

TroSim:

Trophic Simulation Model

Mississippi Sound (MS),
Barataria Bay (LA),
or anywhere else...

Scott P. Milroy, Ph.D.
Associate Professor of Marine Science
The University of Southern Mississippi





**Bill
McAnally**



**Haosheng
Huang**



**Just
Cebrian
Glenn
Miller**



**Stephan
Howden
Don
Redalje**



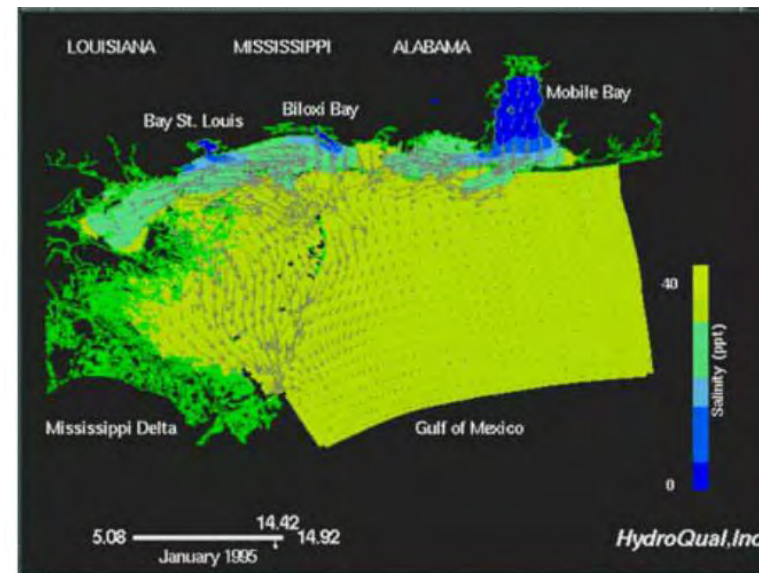
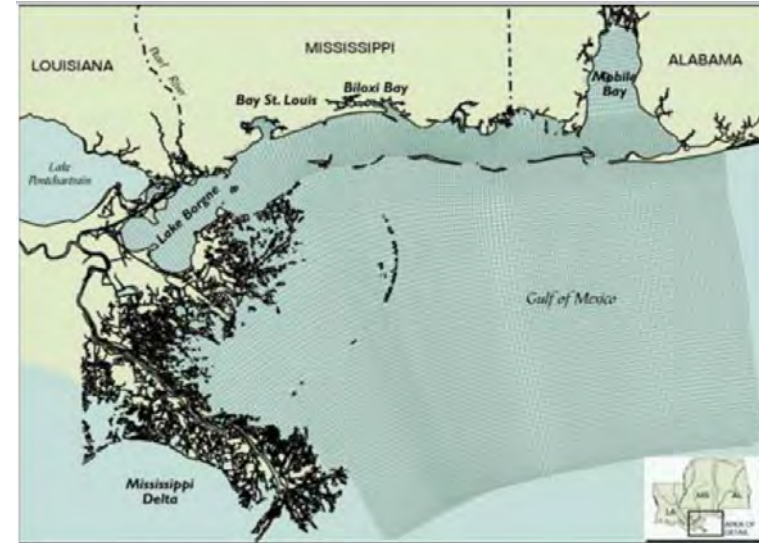
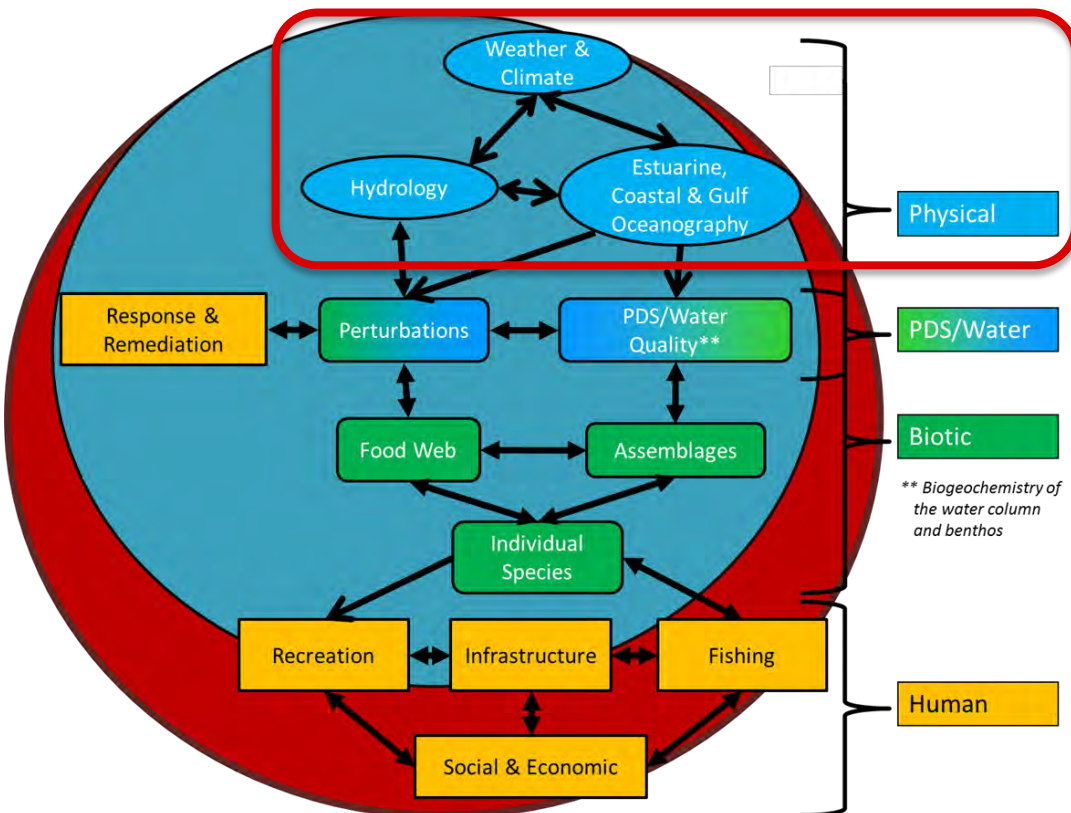
**Rich
Fulford**

Ecological Applications, 20(4), 2010, pp. 915–934
© 2010 by the Ecological Society of America

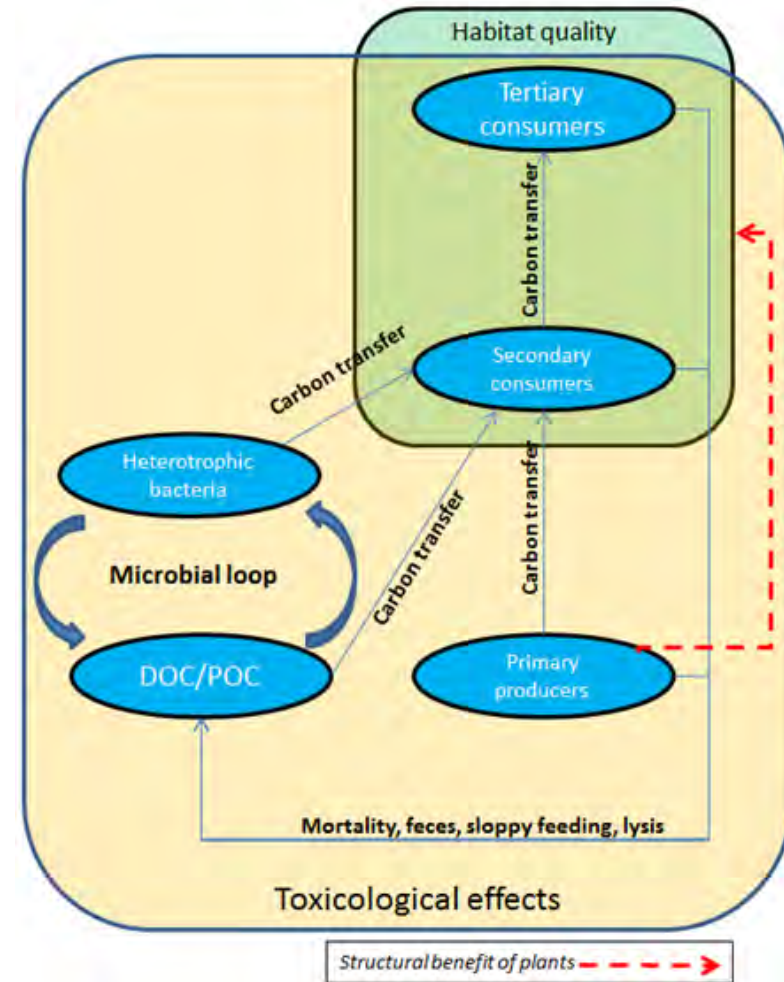
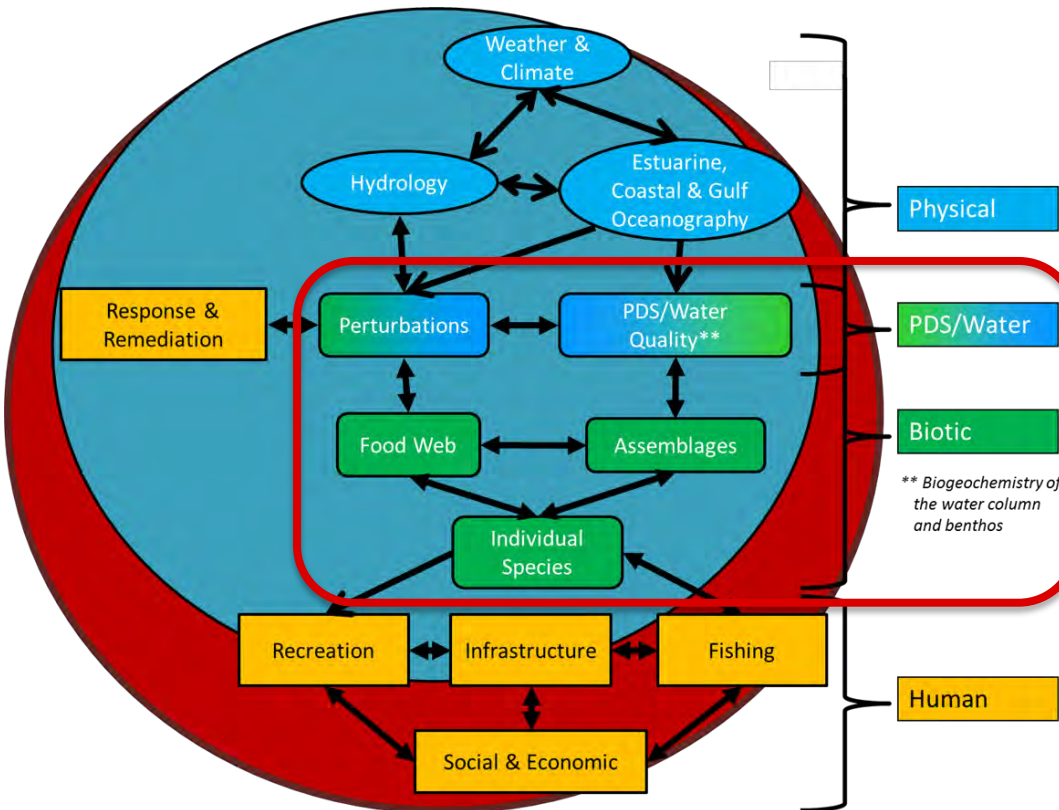
Evaluating ecosystem response to oyster restoration and nutrient load reduction with a multispecies bioenergetics model

RICHARD S. FULFORD,^{1,5} DENISE L. BREITBURG,² MARK LUCKENBACH,³ AND ROGER I. E. NEWELL⁴

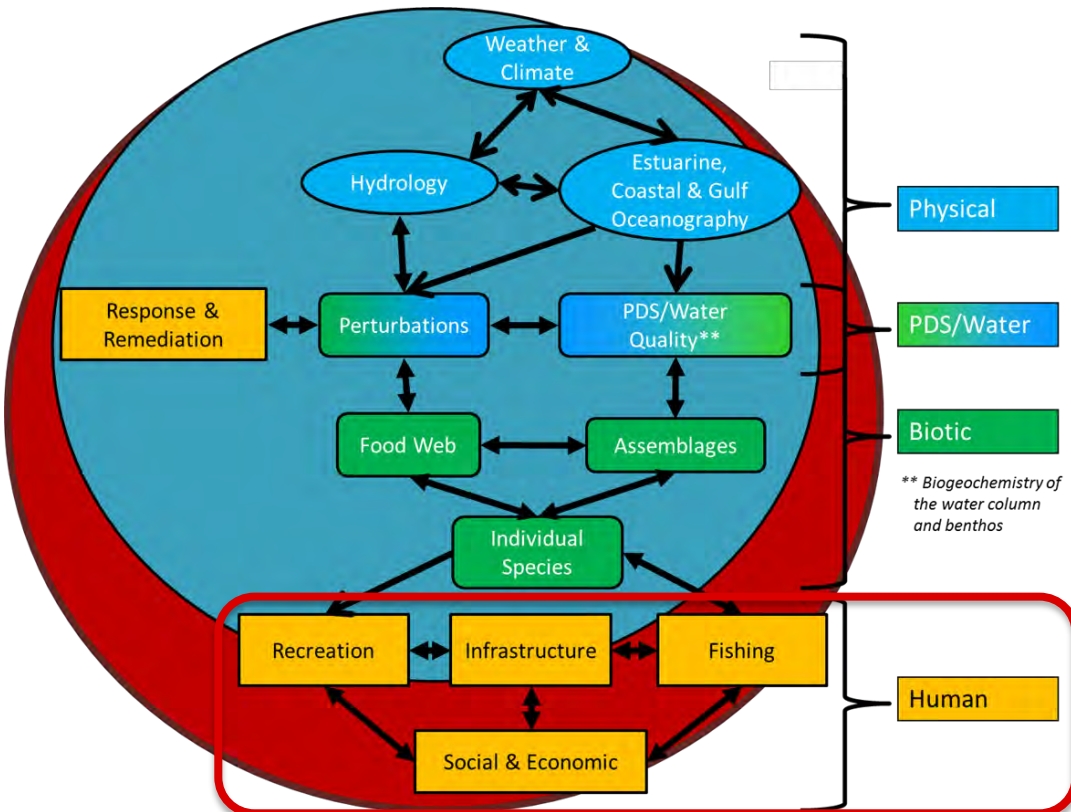
Hydrodynamic Models



Ecological Models



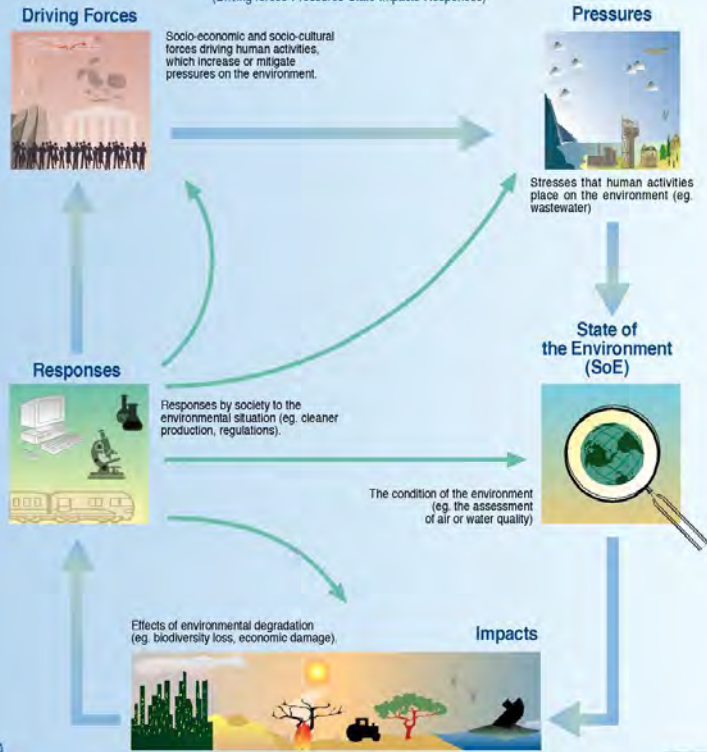
Socio-economic Models



... ?

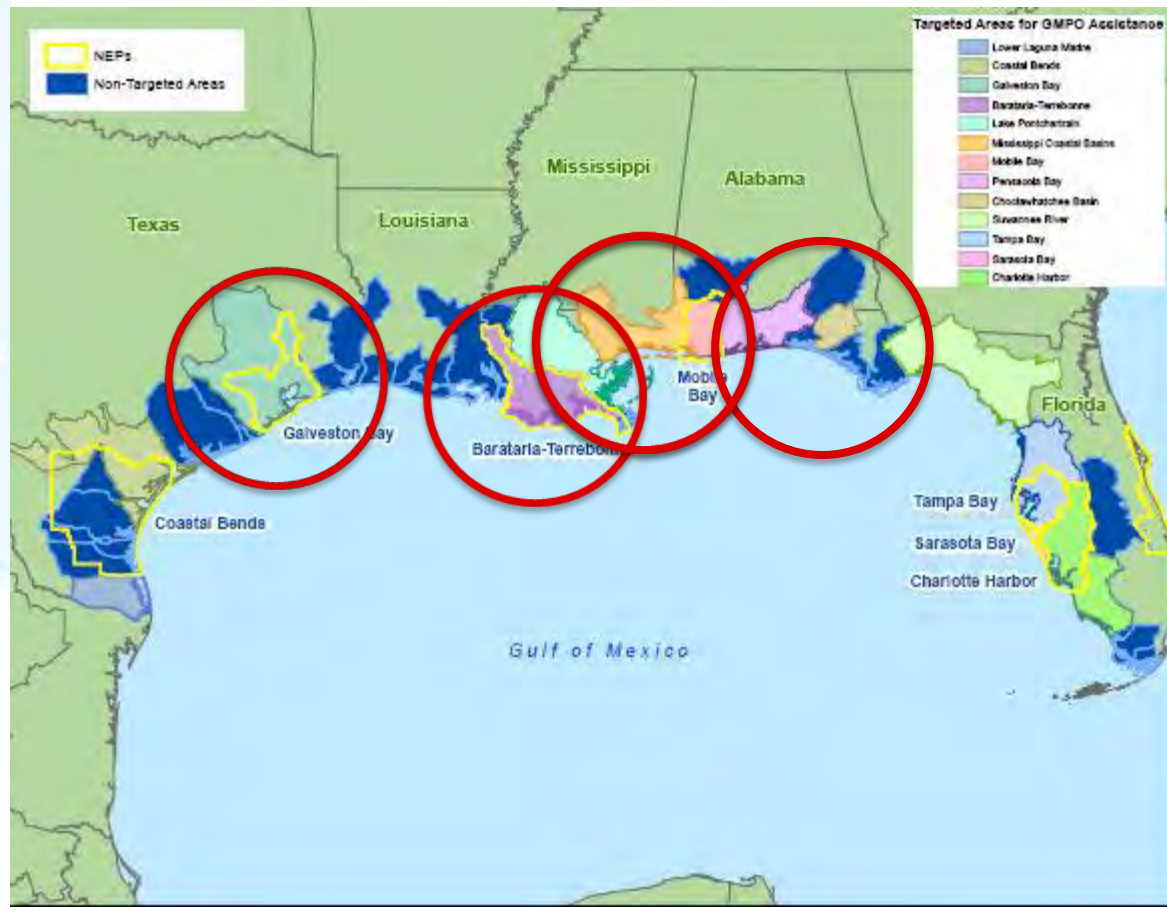
The DPSIR Framework

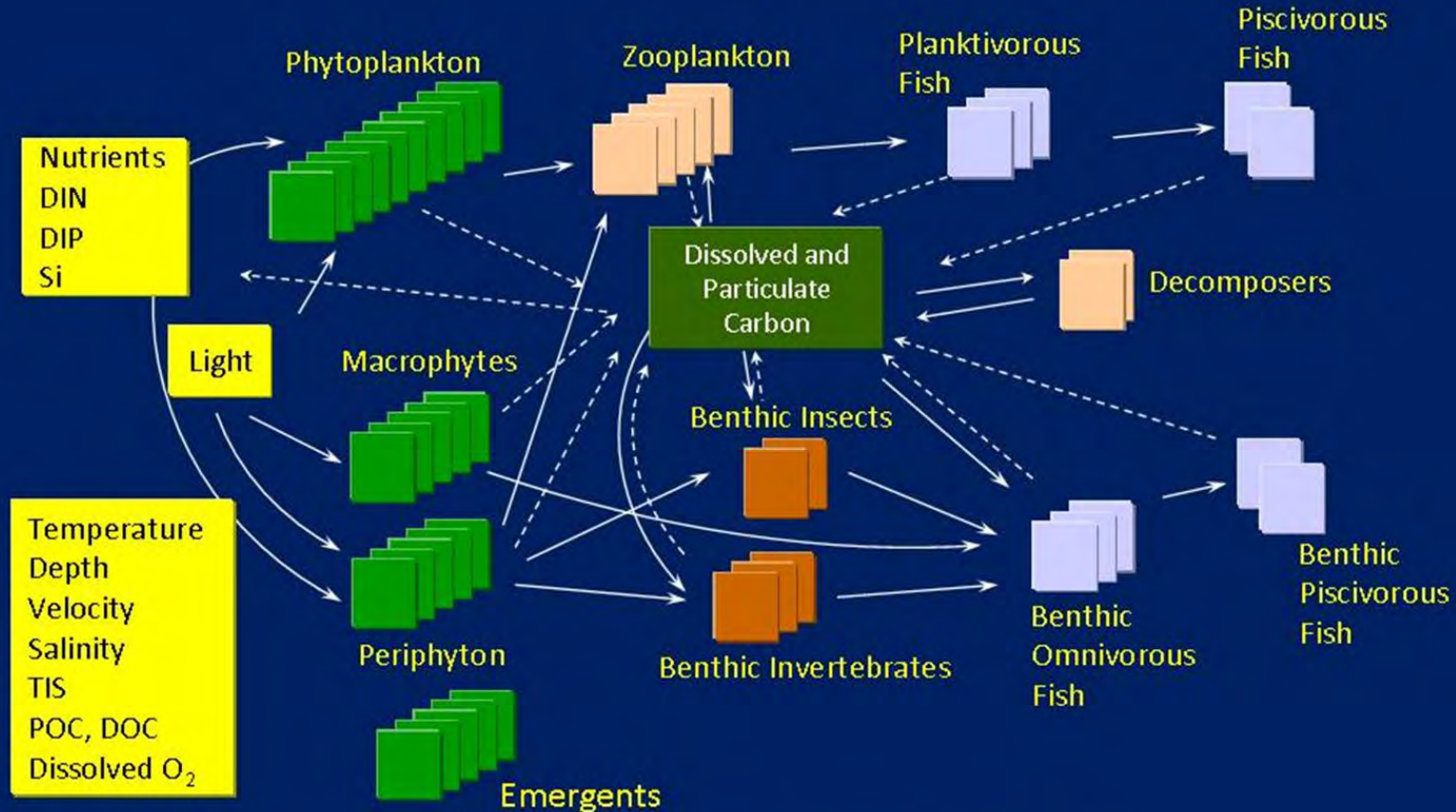
(Driving forces-Pressures-State-Impacts-Responses)



Source : Global International Water Assessment (GIWA), 2001, European Environment Agency (EEA), Copenhagen.

Coastal Ecosystems



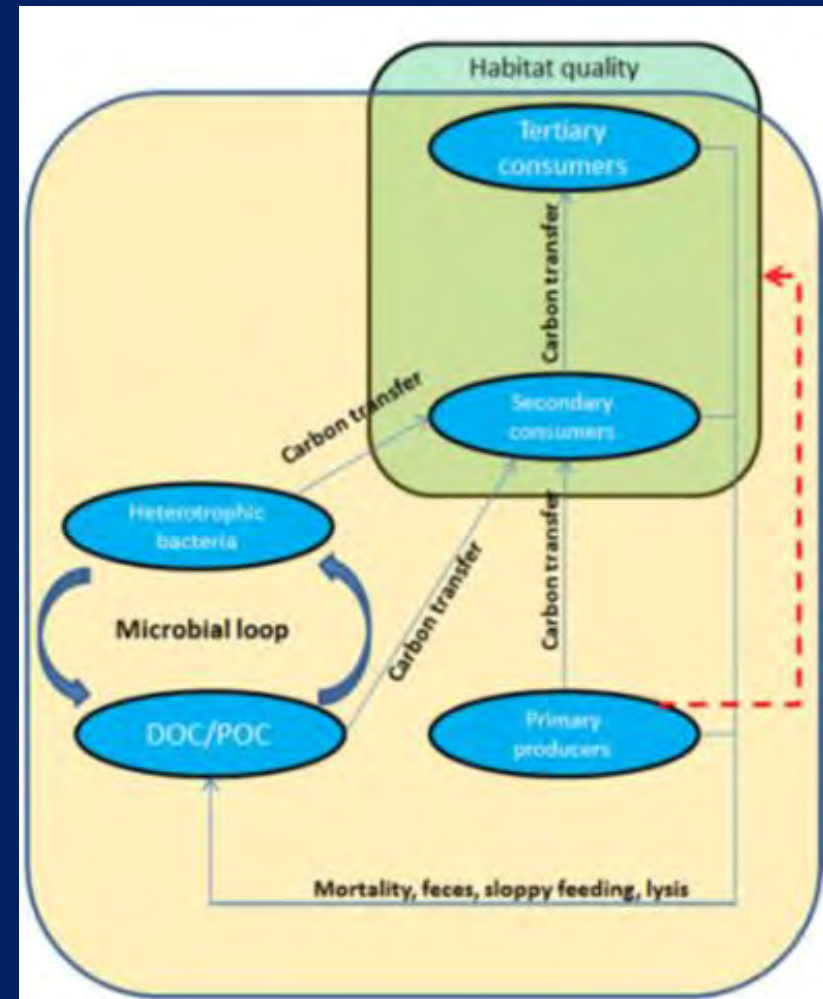


Food Web Model

Comprehensive Aquatic Systems Model (CASM)

Current Differences in TroSim:

- Inclusion of early life history stanzas (e.g. pediveliger, spat, seed, sack oysters)
- Functional group (rather than taxonomic) treatment of lower trophic levels
- Refuge dynamics for forage fishes
- Generally more responsive (*i.e.* less stable) than CASM with regard to shifts in functional group biomass caused by seasonal peaks and/or transient perturbations



Proof-of-Concept for Oyster Production, MS Sound



Reef Stations	LAT	LON
Bay St. Louis Reef 1	30.3153	-89.3187
Buoy Reef 1	30.2525	-89.1795
Henderson Pass Reef 1	30.2805	-89.2557
Henderson Pass Reef 2	30.3030	-89.2473
Henderson Pass Reef 3	30.2890	-89.3052
Long Beach Reef 1	30.3305	-89.1641
Pass Marianne Reef 1	30.2482	-89.2577
Pelican Reef 1	30.2095	-89.2360
St. Joe Reef 1	30.1825	-89.4092
St. Stanislaus Reef 1	30.3000	-89.3224
Telegraph Reef 1	30.2267	-89.2949
Telegraph Reef 2	30.2060	-89.2700
Waveland Reef 1	30.2730	-89.3677

- Simple, 2-layer ecological model; daily biomass m^{-3}

PRODUCERS

Phytoplankton

- Diatom
- Chlorophyte
- Cyanophyte

Periphyton

- Generic periphyton

SAV

- Generic SAV

Emergents

- None

CONSUMERS

Crustacean Zooplankton

- Macrozooplankton
- Microzooplankton

Gelatinous Zooplankton

- Ctenophores

Pelagic Omni/Planktivores

- Gulf Menhaden
- Bay Anchovy

Pelagic Piscivores

- Sea Trout

Benthic Invertebrates

- Oyster Drill
- Blue Crab
- Oyster

Benthic Omnivores

- Black Drum
- Atlantic Croaker

LARVAE ET AL.

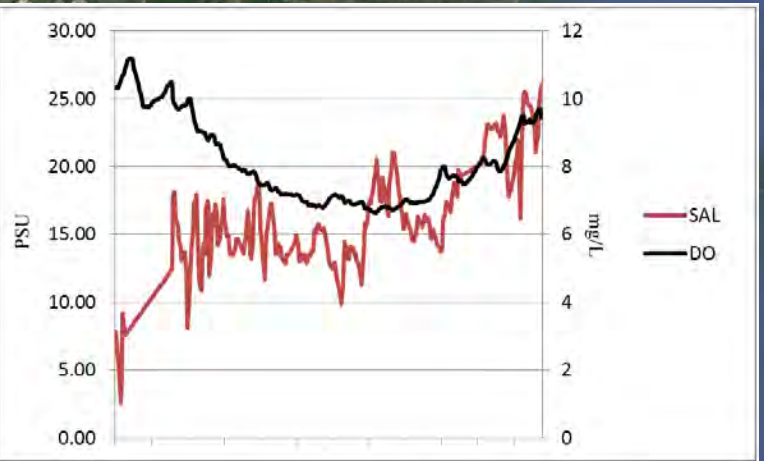
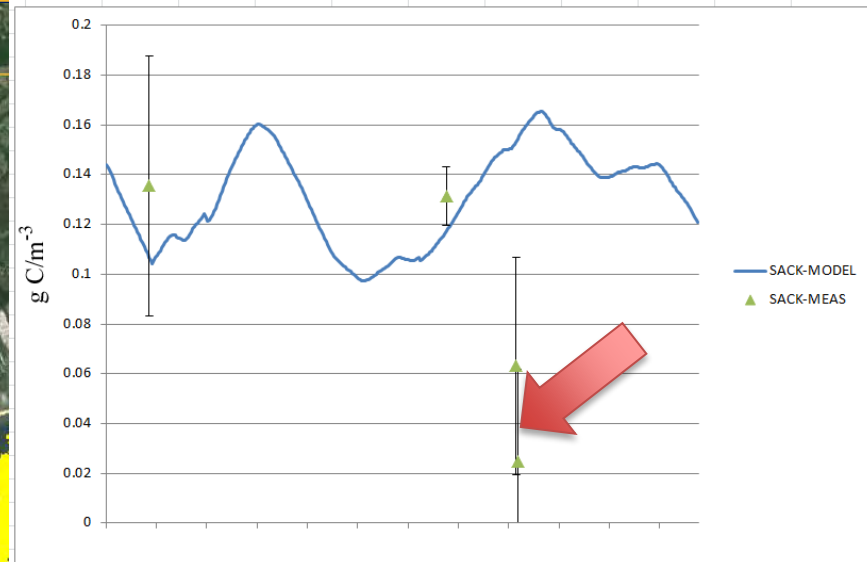
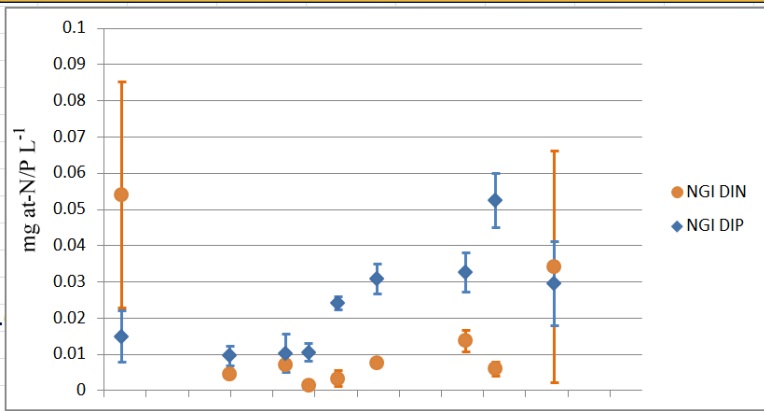
Larvae

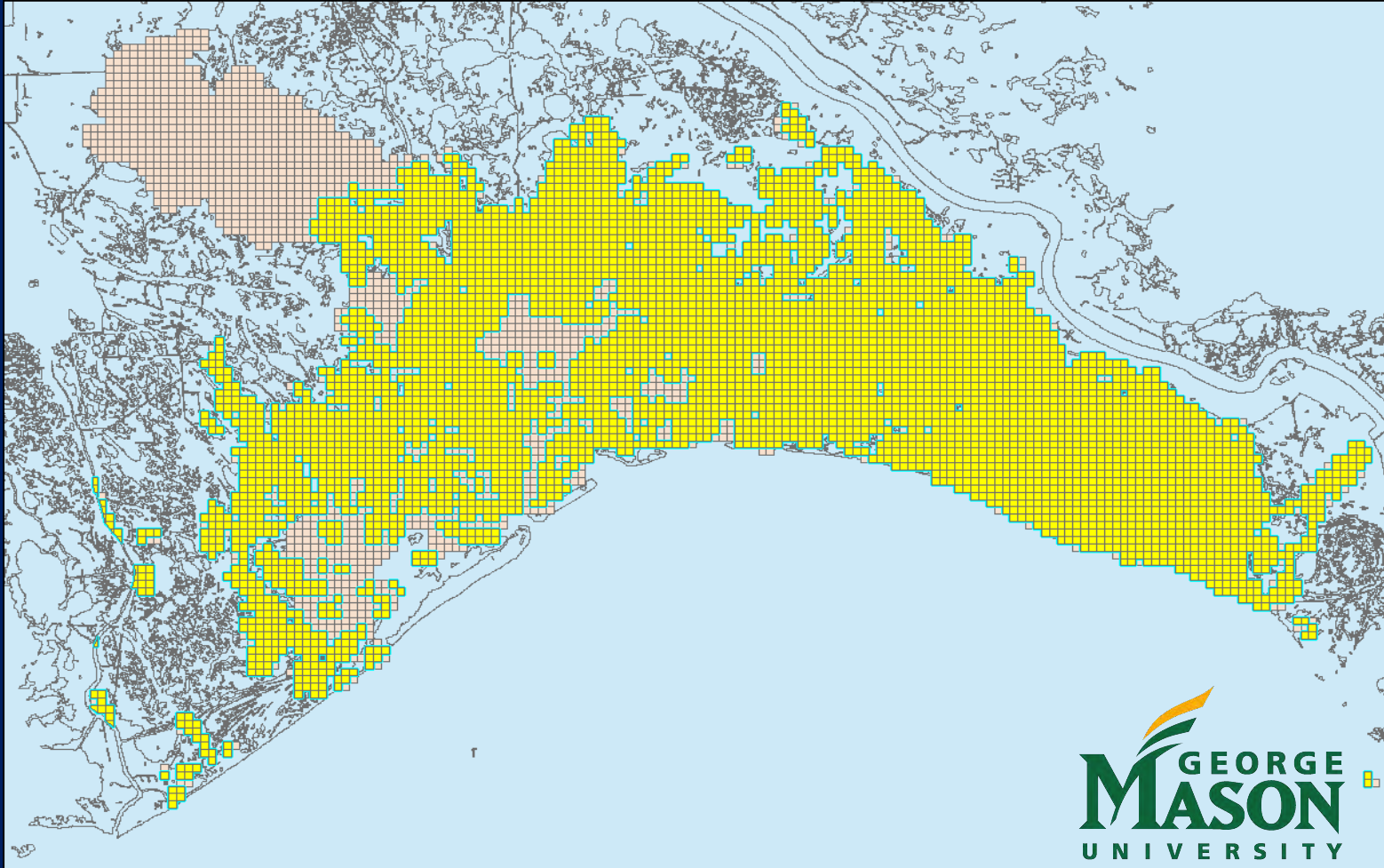
- Ctenophore Larvae
- Anchovy Larvae
- Oyster Larvae

Bacterioplankton

- Water-column Bacteria
- Sediment Bacteria

DRAFT RESULTS: Pass Marianne Reef 2010





Barataria Bay oyster base grid from the 2012 Master Plan. Cells are 500 m² and those highlighted in yellow contain 10% or more cover of cultch in each cell.

PRODUCERS

Phytoplankton

- Diatom
- Chlorophyte
- Cyanophyte

Periphyton

- Diatom
- Chlorophyte
- Cyanophyte

SAV

- Wild Celery (*Vallisneria*)
- Shoal Grass (*Halodule*)
- Turtle Grass (*Thalassia*)

Emergents

- Salt Grass (*Distichlis*)
- Arrowhead (*Sagittaria*)
- Common Reed (*Phragmites*)
- Black Rush (*Juncus*)
- Cordgrass (*Spartina*)

CONSUMERS

Crustacean Zooplankton

- Macrozooplankton
- Microzooplankton

Gelatinous Zooplankton

- Ctenophores
- Hydromedusae
- Salps

Pelagic Omni/Planktivores

- Bluegill Sunfish (juv/adult)
- Killifish (juv/adult)
- Sheepshead Minnow (juv/adult)
- Gulf Menhaden (juv/adult)
- Bay Anchovy (juv/adult)
- Striped Mullet (juv/adult)

Pelagic Piscivores

- Sea Trout (juv/adult)
- Largemouth Bass (juv/adult)
- Red Drum (juv/adult)

CONSUMERS (cont'd)

Benthic Invertebrates

- Blue Crab (juv/adult)
- White Shrimp (juv/adult)
- Brown Shrimp (juv/adult)
- Oyster (spat/sack)

Benthic Omnivores

- Black Drum (juv/adult)
- Blue Catfish (juv/adult)
- Sheepshead (juv/adult)

Benthic Piscivores

- Croaker (juv/adult)
- Gulf Sturgeon (juv/adult)
- S. Flounder (juv/adult)

BACTERIA

Bacterioplankton

- Water-column Bacteria
- Sediment Bacteria

