NOAA/AOML South Florida Ecosystem Restoration Program:

Evolving coastal science to guide, support, and evaluate Everglades ecosystem restoration

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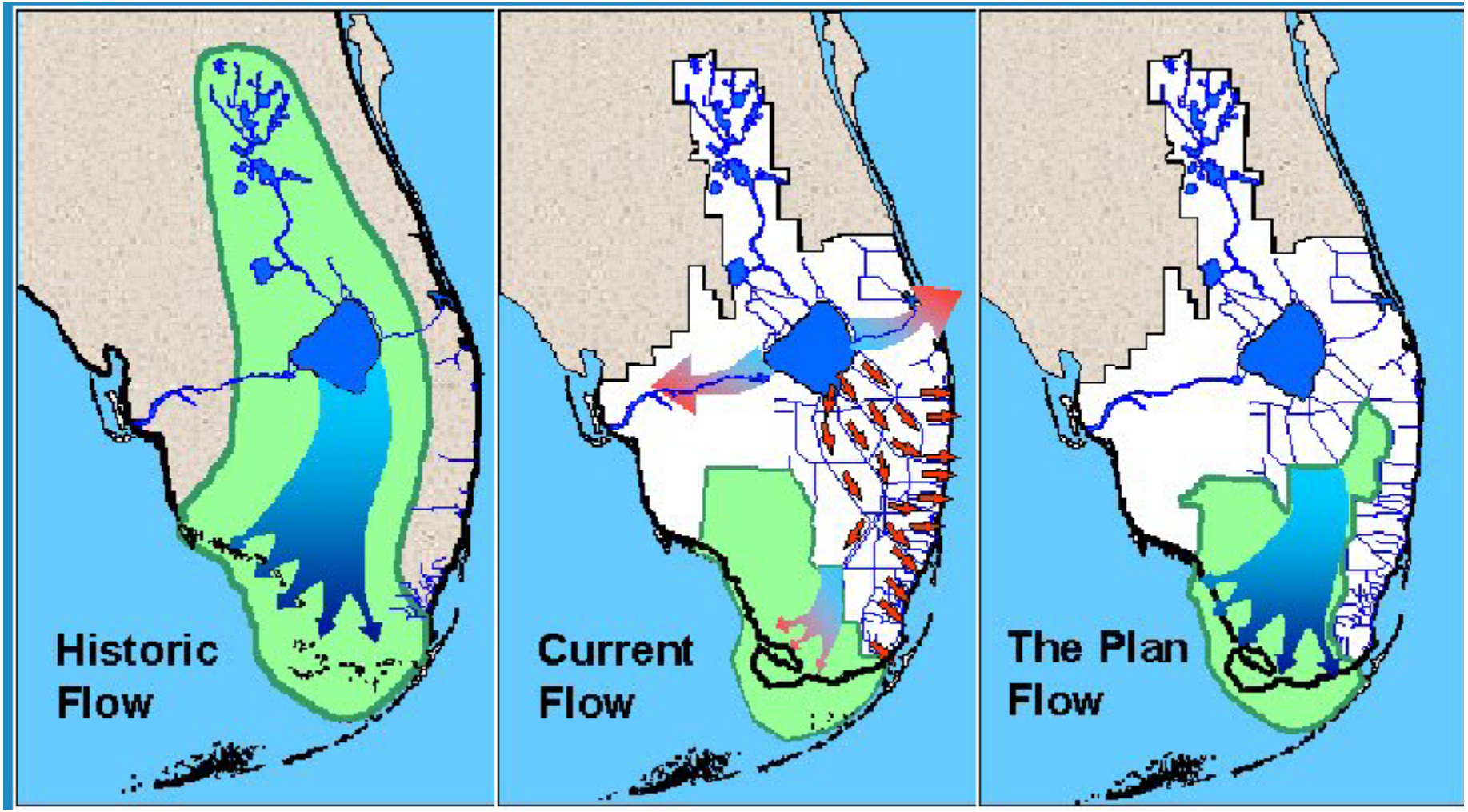
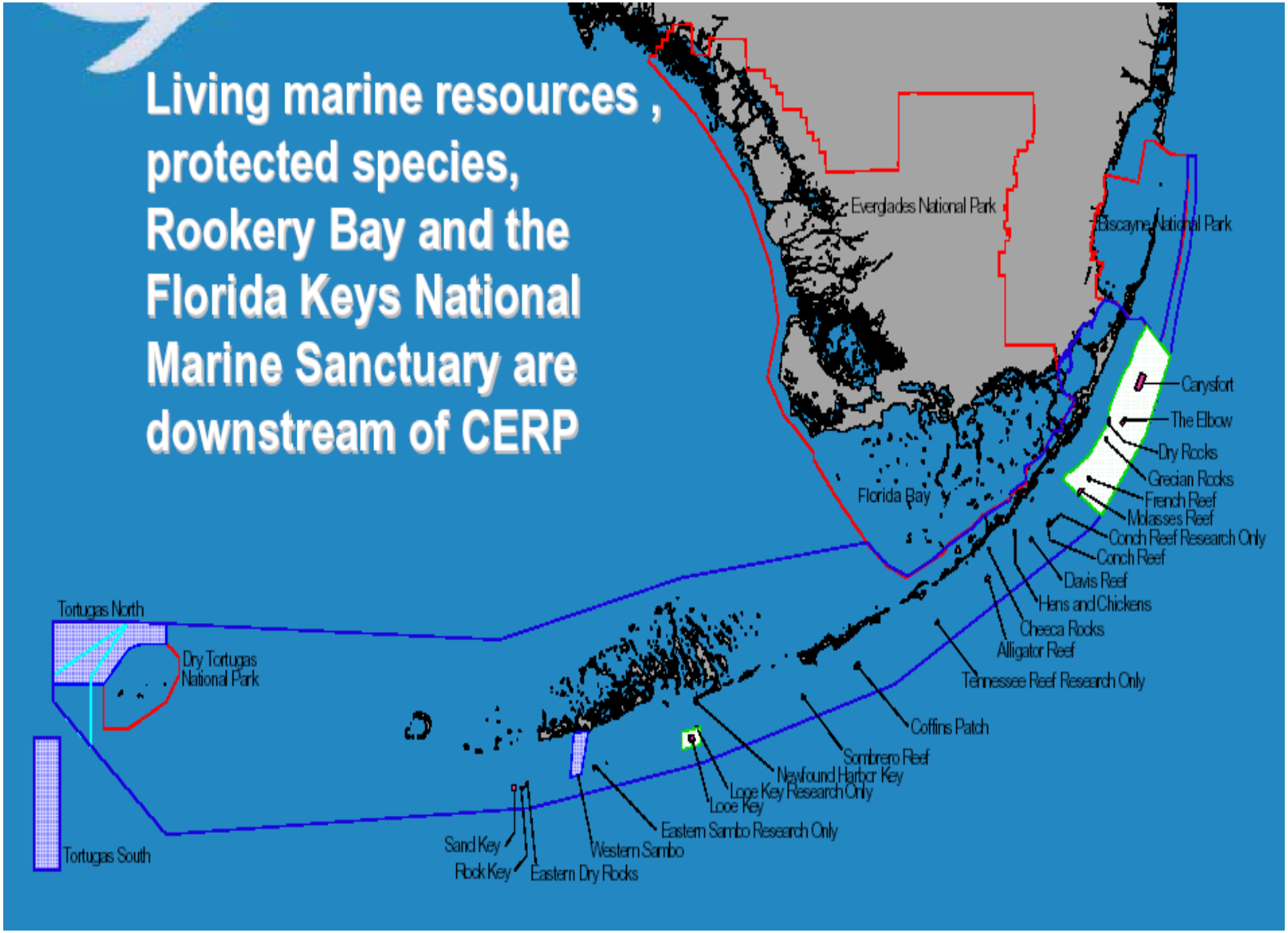
Outline

- Brief Background on South Florida Ecosystem Restoration (SFER) and the Comprehensive Everglades Restoration Plan (CERP)
- Why does NOAA participate?
- Highlights of Our Research Contributions
    - Integrated Ecosystem Assessments, Hurricane Impacts, hypersalinity, lower trophic levels
- Evolution - Future Directions

What is SFER and CERP?



Why does AOML do this research?



The Scientific Question

What will be the effect of the Comprehensive Everglades Restoration Plan (CERP) on the downstream coastal ecosystem?

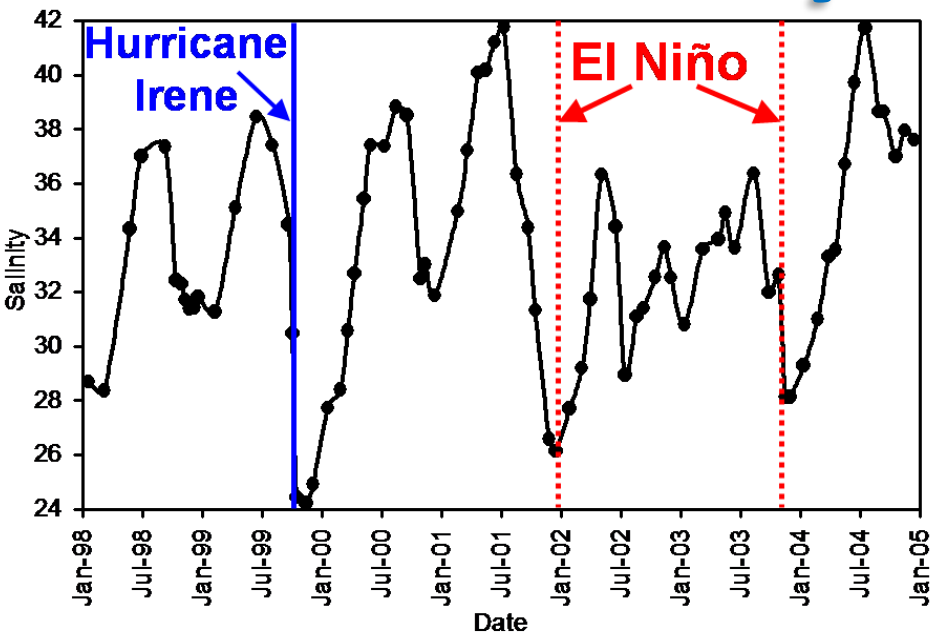
Our Mantra

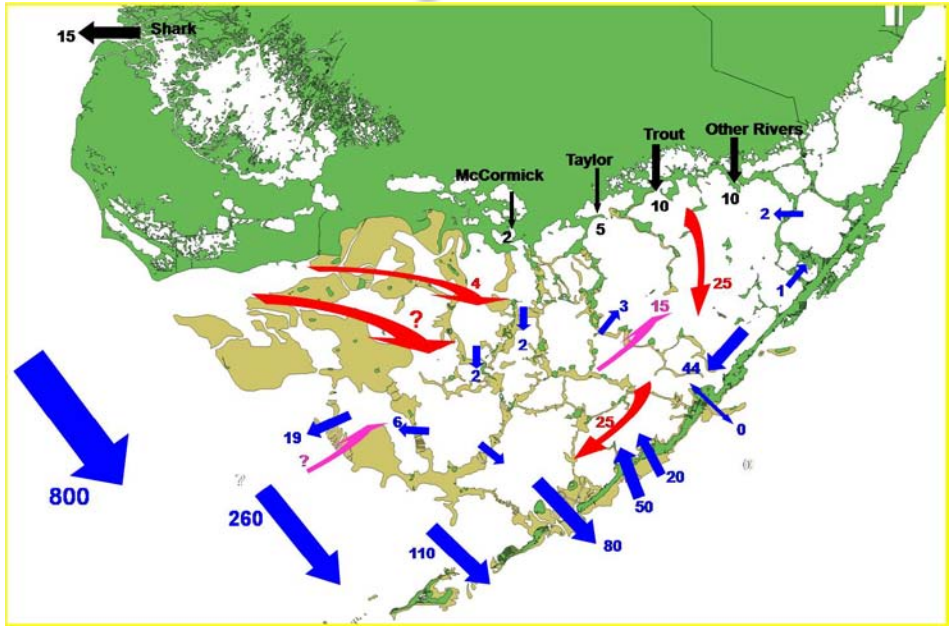
South Florida Ecosystem Restoration must include the Coastal Ecosystem. It is among the most threatened and the most valuable systems in south Florida.

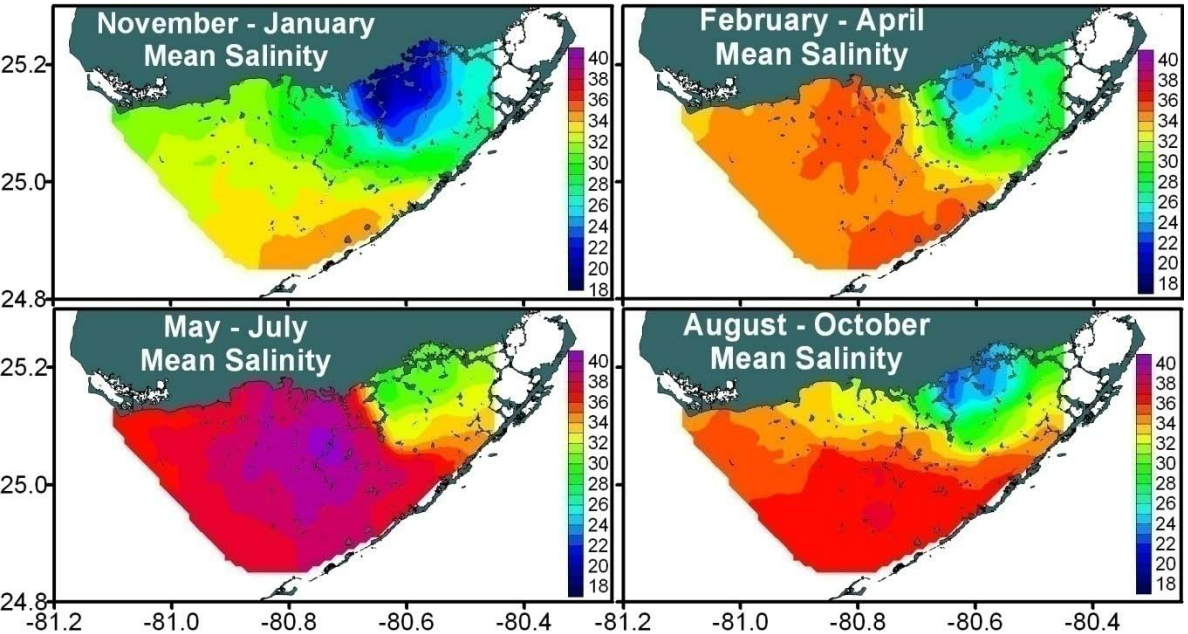
Scientific Focus of AOML/SFERP

- Quantify the causes of salinity variability
- Determine the underlying causes driving nutrient distributions and algal blooms
- Quantify the influence of salinity on lower trophic levels
- Quantify the effects of tropical cyclones and climate variability on the coastal ecosystem
- Biannual Integrated Ecosystem Assessments
    - We call them System Status Reports in CERP-talk
    - Develop a coastal ecosystem indicator suite
- Enable Iterative Adaptive Restoration (IAR) as per National Academy recommendation

Salinity Variability

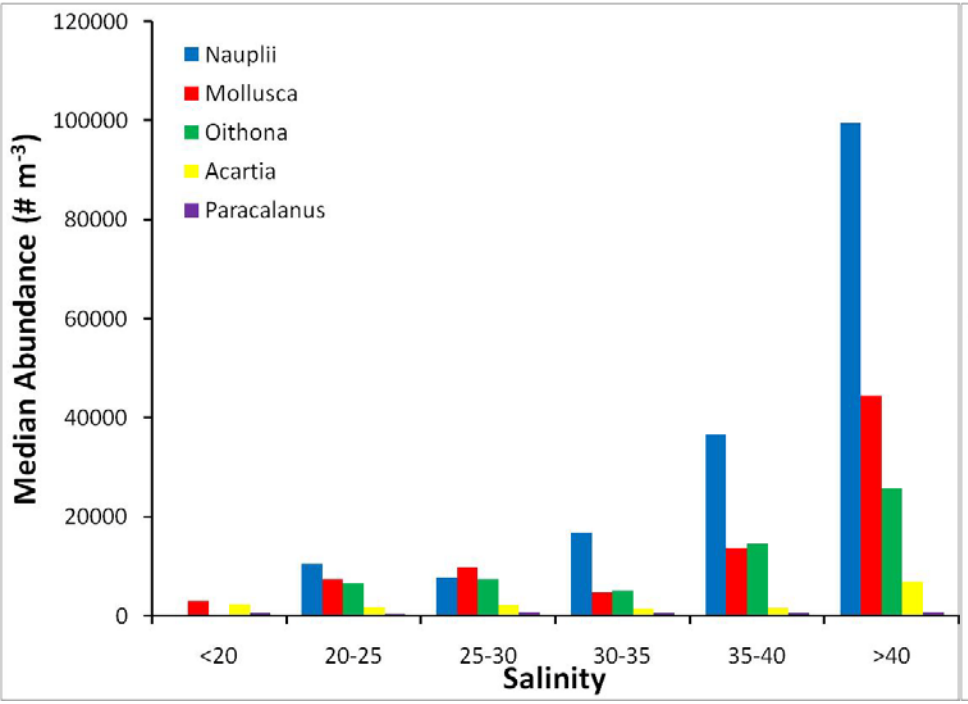


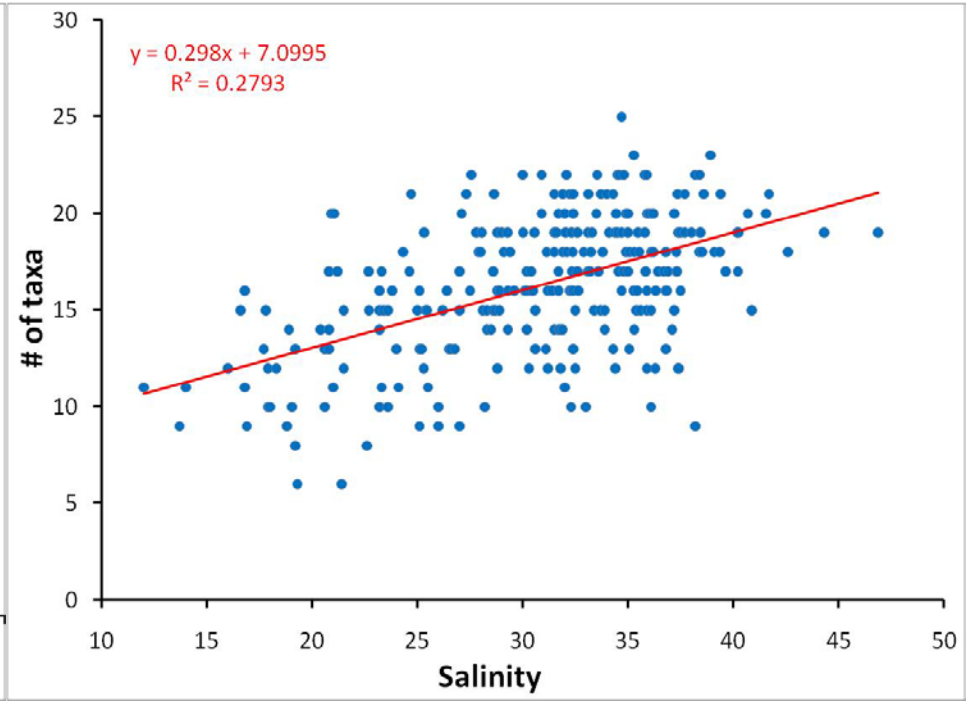




Diverting freshwater runoff to north-central Florida Bay from the northeast may mitigate the formation of hypersalinity.

Salinity & Mesozooplankton





Lowering the salinity in Florida Bay may result in a less abundant and less diverse assemblage of mesozooplankton.

Hurricane Katrina

Biscayne Bay

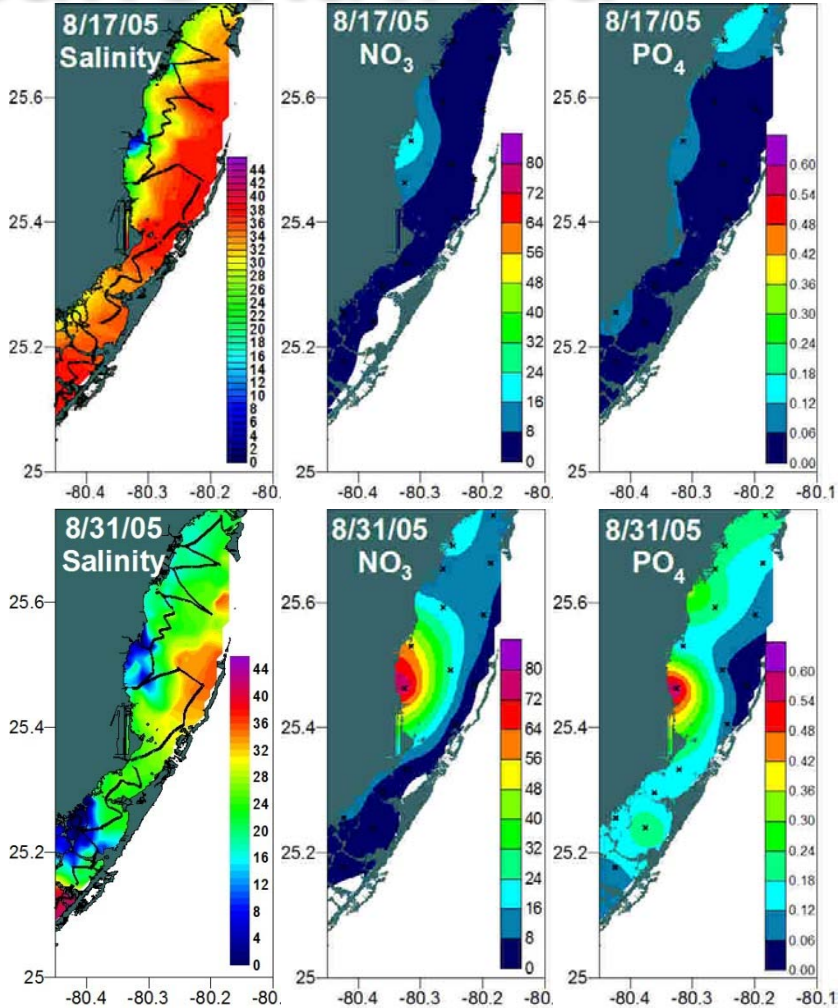
8/17/2005

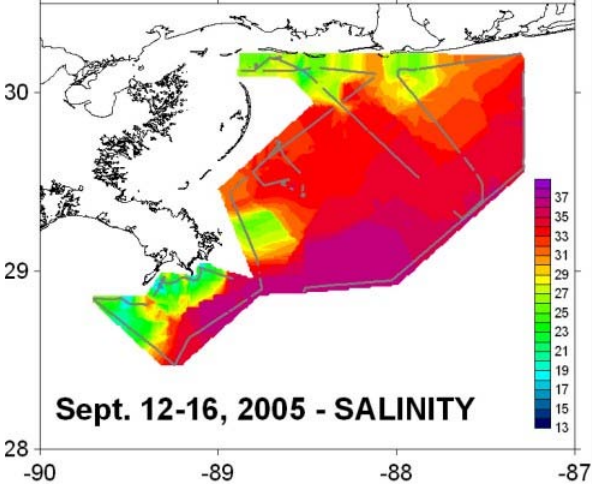
↓

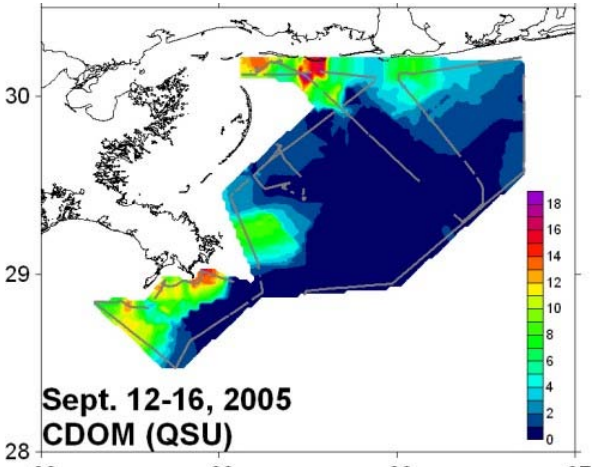
8/25/05 – Katrina

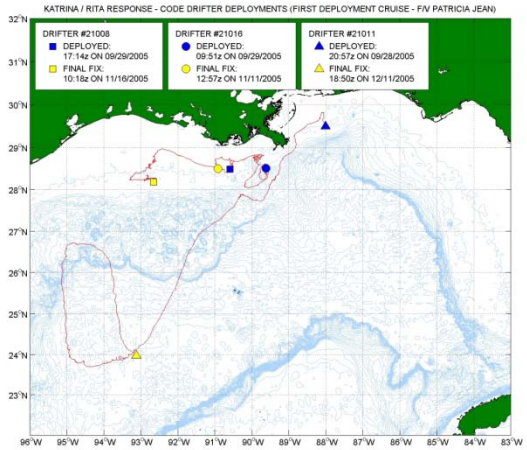
↓

8/31/2005









The capabilities developed in this program are transferrable and allowed us to rapidly respond and provide oceanographic support to study the coastal ecosystem response to Hurricane Katrina.

Integrated Ecosystem Assessment

ALGAL BLOOMS – SOUTHERN ESTUARIES

PERFOMANCE MEASURE	LAST STATUS	CURRENT STATUS[a]	2-YEAR PROSPECTS[b]	CURRENT STATUS[a]	2-YEAR PROSPECTS[b]
Chlorphyll *a* BARNES, MANATEE & BLACKWATER SOUNDS (BMB)				This region of the bay experienced an unusual cyanobacterial bloom in 2006. The bloom was initiated by a large spike in phosphorus from a combination of canal releases and highway construction in response to the active hurricane season. The bloom has abated somewhat but chlorophyll concentrations have not returned to previous levels.	When road construction is completed, we expect that this area will return to its green condition that existed from 1995 until 2006.
Chlorphyll *a* NORTHEAST FLORIDA BAY (NEFB)				The current status is due to influence of the cyanobacterial bloom from Barnes, Manatee and Blackwater Sounds periodic expansion into this region.	The return to a green condition for this region of the bay depends on water management activities improving flows into the C-111 basin and Taylor Slough.
Chlorphyll *a* NORTH-CENTRAL FLORIDA BAY (NCFB)				The current status is due to the presence of a seasonal cyanobacterial bloom in both early and late 2006. These blooms do not appear every year, but have occurred intermittently over the past 15 years.	Without improvements in freshwater flows to Florida Bay the area will probably remain yellow.
Chlorphyll *a* SOUTH FLORIDA BAY (SFB)				The current status is due to the extension of the cyanobacterical bloom from the north-central region of the bay during both years. This has occurred intermittently over the past 15 years and it is unlikely that this signifies a long-term negative trend.	Since blooms in this area are driven by external forces, it is expected that such periodic events may occur.
Chlorphyll *a* WEST FLORIDA BAY (WFB)				The seasonal diatom blooms in this region for both 2006 and current were not as dense or widespread as in the past.	This region is influenced primarily by Shark Slough outputs and southerly transport of Gulf of Mexico water along the SW Florida Shelf. Conditions are therefore dependent on external forcing.
Chlorphyll *a* MANGROVE TRANSITION ZONE (MTZ)				The chlorophyll concentrations were slightly higher in this region for 2006. This may have been due to the active 2005 hurricane season and is unlikely to indicate a negative long-term trend.	The return to a green condition for this region of the bay depends on water management activities improving flows into the C-111 basin and Taylor Slough.
Chlorphyll *a* SOUTHWEST FLORIDA SHELF (SWFS)				The chlorophyll concentrations were slightly higher in this region for both 2006 & 2007. This may have been due to the active 2005 hurricane season and is unlikely to indicate a negative long-term trend.	This region is influenced primarily by Shark Slough outputs and southerly transport of Gulf of Mexico water. Conditions are therefore dependent on external forcing.
Chlorphyll *a* NORTH BISCAYNE BAY (NBB)				The chlorophyll concentrations were higher than the baseline for the past four years.	Without any major hurricanes or changes in water flows to this region it is expected that this region will remain yellow. Significant inputs from canals will continue to affect this area until sheet-flow is restored.
Chlorphyll *a* CENTRAL BISCAYNE BAY (CBB)				The chlorophyll concentrations were higher than the baseline for the past four years.	Without any major hurricanes or changes in water flows to this region it is expected that this region will remain yellow.
Chlorphyll *a* SOUTH BISCAYNE BAY (SBB)				The chlorophyll concentrations were higher in this region for 2006. This area was also influenced by periodic expansion of the cyanobacterial bloom from Barnes, Manatee and Blackwater Sounds into this region.	Without any major hurricanes or changes in water flows to this region it is expected that this region will remain yellow.

[a]Data in the Current Status column for the algal bloom indicator reflect data inclusive of calendar year 2006.
[b]The assumption being used for the 2-Year Prospects Column is: *There will be no changes in water management from the date of the current status assessment.*

KEY FINDINGS – SOUTHERN ESTUARIES

SUMMARY FINDING: Re-suspension of nutrients from the 2005 hurricane season resulted in algal blooms in many regions of the southern estuaries and may cause continued algal blooms in the bay for some time. However, this is expected to subside within a few additional years in lieu of further significant hurricane activity and if water flows to the southern estuaries is improved should return to predominantly green for all regions with the possible exception of BMB. If water flows do not improve the areas will probably remain yellow.

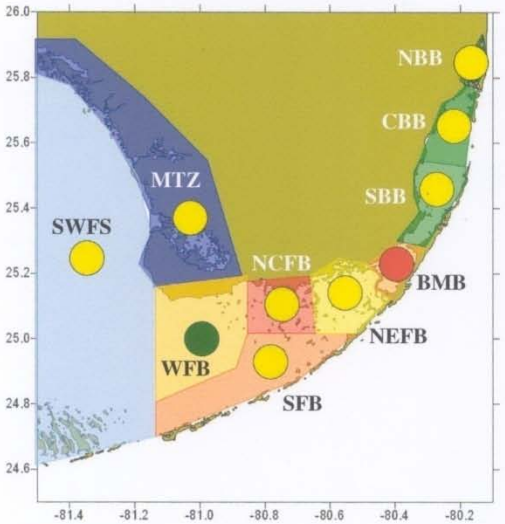


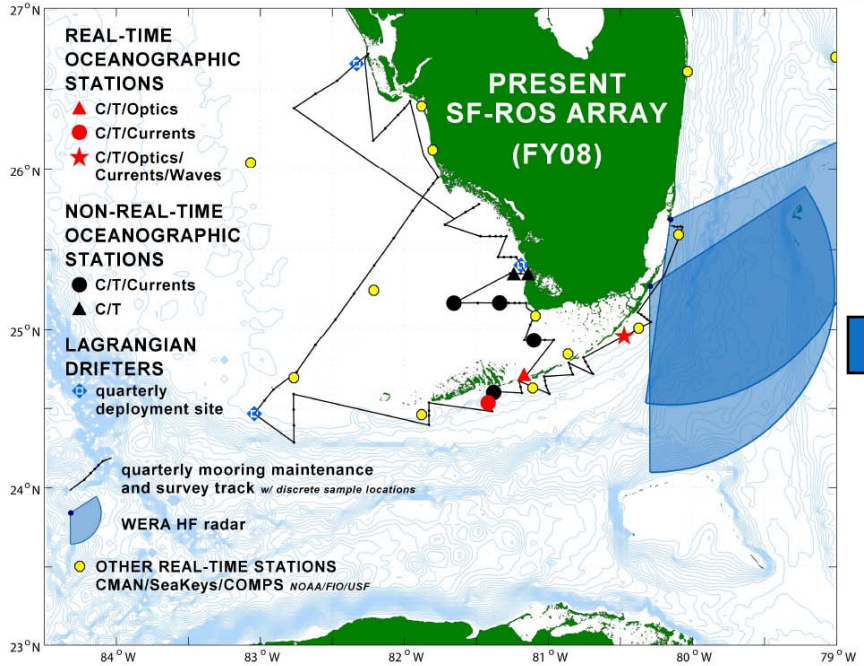
Figure 1. Map of Florida Bay regions with stoplight ratings by region

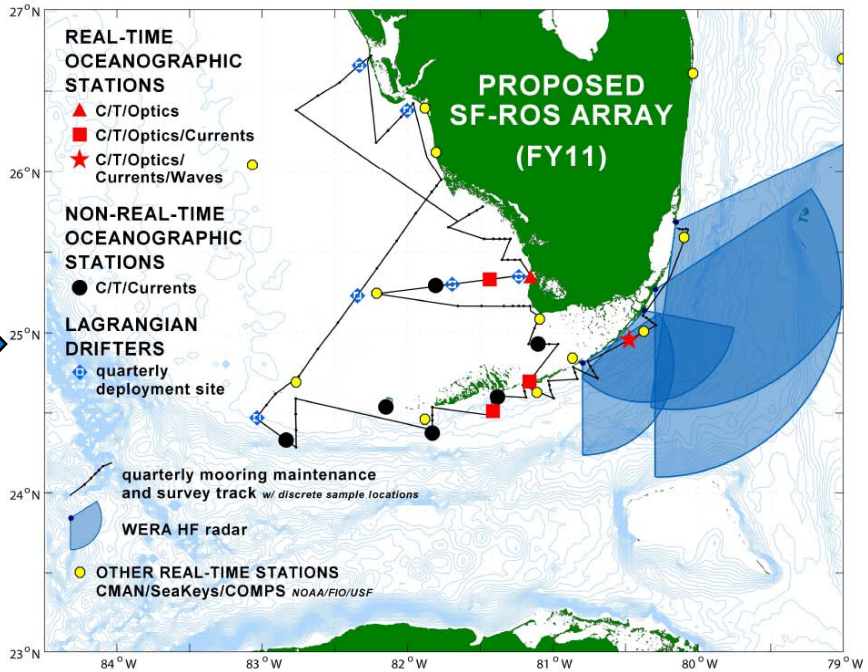
KEY FINDINGS:

1. The majority of regions assessed had significant algal bloom activity that appears to have been predominantly influenced by the heavy 2005 hurricane season aggravated for the eastern bay by road construction on US 1.
2. The majority of regions assessed had chlorophyll-*a* and algal blooms rated as moderate (yellow).
3. The majority of regions assessed where the chlorophyll-*a* was higher than the median do not appear to be indicative of long-term negative trends.
4. The most commonly occurring condition was large spatial coverage of algal blooms and elevated chlorophyll-*a* concentrations.
5. Overall eutrophic symptom expressions were geographically variable and appear to be explainable from existing phenomenological conditions of hurricane activity overall exacerbated by road construction along US 1 in the eastern areas of the bay.
6. If water flows are improved to the southern estuaries we expect the water quality to improve and the number and scale of algal blooms to diminish. However, under current water flow conditions there will probably be little or no improvement in the conditions in the southern estuaries.
7. Monitoring of Barnes, Manatee and Blackwater Sounds was critical to being able to detect the impacts of road construction along US 1.
8. Monitoring long term consequences of nutrient releases into the southern estuaries from both natural (e.g. hurricanes) and human causes (e.g. road construction) and the interactions of hydrological restoration (e.g. more fresh water flow into the southern estuaries, particularly Florida Bay) is critical to continuing the evaluation and assessment restoration for the southern estuaries.

[a]Data in the Current Status column for the algal bloom indicator reflect data inclusive of calendar year 2006.
[b]The assumption being used for the 2-Year Prospects Column is: *There will be no changes in water management from the date of the current status assessment.*

Evolution


PRESENT
SF-ROS ARRAY
(FY08)
REAL-TIME
OCEANOGRAPHIC
STATIONS
C/T/Optics
C/T/Currents
C/T/Optics/
Currents/Waves
NON-REAL-TIME
OCEANOGRAPHIC
STATIONS
C/T/Currents
C/T
LAGRANGIAN
DRIFTERS
quarterly
deployment site
quarterly mooring maintenance
and survey track w/ discrete sample locations
WERA HF radar
OTHER REAL-TIME STATIONS
CMAN/SeaKeys/COMPS NOAA/FIO/USF
27°N
26°N
25°N
24°N
23°N
84°W
83°W
82°W
81°W
80°W
79°W


PROPOSED
SF-ROS ARRAY
(FY11)
REAL-TIME
OCEANOGRAPHIC
STATIONS
C/T/Optics
C/T/Optics/Currents
C/T/Optics/
Currents/Waves
NON-REAL-TIME
OCEANOGRAPHIC
STATIONS
C/T/Currents
LAGRANGIAN
DRIFTERS
quarterly
deployment site
quarterly mooring maintenance
and survey track w/ discrete sample locations
WERA HF radar
OTHER REAL-TIME STATIONS
CMAN/SeaKeys/COMPS NOAA/FIO/USF
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25°N
24°N
23°N
84°W
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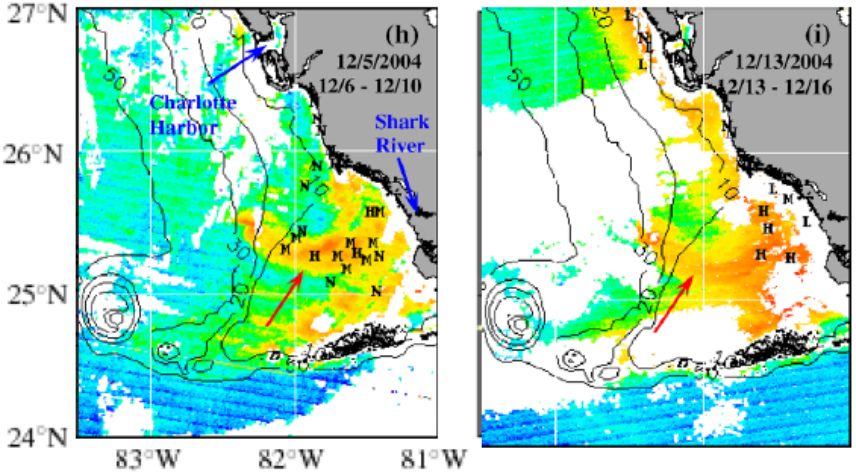
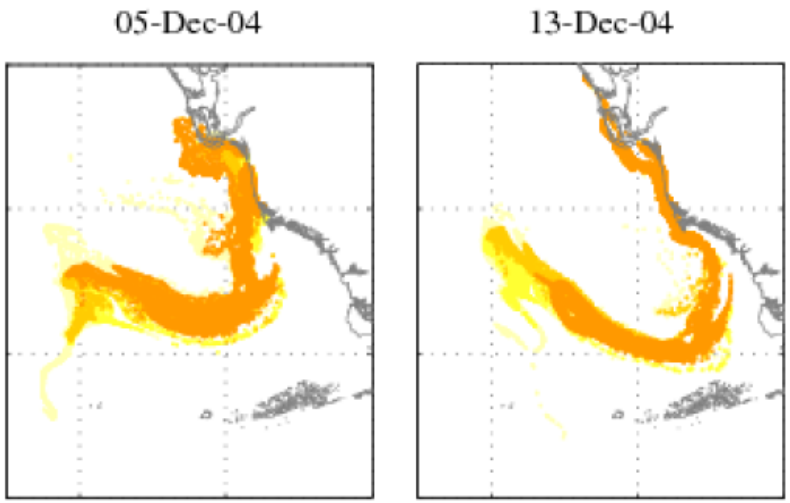
82°W
81°W
80°W
79°W


(h)
12/5/2004
12/6 - 12/10
Charlotte
Harbor
Shark
River
(i)
12/13/2004
12/13 - 12/16
27°N
26°N
25°N
24°N
83°W
82°W
81°W


05-Dec-04
13-Dec-04

Future Directions

- SF-ROS approved for FY09 Integrated Ocean Observing System funding
- Spotted seatrout monitoring (joint NMFS/SEFSC)
- Increase modeling efforts – (IOOS)
  - Hydrodynamic, water quality, algal blooms, mesozooplankton, etc
- Improved integration with FACE
- Goals, endpoints, and indicators for the coastal ecosystem (3 year NOS/CSCOR award)
  - FKNMS, Southwest Florida shelf, southeast Florida shelf ➔ South Florida Total Marine Ecosystem

Questions??????????