NOAA NGOMEX Program – Management Science Needs

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National Centers for Coastal Ocean Science

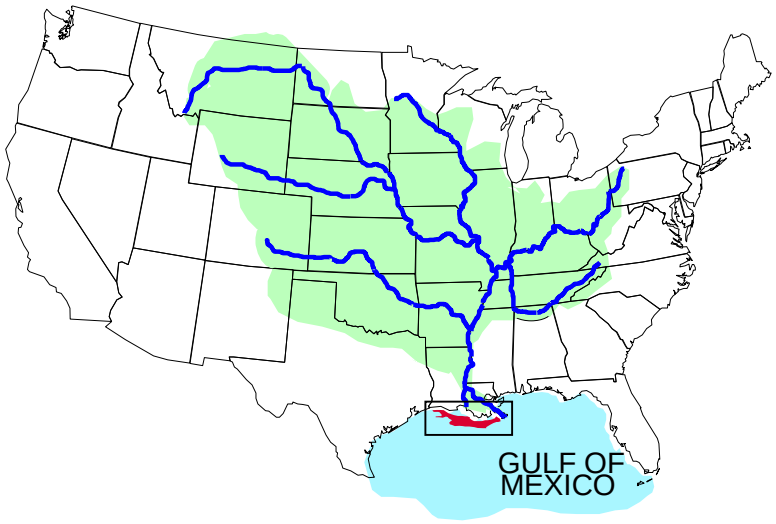
Hypoxia Effects on Fish and Fisheries Workshop/Gulf of Mexico Oil Spill and Ecosystem Science Conference
6 Feb 2017; New Orleans

Harmful Algal Bloom and Hypoxia Research and Control Act (HABHRCA)

- **Important issues that triggered legislation were the Northern Gulf of Mexico hypoxic zone and the mid-Atlantic *Pfiesteria* problems**

- **formation of the interagency Mississippi River/Gulf of Mexico Watershed Nutrient Task Force (aka Hypoxia Task Force) established in the fall of 1997**

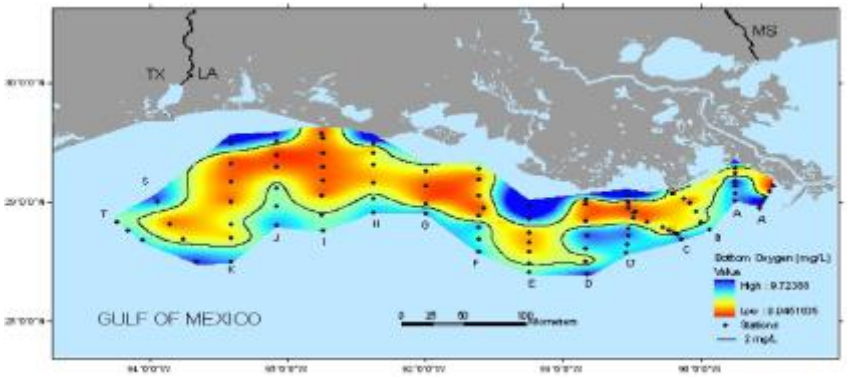
- **mandate for an Action Plan (issued by Hypoxia Task Force in 2001)**



Northern Gulf of Mexico Ecosystems and Hypoxia Assessment Program (NGOMEX)

NGOMEX Objectives:

- **Monitoring:** characterize the magnitude and extent of the hypoxic zone;



From Nancy Rabalais (LUMCON)

- **Modeling Hypoxia Causes:** develop quantitative models to predict the extent of the hypoxic zone given varying levels of nutrient inputs, physical forcing, and other factors that control hypoxia;

- **Modeling Hypoxia Ecosystem Effects:** develop quantitative models to determine the effects of the hypoxic zone on ecologically and economically important living resources.

Management Products Informing Mitigation of Hypoxia

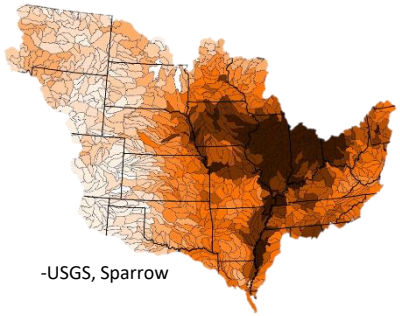
Product 1

Management Need: Measure progress towards the Coastal Goal of the Hypoxia Task Force Action Plan

-Lumcon

Product 2

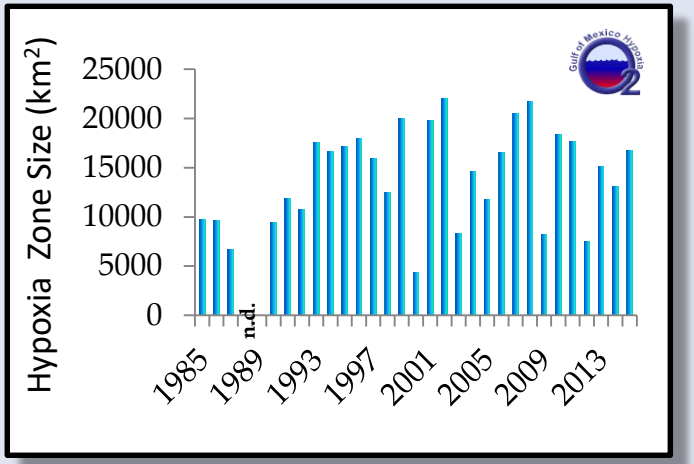
Management Need: Evaluate the overall nutrient reduction required to reduce the hypoxic zone



-USGS, Sparrow

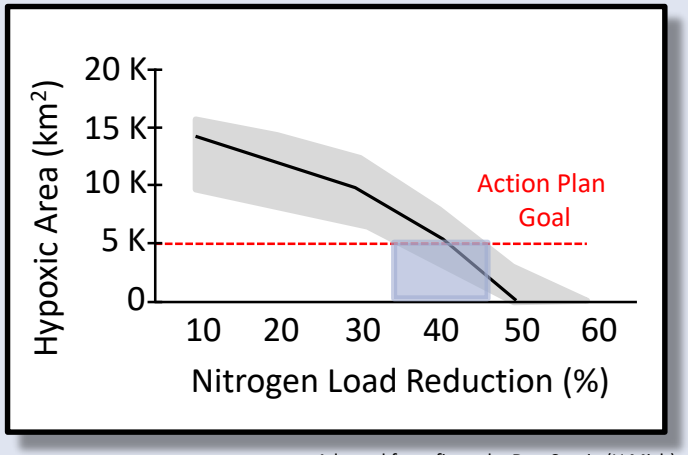
Model Integration / Validation

HTF Goal Metric – Hypoxia Areal Extent



-adapted from data from Nancy Rabalais (LUMCON) & Eugene Turner (LSU)

HTF Guidance on Nutrient Reduction

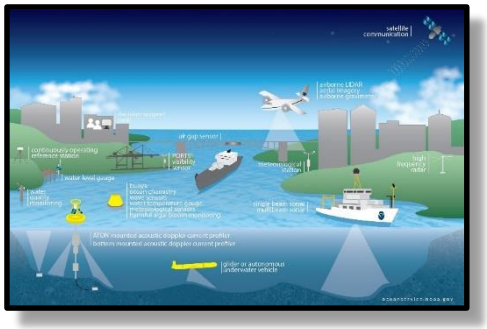


Adapted from figure by Don Scavia (U Mich)

Management Products Informing Mitigation of Hypoxia and its Ecosystem Effects

Product 3

Management Need: Provide comprehensive space/time characterization of hypoxic zone and controlling factors



- NOAA)

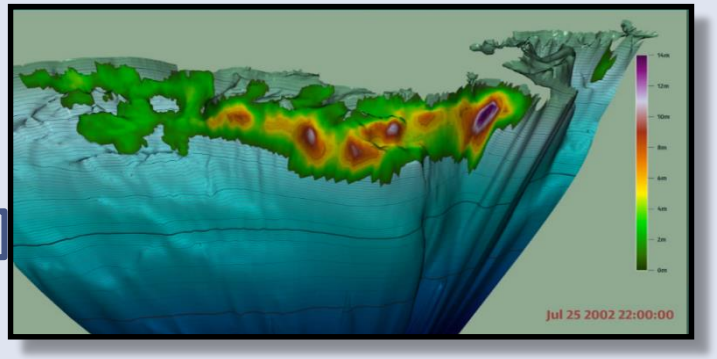
Product 4

Management Need: Determine effects of hypoxia on Gulf of Mexico living resources, habitats, fisheries, economies

- NOAA)

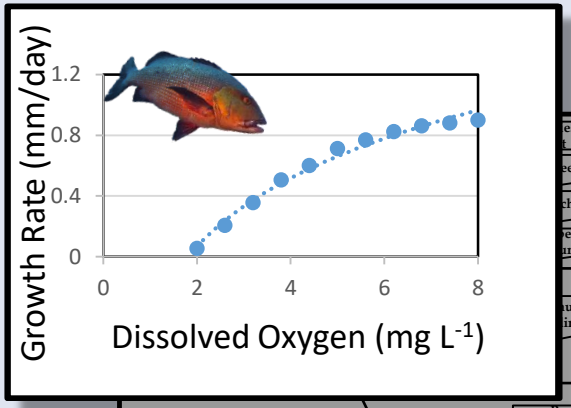
Model Coupling

3-D Time Variable Hypoxic Zone Characterization



-Dubravko Justic (LSU)

Living Resource and Habitat Effects



- Adapted from Szedlmayer et al. 1999

- Kim de Mutsert et al. (Ecopath/Ecosim)

Management Users of FY16 NGOMEX Outputs

1. **Hypoxia Task Force – ecological basis for refining hypoxia mitigation goal**

HTF Action Plan -- Action 5

Action 5 of 2008 Hypoxia Task Force Action Plan:

"Identify and, where possible, quantify the effects of the hypoxic zone on the economic, human and natural resources in the…Northern Gulf of Mexico, including the benefits of actions to reduce nitrogen and phosphorus and the costs of alternative management strategies."

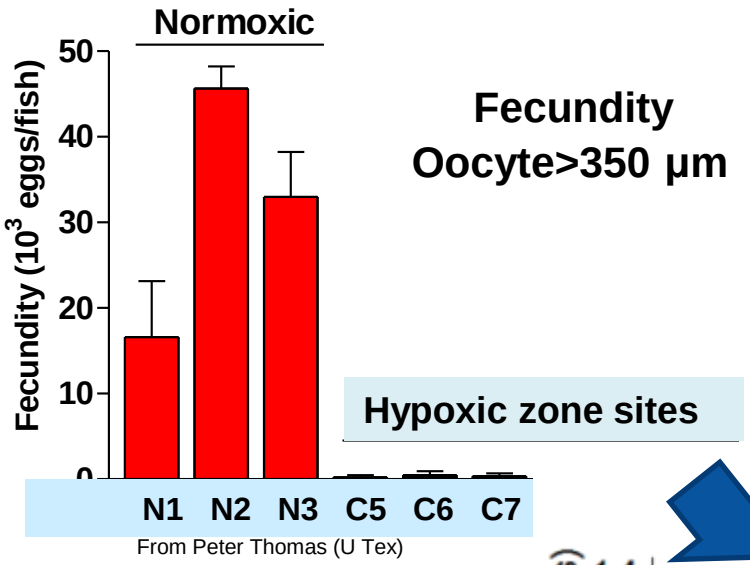
Management Users of FY16 NGOMEX Outputs

1. Hypoxia Task Force – ecological basis for refining hypoxia mitigation goal

2. **Fisheries Managers – population to ecosystem level responses**

Ecological Modeling

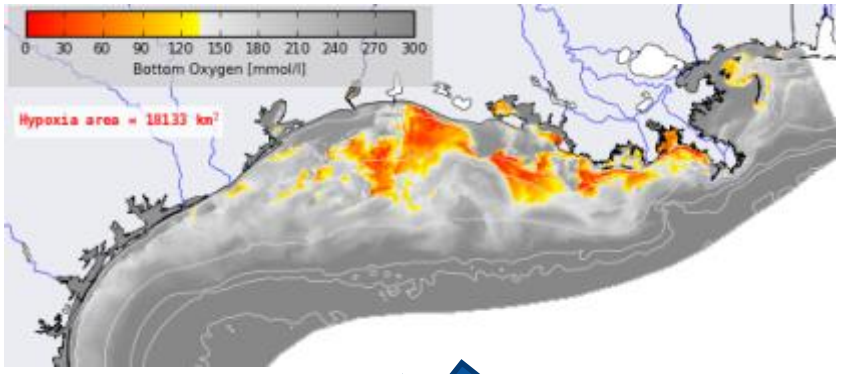
Ecological models developed to predict fisheries responses to hypoxia at population and ecosystem levels



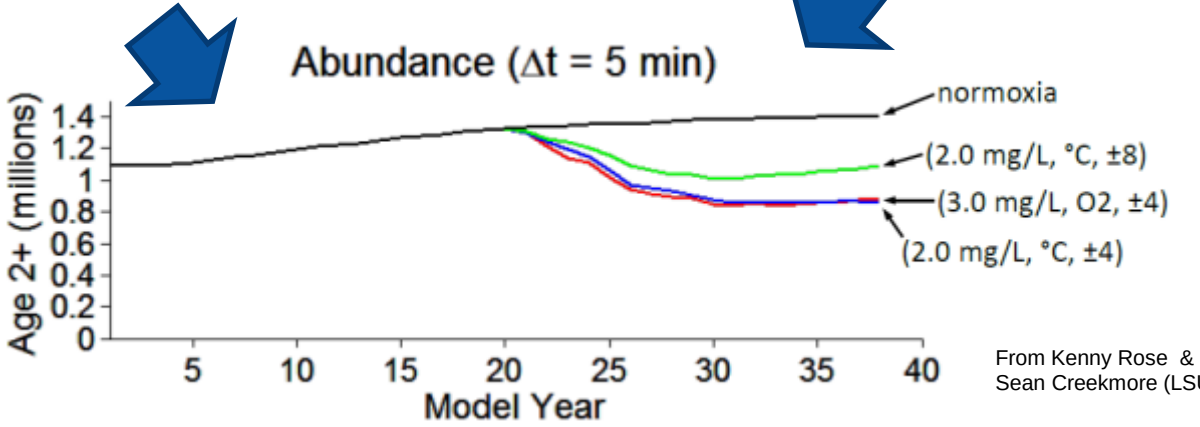
From Peter Thomas (U Tex)

Fecundity
Oocyte>350 µm

From Steve DiMarco (TAMU)



Atlantic Croaker Population Trend Scenarios



From Kenny Rose &
Sean Creekmore (LSU)

Management Users of FY16 NGOMEX Outputs

1. Hypoxia Task Force – ecological basis for refining hypoxia mitigation goal

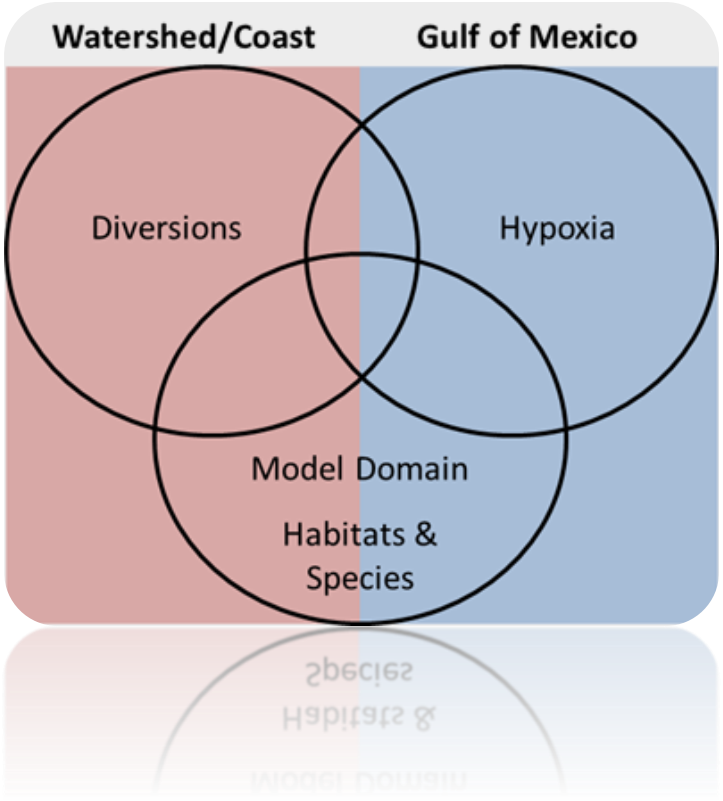
2. Fisheries Managers – population to ecosystem level responses

3. **Diversion Managers – inform adaptive management of fisheries responses to diversions and hypoxia**

Interactive Effect of Diversions and Hypoxia on Fisheries

5th Annual NOAA/NGI Hypoxia Research Coordination Workshop, 14-16 July 2014

- **Proceedings Paper on *Advancing ecosystem modeling of hypoxia and diversion effects on fisheries in the Northern Gulf of Mexico***



NOAA/CPRA Working Meeting on Proposed River Diversion Project Socioeconomic Analysis and Adaptive Management Plan Development

- Workshop Report

FY16 NGOMEX Projects

- ***User-driven tools to predict and assess effects of reduced nutrients and hypoxia on living resources in the Gulf of Mexico***
  - **Lead PI: Kim de Mutsert (GMU)**
  - **Application PI: Matt Campbell (NMFS)**
  - **co-PIs: Stephen Brandt (Oregon St), Joe Buszowski and Jeroen Steenbeek (Ecopath International Initiative), Arnaud Laurent (Dalhousie), Kristy Lewis (GMU)**

- ***Synthesis and integrated modeling of long-term data sets to support fisheries and hypoxia management in the Northern GOMEX***
  - **Lead PI: Dan Obenour (NCSU)**
  - **Application PI: Kevin Craig (NMFS)**

- ***Using linked models to predict the impacts of hypoxia on Gulf Coast fisheries under scenarios of watershed and river management***
  - **Lead PI: Kenny Rose (LSU)**
  - **Application PI: Kevin Craig (NMFS)**
  - **co-PIs: Haosheng Huang, Dubravko Justic, and George Xue (LSU), Ehab Meselhe (TWIG), Hanqin Tian (Auburn)**