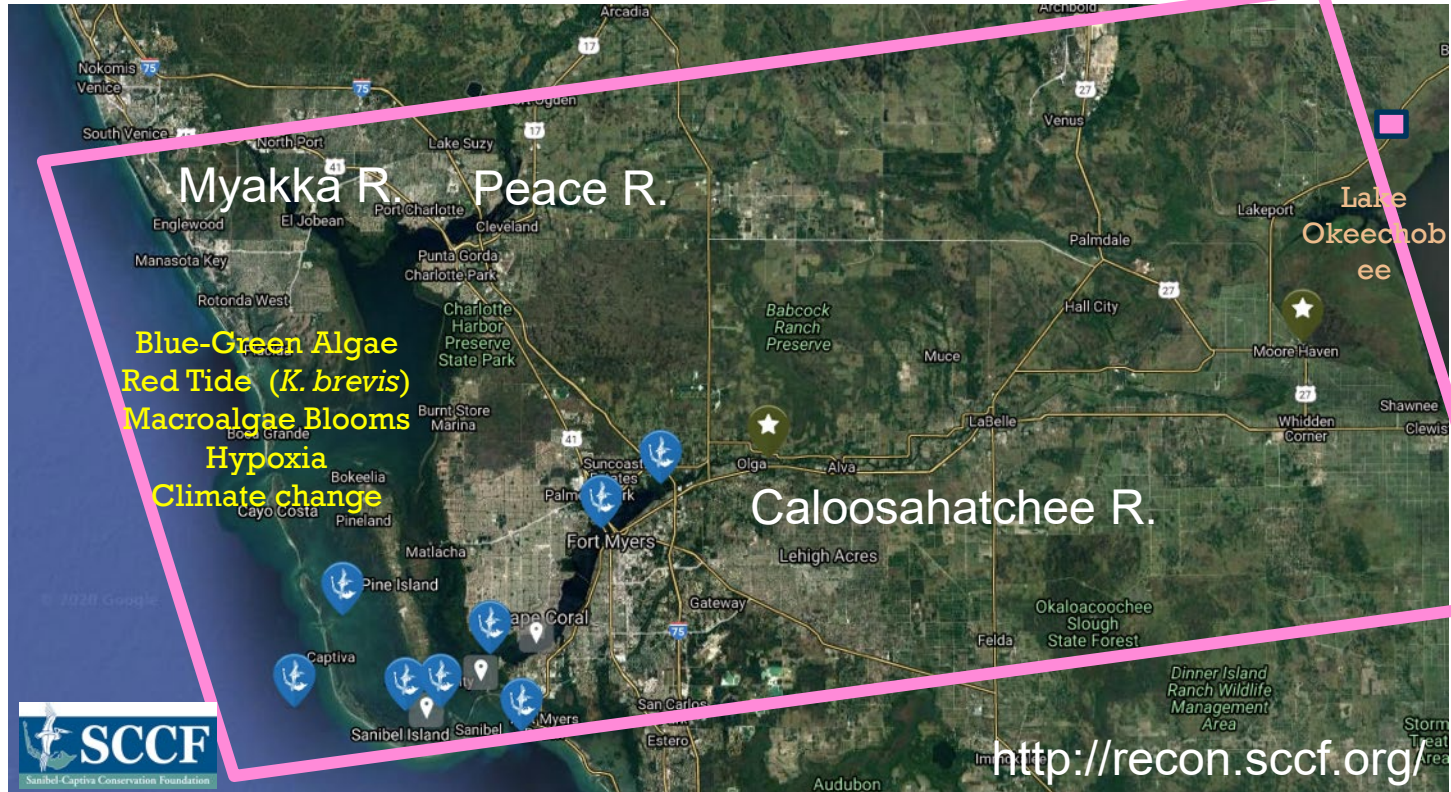


# What does 'real-time intelligence' look like?

The CCS's is uniquely positioned to transform Florida's ability to make proactive and effective water quality management decisions and policy changes by innovating key products:

- (1) Integrated 3-D Mapping of Historic, Current, Future Conditions
- (2) Decision Simulation System to Evaluate Policy, Infrastructure Investment and Management Action Trade-offs

# 3-D Integrative Mapping System Pilot: Charlotte Harbor in SW Florida



# Reliable, High Resolution Water Quality Hindcasts + Forecasts

## Dr. Maitane Olabarrieta, Dr. David Kaplan, Dr. Luming She

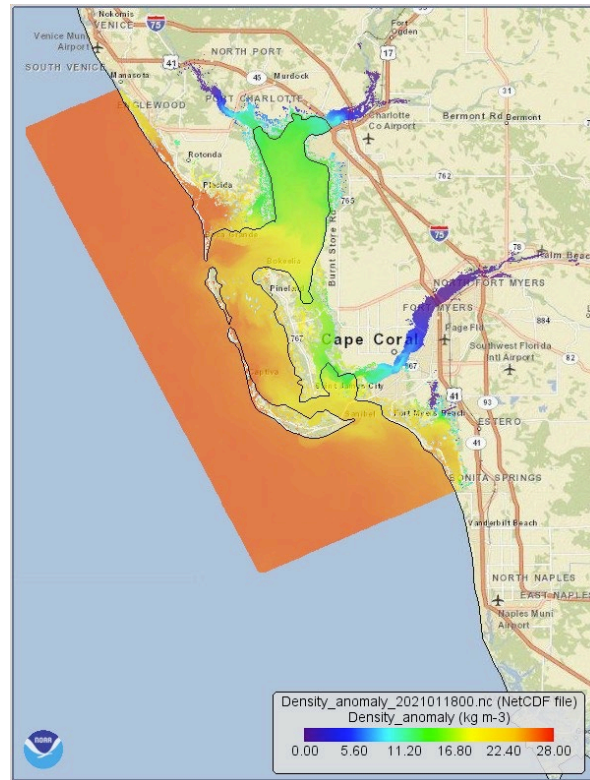
'21: Building forecasting model

- Temperature, salinity, oxygen

'22: Nutrient loading from rivers and other sources

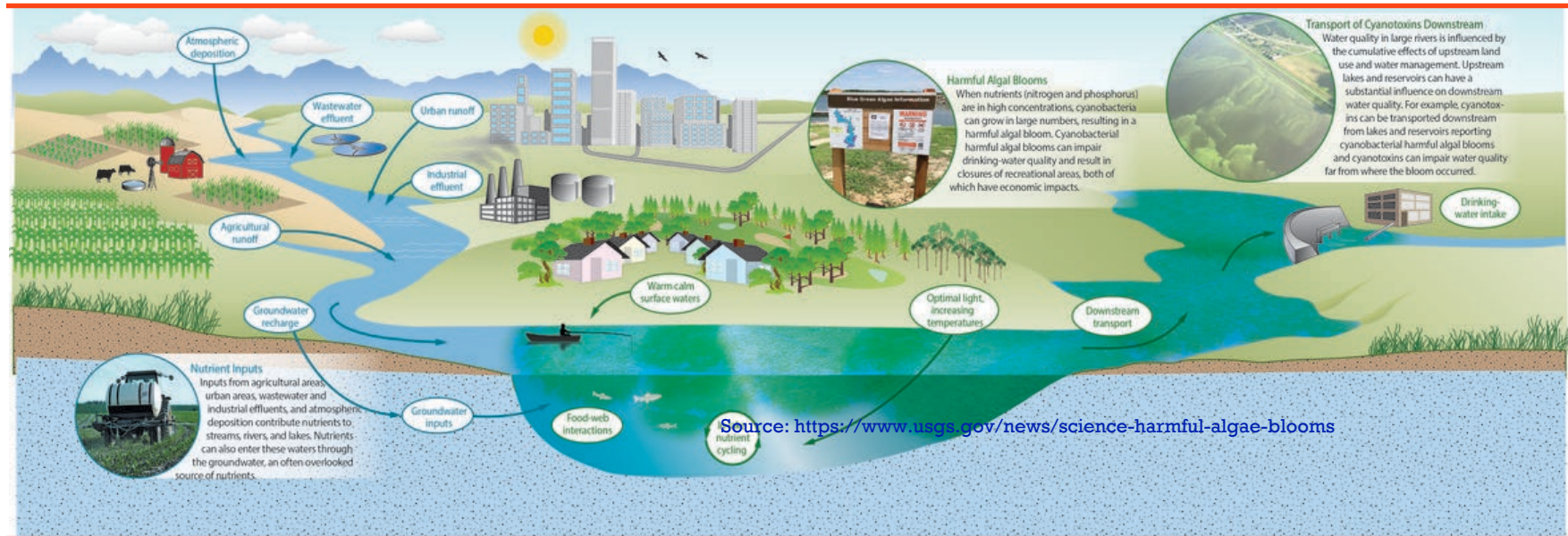
'23-24: Harmful algae, macroalgae, other biota

'24-beyond: Replicate in other estuaries/waterways



# Real-time 3-D Mapping & Forecasting System

Will display historic, current, future hazards affecting waterways across the state.



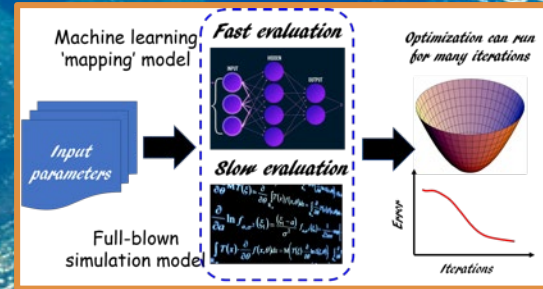
# Decision Simulation System – Build upon mapping platform

Reinforcement Learning based algorithms will allow users to explore the scale, location, timing, sequence of management actions or policies, supporting disaster response and long-term planning for how to achieve measurable improvements in water quality



Identification of interventions that achieve high returns-on-investment in improvement in water quality, economic activity, public health wildlife health, etc.

- Potential interventions:
- Nutrient load reduction policies
  - Septic conversion investments
  - Modify lake discharge schedule
  - Oyster reef construction



# Why UF?

Uniquely positioned to leverage  
the brightest minds & most advanced technologies  
to improve Florida's economic,  
human and environmental health.



# University of Florida

## Unmatched Data Analytics & AI Capabilities

- 5 new hires through AI-100
- \$70M UF-NVIDIA AI Superpod

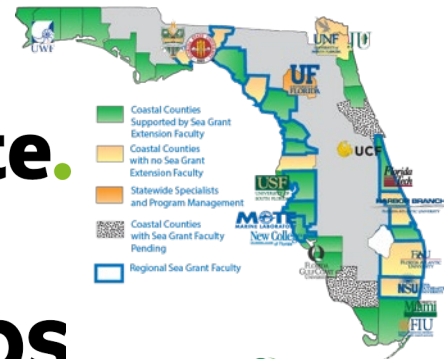
## World-Class Leadership & Expertise

- >50 Affiliate Faculty from Engineering, Medicine, Public Health, Law, Biology, Agricultural & Life Sciences

## Meaningful Engagement of the Public & Private Sector

- Private sector accelerating tech innovation (SAS, NVIDIA)
- Public sector facilitating translation of science into management & policy

## Statewide Education and Extension Driving Workforce Development – including Florida Sea Grant collaboration



# Nature-Based Solutions for Coastal Resilience

NFWF Coastal Resilience Fund, USACE-ERDC  
Engineering with Nature and DoD REPI Challenge

## Objectives will involve:

- Historic analysis of wetland/dune change & underlying drivers
- Modeling systems to evaluate multi-scale hydrodynamic-sediment transport-ecological coupling
  - Models to be validated with extensive field observations & experiments
- Forecasts of system change under sediment management, restoration, climate change scenarios
- Implementation of large-scale nature-based coastal resilience projects at Tyndall Airforce Base by 2024

<https://www.erd.c.usace.army.mil/Media/News-Stories/Article/2709548/engineering-with-natures-tyndall-coastal-resilience-study-recognized-with-inter/>



Learn more about how to become a part of the solution:  
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