



Hurricane Science in NOAA

Richard W. Spinrad, Ph.D
Assistant Administrator
NOAA Research

Robert Atlas, Ph.D
Director
NOAA Research

Atlantic Oceanographic and Meteorological Laboratory



NOAA Activities Supporting Hurricane Science

- Weather Forecasts and Warnings
–underlying applied research
- Climate – analysis and forecasting
- Ecosystems – research and assessment
- Commerce and Transportation – research, analysis, and navigation

NOAA is an operational service agency with supporting research

Preparation

Outreach & Education
Disaster Preparedness
Hazard Assessment
Continuity of Operations Planning

Timeframe:
Ongoing

Forecasts & Warnings

Media, Federal, State, and Local Outreach & Communication
Weather Monitoring
Hurricane Forecasting
Pre-disaster Readiness

Timeframe: Starts at identification of tropical depressions

Response

Damage Assessment
Updated Navigational Aids
Living Marine Resources Assessment
Employee Tracking and Support
NOAA Infrastructure Assessment

Timeframe: Event through 1-2 months following

Rebuilding

Update Management Plans for Trust Resources
Support for Community Rebuild
Ongoing Employee Support
Repair Impacted NOAA Facilities

Timeframe:
Months to years

These are critical services in case of hurricanes and other natural and human-induced disasters

“Grand Challenges for Disaster Reduction”

National Science and Technology Council



- Provide hazard and disaster information where and when it is needed.
- Understand the natural process that processes that produce hazards
- Develop hazard mitigation strategies and technologies
- Recognized and reduce vulnerability of interdependent critical infrastructure
- Assess disaster resilience using standard methods
- Promote risk-wise behavior

NOAA Hurricane Products and Activities



- Operational Hurricane Products
- Joint Hurricane Test Bed
- Previous Hurricane Season Critical Review
- Hurricane model development
- Experimental Products
- Hurricane Awareness Tours
- Seasonal Outlook
- WFO/RFC Special Products and Outreach

The Hurricane Team



Team NOAA

- NWS
- NESDIS
- OAR
- NOS
- NMAO
- NMFS
- CIO
- Others

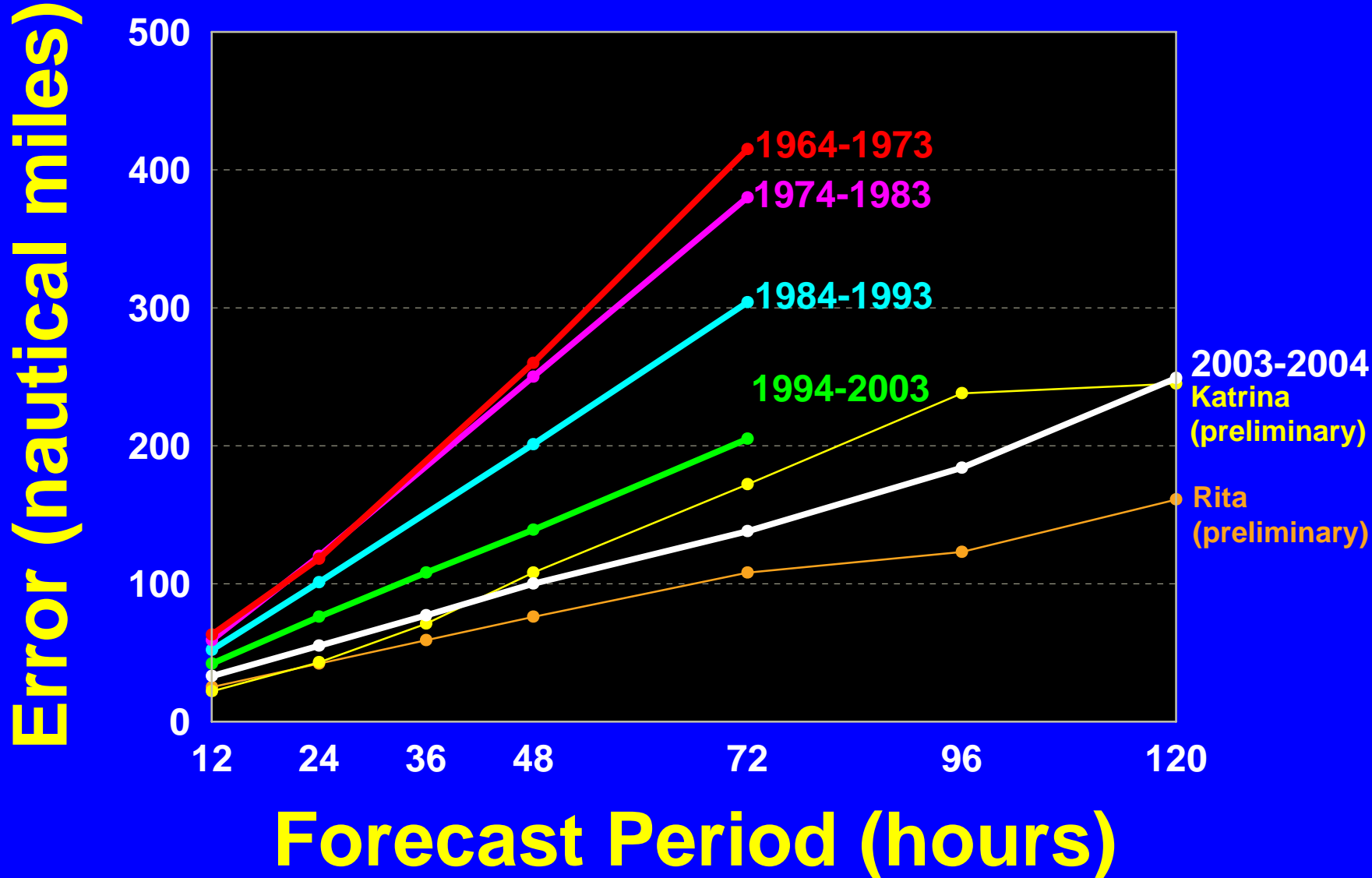
The Larger Team

- USAF Reserve
Hurricane Hunters
- NIST
- Academia
- Private Sector
- Media
- Emergency Managers
- Responders
- Public
- ***Research in support of hurricane forecast improvements – history of close coordination with NASA and NSF***

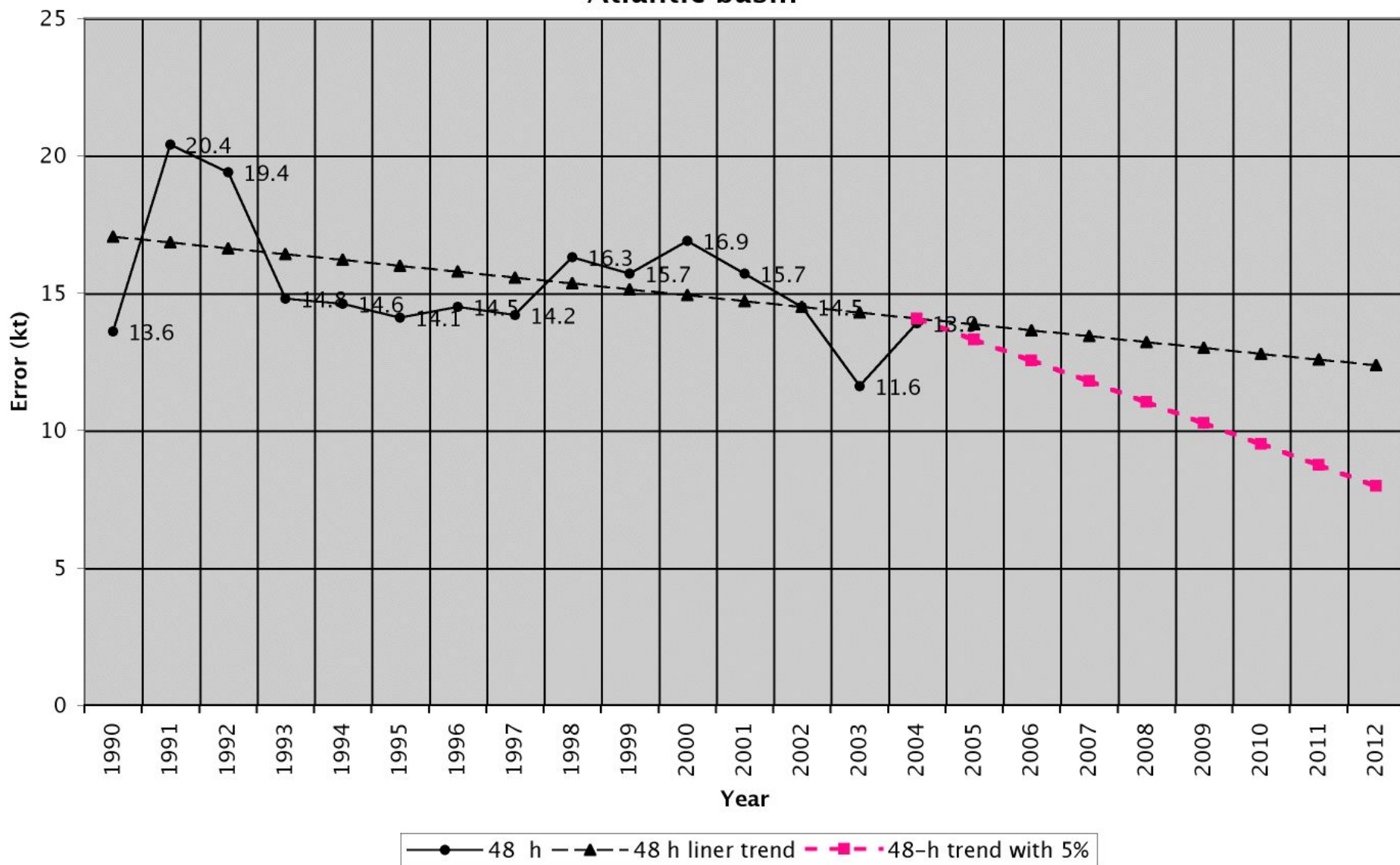
Hurricanes and NOAA's Mission



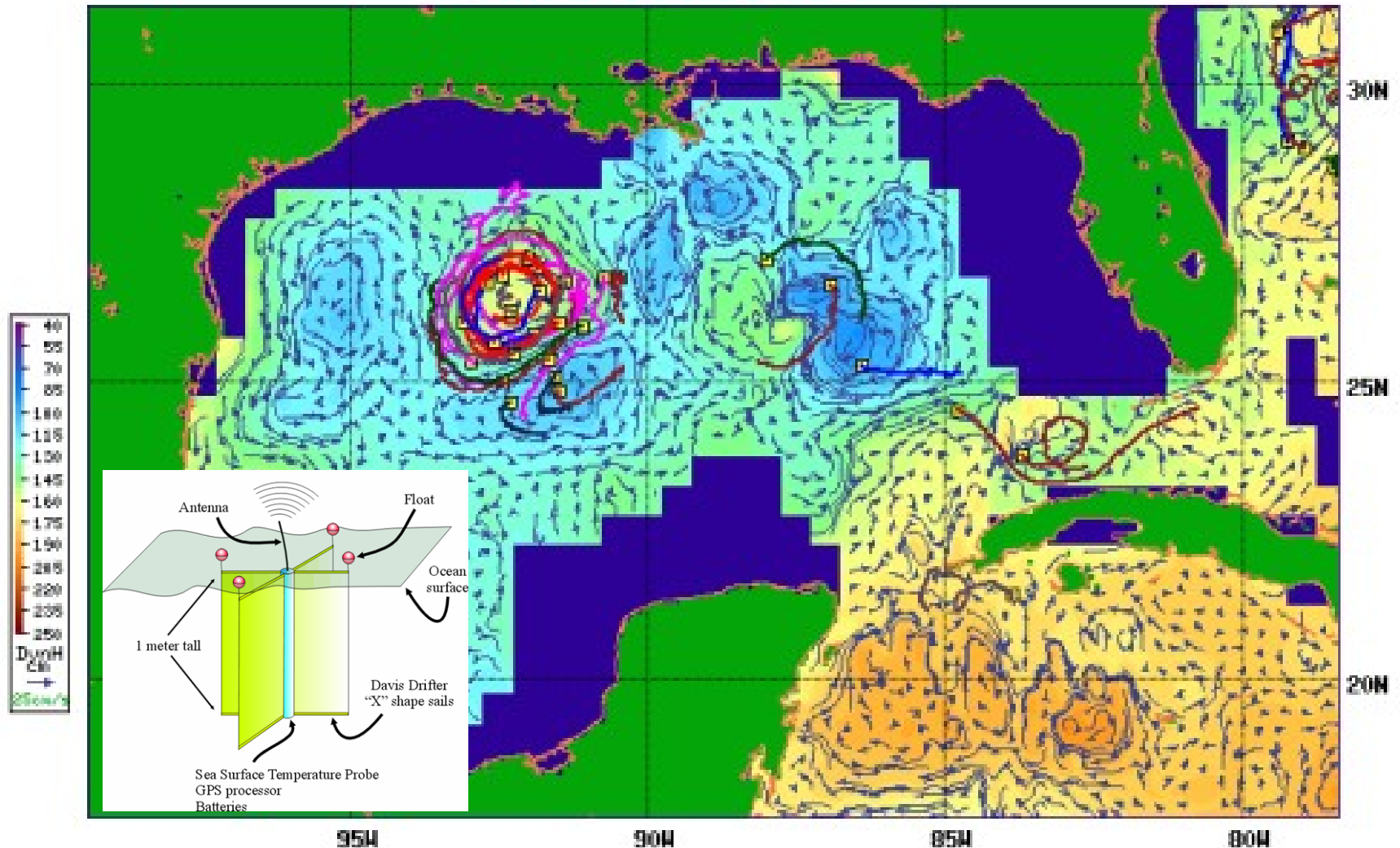
NATIONAL HURRICANE CENTER ATLANTIC TRACK FORECAST ERRORS



Tropical Prediction Center Performance Measure
Yearly-average official 48-hour intensity forecast error,
Atlantic basin



Oceans Modeling of Water Mass Movements



CODE Drifter

Wetlands Inundation

Southeast Louisiana and Western Mississippi Inundation Hurricane Katrina



Land Cover Change



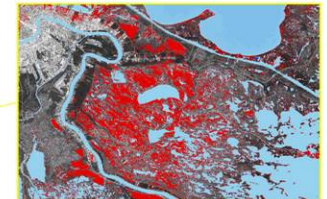
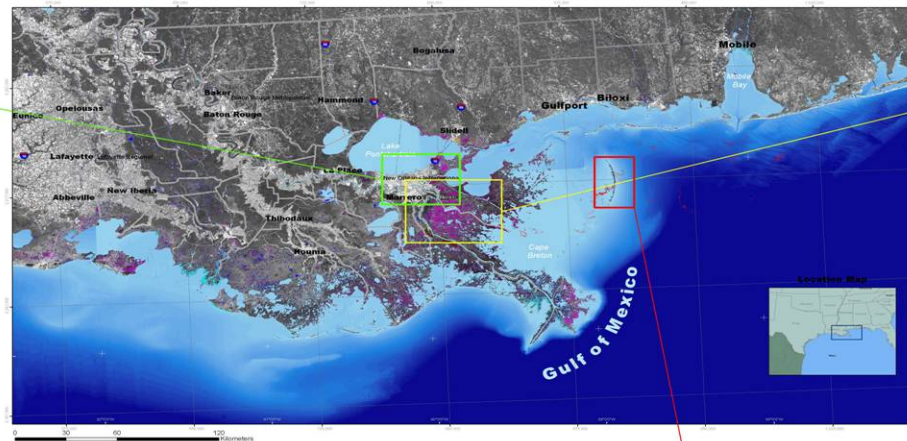
Landsat Enhanced Thematic Mapper (ETM), August 31, 2005



Landsat ETM, June 19, 2005

New Orleans

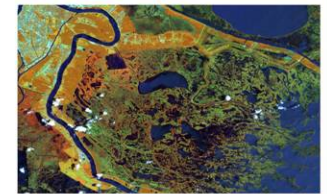
The above example of downtown New Orleans shows the extent of flooding that occurred within the city. Low-lying developed features, such as parks and streets, are clearly flooded. Twenty-three square miles of developed features were so inundated they are captured as water features in this analysis and can be seen in red within the figure at the top.



Land Cover Change



Landsat ETM, August 31, 2005



Landsat ETM, June 19, 2005

Breton Sound

Louisiana's Breton Sound area shows a large area of Hurricane Katrina's impact to the state's emergent (or above herbaceous) wetlands. This area is one of the largest affected wetlands within this study. Newly formed areas of open water are clearly visible within the post-Katrina imagery. Flooded areas of wetlands (shown in red) could result in potential loss, thinning, or displacement of these wetlands.



Landsat ETM, June 3, 2005

C-CAP Baseline Land Cover 2001

Landsat ETM, August 31, 2005

Land Cover Change

Chandeleur Islands

The example above, off the coasts of Louisiana and Mississippi, shows dramatic areas of emergent wetland and unconsolidated shoreline loss surrounding the Chandeleur Islands. A large amount of floating rack is also clearly visible (shown in red) in the days immediately following Katrina.

Ecosystems



**Looking for Evidence of
Potential Movement of Toxics &
Pathogens**

Pollution Issues Subject to Sampling

- Hydrocarbon releases along the lower Mississippi River and from sunken vessels
- Toxics and pathogens from pumping out New Orleans
- Large numbers of sunken vessels inshore of Mississippi Sound
- Contents of storm surge waters
- Offshore releases



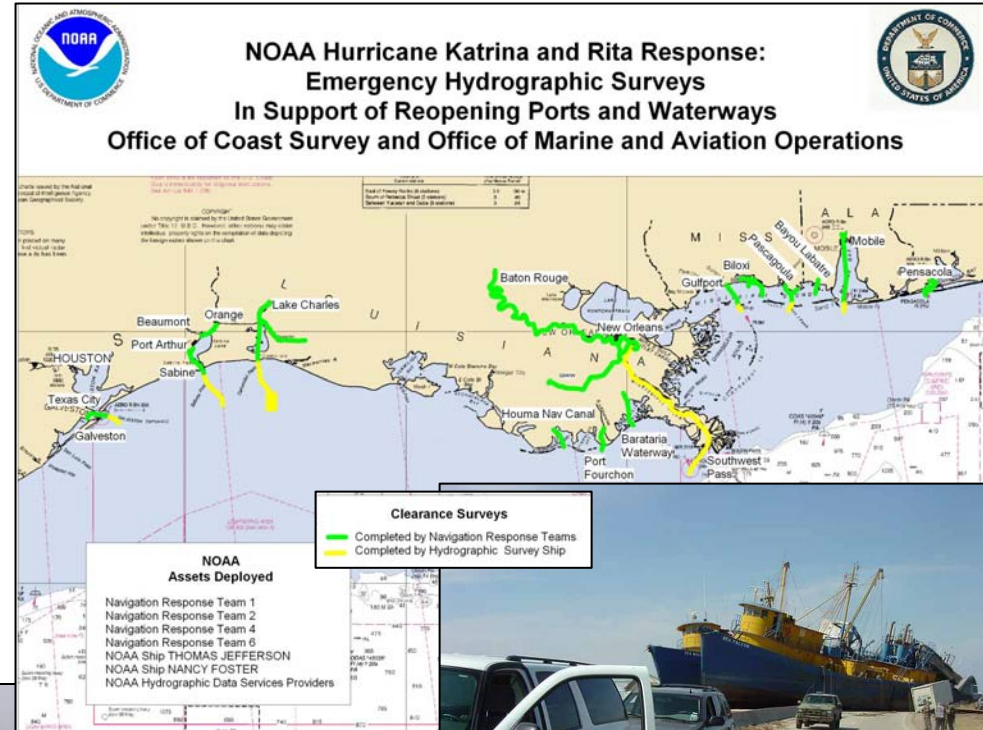
Ecosystem/Fisheries Issue from Katrina



- Interagency coordination of toxics/pathogens sampling and public release of findings – EPA, FDA, USGS, US Army Corps
- Rebuilding Gulf fisheries needs to be on a sustainable basis (many fisheries were overcapitalized before *Katrina and Rita*)
- Rebuilding fisheries must be done within existing Regional Institutions (Gulf States Marine Fishery Commission, Gulf of Mexico Fishery Management Council, State Agencies, other collaborative groups)
- Will build upon long standing partnerships for wetlands restoration (CWPPRA in LA), similar governance model could be applied to MS, AL, TX, and FL

Commerce and Transportation

- Navigation Response Teams, NOAA ships (*Nancy Foster* and *Thomas Jefferson*) and contract vessels surveyed rivers and ports to ensure waterways were clear of hazards
- Surveys allowed critical ports and harbors to open to commercial and emergency vessel traffic sooner



Socio-Economic Assessments



Re-evaluate up-to-date, community-level information for measuring impacts on:

- Local and regional socioeconomic conditions
- Local and regional demographic trends
- Nature and extent of local and regional involvement in fishing, oil/gas, tourism, other industries
- Social and economic relationships between Gulf communities
- Use, and by extension availability, of inshore, near-shore, and offshore marine resources for commercial and recreational purposes
- Fishing and marine-specific service and physical infrastructure
- Socio-cultural aspects of life in Gulf communities

Conducting surveys to assess losses of infrastructure in affected communities

Improvements Underway



- Continue work to improve response to warnings
- Continue to improve hurricane intensity and storm surge models
 - External (to NOAA) Hurricane Intensity Working Group to provide report to NOAA by this summer
- Update NOAA disaster response plans to include necessary ecosystem assessments
- Continue to strengthen internal communication
- Strengthen connections between HAZMAT and HAB responses and large-scale environmental models