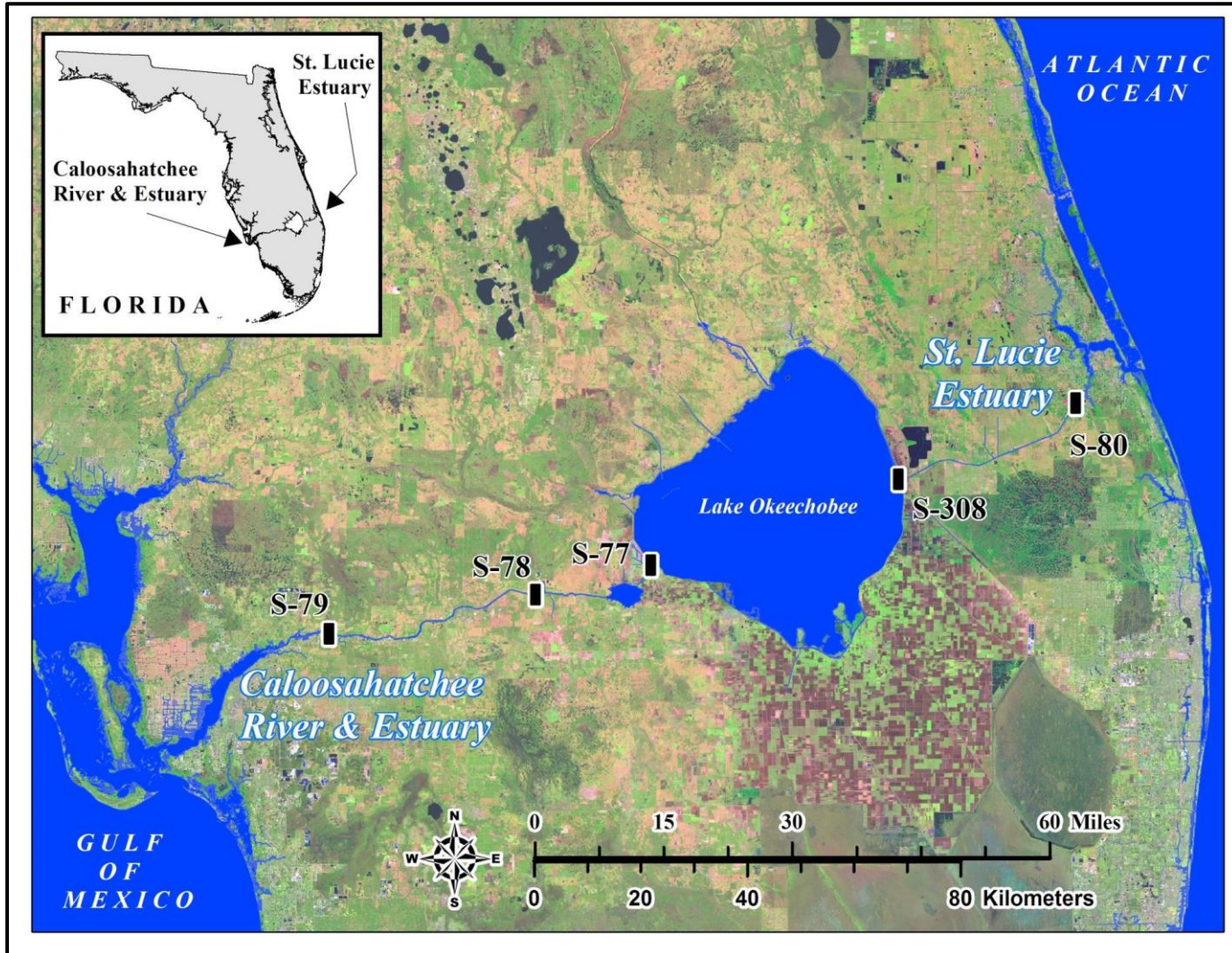


UNESCO IHE Coastal Ecosystems 28 May 2014

1. Overview of Coastal Modeling (10 min)
2. Coastal Watershed Modeling (Dr. Fawen Zheng; 40 min)
3. Hydrodynamic and Water Quality Modeling (Dr. Detong Sun; 40 min)
4. Coastal Ecological Modeling (Dr. Christopher Buzzelli; 40 min)



General Approach to Managing Estuaries

What can we do in the watershed to get the desired ecological response in the estuary?

When this
Happens in
Our Estuary



So We Can
Have
Something
Like This



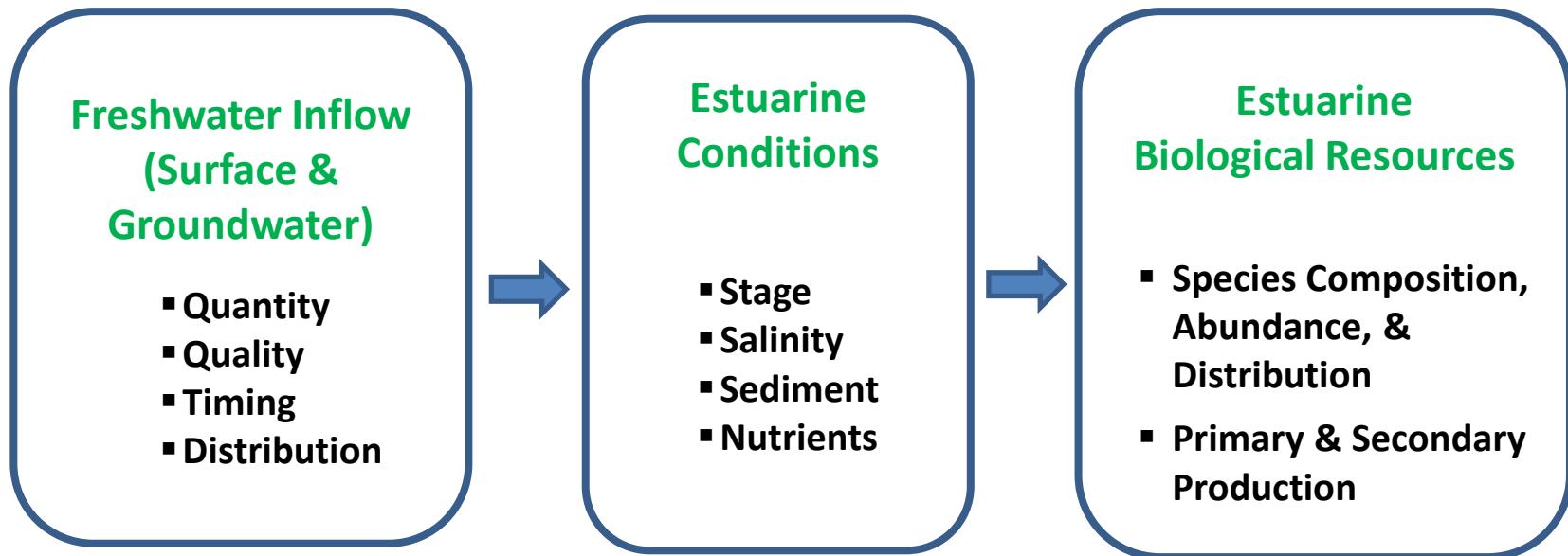
We Change
Something in
The Watershed



Conceptual Model

(Modified from Alber, 2002)

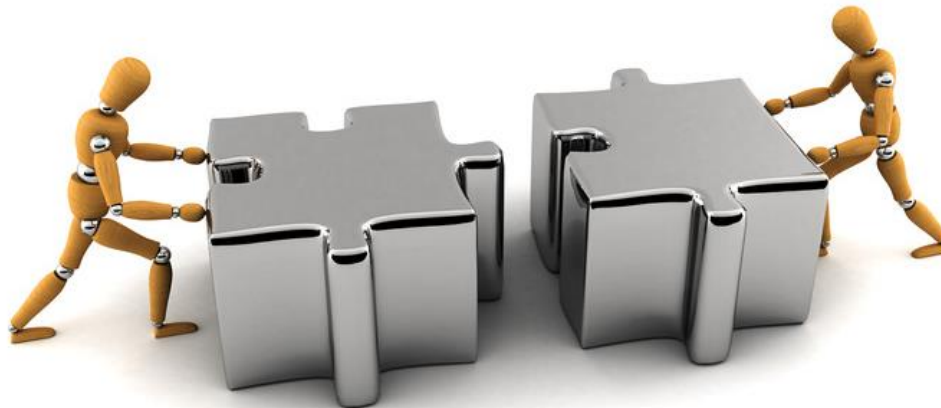
- Freshwater inflow links watershed and estuary
- Freshwater inflow influences estuarine conditions
- Estuarine organisms respond to conditions



“What can we do in the watershed?”



To provide guidance and some predictive ability in answering the question, the Coastal Ecosystems Section is developing and using an integrated modeling framework

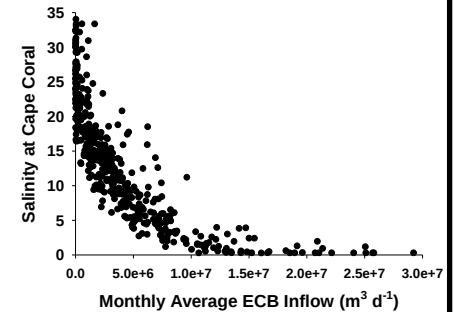


INTEGRATIVE MODELING FRAMEWORK

INFLOW SCENARIOS
Daily inflows 1965-2005
ECB, FWO, ALT4R scenarios
CRE = S79 at upstream limit
SLE = multiple tributary inflows



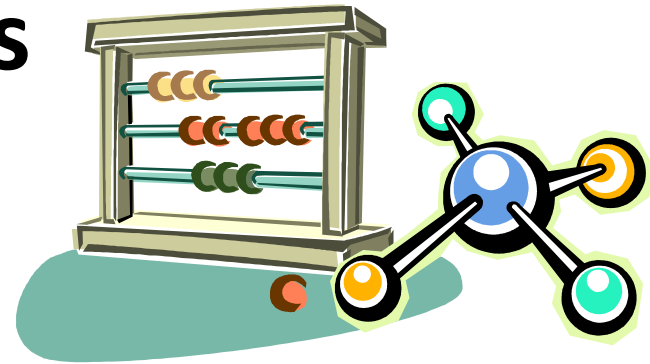
SALINITY PREDICTIONS
Hydrodynamic model
Statistical model
CRE =Cape Coral, Shell Point
SLE =US1, Boy Scout Island



ECOLOGICAL MODELS
Cape Coral & US1 – Oyster
Shell Point – Oyster and *Halodule*
Boy Scout Island - *Syringodium*



Models



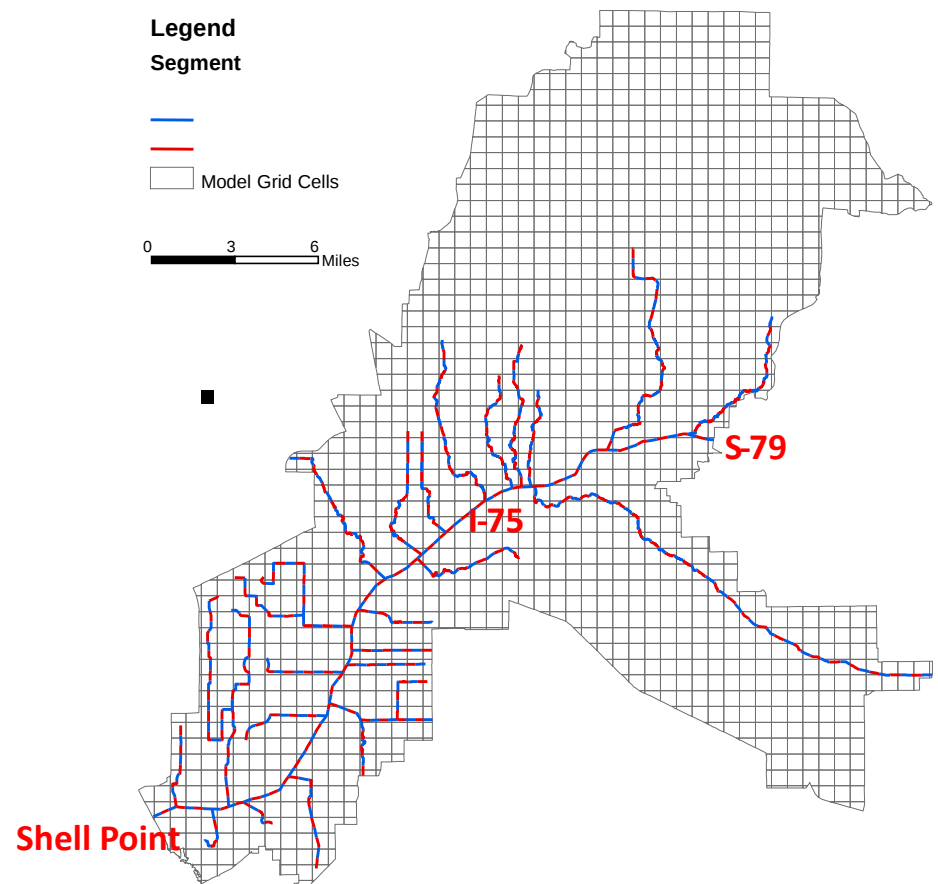
- **Tidal Basin Model**
 - Simulates Freshwater Inflows
- **Hydrodynamic and Water Quality Models**
 - Simulates Circulation and Salinity
 - Water Column and Sediment Biogeochemistry
- **Ecological Models**
 - Water Column Biogeochemistry
 - Density of Submersed Aquatic Vegetation
 - Density of Oysters



Tidal Basin Watershed Model (WaSH)

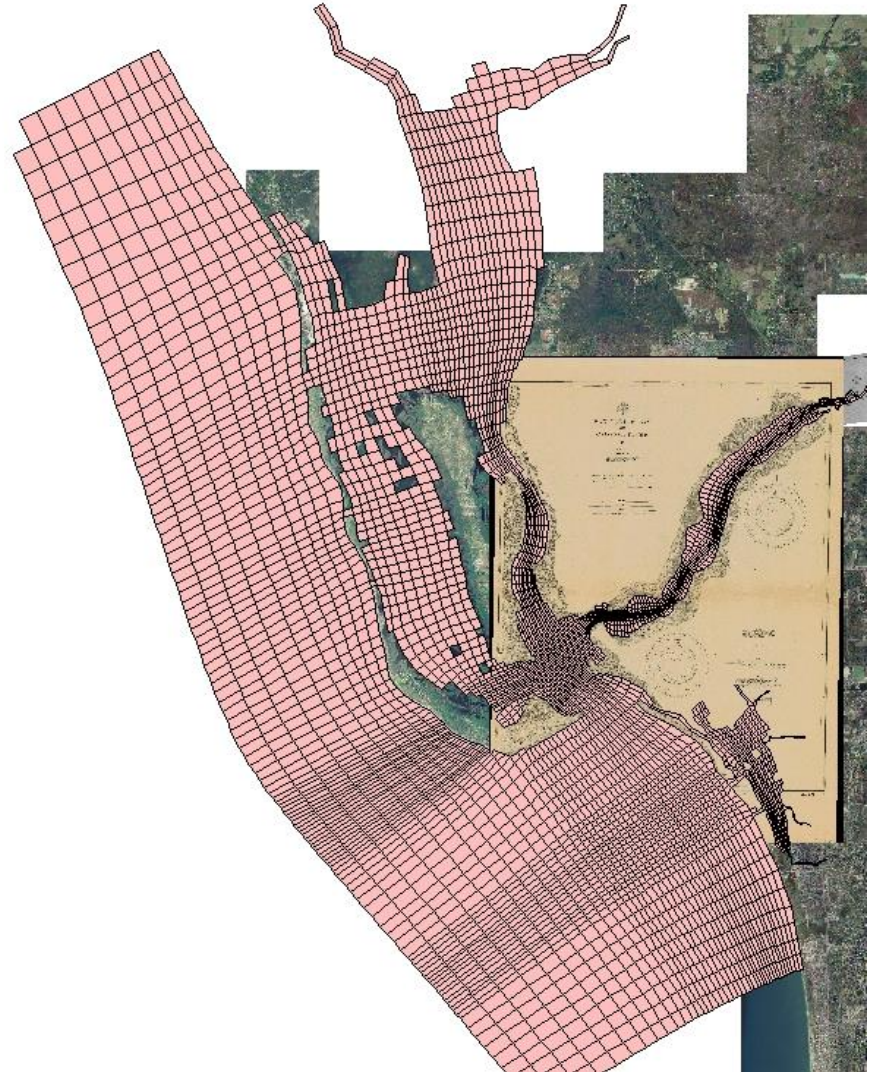
- Simulates freshwater inflow into the estuary from the tidal basin
- Calibrated and verified with data collected: 2008-2013
- Water quality not initiated
- Simulation period: 1965~2005

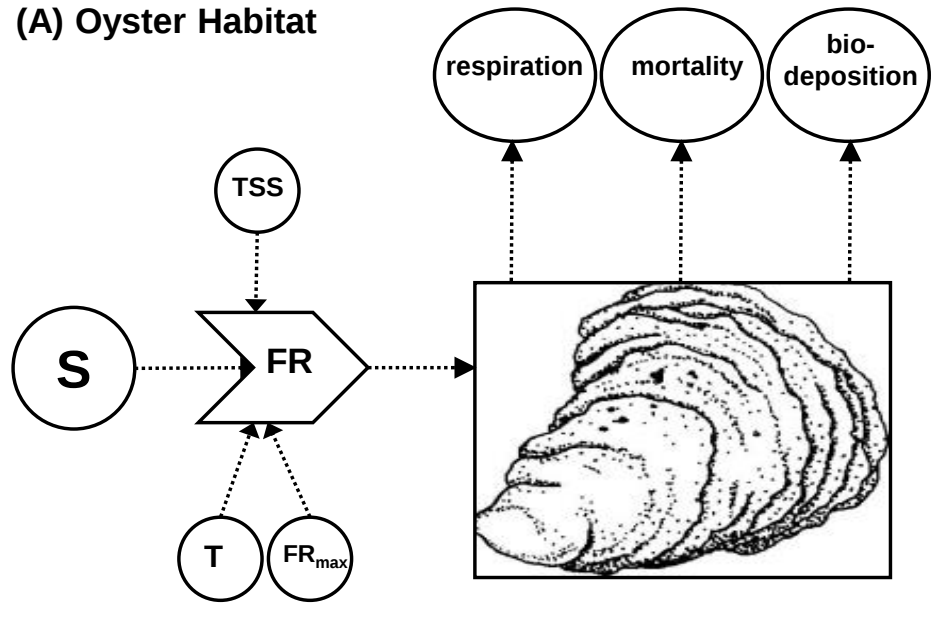
Tidal Caloosahatchee River Basin Model Discretization
(Domain Grid Cells and Reach Segments)



The CH3D Hydrodynamic Model

- Simulates salinity and water level in the estuary
- Grid includes Charlotte Harbor, Caloosahatchee, Estero Bay
- Caloosahatchee portion calibrated with monitoring data collected from 1992 to 2012

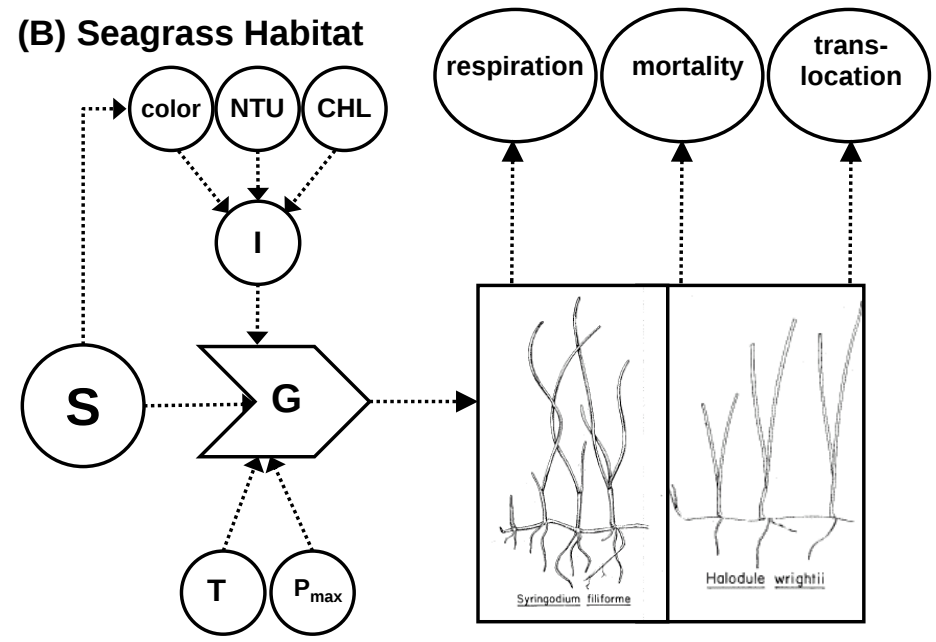


(A) Oyster Habitat

OYSTER AND SEAGRASS MODELS

- Process-based simulations
- Salinity, light, nutrients, temperature
- Freshwater inflow and salinity
- Daily, seasonal, annual, inter-annual

- Prescribe optimal inflows
- Help define beneficial environmental conditions
- Forecast potential responses to changes

(B) Seagrass Habitat

Applications:

Quantities of Water that We Identify



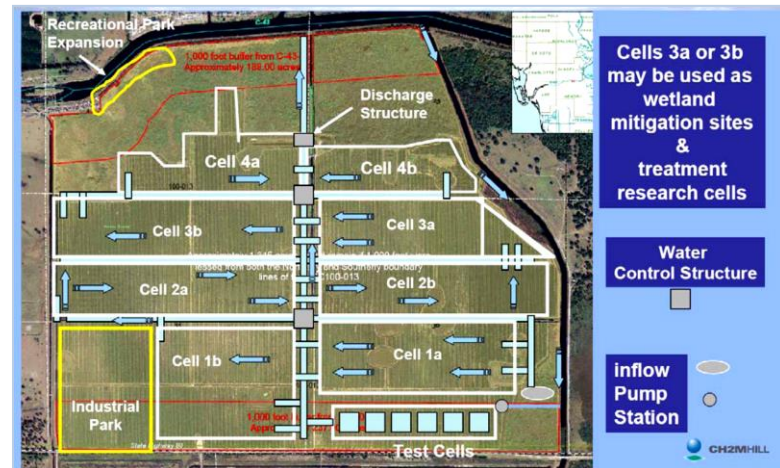
- **Minimum Flow and Levels**
- **Reservations**
- **Restoration Flows**

(Consumptive Use Permitting and Protection of the Natural System)

Operations and Facilities



- Lake Schedule Revisions
- Operations
 - LORS2008
 - Adaptive Protocols
- Project Planning
 - Analysis of Alternatives
 - Plan Formulation





Questions ?

