National Estuarine Research Reserve System

Promoting stewardship of the Nation's estuaries through science and education using a system of protected areas.

Protected for:

- Long-term research and monitoring
- Education
- Resource Stewardship

A network of 26 reserves in 21 states and territories

National Programs

- Graduate Research Fellowship Program
- Coastal Training Program
- Partnership with the Cooperative Institute for Coastal and Estuarine Environmental Technology (CICEET)
- System-wide Monitoring Program

System-wide Monitoring Program

- Identify and track short-term variability and long-term changes in the integrity and biodiversity of representative estuarine ecosystems and coastal watersheds for the purposes of contributing to effective national, regional and site specific coastal zone management.

System-wide Monitoring Program

- Abiotic Monitoring
- Biotic Monitoring
- Land Use, Habitat Mapping and Change

Reference

Non-point source influenced

Initial Deployment Coverage

Enhanced Deployment Coverage

"Estuarine Gradients"

- Salinity
- Land-use
- Habitat
- Vertical

Abiotic Monitoring

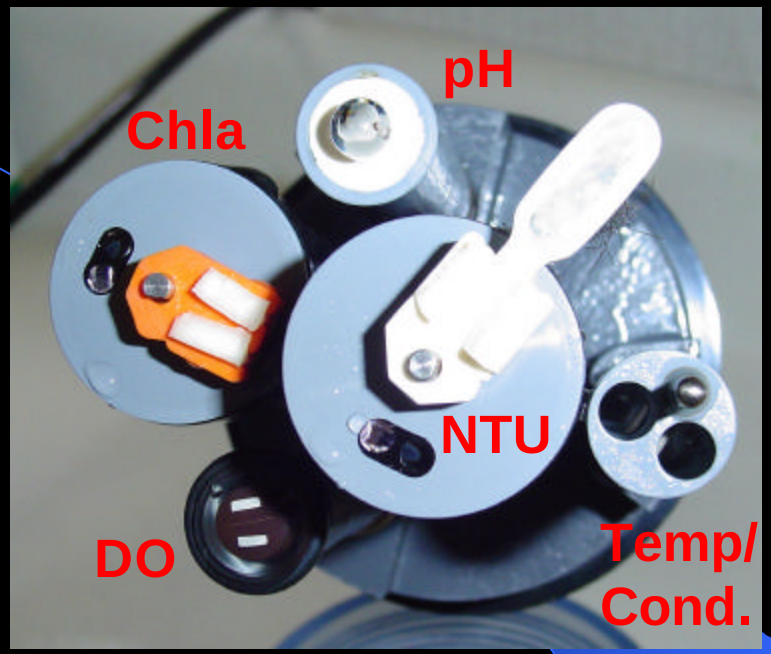
NERR water quality monitoring station

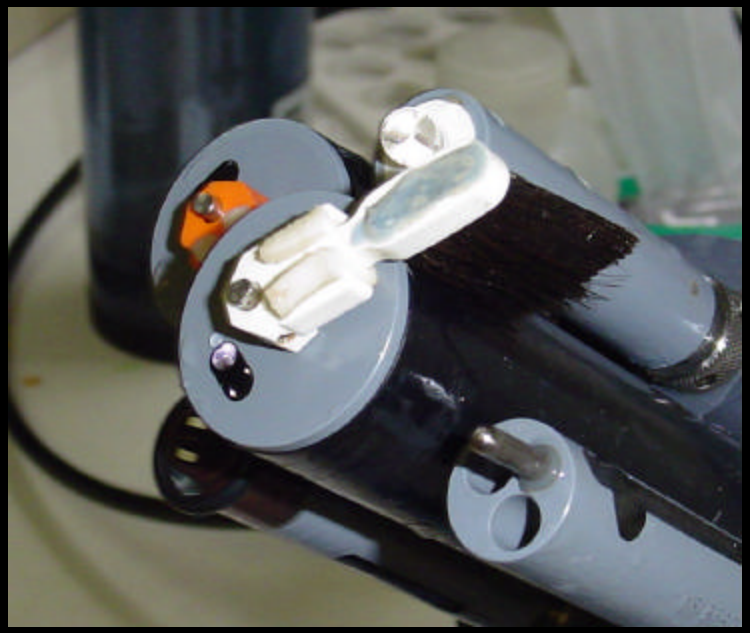
Water quality variables:

- Temperature
- Conductivity
- Dissolved oxygen
- Turbidity
- Water level
- pH

Nutrients: Orthophosphate, Ammonium, Nitrate Nitrite, Chlorophyll a

YSI 6600 EDS





SWMP: Nutrient and Chla Monitoring Program

- **Monthly grab sampling program**

  to quantify the spatial and temporal variability of selected nutrients and Chla along the salinity gradient in the York River

- **Diel sampling program**

  to quantify the short-term (tidal) variability of selected nutrients and Chla in a tidal marsh creek system

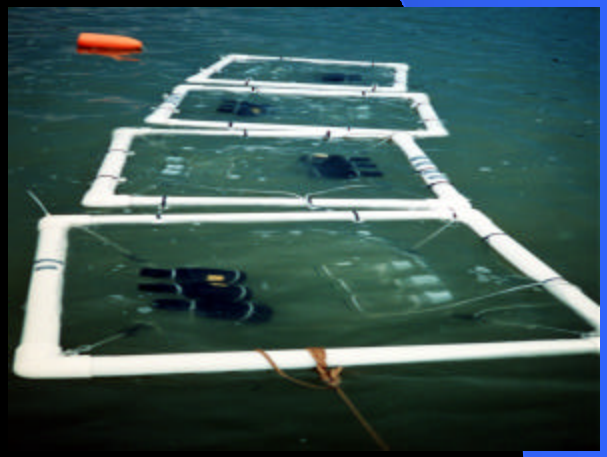
Measured Parameters

- Tier I (required)

  NH4, NO3, NO2, PO4, Chla

- Tier II (optional)

  Si, TN, TP, TDN, TDP, TOC, DOC, TSS



Abiotic Monitoring

Weather variables:

- **Temperature**
- **Wind speed and direction**
- **Relative humidity**
- **Barometric pressure**
- **Rainfall**
- **Photosynthetically Active Radiation**

NERR weather station

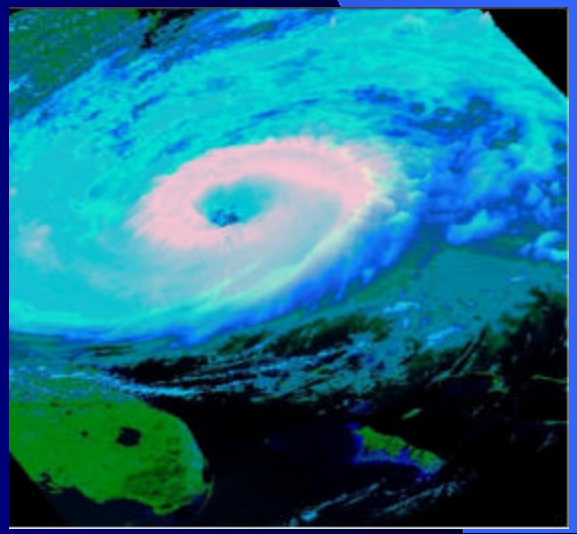
Centralized Data Management Office

- Oversees the management, documentation and publication of data on the Internet.
- Provides:
  - QA/QC
  - Training, data management strategies and protocols.
  - Internet access to data http://cdmo.baruch.sc.edu

SWMP Syntheses

Abiotic Monitoring Syntheses

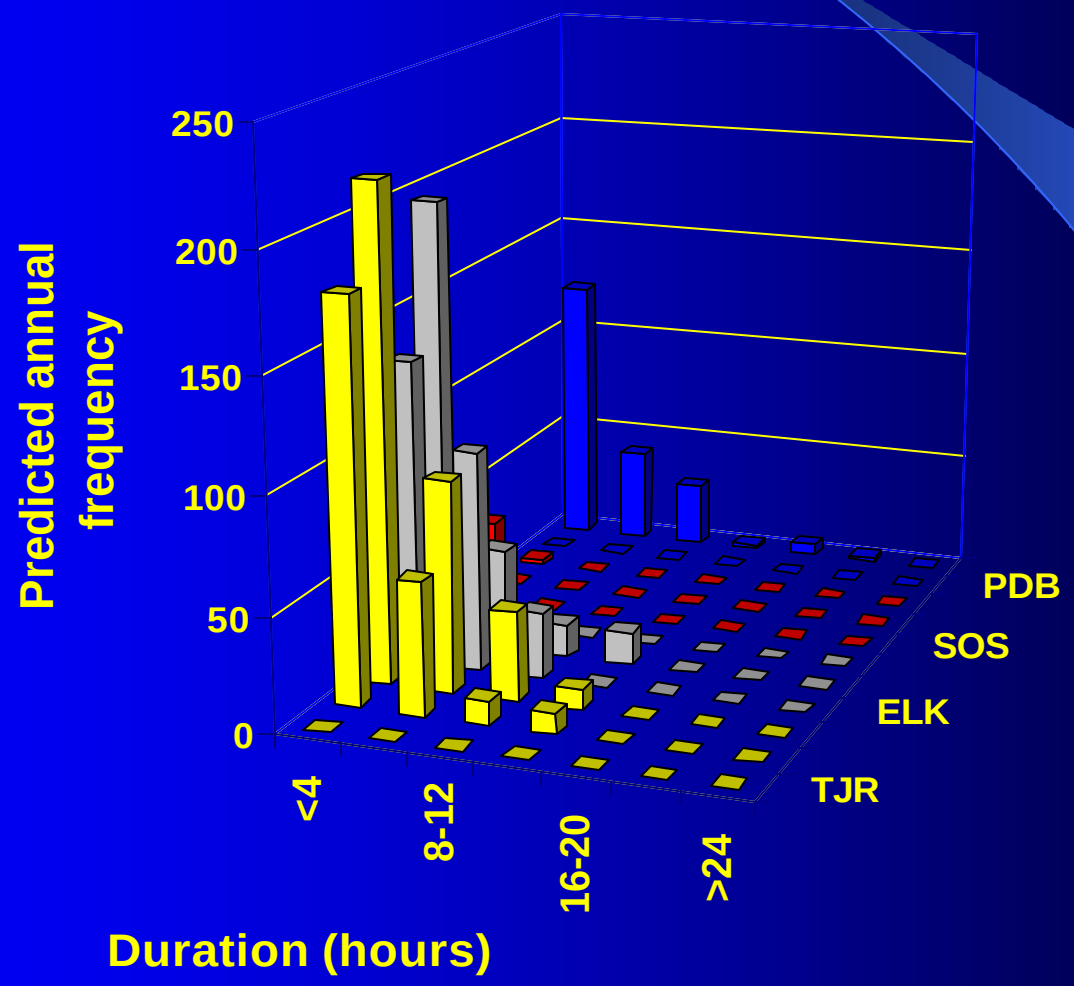
- **Characterize water quality conditions at sites.**
- **Determine the frequency, duration, and periodicity of water quality variables**
- **Compare water quality variables among NERR systems and regions**
- **Determine impacts of storm events**



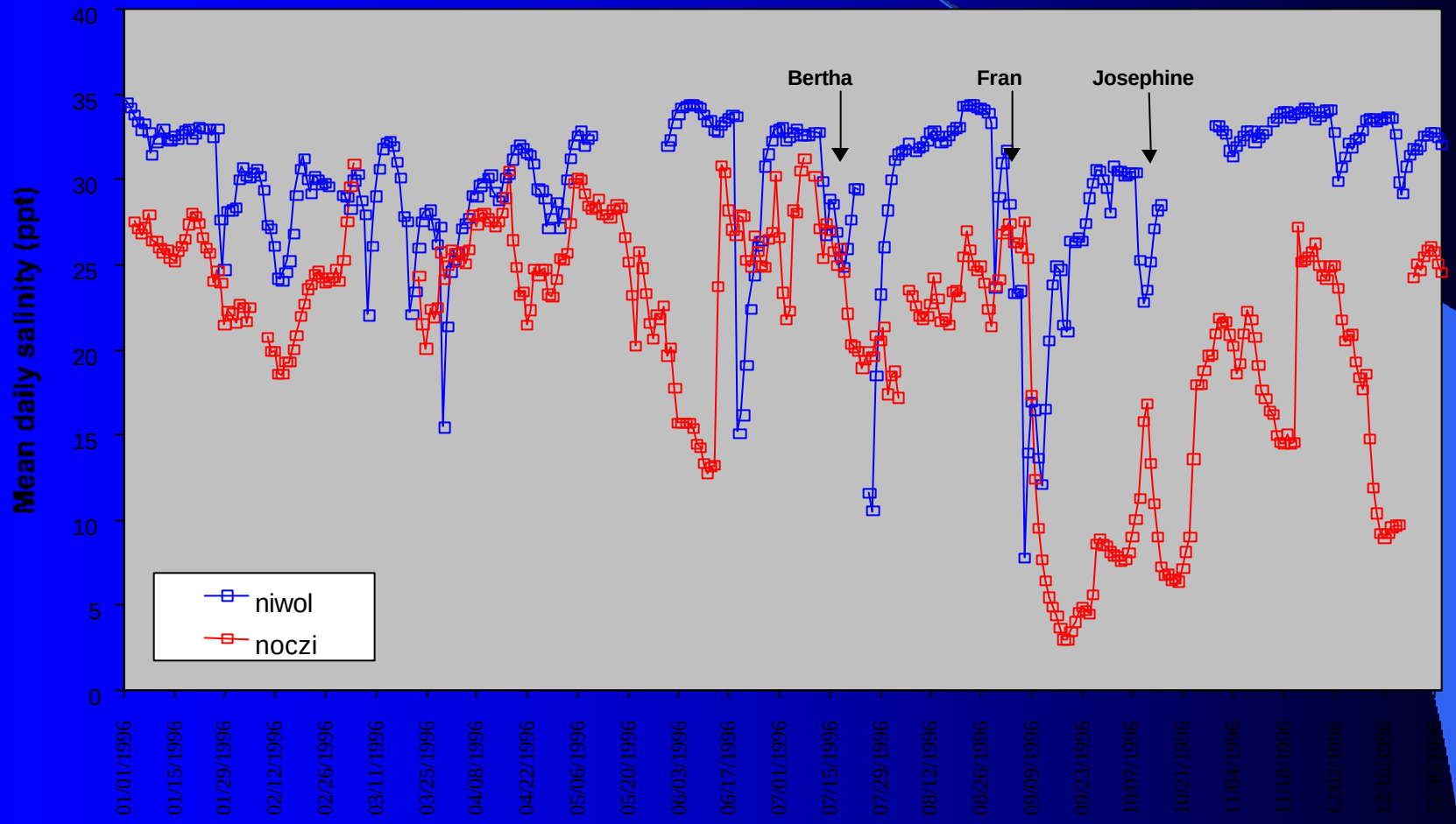
Frequency of occurrence and duration of hypoxia at NERR sites, 1995-2000

Region	N	%N	%<4 h	%4-8 h	%8-12 h	%12-16h	%16-20 h	%20-24 h	%>24 h
West Coast	502	32	63	25	9	2	1	0	0
Northeast	182	12	85	8	4	1	1	1	1
Mid-Atlantic	311	20	76	17	2	2	0	0	3
Southeast	180	12	88	8	2	1	0	0	1
Gulf/PR	389	25	74	14	4	3	2	2	3
Percent			74	17	5	2	1	1	1

Duration of Hypoxia in West Coast Reserves



Impacts of Storms



Conclusions

- Hypoxic events are generally of short duration
- Most hypoxic events occurred in summer (warm H_20)
- Hypoxia was most frequently observed at sites in lower latitude having warm water temperature
- Reserves in the Gulf of Mexico and Caribbean had the highest occurrence of hypoxia >24 h duration
- With a few exceptions for salinity, changes to water quality parameters during the passage of tropical storms were abrupt and short-lived.

SWMP Data Uses and Links to Other Programs

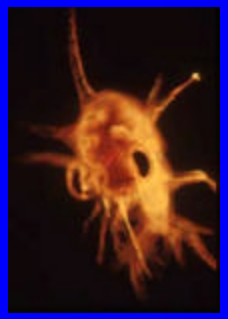
Local

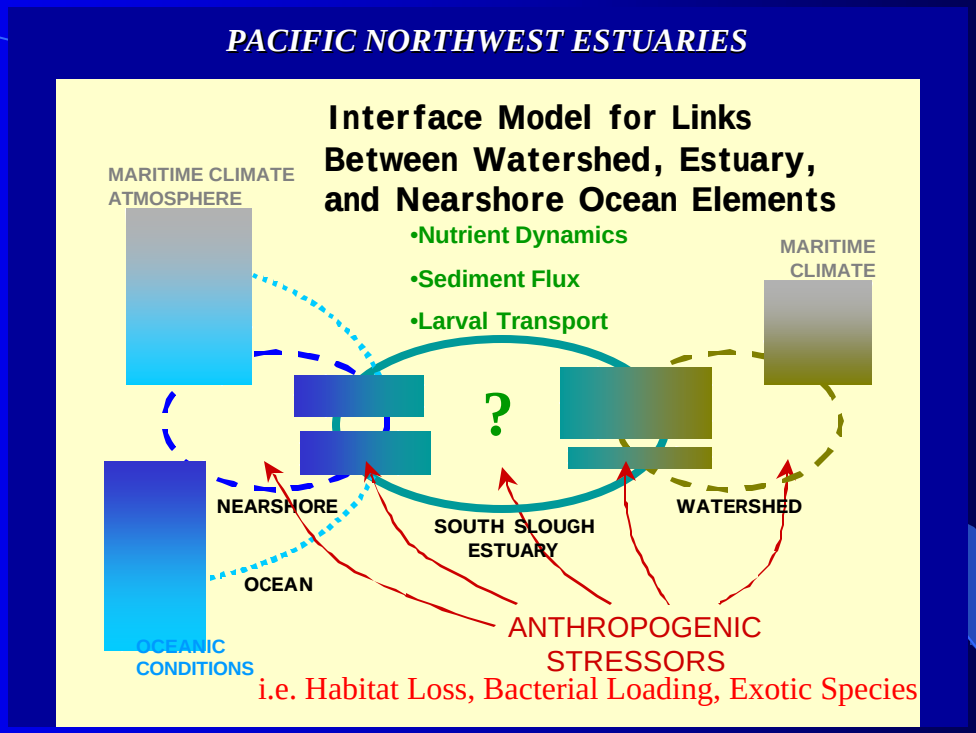
South Slough restoration of Winchester tidelands. SWMP data used to measure DO following dike removal.

Regional

Chesapeake Reserves expanding with EPA funds – Linking with Chesapeake Bay monitoring (e.g., Eyes on the Bay)

Rookery Bay: Provides baseline data for South Florida Restoration efforts.





Riverine

NOAA Surveys

Winchester Tidelands Restoration

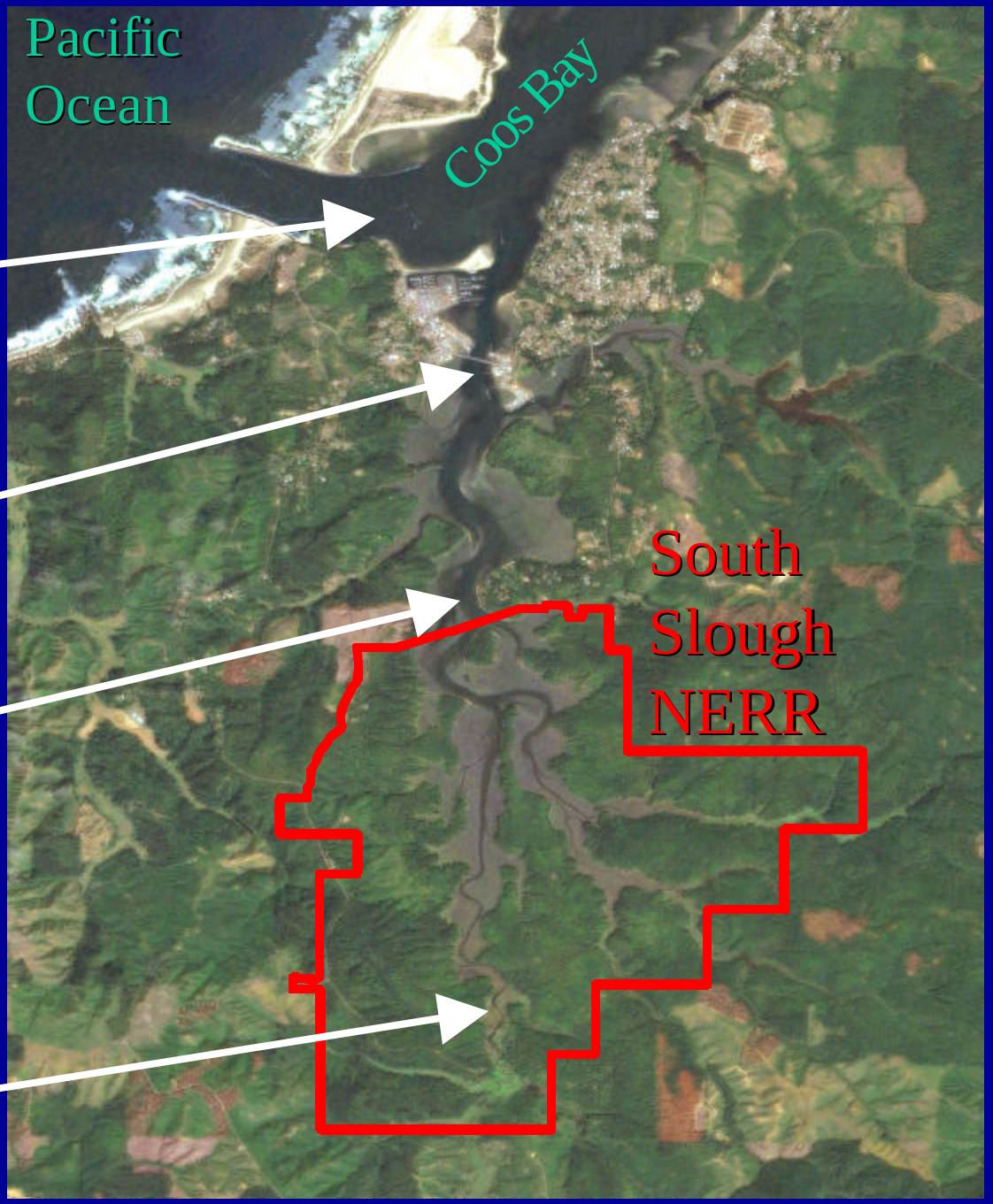
South Slough Estuarine Gradient

MARINE / BAY
Boathouse

MARINE DOMINATED
Charleston

MESOHALINE
Valino Island

RIVERINE
Winchester Creek

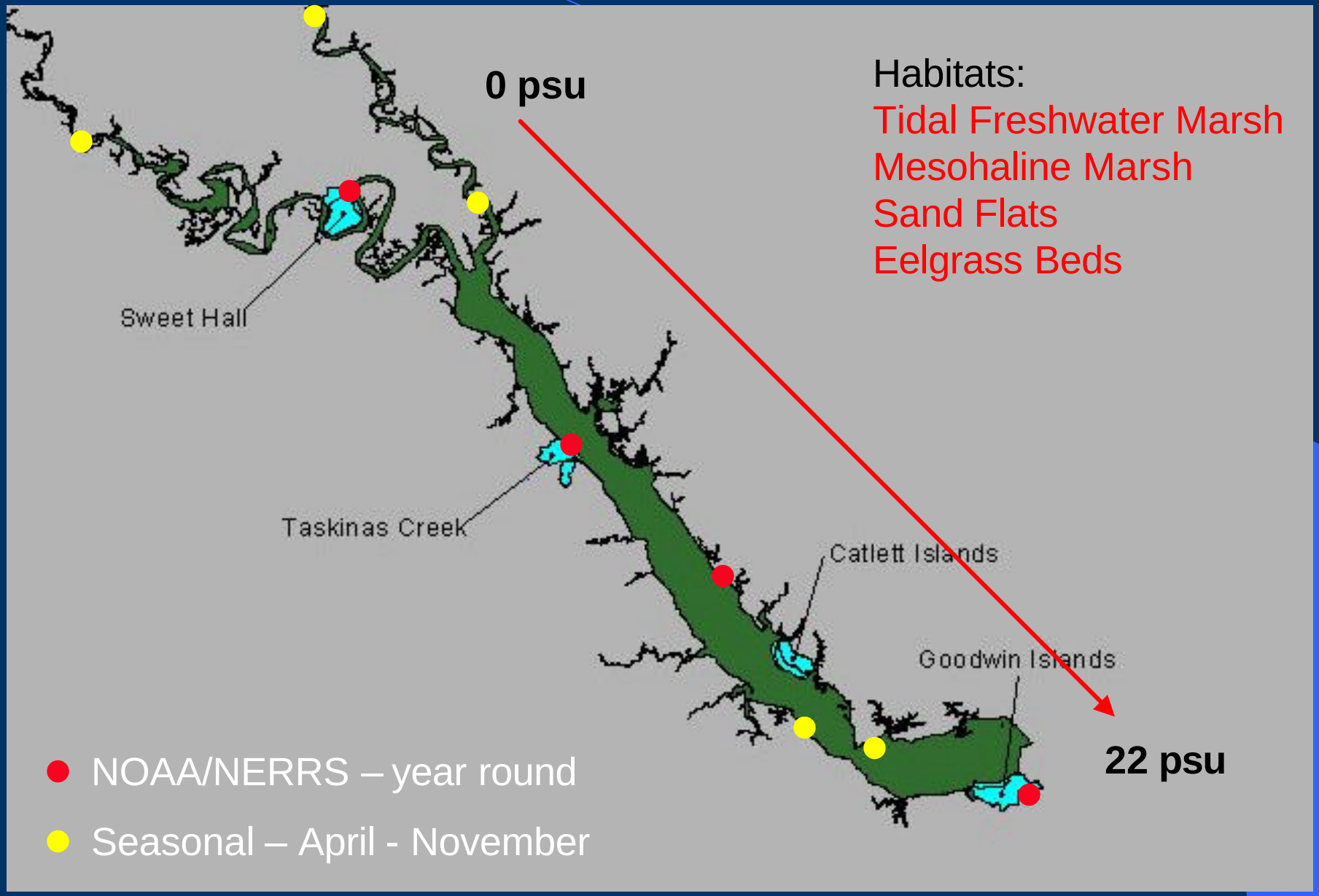


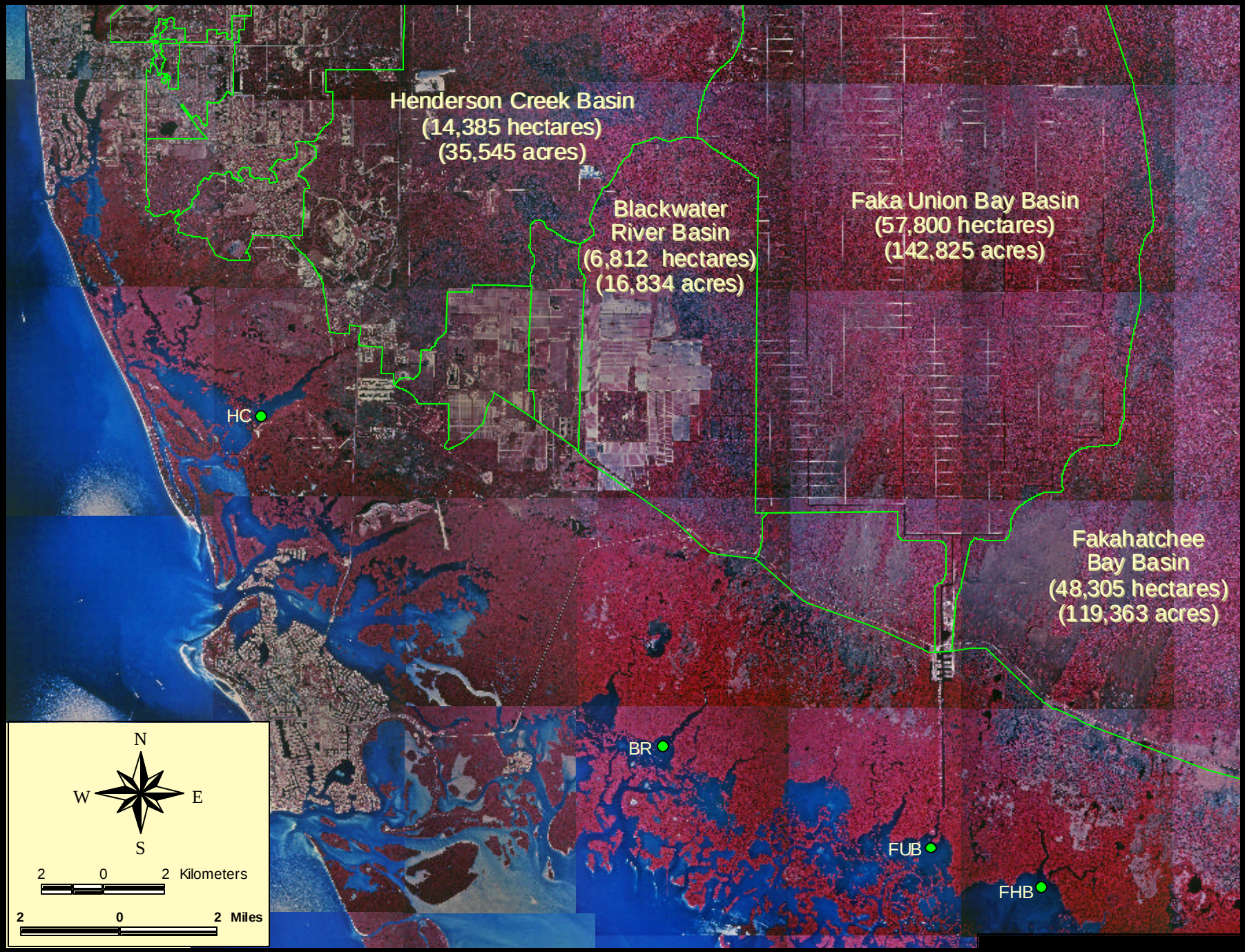
South Slough Reserve – Winchester Tidelands Restoration: Dike Removal and Experimental Correction for Subsidence

Before

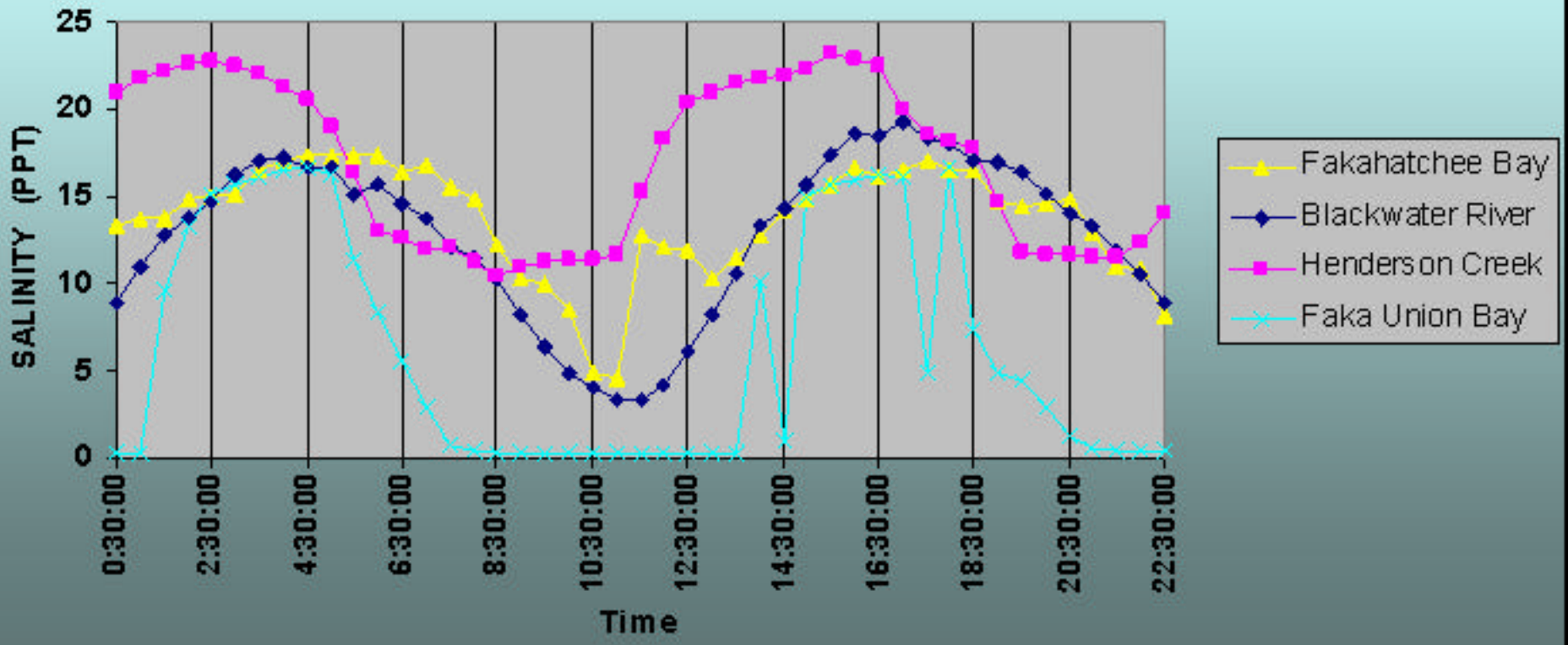
After

York River Water Quality Fixed Station Monitoring Program




Henderson Creek Basin
(14,385 hectares)
(35,545 acres)
Blackwater
River Basin
(6,812 hectares)
(16,834 acres)
Faka Union Bay Basin
(57,800 hectares)
(142,825 acres)
Fakahatchee
Bay Basin
(48,305 hectares)
(119,363 acres)
HC
BR
FUB
FHB
N
W
E
S
2 0 2 Kilometers
2 0 2 Miles

HOURLY SALINITY
September 19, 2001
(Water Flowing Over Weirs)



Future Phases

Biotic Monitoring

- **Submerged aquatic vegetation (seagrasses, algae) and emergent vegetation (marsh plants)**

Land use/cover and Habitat Change

- **Measure long-term changes in estuarine ecosystems by conducting change analyses of upland and subtidal communities.**