



# RESTORING PRE-DEVELOPMENT HYDROLOGY IN BISCAYNE BAY: THE RECOVER PLANNING PROCESS

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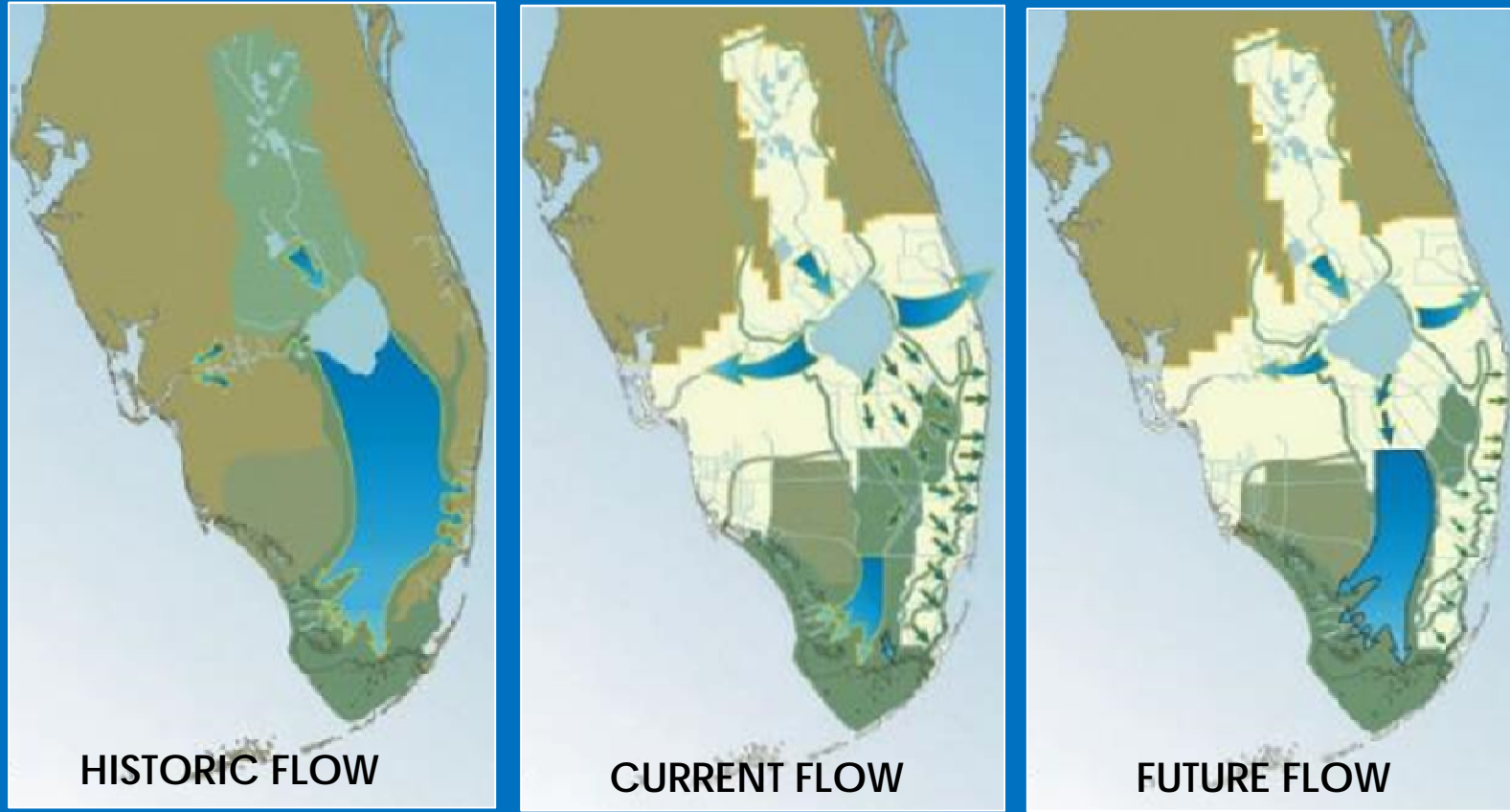
## BACKGROUND

### Focus of Poster

Biscayne Bay is ecologically and economically important to south Florida. Sensitive to environmental stress, altered freshwater inputs to the bay have increased salinity, threatening diversity and habitat structure. For implementation of the Comprehensive Everglades Restoration Plan (CERP), tools to predict and assess salinity within Biscayne Bay are needed.

### What is RECOVER?

RECOVER (REstoration COordination and VERification) is a multi-agency team of scientists, modelers, planners and resource specialists who organize and apply scientific and technical information in ways that are essential in supporting the objectives of the Comprehensive Everglades Restoration Plan (CERP).



The Comprehensive Everglades Restoration Plan (CERP) is the largest environmental restoration program in history. The objective of CERP is to find the correct balance among the flow types throughout all regions to ensure a healthy and sustainable natural and human environment.

The RECOVER team conducts scientific and technical evaluations and assessments for improving CERP's ability to restore, preserve and protect the south Florida ecosystem while providing for the region's other water-related needs. RECOVER applies a system-wide perspective to the planning and implementation of the CERP and communicates and coordinates the results of these evaluations and assessments to managers, decision makers and the public.

### RECOVER Mission Components

#### Planning

Identify and provide analyses regarding potential improvements in the design and operation of the CERP, consistent with the CERP objectives and to strive for consensus regarding scientific and technical aspects of the CERP.

#### Assessment

Develop and implement an appropriate ecological monitoring program in order to establish pre-restoration environmental conditions and track and define ecological response as restoration progresses. To provide the system-wide science perspective necessary to prudently ensure projects meet intended objectives and to guide planning and operations in order to maximize benefits to the natural system.

#### Evaluation

Evaluate, using numerical modeling and other tools, the performance of project and program plans and designs to ensure that they are fully linked to the system-wide goals and purposes of CERP.



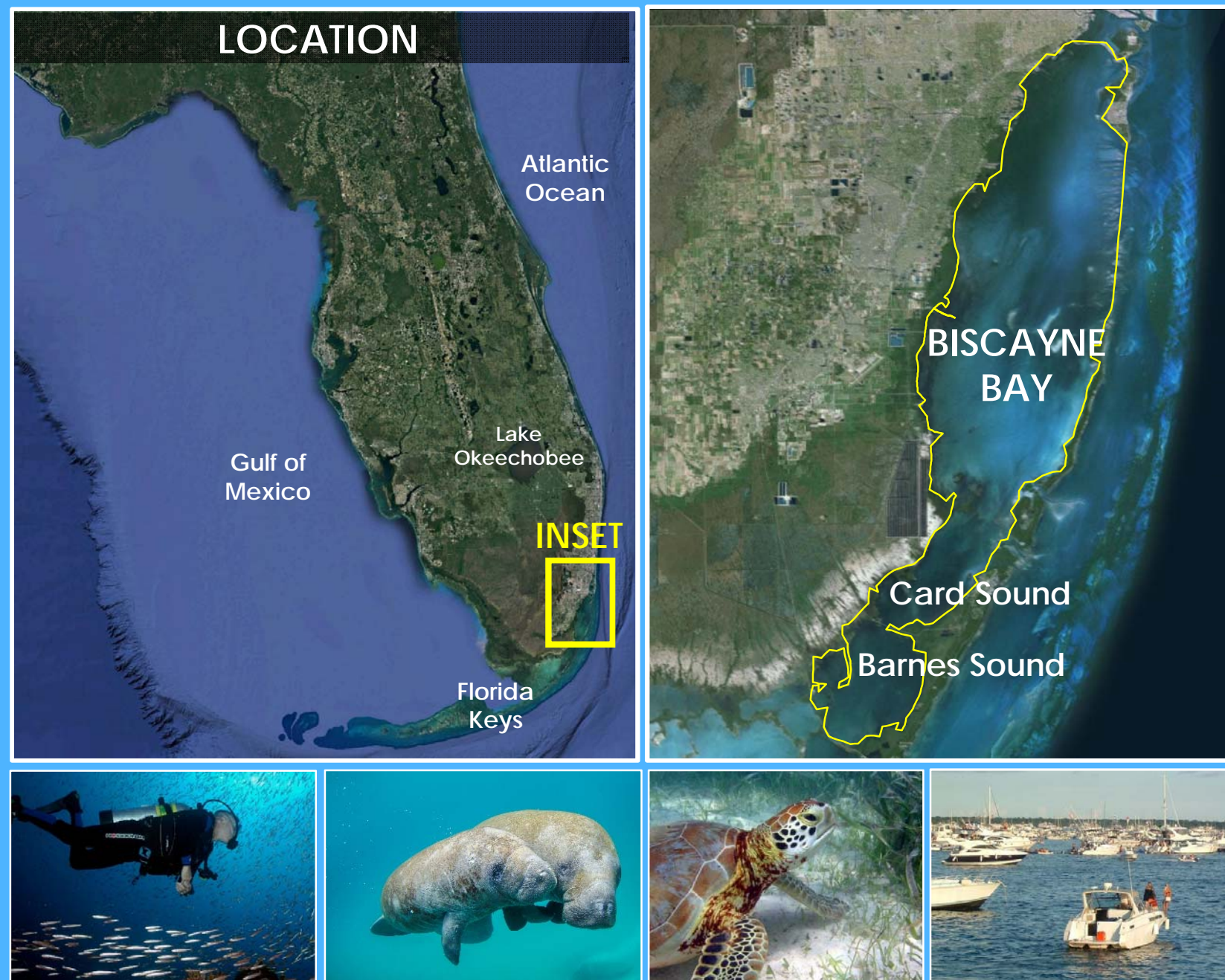
### CERP AND BISCAYNE BAY

The Comprehensive Everglades Restoration Plan (CERP) will primarily benefit the nearshore plant and animal communities of southern Biscayne Bay, including Barnes and Card Sounds.

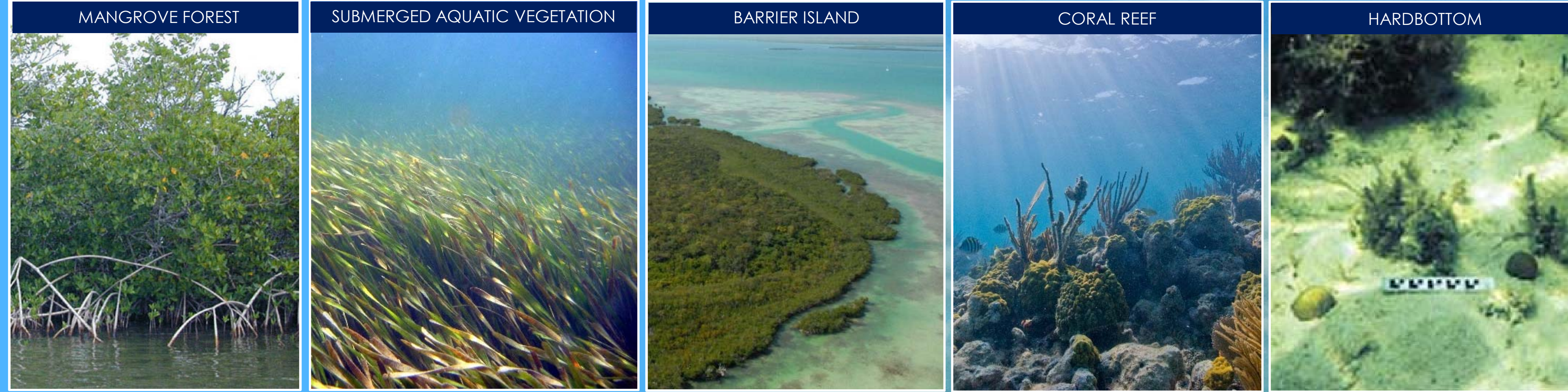
Increased freshwater inflows to the bay through the tidal creeks and herbaceous marshes of the South Dade wetlands are expected to lower salinity at mouths of the creeks to levels favorable for establishment of more estuarine salinity patterns supporting seagrass beds and oyster beds in nearshore areas that presently do not support seagrasses or oysters.

The delivery of freshwater to the bay should reduce the accompanying nutrient inputs and establishment of more natural inflow patterns is expected to restore oyster bars and estuarine fish communities and to increase densities of juvenile pink shrimp in the nearshore environment of southern Biscayne Bay.

## BISCAYNE BAY OVERVIEW



Biscayne Bay is a shallow body of water located between the southeastern coast of the Everglades and the Atlantic Ocean. It plays an important role in the ecological sustainability of the southeast coast of Florida with five prolific ecosystem types that support a diverse assortment of species during various stages of life by providing nursery habitat, protection/shelter, and foraging grounds.



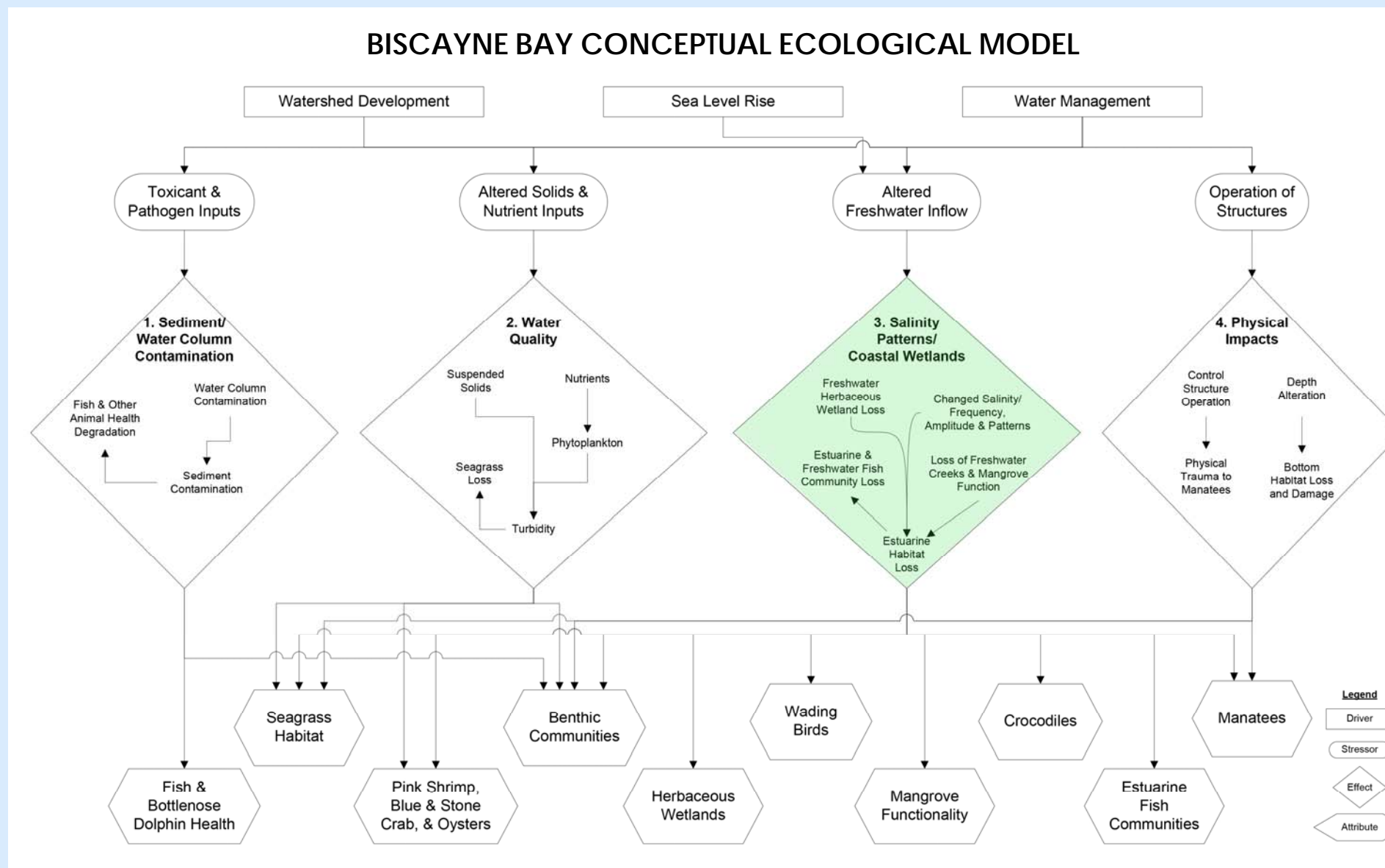
Biscayne Bay is vital to the economy and quality of life of Southeast Florida providing commercial fishing and recreational opportunities such as eco-tours, kayaking, snorkeling, and wildlife viewing.

## ECOLOGICAL CHANGE AND RECOVER INTERIM GOALS TO ADDRESS HYDROLOGY IN BISCAYNE BAY

Man-made changes to the quality, quantity, timing, and duration of freshwater inflows to the Southern Estuaries have changed circulation and salinity patterns in the estuaries.

These stressors have:

- Altered habitat affecting species like pink shrimp and other crustaceans, fish, and seagrasses
- Degraded water quality:
  - In deep areas, conditions are poor as a result of heavy pollutant loading and little mixing within the water column
  - In east-central areas, conditions are better due to little overland pollution and a high exchange with marine waters
  - Parts of the bay are subject to rapid shifts in salinity and nutrients from canal flows



### RECOVER INTERIM GOALS:

- RECOVER realized there was a need to develop a salinity model for Biscayne Bay.
- The RECOVER Southern Coastal Systems Regional Coordinators tasked the Regional Team to develop a monitoring and predictive performance measure for Biscayne Bay similar to the Florida Bay Salinity Performance Measure.

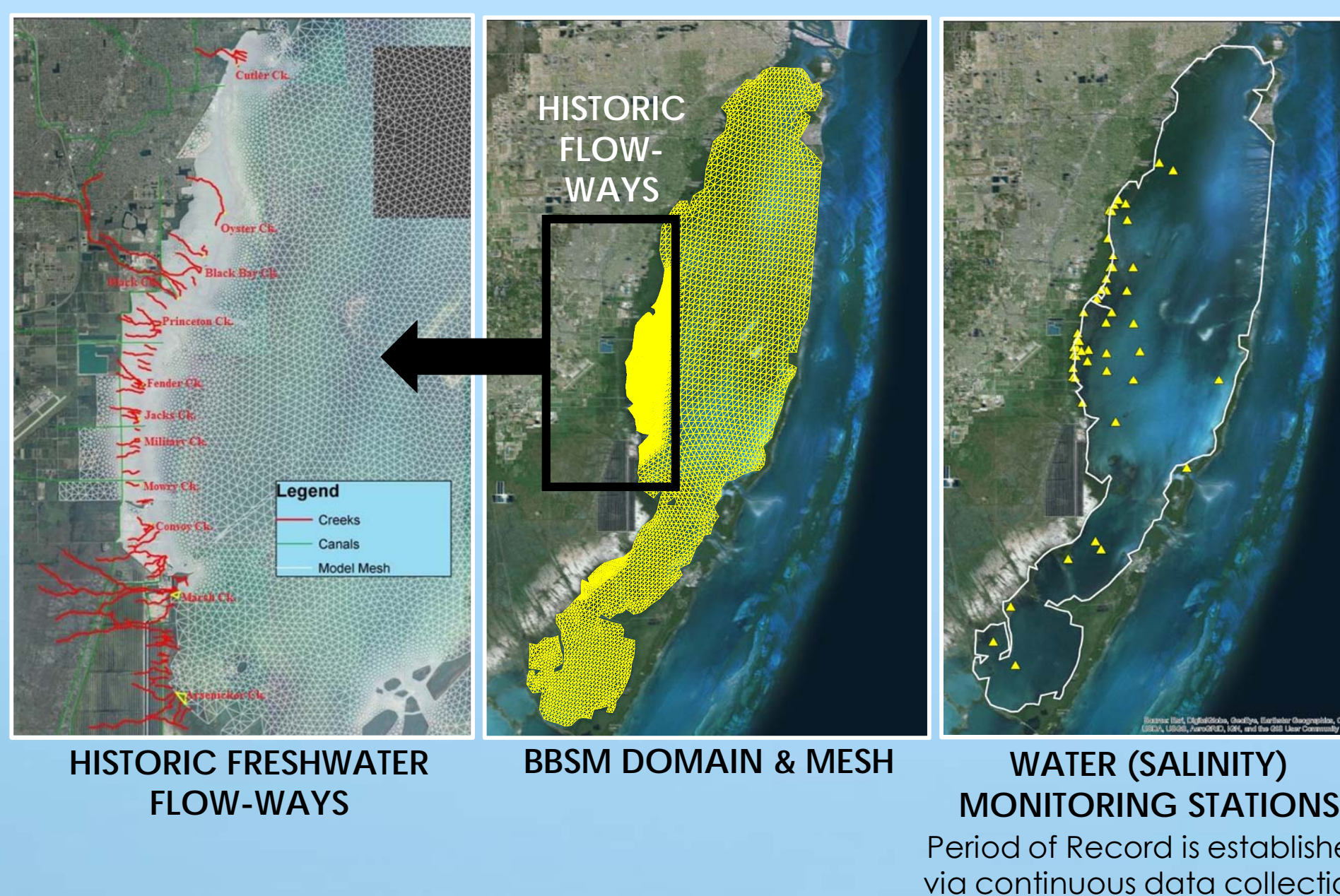
Image: The Biscayne Bay Conceptual Ecological Model describes ecological processes occurring in Biscayne Bay including drivers, stressors, ecological effects, and attributes specific to the bay itself.

## DEVELOPING A MODEL FOR SALINITY IN BISCAYNE BAY | THE BISCAYNE BAY SIMULATION MODEL (BBSM)

Note: check marks indicate completed items.

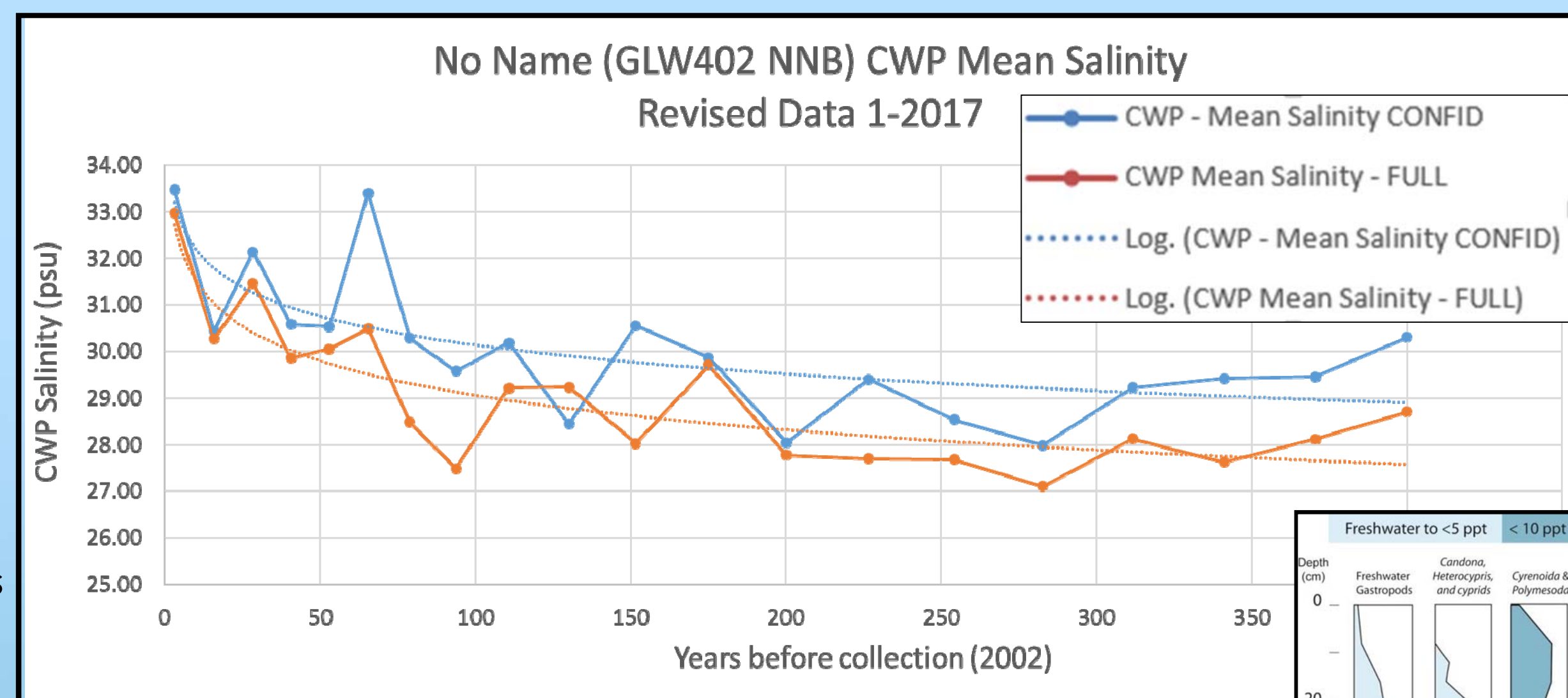
### BBSM Design

- Definition of the Problem
- Conceptual Model Development
- Hydrodynamics and Salinity
- Delineate Model Domain
- Describe a Triangular Mesh for Model Domain
- Define Initial and Boundary Conditions



### BBSM Application

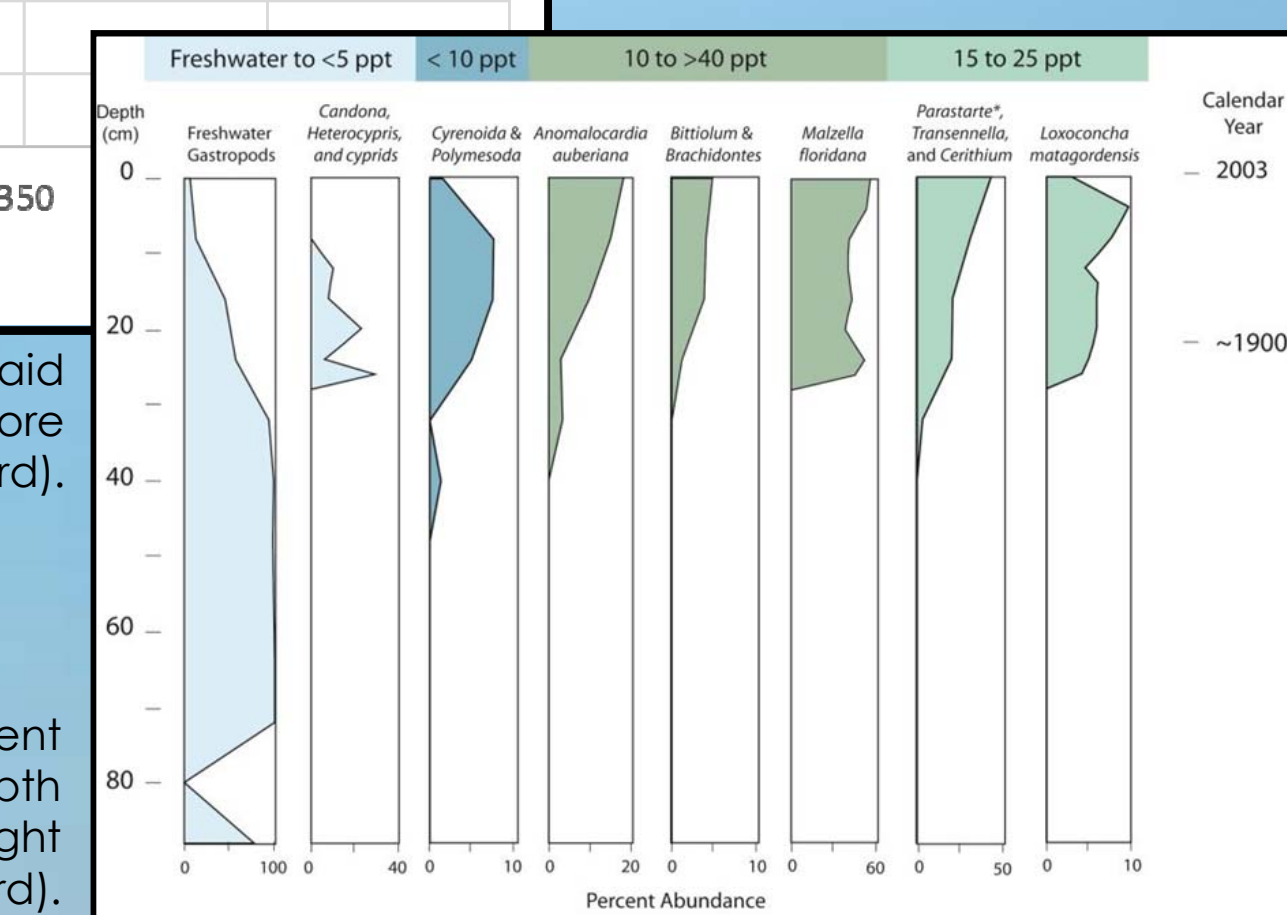
- Establish Target Time Period
- Establish Period of Record (Hydrological and Ecological Monitoring for Environmental Conditions)
- Research Historic Salinity Records and Data
- Analyze Monitoring Data
- Set Targets - Run Scenarios
  - NSM, NSM-ALT, NSRSM, NSRSM-ALT, MECB



### BBSM Validation

- Determine Acceptable Disparity
- Generate BBSM Model Output
- BBSM Model Verification, Calibration, and Validation

Historic salinity levels dating back 400 years - determined via analysis of a core sample - will aid in the determination of pre-development salinity levels in Biscayne Bay. Additional core samples will be taken throughout Biscayne Bay (Permission for use from Lynn Wingard).



Changes in salinity in the Middle Key Basin as indicated by percent abundance of key ostracode and mollusk indicators plotted against depth in centimeters. Calendar years (1900 to 2003) are indicated on the right (Permission for use from Lynn Wingard).

Graph of salinity data.

## DEFINING PERFORMANCE MEASURES

**Goal:** An approved and accepted Biscayne Bay Salinity Performance Measure to measure and predict salinity within Biscayne Bay, Barnes Sound, and Card Sound (similar to the Florida Bay Salinity Performance Measure approved in 2012).

