Restoring the Gulf Environment

What Can Dynamics Solutions, LLC Do To Assist Bay County Under the RESTORE Act?

Jan Mandrup-Poulsen
Sr. Environmental Scientist

Panama City, FL
November 12, 2014

Dynamic Solutions LLC

What Can Dynamic Solutions Do?

- Dynamic Solutions, LLC has performed water quality assessments around the nation. For 20 years, they have provided expert help by providing expertise on hydrodynamic and water quality models.

- Jan Mandrup-Poulsen spent over 30 years working with FL DEP, with 15 years creating and leading the TMDL Program.

Dynamic Solutions
LLC

What Will Be Provided?

Dynamic Solutions, LLC will provide to Bay County a foundational tool that will allow for the assessment of impacts to the local ecology (e.g., fish, crabs, scallops, seagrass) due to proposed structural and operational modifications in St. Andrew Bay and the nearby coastal waters. Potential impacts can be assessed <u>prior to</u> final project selection and funding.

Project Area to be Covered (Estuarine and Coastal Waters)

EPA's Modeling Tools

- In 2010, EPA established a Total Maximum Daily Load for St Andrew Bay to address high nutrients and low dissolved oxygen concentrations.

- Under either option, this proposal will leverage the existing modeling done by the EPA to expedite the development of the project and reduce the overall cost.

Dynamic Solutions
LLC

EPA's Modeling Tools

EPA developed the following models:

- LSPC – A watershed loading model

- EFDC – A hydrodynamic model

- WASP – A water quality model

Under Option 1, DSLLC will use the outputs from EPA's models to drive the CASM.

Under Option 2, DSLLC will update the EPA's models with data gathered since 2008 to drive the CASM.

Dynamic Solutions LLC

Comprehensive Aquatic Systems Model (CASM)

- Bioenergetics-based growth in an aquatic food web model

- Producers: dB_P/B_Pdt = Photosynthesis – Photorespiration – Dark Respiration – Sinking – Natural Mortality – Grazing

- Consumers: dB_C/B_Cdt = {Consumption - (Egest+Excrete+SDA) – Respiration – Natural Mortality – Predation}*hmod

- Consumption dependent upon prey and predator biomasses

CASM Approach for St Andrew Bay

- 33 species/functional groups in the food web

- CASM food webs set up on the hydro model grid

- Daily time step simulated over single years

- CASM inputs are averaged daily values from field data and cell outputs from the hydro model

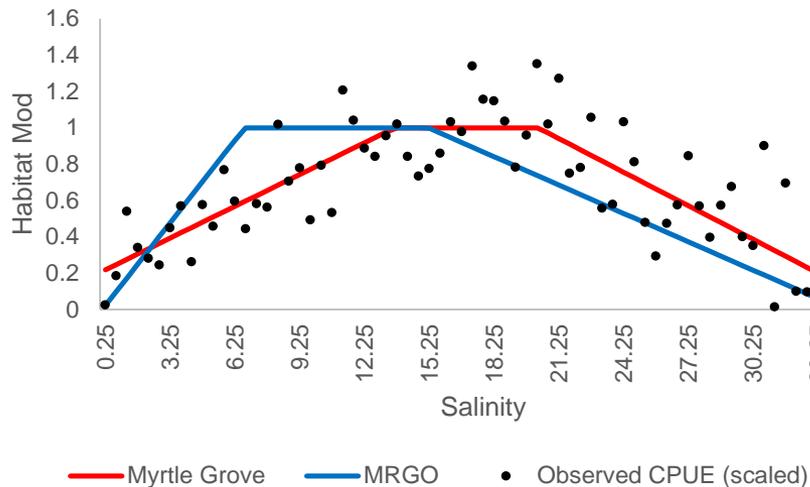- Environmental inputs modify producer and consumer processes in food webs

Dynamic Solutions LLC

CASM for Gulf Restoration

- CASM (plus other models) set up for specific coastal regions to evaluate lethal and sub-lethal effects on key species in food web

- Food web dynamics driven by temperature, light, nutrients, salinity, habitat structure, species effects from toxins measured in the field and laboratory

- Environmental inputs from data and/or linked with hydrodynamic and water quality models

- Evaluate bottom-up effects and species interactions at daily and seasonal, annual and multiyear time scales
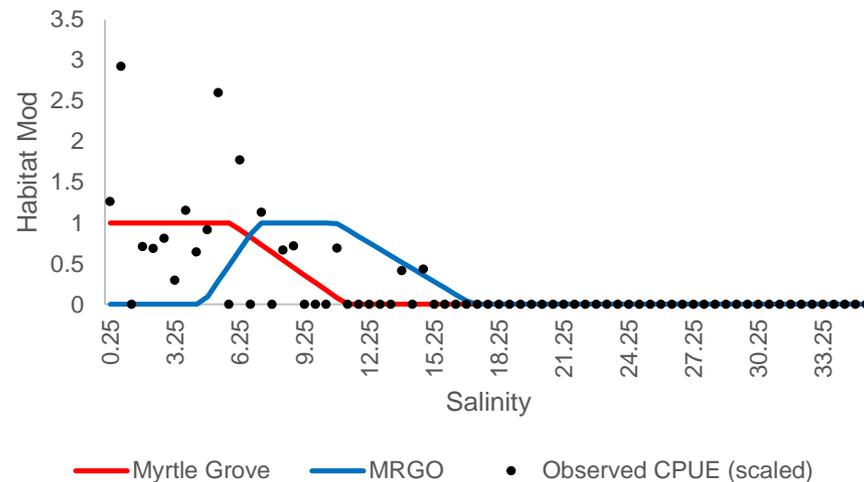 - Short-term, pulsed, decaying, or varying effects

CASM Food Web
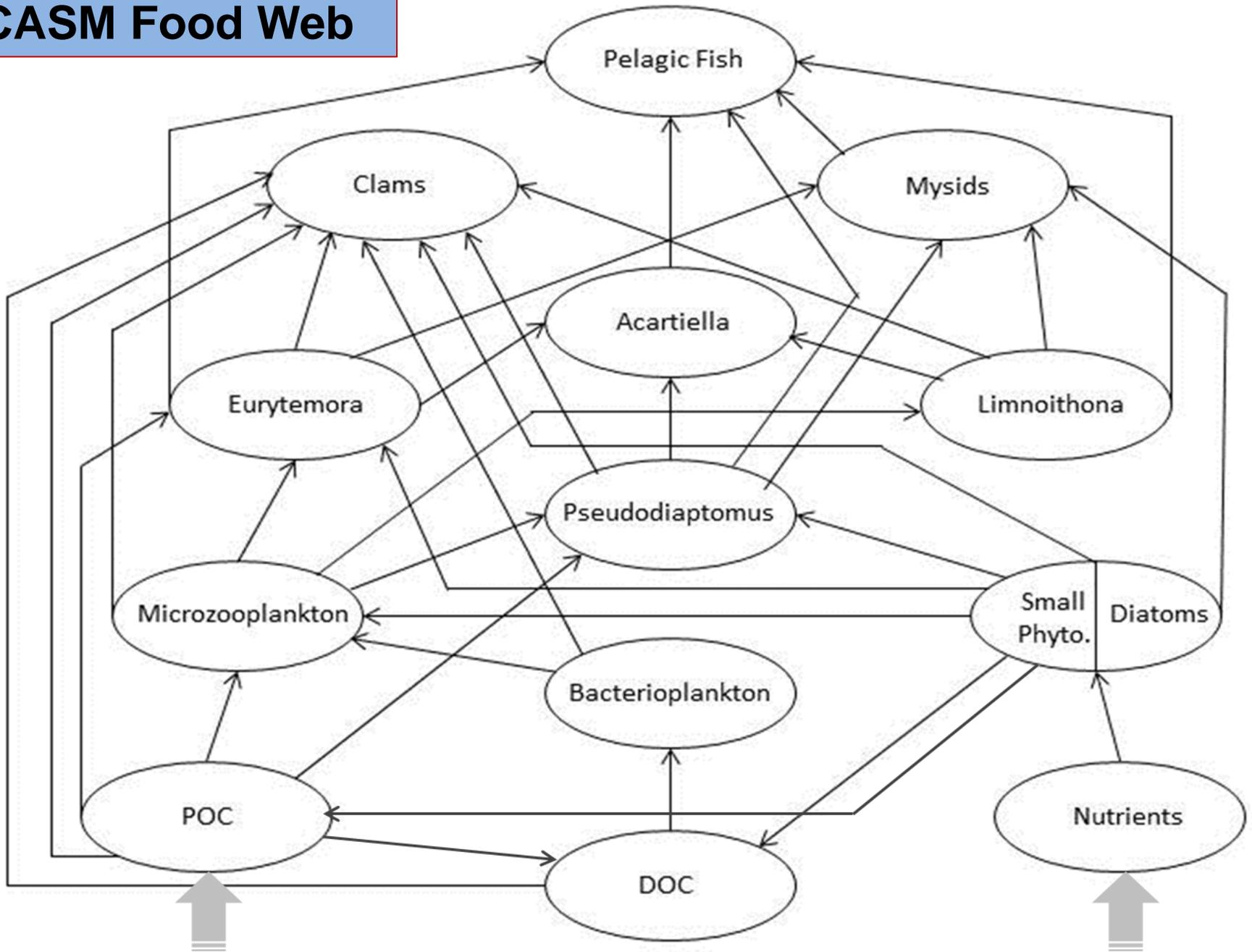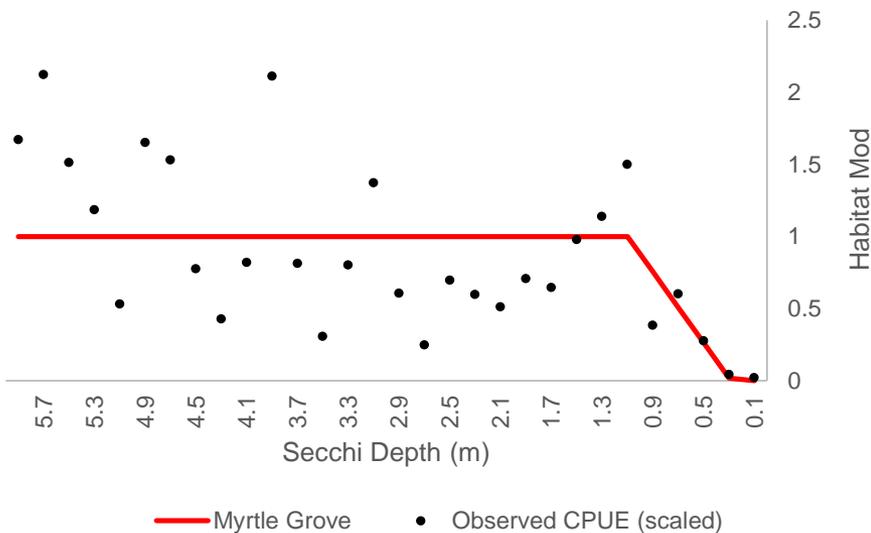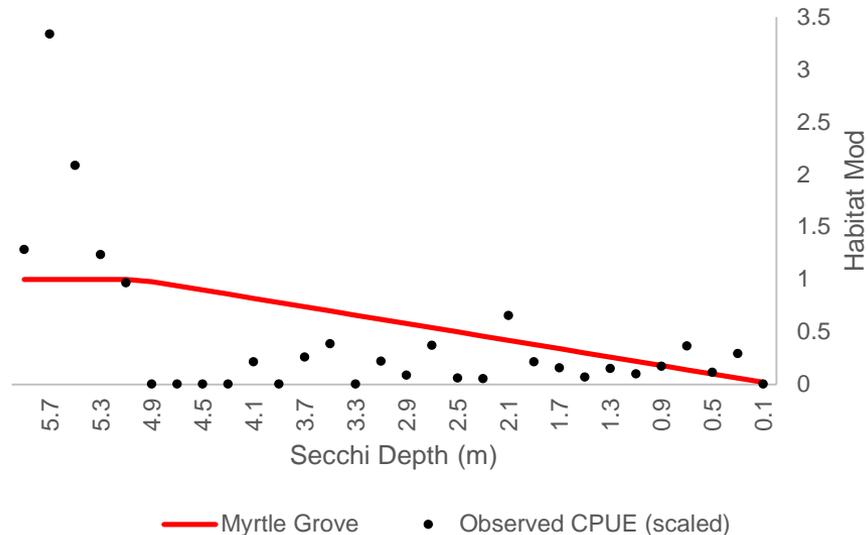
Biological Data: Habitat Modifiers

Axis labels: Biomass Consumed (g C/m²) (y-axis); Day of Year (x-axis)

a. Blue crab YOY

Periphyton

b. Spotted seatrout YOY

White Shrimp

c. Largemouth bass

d. Oysters

Phytoplankton
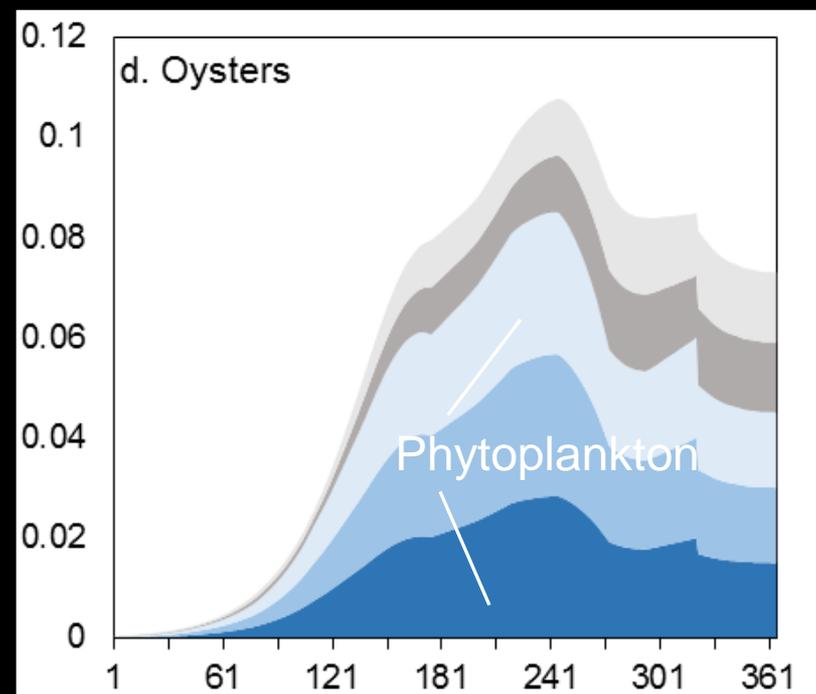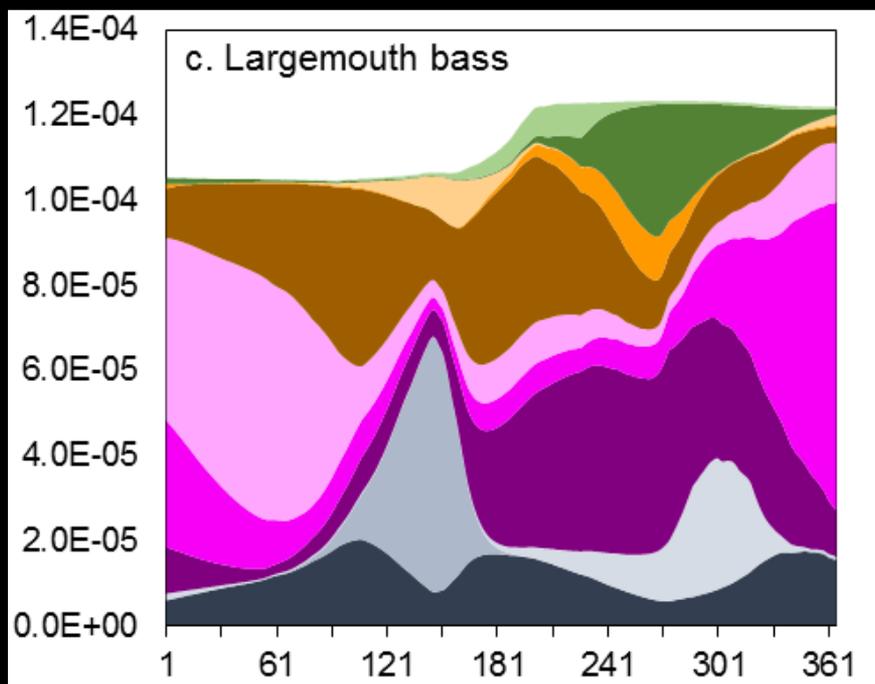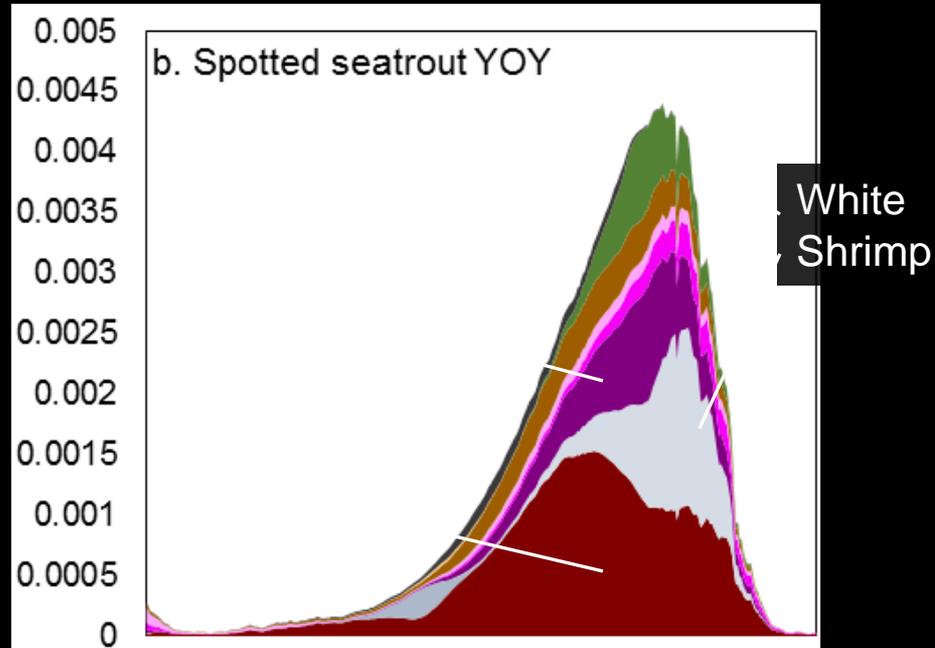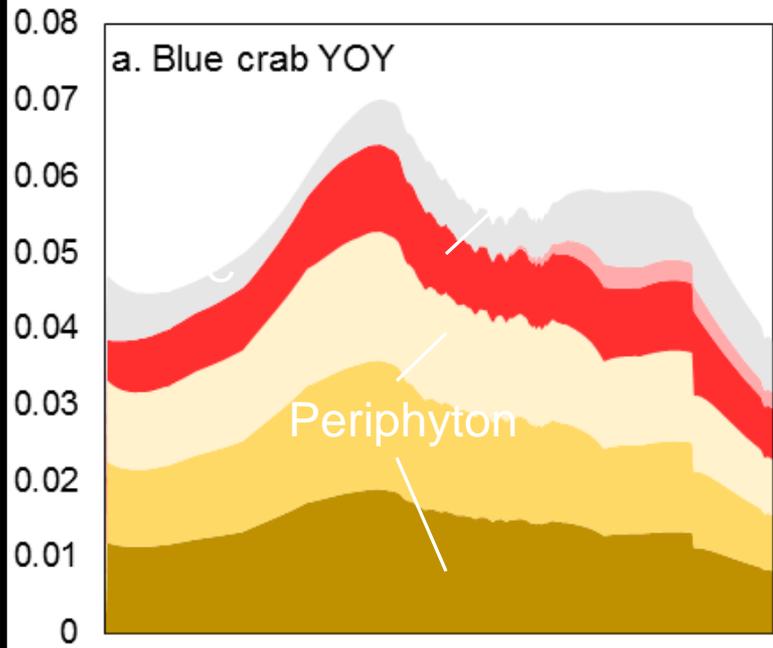
Summary

- This project conforms to the Bay County Multi-Year Implementation Plan.

- Provides a one-time foundation tool that can be used to aid in the restoration and protection of aquatic resources that are important to Bay County residents.

- Aids in the mitigation of damage to fish/ other estuarine and marine organisms.

Summary

- Addresses all of the estuarine and near-shore coastal waters in Bay County (approximately 142,800 acres).

- Uses the Best Available Science:
  - By applying nationally accepted peer-reviewed, public domain modeling tools
  - Using local water quality and ecological data
  - Does not require new data collection

- Provides planning assistance.

Project Cost

- Option 1: Use existing EPA models (with pre-2009 data) to develop and inform the ecological model: $380,566

- Option 2: Update the existing EPA models (using existing data gathered through 2013) to develop and inform the ecological model: $448,420

Dynamic Solutions
LLC

Contact Info

Dynamic Solutions, LLC

Jan Mandrup-Poulsen

Tallahassee, FL

850/567-2711

jmandrup-poulsen@dsllc.com