

Florida's Coral Reef Water Quality Data Compilation, Analysis, and Decision Support



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Project Team and Funding

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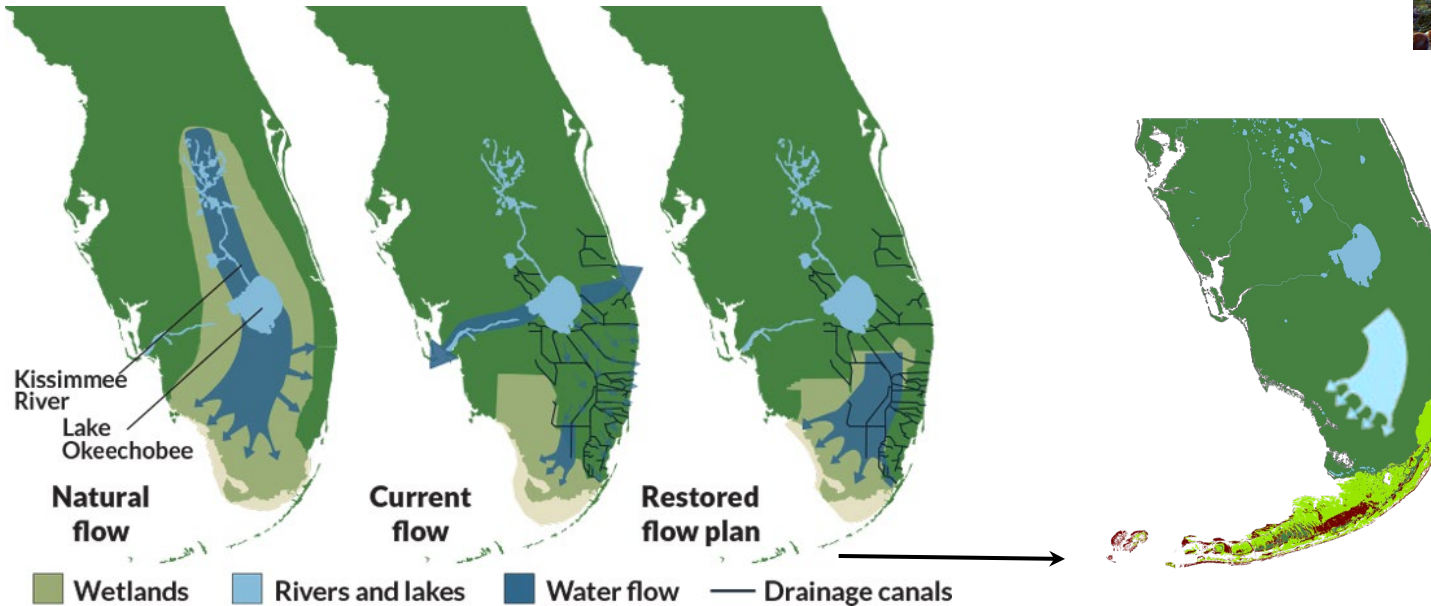
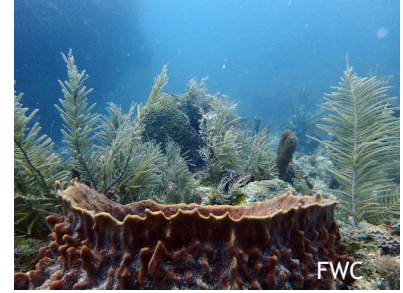


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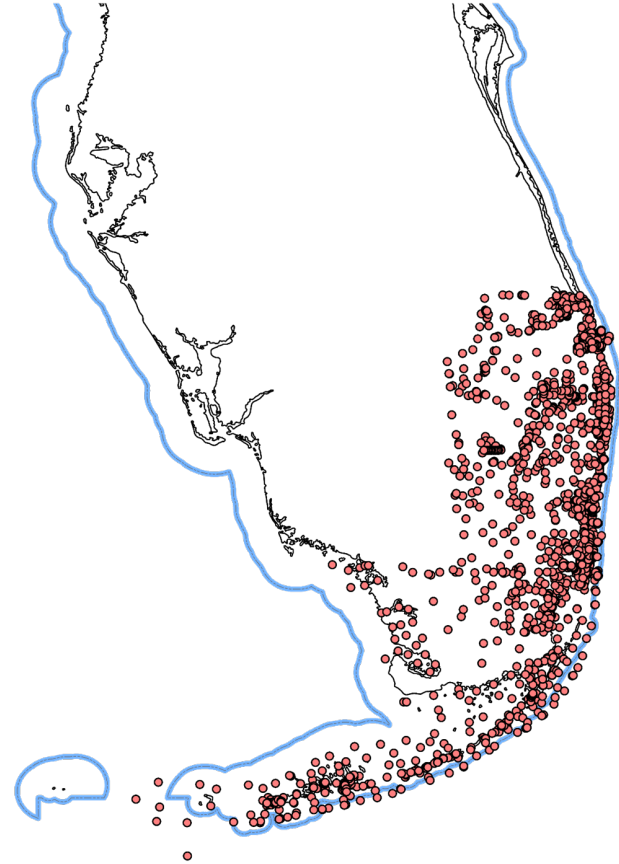
Introduction

- Changes in water quality impact benthic ecosystems:
 - Excess sedimentation and nutrient enrichment pose significant threats
 - Restoration efforts in the Everglades (CERP) ~\$23.2 billion



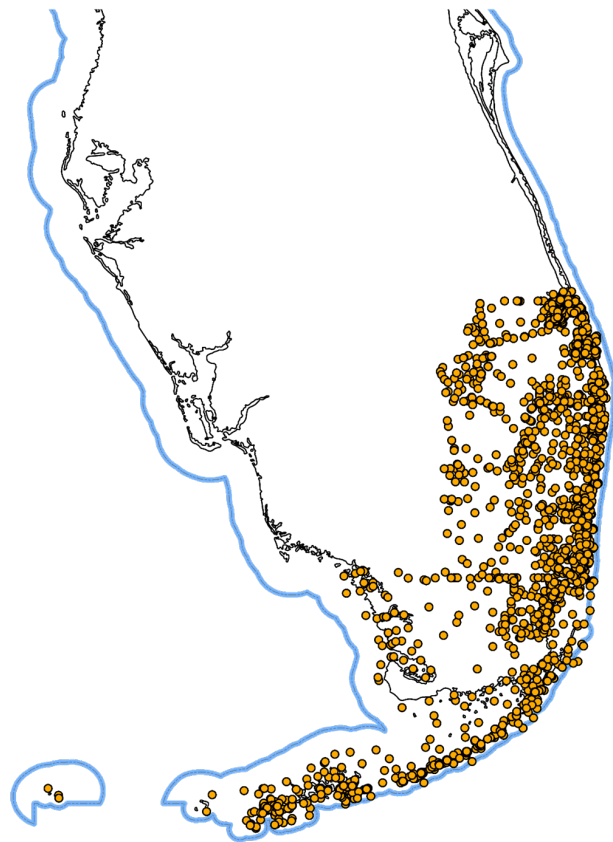
Introduction

- **Extensive Water Quality Data Collected Across Florida**
 - Water-Cat: **33388** active stations for Florida
 - **2000** from Martin County to Monroe (**26** different organizations)



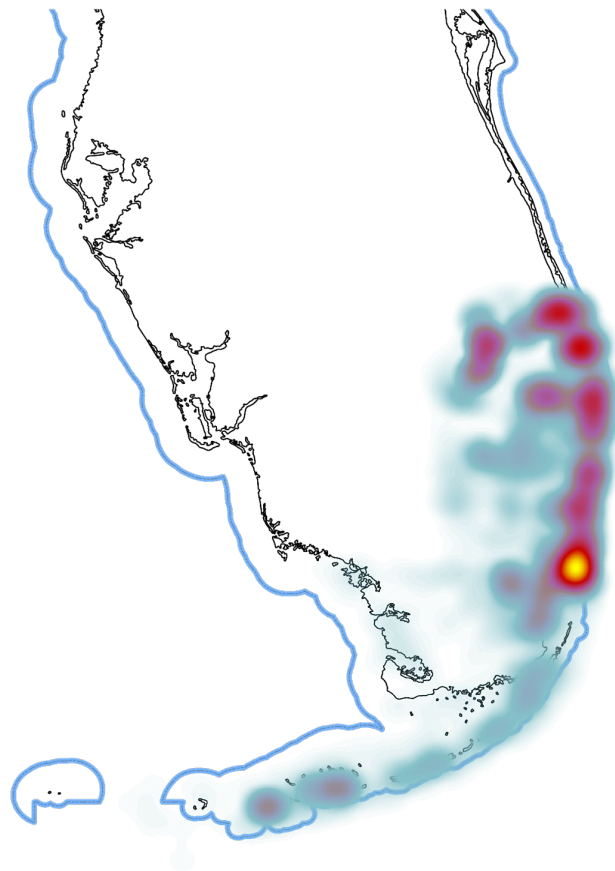
Introduction

- **Extensive Water Quality Data Collected Across Florida**
 - Water-Cat: **33388** active stations for Florida
 - **2000** from Martin County to Monroe (**26** different organizations)
 - WIN: **34309** stations for all Florida
 - **2839** from Martin County to Monroe (**20** different organizations)
 - SEACAR: over **90** programs sample for water quality
- **At first glance, it might seem like a lot, but...**



Introduction

- Not all areas have equal coverage
- Not all programs monitor for the same parameters
- Not all parameters are collected the same, e.g.
 - “Continuous” filter on WaterCat:
 - **33388 > 2588**
 - Uncorrected vs corrected chlorophyll
 - Different standards: NELAC

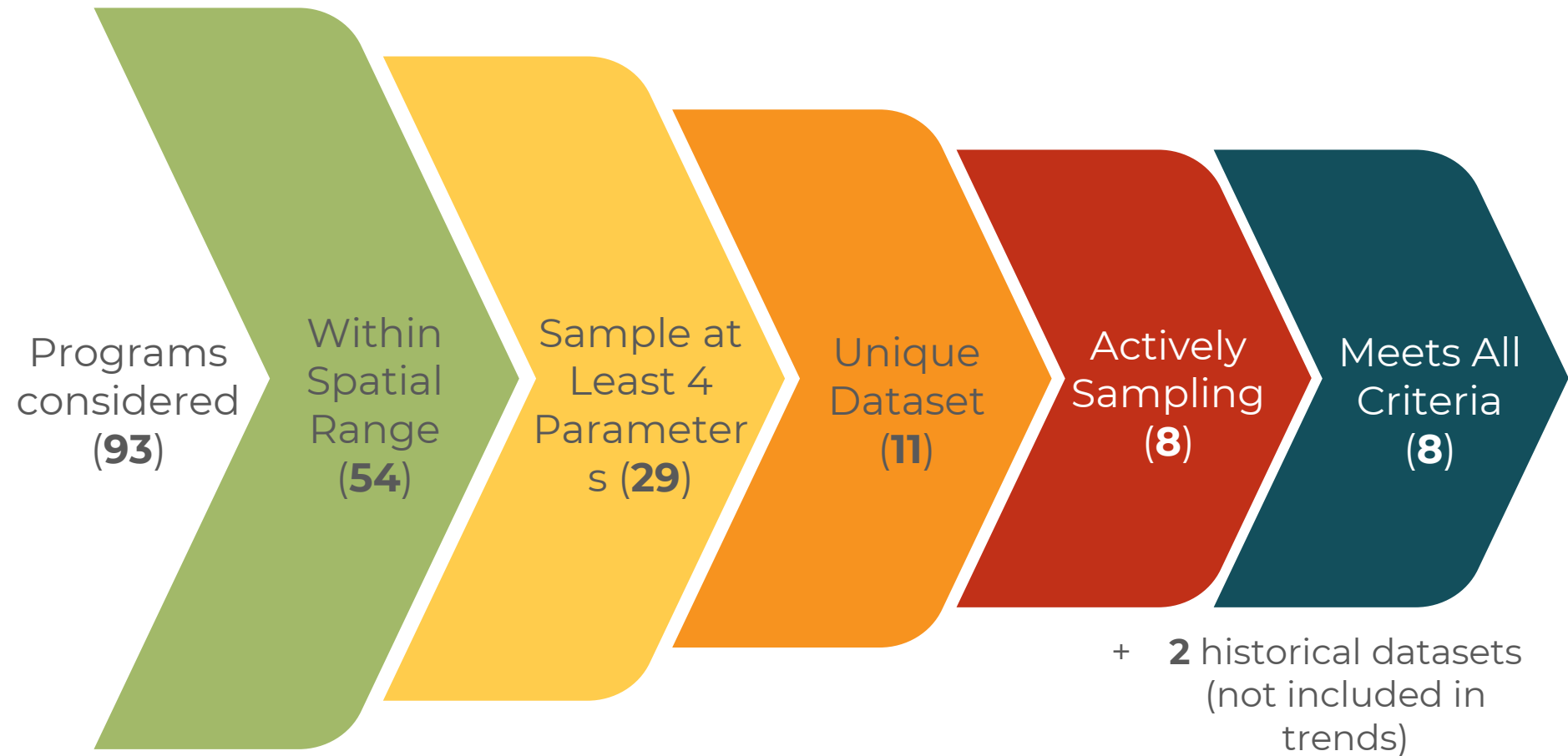


Goals & Objectives: Years 1 - 4

- Create a unified water quality monitoring dataset across Florida's Coral Reef
- Identify long-term trends and monitoring gaps
 - Focus on nutrients and water clarity



Methods - Overview



Methods - Parameters

Nitrogen

- Total Nitrogen
- Nitrite (NO₂)
- Nitrate (NO₃)
- Ammonium
- TKN

Phosphorus

- Total Phosphorus
- Orthophosphates (PO₄)

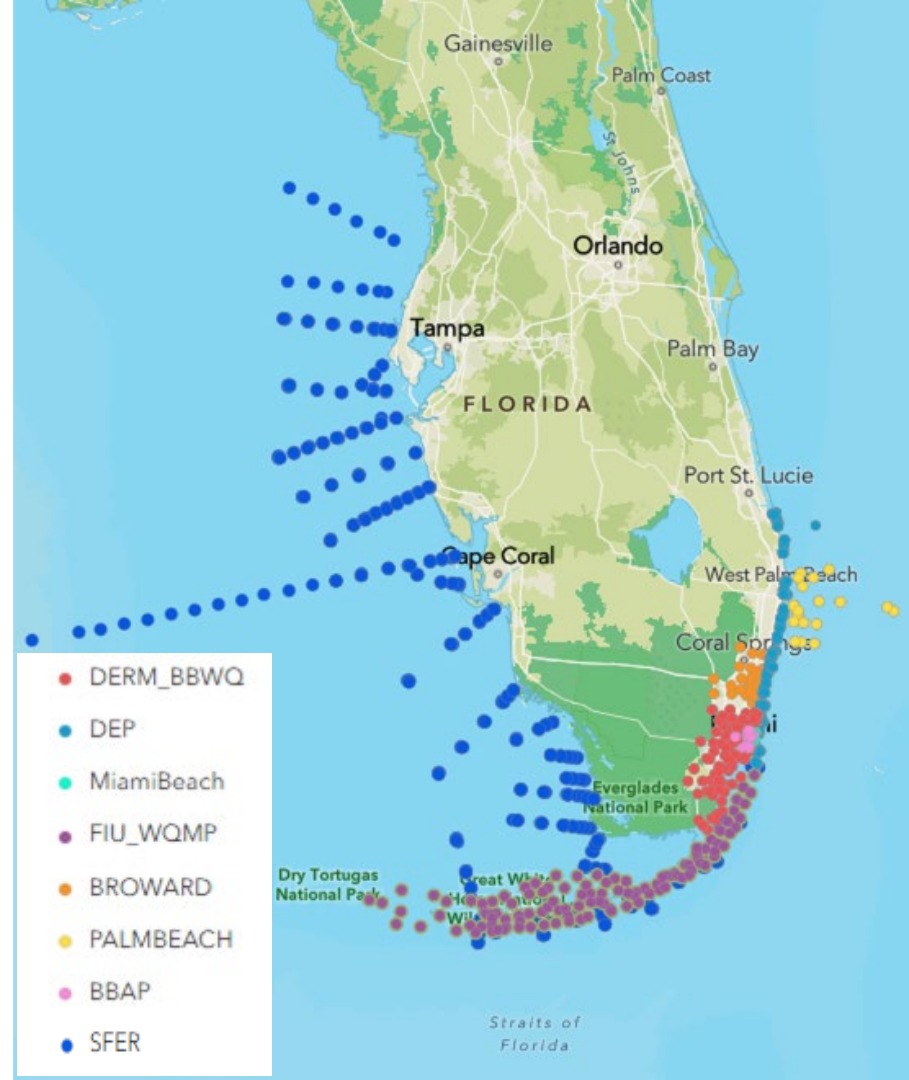
Water Clarity

- Chlorophyll-a
- Turbidity
- Silicates

Sample at
Least 4
Parameters
(29)

Results - Nutrient Monitoring Data Aggregation

- Sampling **Nitrogen, Phosphorus, Chlorophyll**, or **Water Clarity**
- **Over 5 years** of consistent data collection
- At least **annual samples** frequency
- **Eight** programs:
 - AOML
 - Biscayne Bay Aquatic Preserve/Water Watch
 - Broward County
 - DEP ECA
 - Miami DERM
 - FIU/SERC
 - City of Miami Beach
 - Palm Beach County



Results - Data Visualization Tool



Sampling program (icon color)

Switch between water clarity/Nitrogen/Phosphorus

Number of observations (icon size)

Filters:

- Actively sampling
- Time period
- Program
- Number of obs.



Time Series of WQ Parameters

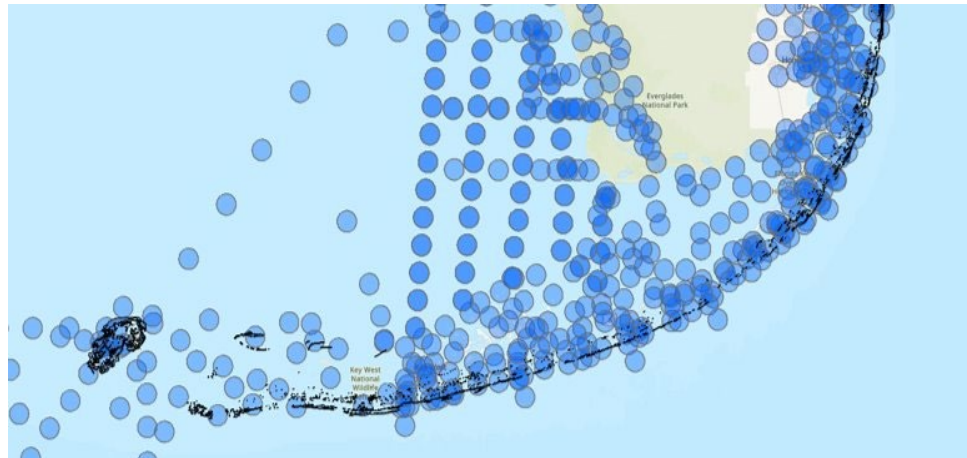
Results - Gap Analysis (1)

- Spatial correlation (semivariograms)
 - Shows how far apart samples still reflect similar trends
 - Buffer distances vary by analyte: **1.7-7+ km**
 - No buffer for nitrogen due to strong inshore-offshore gradients

Total Phosphorus - 1.7 km buffer

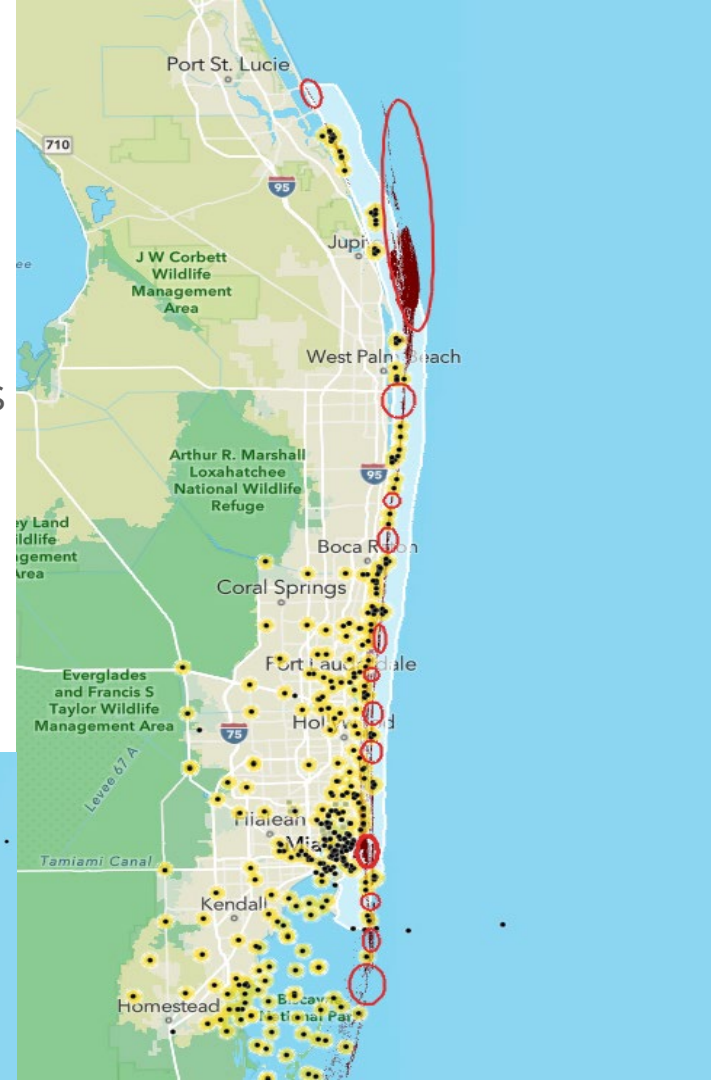
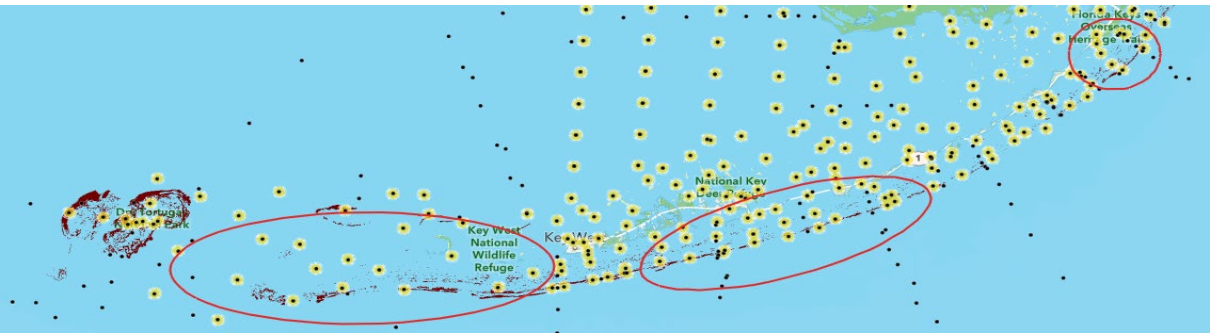


Orthophosphates - 3.5 km buffer



Results - Gap Analysis (2)

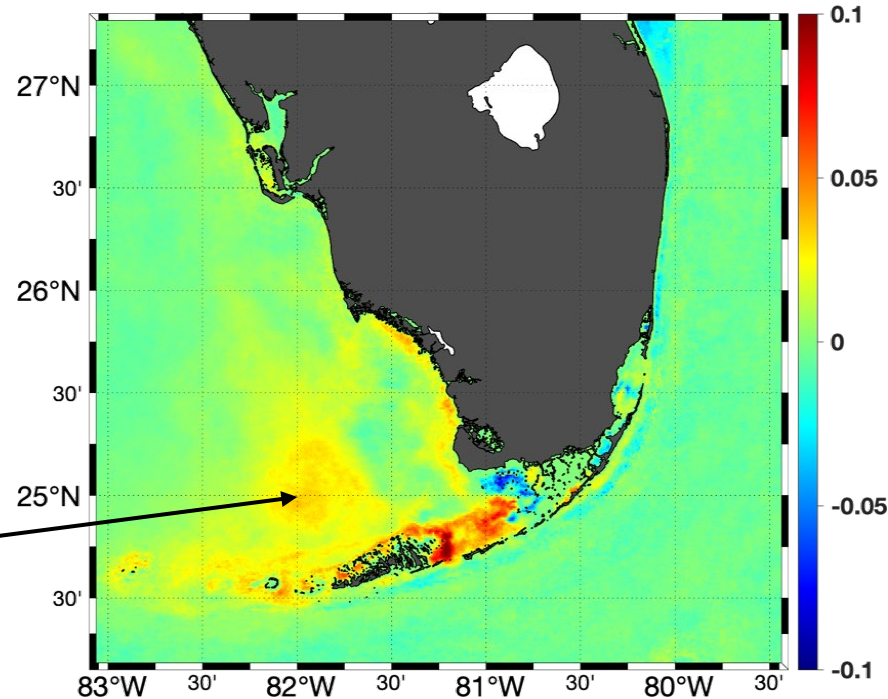
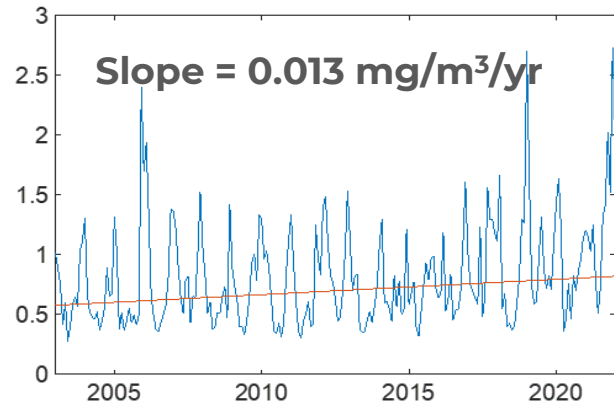
- Semivariogram analysis of Total Phosphorus overlaid with the URM reveals several gaps
 - Largest gap in the Kristin Jacobs Coral Ecosystem Conservation Area + small gaps throughout Miami-Dade and Broward counties
 - Sampling gaps in the Florida Keys, Marquesas and Dry Tortugas



Results - Remote Sensing Data

- Satellite imagery to fill in sampling gaps

- MODIS satellite (1-km pixel, 2003-present)
 - Chlorophyll-a, SST and reflectance (turbidity)
- Thiel-Sen slope used to compare with in-situ data



Goals & Objectives: Years 4 - 6

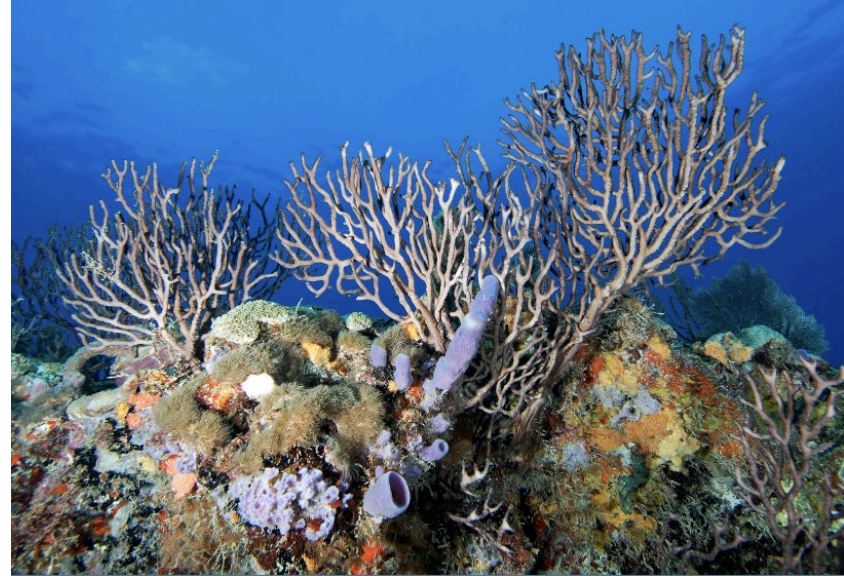
- Contribute to FCRCT integrated framework to answer question: can we detect change from management and restoration efforts?
- Inventory of abiotic water quality and biological and ecological monitoring programs



Unified Monitoring Framework for Florida's Coral Reef

PRIORITY FOCUS: INVENTORY EXISTING MONITORING PROGRAMS

- **ACTION 1:** Inventory existing **water quality** monitoring programs along FCR and nearshore coastal waters of South Florida.

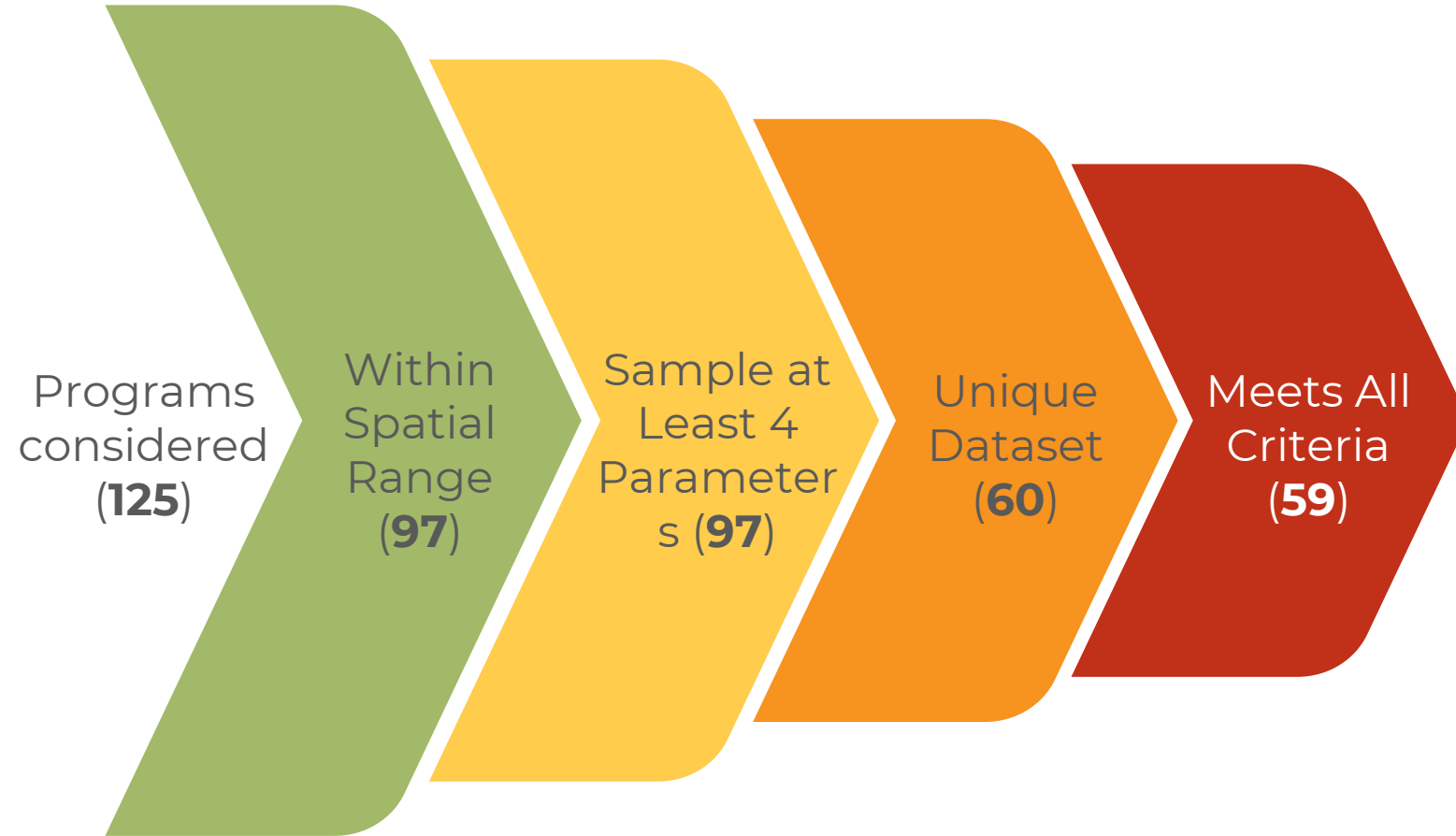


UNIFIED MONITORING FRAMEWORK FOR FLORIDA'S CORAL REEF

ADOPTED: November 9, 2023

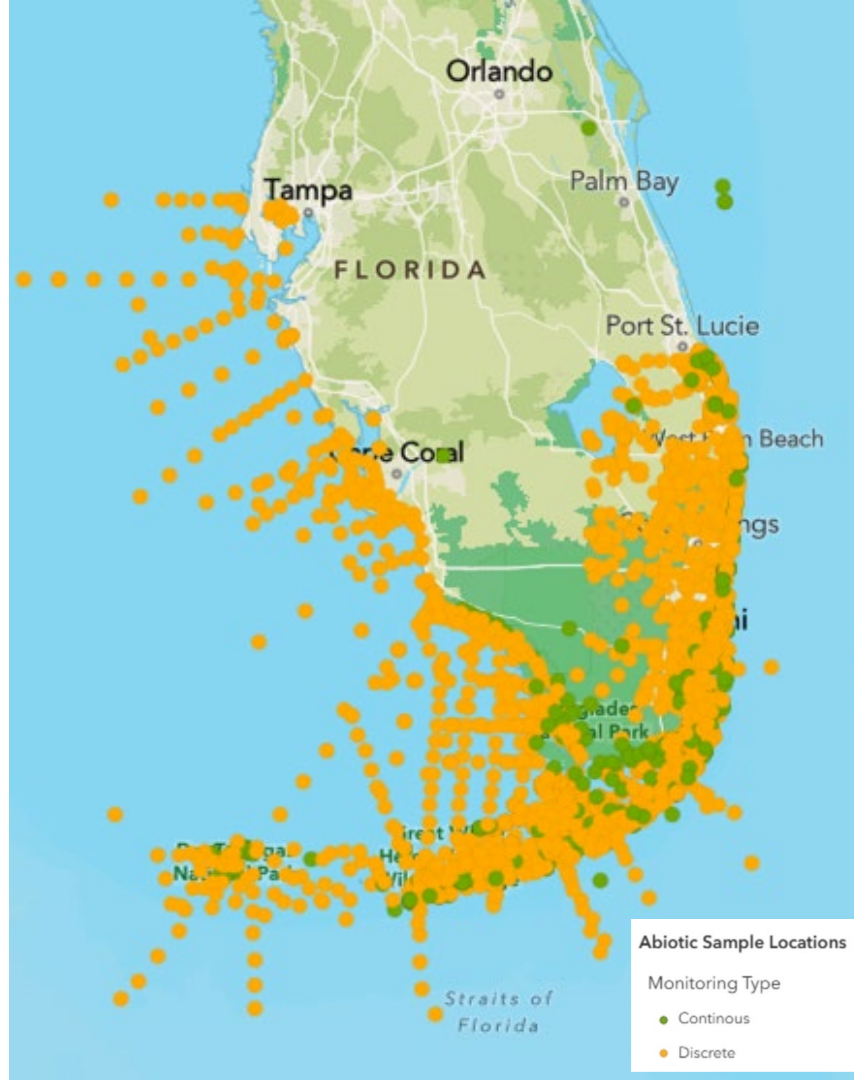


Methods - Overview



Action 1 - *Abiotic* Sampling Program Inventory (1)

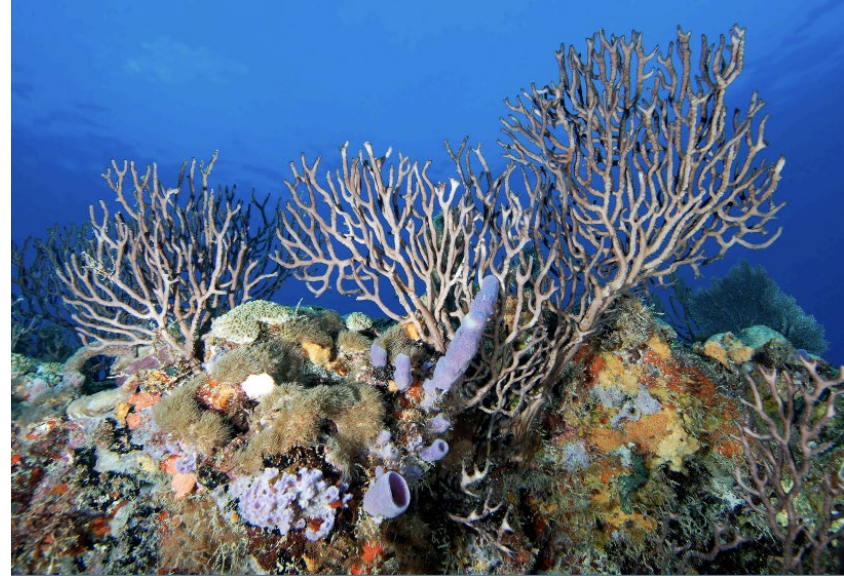
- pH, DO, salinity or temperature
- 59 programs
- Where are abiotic factors being sampled and how?
 - Parameters
 - Frequency (continuous/discrete)
 - Depth
 - Sampling program
- Cheaper/faster to sample
 - Fill gaps and track water movement



Unified Monitoring Framework for Florida's Coral Reef

PRIORITY FOCUS: INVENTORY EXISTING MONITORING PROGRAMS

- **ACTION 2:** Inventory existing **biological or ecological** monitoring programs related to FCR and associated within the South Florida ecosystem.



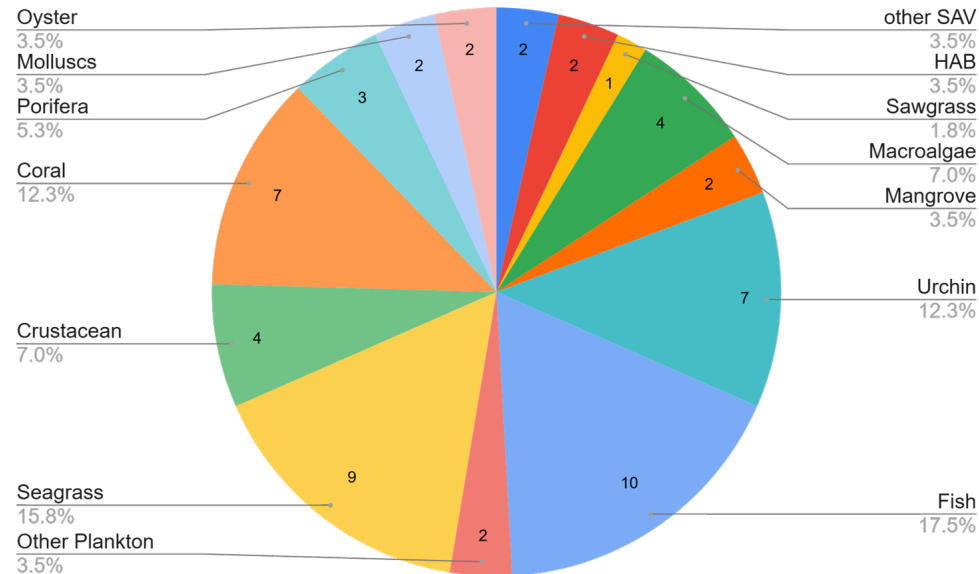
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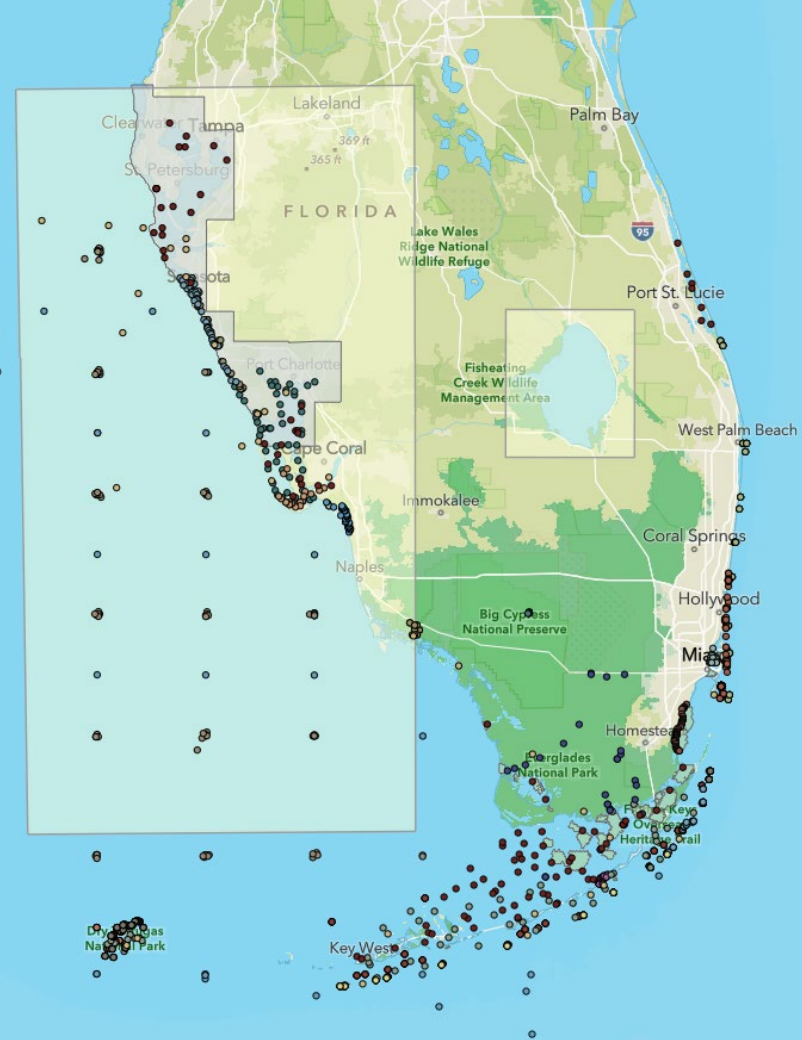
Action 2 - Biological and Ecological Monitoring Program Inventory (1)

- 116 programs > 33 final programs
- Included coral/benthic inverts, fish, red tide, seagrass, mangroves, pelagic plankton



Action 2 - Biological and Ecological Monitoring Program Inventory (2)

- Survey locations could be fixed or random
 - Monitoring locations were either polygons or points



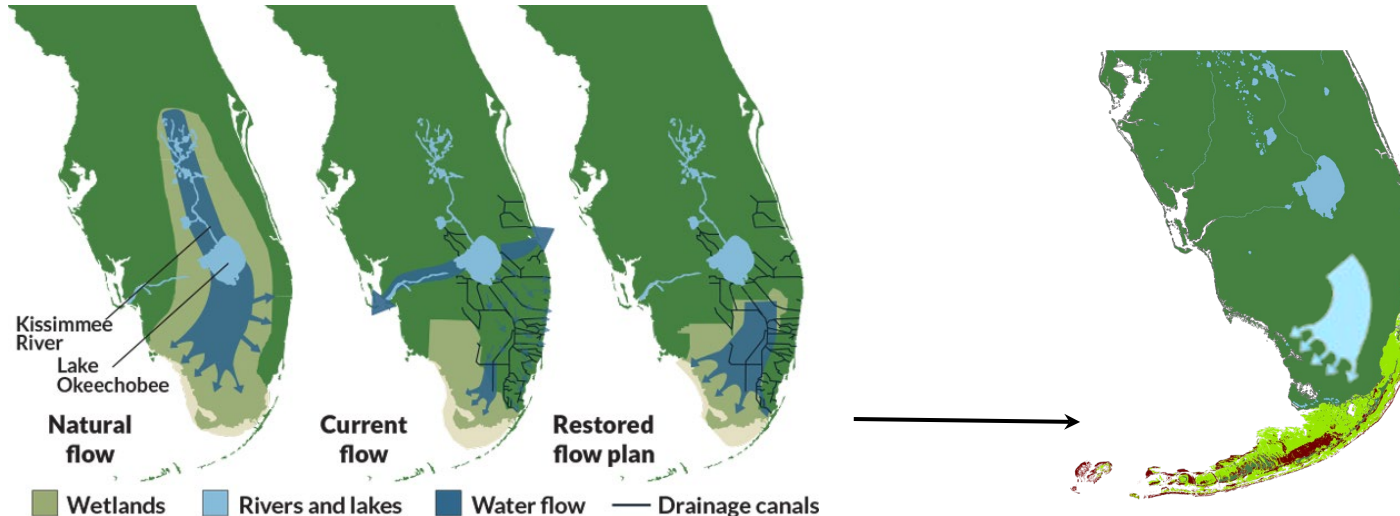
Improving our inventories

- Survey was sent out to relevant partners to gather feedback on our abiotic and biological/ecological inventories
 - To capture information on programs/sampling locations we might've missed
 - To gather feedback on the data discovery products



Conclusion & Future Steps

- Collecting water quality data is important, but significant effort is required to make it compatible and useful
 - Essential to assess impacts of major restoration projects and better inform management efforts
- Ensuring public accessibility is an additional challenge
 - Integration with SEACAR
 - Adding all the web maps to a HUB



Thank you! Questions?

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