NOAA-NASA Workshop, 3-5 May 2006, Monterey, CA

An Ecosystem Approach to Management (EAM)

Russ Beard, Director Ecosystem and Liaison Office
NOAA’s National Coastal Data Development Center (NCDDC), Stennis Space Center
NCDDC: Location

• Located at the Stennis Space Center, Mississippi
  – A unique ‘Federal City’
  – Home to more than 40 Federal & State Agencies
    ▪ NOAA
      ▪ NWS, NMFS, NESDIS, NOS
    ▪ NASA, Navy, Coast Guard
    ▪ EPA, USGS
    ▪ Contractors & Vendors
    ▪ Small Business Incubator’s
    ▪ Universities
    ▪ Future site of the new NOAA OAR Cooperative Institute.
Moving NOAA towards a Functional Ecosystem Approach to Management

Workshop Summary and Initial Action Plan

December 2005

Seven Actions Developed
Action 1
EAM In-reach: Build internal awareness and support for EAM, with the endpoint of a common understanding of EAM, and eventually, establishing a new way of doing business at NOAA

Action 2
Establish an expert EAM Team at NOAA

Action 3
Establish an EAM-dedicated regional NOAA presence*

Action 4
EAM Team: Develop guidance and processes to support EAM implementation – regional approaches, stakeholder analysis, and issue identification*

Action 5
Build awareness, support, and a “directive” for EAM from NOAA leadership

Action 6
Engage federal agency partners on EAM issues and a management framework*

Action 7
Develop an EAM-dedicated data management, analysis, and visualization capability at NOAA*

* Today’s focus addresses Actions 3-4, and 6-7
EOP FY2008 PBA Best Program Alternative – Integrated Ecosystem Data Management

“This proposal recommends that the GOM serve as a regional demonstration for a Large Marine Ecosystem (LME) in which to implement and build off existing integration efforts.” FY08 EOP PBA

- Standard Metadata system needs
- Regional/National Data Archive System
- Technology Refreshment
- Data Information System
- Information access & dissemination
- S&T IT architecture upgrade and maintenance
- Interoperability
Regional Ecosystem Concept- Beta Website

- Purpose is to provide access to data for delineation of the regional ecosystem and integrated data management:
  - Ecosystem Programs Data
  - Environmental Indicators/Projects
  - Regional Observing Systems Data
  - GIS Mapping
  - Data Search
  - Other Links
  - Feedback
- Initial Data Sets: Fisheries and Water Quality

https://test.ncddc.noaa.gov/CMECS

Partners- Southeast Fisheries Science Center, MDMR, NRL, NASA ASP, EPA GOMP, MDEQ, NMFS/CSC technical advisor (Dr Becky Allee)
Ecosystem Programs

- Provides entry point into the Ecosystem Goal Team Web Site &
- Entry points into the 9 Ecosystem Goal Program web sites

Ecosystem Goal Team web site provides access to its mission statement, regional ecosystem locations, ecosystems programs, budget requests...
To Learn more...

Aquaculture Program
The Aquaculture Program is a matrix-managed, multi-line office program established in 2003 to develop a science and technology based regulatory framework for a well-managed and productive...
To Learn More

Coastal & Marine Resources
The Coastal and Marine Resources Program (CMRP) helps federal, state, local, and international managers to protect, restore, and use coastal ecosystem services. CMRP promotes a comprehensive approach to balance...
To Learn More

Corals
NOAA has significant responsibilities to conserve and manage coral reef resources as outlined in legal and administrative mandates and international treaties. NOAA works closely with other Federal agencies, state and territory...
To Learn More

Ecosystem Observations
NOAA’s Ecosystem Observation Program (EOP) is designed to be a coastal and oceanic ecological observing system that supports the programs in the Ecosystem Goal. It provides information on...
To Learn More
• Provides access to specific projects developed to assist/inform users of specific environmental indicators or programs.
Link to ...Katrina Impact Assessment Post-Katrina Turbidity Product (NASA ASD)

Environmental Indicators/Projects

The Katrina Impact Assessment Project is a cooperative effort whose objective is to assess and monitor the environmental and physical impact of Hurricane Katrina on the ecosystems.

Aqua false color 7 Sep – light plumes
TSM

Terra 24 Oct post-front re-suspended sediment
Regional Observing Systems

Provides access to Regional Observing Systems Data Nodes and Websites

- Gulf of Mexico Coastal Ocean Observing Systems (GCOOS)
- EOP Observing Systems
- COOS (NCDDC)

GCOOS
Many organizations and individuals are concerned with sustained observations and/or products and services based on such observations from the estuaries and Exclusive Economic Zone of the Gulf of Mexico. Learn More

Ecosystem Observation Systems
Ecosystem Observation Systems provide Internet access to observational data collected in and around the U.S. coast lines… To Learn More

COOS
The Coastal Ocean Observing System provides access to a collection of real-time and recent weather, oceanographic, water-level and stream gauge observations. To Learn More...
Regional Observing Systems (GCOOS)

GCOOS Members

- TABS
- TCOON
- PORTS
- COMPS
- Army COE
- WAVCIS
- LUMCON
- NWLON
- NDBC Moorings
- NDBC C-Man
- WAVCIS/LUMCON
- SEAKes
Regional Observing Systems WAVCIS

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EGT & Ecosystem Observing Systems

- Provide discovery and access to the following data nodes:
  - Economic and Sociocultural
  - National Observer Program
  - Fish Surveys
  - Commercial and Recreational Fish Statistics
  - Ecosystem Surveys
  - Protected Resources
  - National Status & Trends
  - Passive Acoustics Observing System
  - Coral
  - National Estuarine Research Reserve System-wide Monitoring Program
  - National Marine Sanctuaries Monitoring Program

The NOAA Fisheries Economics and Social Sciences Program supports an ecosystem-based approach for managing the Nation’s living marine resources. Within this context, the Program supports:

- National Observer Program
  - The National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries) deploys fishery observers to collect data and support research programs.

- Fish Surveys
  - The Assessment and Monitoring Division supports at-sea resource surveys, stock assessments, fishery observer programs, and cooperative programs.

- Commercial and Recreational Fish Statistics
  - The Fisheries Statistics Division collects data and coordinates information and research programs to support science and management needs.
Data searching capabilities will be provided using one of three methods:

- “Google” type search
- Refined search – CMECS Model
- Map Search

Initial development will be based off of the 1st 3 levels from the Coastal/Marine Ecological Classification Standard (CMECS)
EOP DMA for Modeling – Global Navy Coastal Ocean Model (G-NCOM) Dissemination

- NCOM Surface temperature and current
- NCOM surface current speed and direction
- NCOM surface current and elevation

- Under evaluation by modelers at UM. Provides boundary conditions for coastal models SE USA and Gulf of Alaska (UW, TAMU, UNC, & WH)

- Supports USCG Search and Rescue Ops (SAROP). Surface current fields are input to the Environmental Data Server (EDS) at USCG SAROPS
NMSP West Coast Observation (WCO) Project

Partners: PISCO, SIMoN, NODC, and NCDDC

Automated process by which native ASCII data is converted to NetCDF (COARDS) profile. EML metadata records converted to FGDC and transferred to NODC and posted to multiple search locations.

Data Access Webapp searches the available data on a OPeNDAP server. Create statistics, plots, and download data.
EOP NMFS Hypoxia Website 05
Season- Planning for 06

- ArcIMS upgrade from FY04
- Links to SEAMAP, NMFS, NCDDC, CoastWatch, & RV Oregon II, LUMCON
- MODIS 7 Day composite
- Extract ship flow-through data, e.g., turbidity, S, & Chl
- DO contour maps

Habitat, ERP, EOP, CRMP, & Fisheries Management
An EAM Business Plan

• 2004 NASA REASoN Award to NRL (partners NASA ASP, NOAA NESDIS/NOS, and ACT)

• Discussions were held in 2004 with local stakeholders on what products and services were needed

• Signed MOA between NOAA NESDIS and the Mississippi Department of Marine Resources (MDMR) for products, information, and services related to NASA’s Terra (EOS AM) and Aqua (EOS PM) Moderate Resolution Imaging Spectroradiometer (MODIS) developed by NRL

• Validate the Business Plan and expand effort to LA, AL, TX and FL
Mississippi Partners

**MS Department of Marine Resources**

- Gulf States Marine Fisheries Commission
- MS Department of Health
- MS Department of Environmental Health
- Gulf Coast Research Lab (USM)
- MS Civil Defense, MS Department Wildlife, Fisheries, and Parks
Improved EAM Through New Observations – MODIS Terra and Aqua Scan Sensors & Model Output for HABS Events

**Products**

- Optical- Absorption & Backscattering
- Bio/Phys- Turbidity, Chlorophyll, SST
- Models- 6 Km resolution
  - T, S, tidal and surface currents, sea surface heights
  - 48 forecasts

**MODIS PM 7-Day For Chlorophyll-a (mg/m3)**

NASA ESA, NRL, NOAA-NCDDC, EPAGOMP, & MDMR Partnering
Accessing REASoN Products via NCDDC ArcIMS websites

www.ncddc.noaa.gov/website/MS_DMR/viewer.htm
High levels of fecal coliform can contaminate or indicate contaminated oysters requiring DMR officials to close the oyster reefs.

Fecal coliform die-off rates and predictions of concentration can be correlated to relative solar radiation, cloud cover, SST, river runoff (turbidity) and salinity.

NRL Stennis is providing MODIS derived estimates of solar radiation, SST, and turbidity as well as salinity estimates.

NOAA NCDDC provides these data to Mississippi DMR for use in their fecal coliform decision tools.
Coastal Exchange Processes

Movement of Eddy Onshore

- Chlorophyll
- Surface Currents
- Sea Surface Height
- Salinity Contour

SeaWiFS Chl 05/03/2004
Identifying Coastal Processes Using IOP – Absorption Budget Water Mass Classification

Controlling Absorption Processes
- CDOM
- Phytoplankton
- Detritus

Inputs to bio-physical models

Phytoplankton Absorption (green)
CDOM Absorption (blue)
Detrital Absorption (red)

Gould, Green et al., Organic/ Inorganic

Open Ocean and Coastal Water Processes are different
MODIS PRODUCTS

- Daily
- 60 day Mean

Harmful Algal Bloom (HAB) Monitoring
Targeting - Possible HARMFUL from non-HARMFUL ALGAL
Supporting Ship Sampling regions measurement programs
Assessing Size, Location and Movement of “Bloom”

MODIS PRODUCTS

- Chlorophyll
- Oct. 9, 2005

Daily Real-Time Monitoring

Improved Decision Aide for Ship Sampling Sites

Possible HARMFUL from non-HARMFUL ALGAL

Potential HABS

Next Day Forecast

Under Evaluation

Advanced MODIS Bio-Optical Anomaly Products
- Backscattering
- CDOM detritus absorption

Daily 60 day Mean Anomaly

Improved Decision Aide for Ship Sampling Sites

YES

NO
Additional Anomaly fields
Under evaluation for HABS targeting

MODIS - Aqua
Nov. 07, 2005

CHLOROPHYLL
Anomaly

New Capability
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Anomaly Fields
- Scattering
- Absorption
- CDOM

The absorption to scattering ratio (Single Scattering Omega) is linked to species identification.
Requires evaluation with Cell Counts (with R. Stumpf).

Present Chlorophyll Anomaly Product

Products available in OPEN DAP.
DMR sampling and monitoring efforts benefit from locating and tracking turbidity fronts in the Mississippi Sound:
- Estuarine-dependent and coastal fish species production is enhanced in the vicinity of riverine discharges
- Larval fish densities are highest at the associated turbidity fronts

Additionally, tracking overall turbidity in Mississippi Sound is important for monitoring the health of submerged aquatic vegetation (SAV) such as sea grasses:
- Large areas (some estimates as much as 60% of the total area) of SAV have been lost in Mississippi Sound in the past 30 years
- SAV provides critical habitat for many recreational and commercial fish species
- DMR monitors sediment fall-out areas for changing patterns of deposition and possible impacts from trawling and dumping of dredge spoils
Enhanced SST Product
Combining Model and MODIS SST

- Removed Clouds
- MODIS derived SST is integrated with AVHRR analyses

Benefits:
- Increases SST data available for the analysis (spatial coverage of satellite data)
- Resulting field at higher resolution that operational SST products

Mar. 10, 2006

Composite SST
Using Ocean Color Imagery to Monitor Salinity in the Northern Gulf of Mexico –

Locations of Station Data used in Salinity Algorithm Development

Chesapeake Bay, VA
108 Stations

Mississippi Bight
287 Stations

Fort Lauderdale, FL
18 Stations

Tampa Bay, FL
68 Stations

Corpus Christi, TX
4 Stations

Y = 36.20826 - 46.48789 X + 27.68292 X^2 - 8.33762 X^3 + 0.96511 X^4

For Barataria Bay Buoy, the derived salinities are estimated within 6 PSU’s between February and November and up to 15 PSU’s for December and January.

(B) The satellite derived values are underestimated in the fall and winter months and overestimated the majority of the time in the spring and summer.

(A) For Barataria Bay Buoy, the derived salinities are estimated within 6 PSU’s between February and November and up to 15 PSU’s for December and January.

(B) The satellite derived values are underestimated in the fall and winter months and overestimated the majority of the time in the spring and summer.

(Ladner et al. 2006 – Ocean Science)
**Lake Ponchartrain - Impact**

Following the Katrina

Following the dispersion of the “turbidity” zone in the Lake Center.

- Changes in the Western Lake
- Discharge of the Plume through the Rigolets
- Rigolets connects the Lake with MS Sound and shelf circulation

MODIS Terra (beam attenuation coefficient) (“turbidity”) With PC Tides

Software developed and provided to Goddard For SeaDAS release. Atmospheric Corrected
Forecasting the MODIS Particles. (Animated)
Advection of the Nov 22 backscattering image
- NEGOM—surface currents
- hourly prediction (2 hour Step)

Nov 22 - 00gmt → Nov 24 - 00gmt

River Flux
Metrics

- NOAA’s National Coastal Data Development Center (NCDDC) is the most regular and largest volume user of the NRL server
  - NCDDC supports several interfaces to NRL Data (e.g. Katrina Impact Assessment, Mississippi Department of Marine Resources, and the HABSOS sites – http://ncddc.noaa.gov
  - FGDC compliant metadata available for product or product family on NRL’s OpenDAP server for use by NCDDC
  - Data is provided in geolocated format for use in GIS web-based systems and distributed thru NCDDC IMS sites

- Other government users of the server included USCG, USJFCOM, and National Data Buoy Center (NOAA/NWS)
Questions??

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