



# National Oceanic and Atmospheric Administration's Framework for Advancing Ecological Forecasting

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MEOPAR/MEAP-TT Workshop Program  
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Halifax, NS

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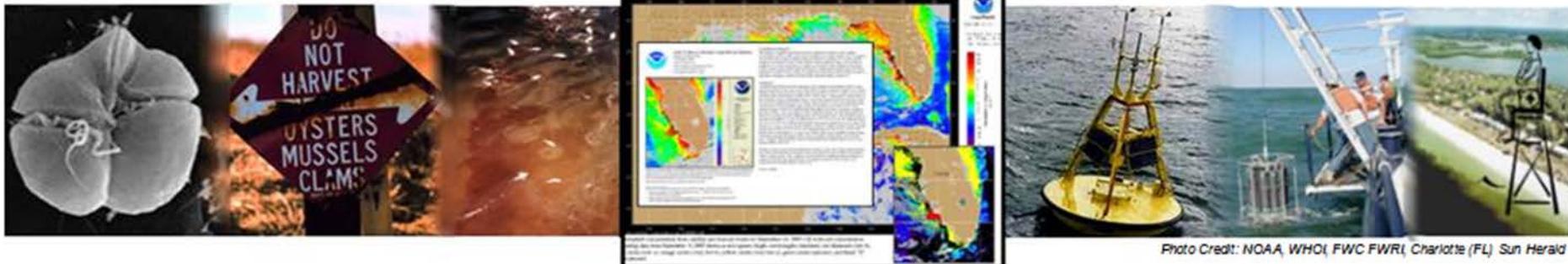


Photo Credit: NOAA, WHOI, FWC FWR, Charlotte (FL) Sun Herald



# NOAA Ecological Forecasting Roadmap: Missions Supported

*"Our job is to build an understanding of the Earth, the atmosphere, and the oceans to transform that understanding into critical environmental intelligence: timely, actionable information, developed from reliable and authoritative science, that gives us foresight about future conditions"*

Dr. Kathy Sullivan  
NOAA Administrator

## Legislation and Executive Mandates Pertinent to the Ecological Forecasting Roadmap

- NOAA Administrative Order 216-108 "Requirements Management"
- Harmful Algal Bloom and Hypoxia Research and Control Amendments Act of 2014 (Public Law 113-124)
- Chesapeake Bay Executive Order
- The Coastal Zone Management Act
- Coral Reef Protection Executive Order/Coral Reef Conservation Act
- Magnuson-Stevens Fishery Conservation and Management Reauthorization Act
- Clean Water Act
- National Marine Sanctuaries Act
- Marine Mammal Protection Act

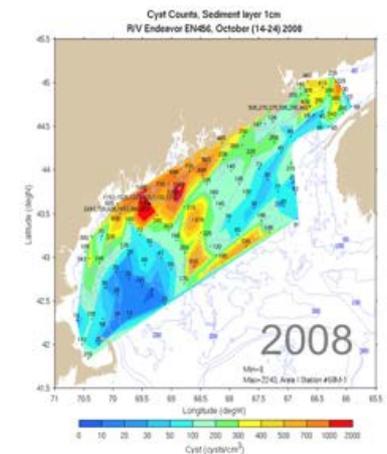
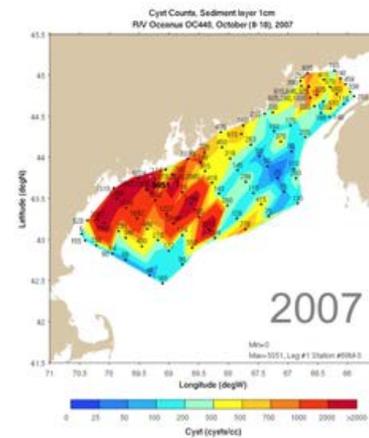
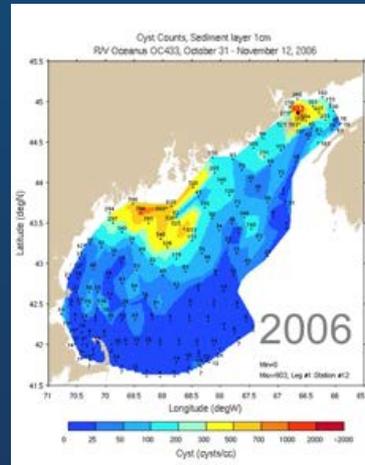


Credit: NOAA



# NOAA's Ecological Forecasting Roadmap: What we will achieve

- Strong science to enable delivery of forecasts
- Delivery of more products and services building on existing NOAA and partner capacity
- Delivery of more consistent, efficient, reliable, and national forecasts (tailored to region-specific needs)



# Ecoforecasting In Action: HABs



## Toledo's water crisis



An algal toxin in Lake Erie contaminated the drinking water used by Toledo and many of its suburbs in August, 2014. It prompted a "do not drink" advisory for parts of three days and fueled public discussions about what created the problem and how to prevent it from happening again.

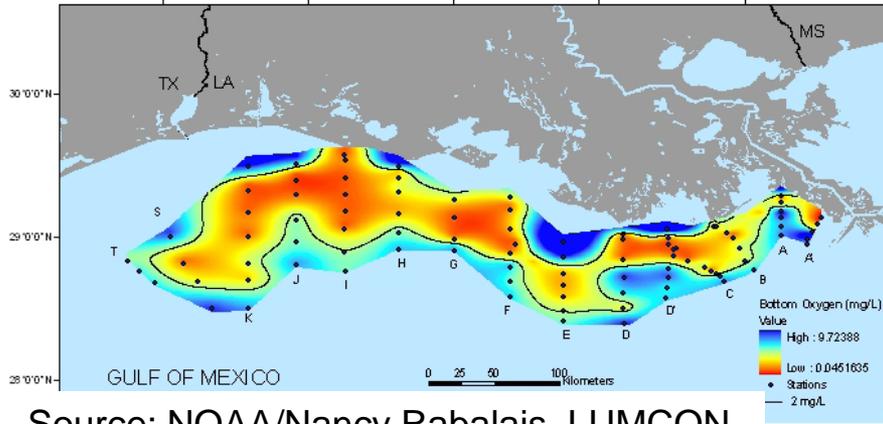
**Saturday, Aug. 2: City issues 'do not drink' water advisory**

**Over a half million people impacted by "Do Not Drink Advisories" in Northwest Ohio and Southeast Michigan.  
(August 1-3, 2014)**



# Three Largest Hypoxic Zones in US

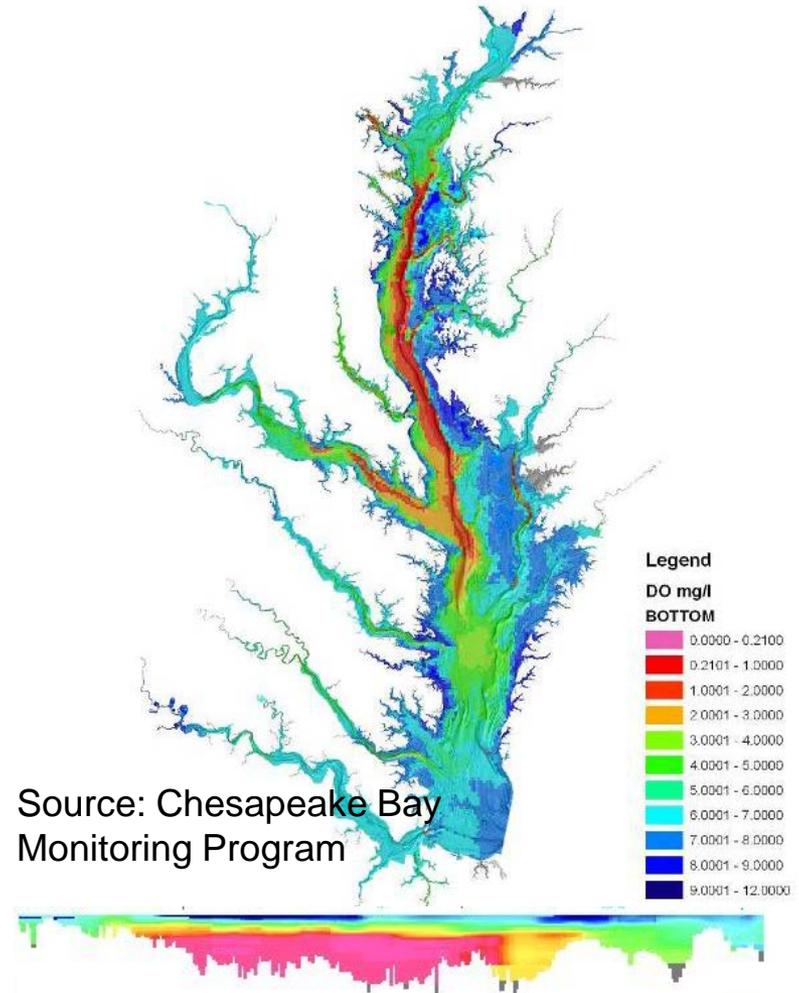
## Gulf of Mexico



Source: NOAA/Nancy Rabalais, LUMCON

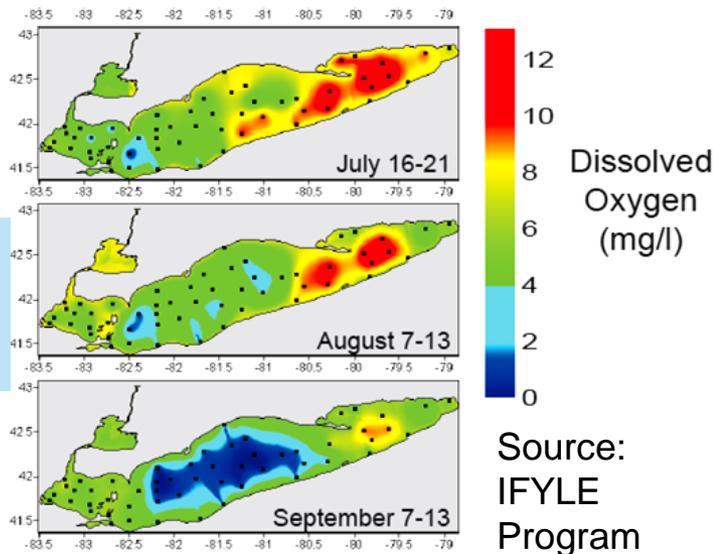
## Chesapeake Bay

Mean Summer Bottom DO - 2006



Source: Chesapeake Bay Monitoring Program

## Lake Erie

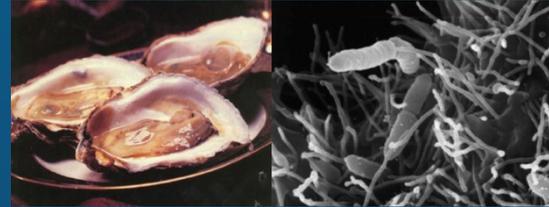


Source: IFYLE Program



# Vibrio

*Vibrio cholerae*



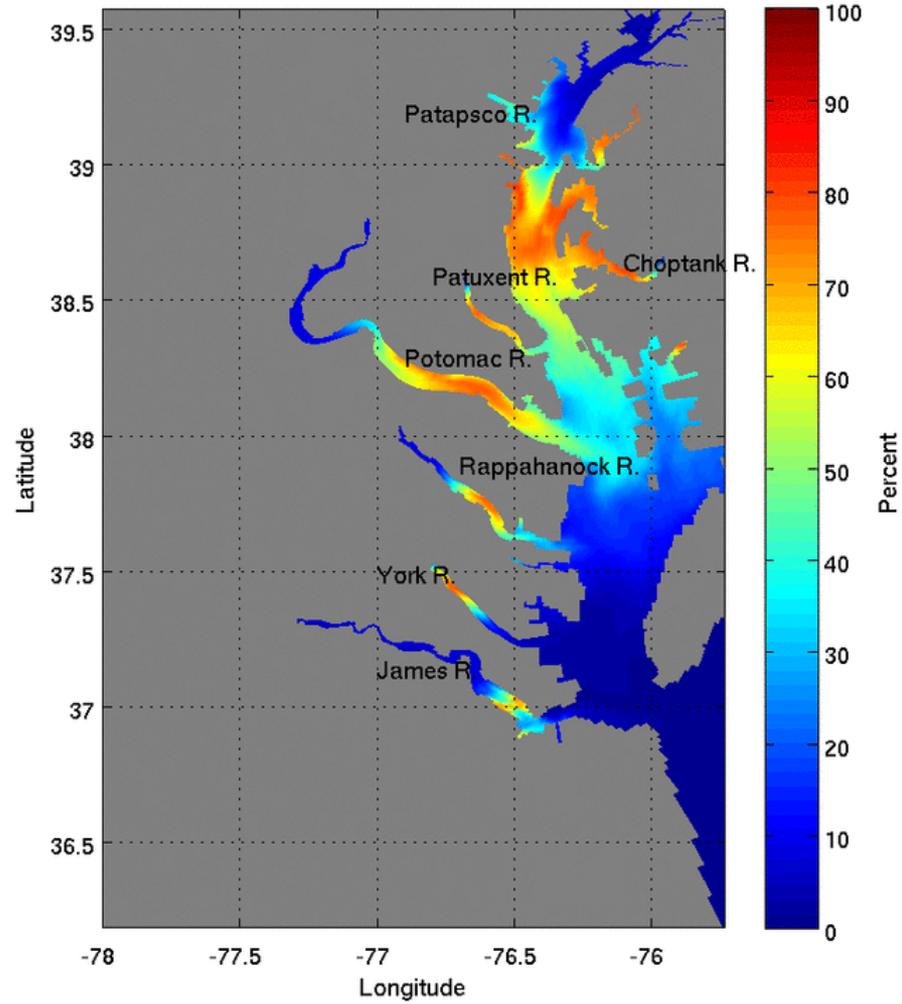
*Vibrio parahaemolyticus* (Vp)  
*Vibrio vulnificus* (Vv)



- Naturally occurring bacteria in coastal waters
- Vv responsible for 95% of all seafood related mortality
- Vp estimated at 80,000 cases per year
- Over \$300 million annually in health care costs alone.



Probability(%) of *Vibrio vulnificus* in the Chesapeake Bay  
CBOFS Model Run:20130709/0000 Daily Forecast for:20130709





# Habitat Science and EcoForecasting

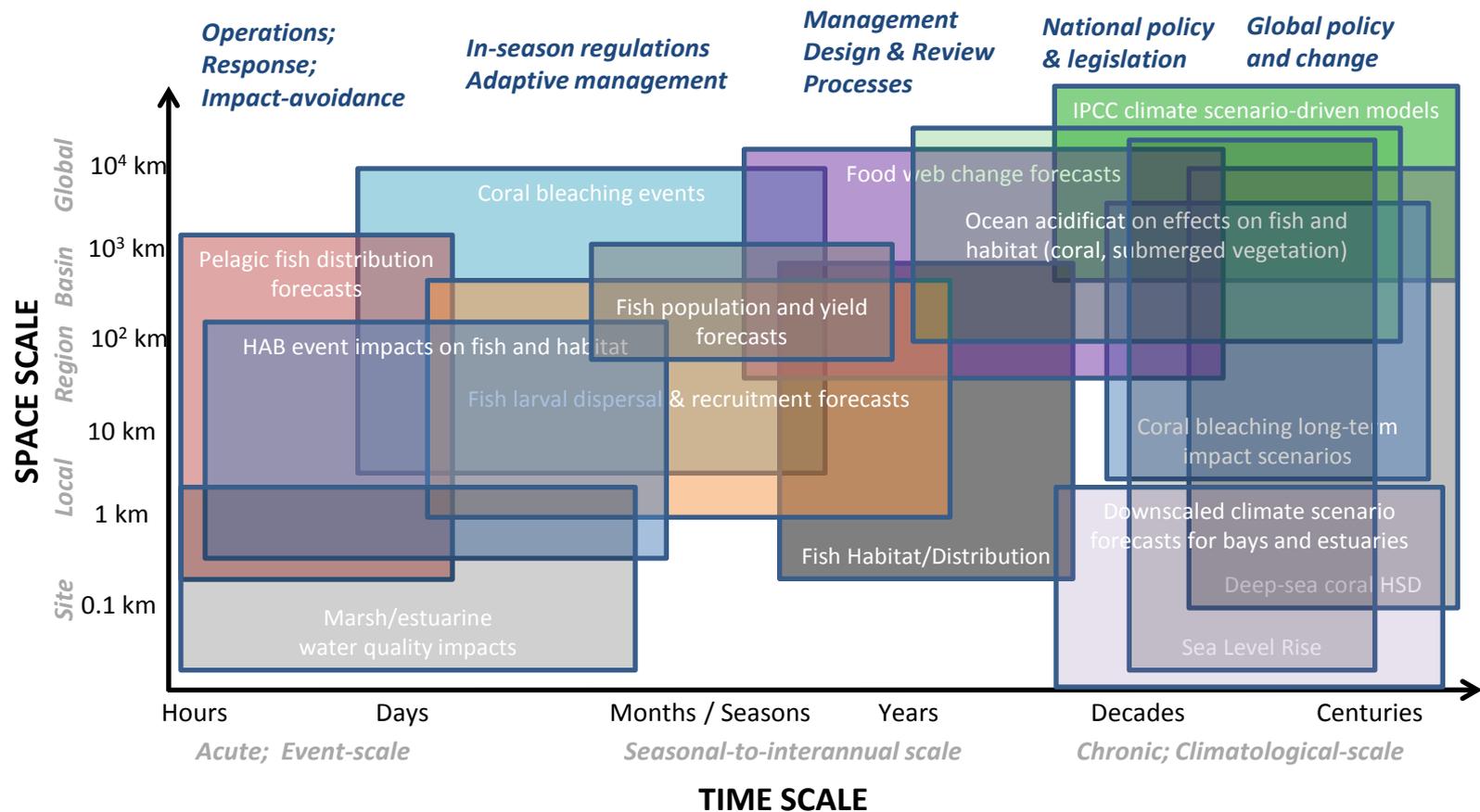
- Purpose: To understand & forecast how changes in benthic & water column habitats impact species' distribution & abundance.
- Requires focused efforts on scenario-based forecasting across multiple spatial & temporal scales due to the magnitude & complexity of habitat modifications.
- Utilize NOAA investments in computational capacity to develop models and to store and deliver results.



# Wide Range of Space and Time Scales, Linked to Different Forecast Needs



## MANAGEMENT INFORMATION NEEDS:





# COMT

*Mission: To use targeted research and development to accelerate the transition of scientific and technical advances from the coastal and ocean modeling research community to improve identified operational ocean products and services (i.e. via research to operations and also operations to research).*

*Vision: A National Coastal and Ocean Modeling Testbed to enhance the accuracy, reliability, and scope of the federal suite of operational ocean modeling products, while ensuring its diverse user community is better equipped to solve challenging coastal problems and recognize the COMT to be where the best coastal science is operationalized.*

# COMT Role

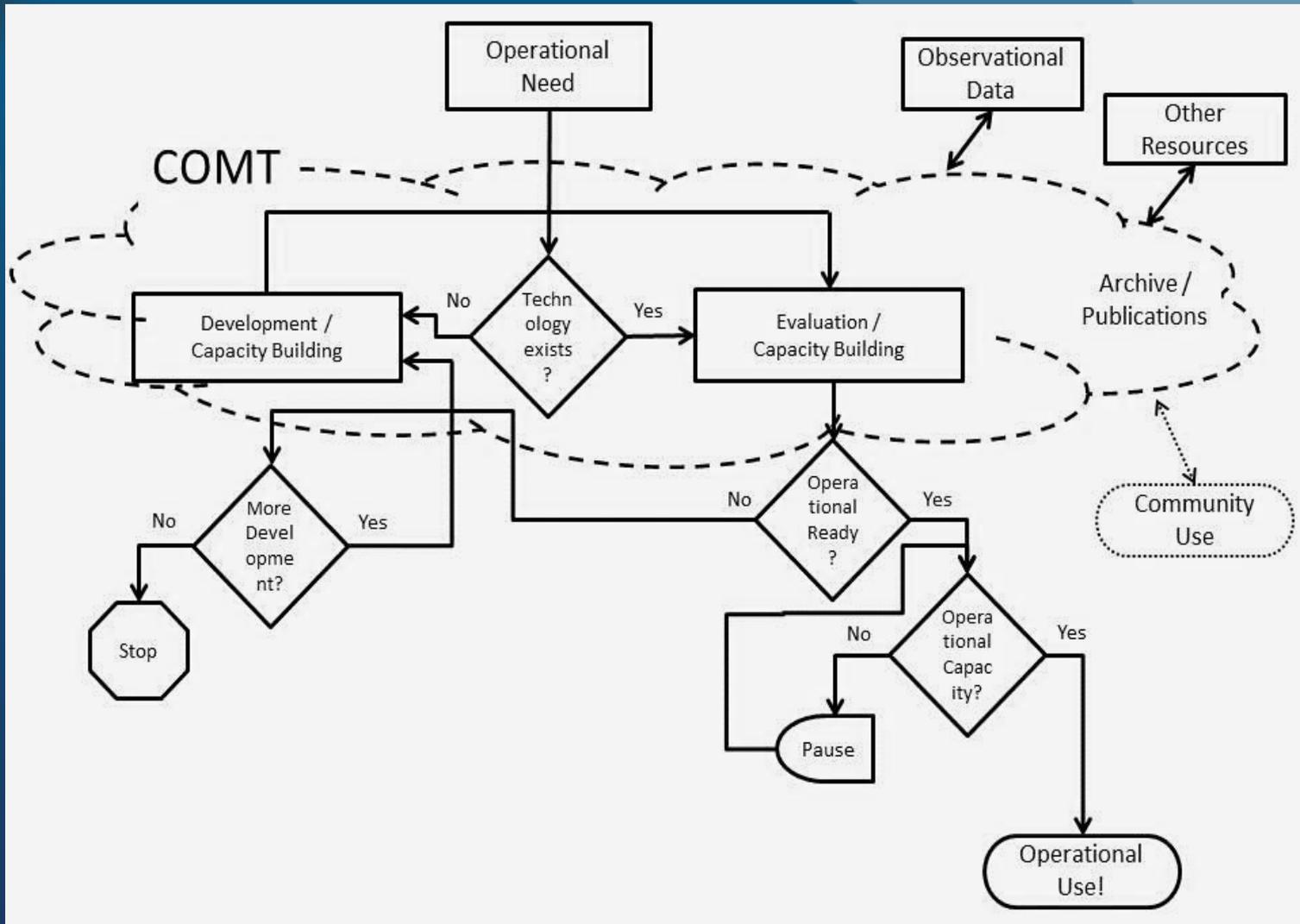


Figure by R. Luettich



# COMT Ongoing Goals

1. Advance common infrastructure for access, analysis and visualization of all ocean model data produced by the Federal Backbone and the IOOS Regions
2. Improve R2O and O2R by building stronger relationships between academia and operational centers through collaboration
3. Advance skill metrics and assess models in different regions and dynamic regimes
4. Transition models, tools, toolkits and other capabilities to federal operational facilities
5. Allow for both continuity of effort and new projects

# Cyberinfrastructure for COMT

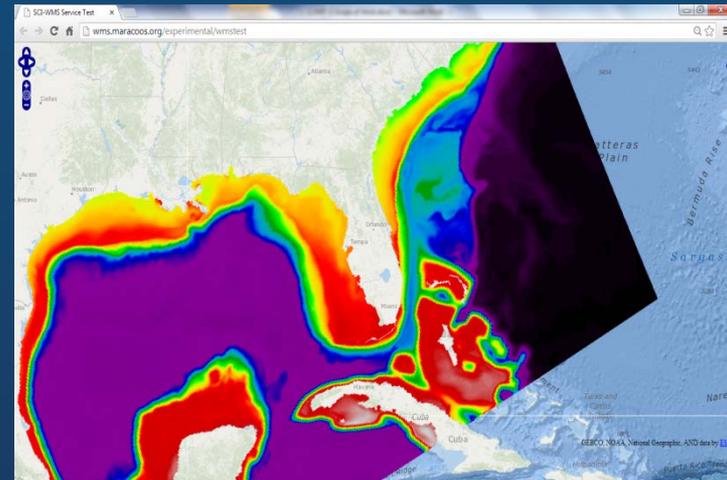


## Objective:

- Improve function and performance of SciWMS so it can be used to visualize all compliant model results and observational data stored on the COMT archive server
- Develop a SciWMS based web client to perform the visualization

## Infrastructure and Transition:

- IOOS Catalog coordination
- Visualization tools



SciWMS image below for Ruoying He's model rendered directly from a DAP server.



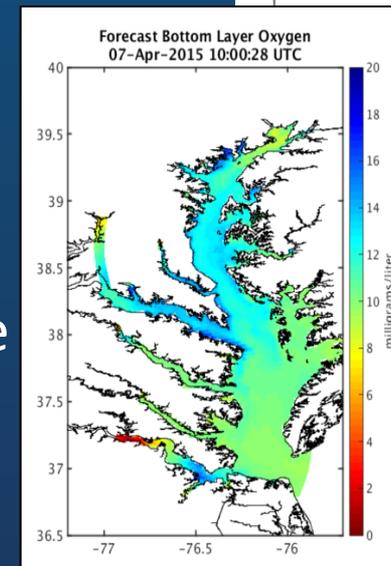
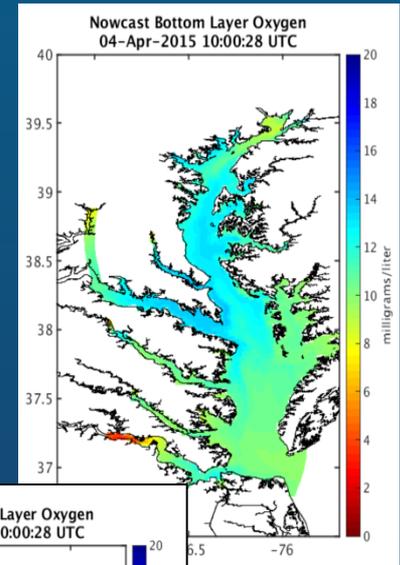
# Transitioning an Estuarine Hypoxia Model to Operations in the Chesapeake Bay

## Objective:

Assess suite of estuarine dissolved oxygen models to make recommendations for producing predictions of hypoxia within Chesapeake Bay

## Infrastructure and Transition:

- Code is ready for testing
- Learning the requirements for transition
- Connecting to CO-OPS development cycle
- Part of pilot for EFR Hypoxia Team





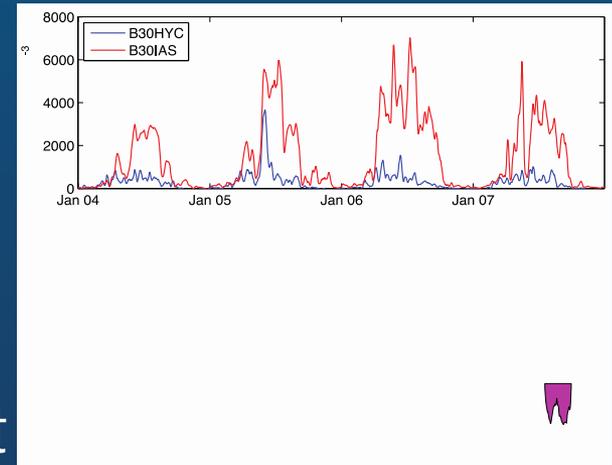
# Seasonal and Short-term Forecast System and Nutrient Load Scenarios for Hypoxia Prediction in the Northern Gulf of Mexico

## Objective:

Implement and demonstrate a real-time hypoxia forecasting system applicable to the hypoxia-prone Northern Gulf of Mexico.

## Infrastructure and Transition:

- NOAA, EPA and ONR engaged in process
- NCCOS coordinating COMT work as it funds complimentary work and plans out year work
- EFR Pilot project in planning process



Fennel et al. JGR SURF issue (2013)

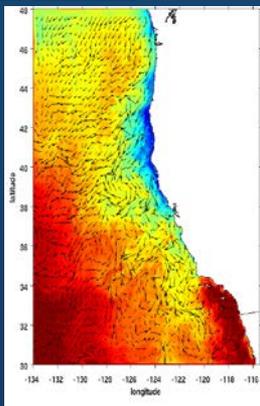
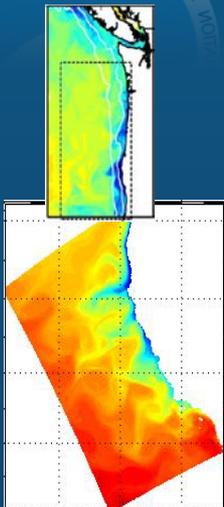


# The West Coast Project

Part of a larger NOAA development project for a West Coast Ocean Forecast System (WCOFS)

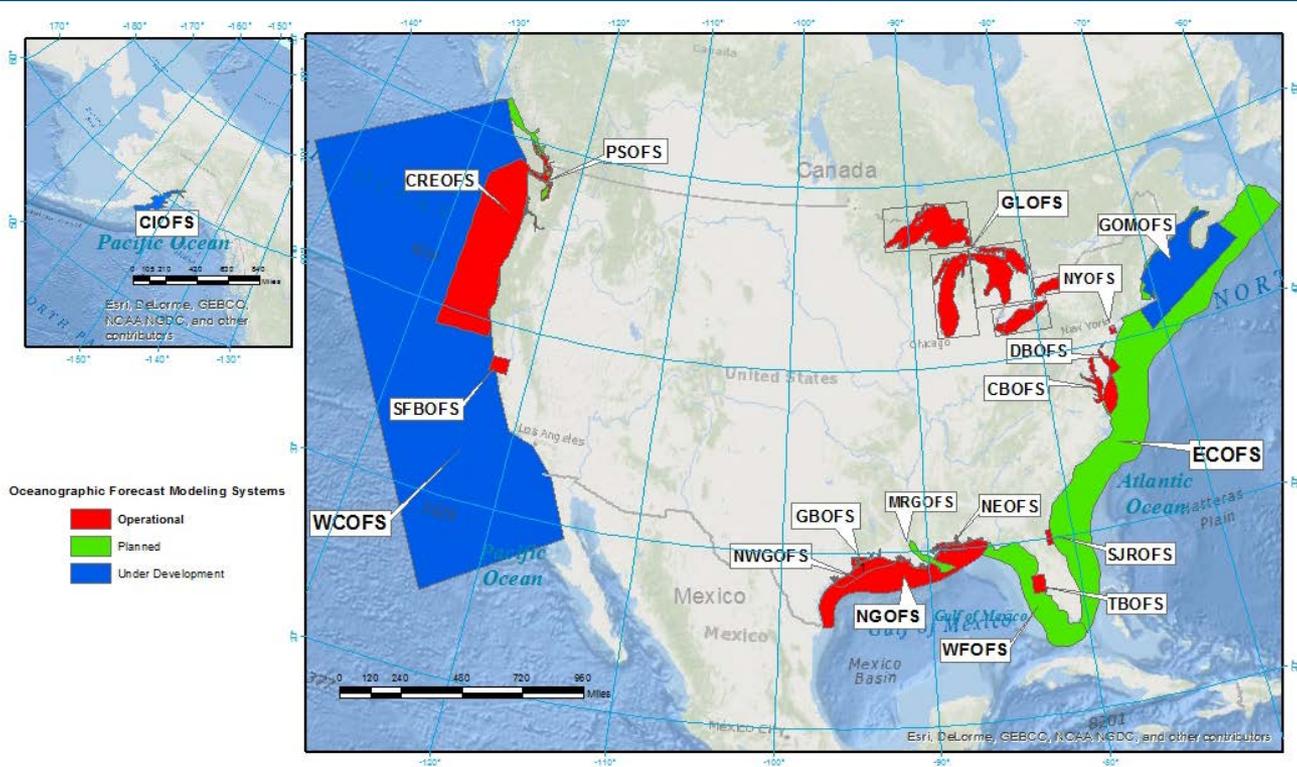
Objectives are to:

- Compare 3 ROMS based models as a step toward a coordinated super-regional modeling capability for the U.S. West Coast.
- Compare performance of 3 different bio-chemical models (NPZDO, NEMURO, COSINE) within a single ROMS domain.





# NOS OFS Plans



## NOAA/National Ocean Service Operational Coastal Modeling Implementation Strategy

*Subject to Revision by NOS Management Based Upon Stakeholder Needs & Budget Opportunities.  
December 2014*



# EFR and COMT Future

- Connect with global partners (ie. MEAP) to share requirements and strategies
  - DA techniques
  - Obs validation
  - Downscaling BGC models
- Establish EFR and COMT as sustained NOAA capacity
- Improve coordination among NOAA partners to enable transition and implementation
- Connect with other agencies addressing coastal processes



# Questions?

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Photo Credit: NOAA, WHOI, FWC FWR, Charlotte (FL) Sun Herald