"Summit on Long-Term Monitoring of the Gulf of Mexico Hypoxic Zone: Developing the Implementation Plan for an Operational Observation System" Notes

January 30, 2007

Welcome and Opening Remarks

I. Russ Beard, NOAA National Coastal Data Development Center gave the opening welcome and logistics. He also introduced the staff.

II. Alan Lewitus, NOAA Center for Sponsored Coastal Ocean Research gave opening remarks. The goal is to improve hypoxia monitoring. He wants to have an implementation plan that will determine how to proceed and a research gap analysis. Reviewed agenda. There will be a mechanism put in place to ensure that the plan actually gets implemented. There will be an oversight committee to watch progress, reports, and milestones.

Session 1: Context and Drivers

III. Bill Corso, NOAA National Ocean Service

a. Set up an implementation plan and weave everything together to make a Northern Gulf of Mexico model IOOS, GCOOS, etc.
b. Wants management to be able to react to hypoxia in a timely manner. "What happens if it moves? Etc.
c. How do we resolve apparent conflicts? Based on President's comments of becoming energy efficient.
d. IOOS - In December a program will be announce that begins to line things up. Use the sustained integrated end-to-end data system to feed DMAC. DMAC feeds maritime navigational services, Search and Rescue, etc.
e. Better understand the phenomenon, provide information to the public, and understand how to better deal with it.
f. Learn how to piggyback/on multiple organizations. Don't think about how to get your next funding, but use what's already in place. If USM is doing a survey, see how to use that survey for your needs.
g. Try to understand the hypoxia phenomena and learn how to manage it.

h. Questions and comments: Can't integrate systems currently in place without new funding.

IV. Rob Magnien, NOAA Center for Sponsored Coastal Ocean Research

a. He has faced the same challenge being presented today in the Chesapeake Bay. Lessons can be learned from them. Google: "Monitoring for Management Actions".
b. Management structure is already built. Need to provide the information that will drive the management.

c. Forecasting is a big part of information. It is needed to move the management forward. Need modeling to assist with the forecasting.
d. Reviewed action plan and said where they are and what is behind (Action #11 by 2 years). All of this is online and there are public discussions. Revision deals with issues like the "Farm Bill" and others that have come up.
e. Good standard is to keep in front of the task force a hypoxic zone model.
f. Strong suggestion: keep your eye on the ball and focus. Realize why you're taking samples from a particular location. "Translation of Management Issue" equation has example questions on the presentation.
g. Additional points: We have an understanding of the system and let's use that. Establish a data analysis and reporting strategy ahead of time. Vision out the products. It is not sustainable to leave it up to one entity, hence "robust partnerships".

h. Questions and comments:
    i. **Eleven actions were mentioned. It would be nice to review all of them and where they are on each of the actions.** Action plan also says to improve monitoring and this is an opportunity to push forward one of them. No significant progress.
    ii. **Given that the Bay has improvements to make, what lessons do you have to share?** Chesapeake actually has goals. We have a monitoring system that tells us we're not making any progress. Doesn't sound impressive, but other areas don't have that. State standards are starting to be driven by the Bay's results. Still a model we can learn from.
    iii. **In funding and the GOM program, how important is the State partnership?** State partnership is very important. It gives leverage and is very critical. Involvement would be very helpful.

V. Alan Lewitus, NOAA Center for Sponsored Coastal Ocean Research
a. Rob talked more about the management history and Alan will talk more about the science side and needs.
b. Key finding is that the hypoxic zone is increasing over time. Average size of the hypoxic zone has been maintained around 15000 Kilometers over a 5 year period. Hypoxic zone didn't really start forming until the 50's and large scale didn't occur until the 70's. It is an increasing phenomenon. Areal extent was and is a good indicator of the zone. This is a good system for what it was designed to do, but it is limited. It was not designed to monitor hypoxia. We need a sustainable non-competitive program to ensure long-term monitoring and that allows extension of what we do now.
c. Referred to action item #4 in the Action Plan. Need to extend spatial boundaries is recognized in 2001. How far does it extend past the Southwest Pass? Need much more detail on that.
d. Lack of information on Benthic processes. Nutrient transformation processes in general.
e. Need to know the hypoxic volume; not just the size of the area.

f. Need to know the indirect effects on fish, shrimp, etc. Need food-web models to understand the various tropic effects.
g. All of the models have too many black boxes and need more information. Support models to show relationship between nutrient load and hypoxia, and causes of hypoxia.

h. Questions and comments:
    i. **Researches driven in the past, are we focusing on monitoring or research for the Summit?** They go hand in hand. How can monitoring support the work and models done. Food-web models are starving for information.
    ii. **Monitoring is put in a context of what the managers will need to know in order to manage better.** All of the above apply. We need to know the processes that apply to it.
    iii. Rob's comment: Focus is the monitoring, but we're not attempting to divorce the demands and what are the uses from this monitoring.
    iv. Alan's comment: Sort out what needs to be done and what doesn't need to be done.
    v. **Not a competitive process – should be base funded or contractor support?** Not sure I have a solution, but have a problem. Can be teamed to fund this a little bit.
    vi. **Missing infrastructure? What do we do?** Russ will talk more about that and the nitty gritty.
    vii. **Are there examples that not just the information goes up the hill to the management community? Is there feedback/ adaptive management program where communication works both ways?** There are things like the MMR report that calls for changes. That's one of the feedbacks.
    viii. **Thought the key point was that the probability of success is clear management decisions. What are the management questions and issues?** Management issue is the zone. Questions are 'how big is the zone?' etc. Need to come up with more questions.
    ix. It would be nice to be specific.
    x. **Two way communication, we need to know who's asking the questions. Where does it reside? Where does the information go?** The task force layout was reviewed. Symposia, expert panels get the information back and forth. Some elements of NOAA have this very clear and defined. It would be good that it is clear and defined here as well.

Session 2: Relevance of existing programs and assets for implementation

VI. Nancy Rabalais, Louisiana Universities Marine Consortium

a. Need to know what your goals are based on prior and current hypoxia research. Define causes, dynamics, and consequences.
b. Define relationships of physical, chemical, and biological processes.
    i. Use temporal and spatial characteristics

   ii. Use seasonal and inter-annual variability of the onset, duration, and areal extent.
c. We're getting more and more data and better temporal and spatial data. Cruises usually done in late July.
d. A lot of early data was weather dependent. Now it's not. Year round and monthly data is gathered. It is apparent that some models are data rich and others are not. Gaps are identified.
e. ND stands for "no dollars" which brings back up the question of how do you do this with no funding.
f. Platform of choice are the oil platforms for the buoy to be tethered to.
g. More data is being collected related to Hypoxia.
h. SEAMAP, Southeast Area Monitoring and Assessment Program, data is similar, but not synoptic. Synoptic is important because of the currents pushing the hypoxic zone.
i. SEAMAP in '05 had many tropical storms and boat malfunctions and state cruises.
j. Data has been pieced together over long periods of time.
k. Questions to be asked and answered. Loadings of Nitrogen in the system can be done. Over time, more monthly determinations, transects, etc. are needed.
l. More data will support more attention from Congress.

VII. Rick Greene, *EPA Office of Research and Development*
a. EPA involvement began in 2002 to develop a suite of applications, data products, and other tools.
b. Some gaps in cruises.
c. Intent is not to duplicate ongoing efforts by Nancy's group. Trying to focus on the non-Summer conditions and events leading up to Hypoxia.
d. Working to implement Sediment Diagenesis model, Water Quality Model, and other models.
e. Not a lot of data on the sediment processes in the hypoxic zone and not sure how to capture that in an OOS.
f. The future for EPA investment in long-term monitoring is unclear. EPA only has one research vessel. Historically, the research vessel is on the East coast. Space is usually available and open for people who want to add on research.

g. Questions and comments:
   i. **How do you get on the cruise?** Contact Rick to get on the cruise. Timing is based on the EPA and the ship request.
   ii. **How do you get attention at the highest levels to get the resources needed?** Mechanisms are can be used to get attention at the highest level. Report out to the Environmental Work Group.
   iii. What's relevant is the freshwater discharge vs. sediment. Nitrate concentration and load and how much comes from where.

VIII. David Shaw, Mississippi State University

a. Impacts on coastal/marine water quality are the focus of today.
b. This institute is an opportunity to breakdown barriers between institutions (not just academic). Also allows for crossing between NOAA line offices.
c. Co-Director named – Glade Woods.
d. Trying to fill major research voids and provide the opportunity for entity interaction between federal, state, and local.
e. Trying to improve watershed modeling and to improve modeling. Data resolution is better than the model resolution.

f. Questions and comments: **Is there a place for this institute to assist with this effort?** Due to funding trying to target specific projects, but yes.

IX. Phil Bass, EPA Gulf of Mexico Program, and Bryon Griffith, EPA Gulf of Mexico Program
a. Trying to maintain state leadership. There is an action plan that has been signed by 5 governors.
b. Needs to be driven from the bottom up.
c. Issues that there was consensus on were the focus. Each state became the lead on a particular issue.
d. NOAA designated and Governor's action plans. Well on the way to accomplishing what they said they would. Living document can be found on their website.
e. Tie in between the alliance and this summit. Nutrient reduction has an action that pertains to hypoxia. (N-3)
f. Approach to get all 5 states to recognize this. Resources showing that there are multiple hypoxic zones, including smaller areas that the other states would be interested in.
g. At the end of 3 years have a good progress report that says look at what we've accomplished with very little. Give us more and see what we can do.

X. William Walker, GCRL
a. Letter said we need regional mechanisms to improve regional and coastal health. Ocean policy reform is not progressing fast enough and funding is being removed.
b. Alliance is trying to pull together a plan that will work in the GOM region at the end of the 36 months and say here is what we can do as a region to improve water quality. Task now is to align the other states and get a plan for after the 36 months.
c. Get Congress to recognize this as a priority.

XI. Bob Arnone, Naval Research Laboratory
a. Two basic datasets being put out everyday.
b. Data assimilation results in the salinity, etc.
c. Daily products are 1200+
d. Allows advection river lumes, filaments, eddies, loop current intrusions, and upwelling to be looked at.

e. Data distributed via an OPeNDAP server to different entities.
f. Showed various models.
g. Satellite only sees the surface. So data is from the surface.
h. Trying to project data downward into optical layers.
i. Models can forecast forward. Example showed 24hr.
j. The way forward – embedding an optical model inside a physical model.
k. Bio-optics are very difficult to take.
l. Gap – need better monitoring systems in the Gulf for better data assimilation.

m. Questions and comments:
    i. **Products available to outside?** All distributed through NOAA. NOAA is the link to the outside.
    ii. Operational websites/data portals. EDAC server will have 500 products
    iii. **Who's using the products?** Been trying to find the user. The user wants very simple things.
    iv. Certain products have specific users. MS DNR was mentioned.
    v. **What's the concern about coverage and gaps?** Getting ready for NPP and NPOESS follow on. New research missions are coming up. NASA is trying to get up new satellites. Several opportunities will be available over the next few years.
    vi. **Rumor that Oxygen will be remotely sensed?** Haven't heard that one.

XII. Don Conlee, NOAA National Data Buoy Center
a. Running the NOOS (NDBC Ocean Observing System), typical 3 meter buoy makes up the bulk of the yellow fleet.
b. Huge benefit for placing a buoy for the Hypoxic zone.
c. Oil company partnerships are ideal situations.
d. Dead zone for observations coincides with the hypoxic zone.
e. Observing dissolved oxygen (DO) is possible.
f. Working with Shell to place buoys.

g. Questions and comments:
    i. **Mention of a platform for instruments? Abandoned rigs? Abandoned rigs have to be removed.** In the case of Shell, we are talking about active rigs.
    ii. Opportunities are there. Chevron, shell, and Unical are all approachable companies.

XIII. Zdenka Willis, NOAA National Oceanographic Data Center
a. IOOS definition. Trying to collaborate with federal and non-federal to create an IOOS, but will not recreate.
b. Org chart – Everyone must reside in 2 places, in NOAA and in the PPBES. Increasing management and focus on management. Will develop a budget wedge.

c. Integration Data slide was pulled out of 5 reports. Collected data is not integrated.
d. Focus in on 5 variables to be gathered (temperature, salinity, sea level, currents, and color).
e. Focused on delivering variables. Implied is that the platforms are there to monitor and gather the data.
f. Standards will get out there. They won't be perfect, but will be put out there.
g. Ocean Observing Offices moving together.
h. A staff has been dedicated to this.

i. Questions and comments:
    i. **What do you see as your biggest challenge?** We've got to show something real in a year from now. There's got to be something that the admiral can touch. Convinced that the capacity is there.
    ii. **How do you see your office interacting with the regional associations?** We're spending time to continue to move the RA's forward. Using the regional structure that are there and their RCOOS's that are there to move forward. There is a person on the staff that is the RA POC.
    iii. We're going to build the go-cart with the parts that are there. Hypoxia parts aren't there. We have to build and continue to keep the momentum. Continue to vocally help that in the first year and work on getting the dollars for the next years.

XIV. Worth Nowlin, Texas A and M University
a. No new money, but can help with the integration of existing pieces.
b. Global and Coastal component.
c. Regional contribution and federal contributions to create a backbone.
d. Actions to date: We've spent a lot of time getting people education about what IOOS is, what COOS is, and what GCOOS is.
e. Made a shopping list of products and what are like to have products.
f. Integration of data, trying to make observations that will be of use to NDBC.
g. Tried to identify whose making regular/real time data observations.
h. It really is a system of systems.
i. Gcoos.org
j. Working to bring new things to NDBC, encourages communication, and spent time educating.

k. Questions and comments:
    i. **Current status of operation center?** A letter of intent goes to NOAA tomorrow. Several potential partners to help work on that.
    ii. **Specifics on GCOOS on dealing with the hypoxic zone?** Don't have it. Haven't done anything in the hypoxic area.
    iii. **If something comes out of this it will feed into the GCOOS?** Yes. Equal effort on assessing what the various stakeholders would like to have.

iv. **Seem to have a good handle on the education and outreach side. What are you hearing from non-scientists as far as hypoxia is concerned?** Hired a GCOOS education and outreach coordinator and have a great action plan, but don't have the money to implement.
v. **Scale what necessary funding means?** To get things implemented.
vi. What each Regional Association was encouraged to plan for is about 30 million for 5 years and money each year to continue. 30 million to do what we're doing now.

Session 3: Defining the drivers and system requirements

XV. David Whitall, NOAA Center for Coastal Monitoring and Assessment
a. Drivers:
i. Physical Processes
ii. Nutrient Load Reduction
1. Which, how much, when, and where
2. What is manageable and what is not.
iii. Economic Cost – Benefit
1. Mitigation cost
2. Upstream management
3. Impacts on fisheries
iv. Effects on Ecosystem
1. Relationship between distribution of hypoxia and distribution of living marine resources
2. Benthic community
3. Fishing monitoring
v. Size of Hypoxic Zone
vi. Indices of hypoxia including faunel stress
vii. Characterization of hypoxic zone
viii. Understanding causes of hypoxia
ix. Understanding impacts of hypoxia
x. Supporting predictive models
xi. Relationship between wetlands loss and hypoxia (linked integrally in some areas)
xii. Education and outreach
b. System Requirements (extent and how to measure it)
i. More survey coverage
1. One in Jan, Mar, Apr, and Oct
2. Two in May – Sept.
3. Also, shelf wide with more higher frequency transects
4. Integrated sampling approach with variety of in situ sensors + RS
ii. More instrumentation
1. Additional 5 moored sites
2. Use models to determine moored sites.

iii. Develop better biological models and integrate them with the physical. Also, adapt and improve the physical models. Use them to capture our monitoring.
iv. Additional focus on volume measurement
v. Conduct monitoring cruises East of the Pass
vi. Incorporate Gulf Alliance monitoring guidelines and National Water Quality Monitoring Network Plan into monitoring activities
vii. Improved Bathymetry
viii. Improved accuracy of Nutrient Loading Data with lower error in monthly load estimates (ala NWQMN)
ix. Integrate CEAP models for inflow

***Detailed discussion minutes for this portion available upon request.*

Session 4: New Tools and Technologies

XVI. Jim Ammerman, Rutgers University
a. Rapidly evolving field.
b. Consider Biofouling and Anti-Biofouling Strategies for long-term deployment
c. Different kinds of Oxygen sensors can be used in different situations, but copper interferes with Oxygen sensors.
d. Biological and chemical sensors are to the point they are just becoming useful.
e. Nutrient sensors/Nitrate sensors are more problematic, but becoming useful. Nitrate sensors are important in this area. Good data with Nitrate and Silicate but need TLC.
f. Bio-optic sensors - Favored Wet Labs. Chlorophyll, particle loads, and more can be taken in from these instruments. It relates well to the satellite data we heard before. The sensors are getting good enough to separate components.
g. A few sensors that is a bit more exotic. Fast Repetition Rate Fluorometer is now submersible. Smaller ones are developed that can be put in water.
h. Flow Cytobot can count phytoplankton in situ now.
i. ESP can collect DNA. Has been used in HABS research, but one of a kind. Video Plankton Recorder. Gives you phytoplankton pigments and can be sent out to Range of towed undulating vehicles from use with a small boat to big ships.
j. The surface is very important, but get criticism from not looking at below and this is one way to go.
k. AUV's range from small to 21 feet long. Higher power.
l. Gliders are lower powered. Electric glider, 15-30 days seem to be the way to go for the Gulf Hypoxic zone.
m. Gliders being run near Palmer Peninsula. In terms of a harsh environment, they do work.

n. Questions and comments:
i. 2 on the sensing – On the sensing platform they are using the antibodies created by invertebrates and isolating based on certain chemicals.

ii. Also have been sensing based on the protein secreted in the intestine to determine if it came from a farm, etc. Hypoxia effects on wildlife can have the same effect as low levels of toxins. Gene tips and protein tips are possible.
iii. An opportunity in the gulf is the use of autonomous airborne vehicles with an array of sensors to detect different things and possibly significant things.
iv. Steve L is getting a glider for their area.

Resume tomorrow.

January 31, 2007

Continuing Working Group Sessions

XVII. David Shaw and Sharon Hodge, Mississippi State University
- a. Edits to drivers and system requirements from Day 1.
- b. Partners

GOM Alliance	IOOS	USDA
MMS	NOS	NRL
Industry	NMFS	USACOE
Petro	NCDDC	Academia
Transportation	NDBC	NASA
Comm fisheries	NGI and Other CI	NSF Orion
Rec fisheries	NERR	USCG
GCOOS	GOM Accord	NAVO
EPA	Fisheries Councils + Comms	Sea Grant
NOAA	USGS	
NNDC	NGO	

XVIII. William Corso, NOAA National Ocean Service
- a. Discussed what everyone is here to do.
- b. Possible goals:
  - i. Get funding from Congress
  - ii. Set up a strategy
  - iii. Continue to research
  - iv. Link groups together
  - v. Make known what everyone is currently doing
  - vi. Use the research to provide public services
  - vii. Identify the core group who can do what we've been discussing
- c. Filled in Table 1: Infrastructure Table and Table 2: Synergy Aspect

Infrastructure		Who?	Deliverable	Deadline
Structural	**Non-Structural**			
Ships (surveys)		Nancy R, Steve DiMarco, Rick Greene, Nelson May (NMFS), Mende A. , DMR		
Moorings & Platforms		Nancy, Steve D., Steve, Norm, Greg Stone, Stephen Howden, Rick Crout, Buzz Martin, Jim Ammerman		
AUV		Vernon Asper, George Rey, Nancy, Bill Boicourt, Dick Blidberg		
Remote Sensing		Nelson May (Coastwatch), Nan Walker (LSU), Bob Arnone (NRL), Bruce Spierig		

	Data Management	NCDDC and NDBC, Nancy R, Greg Stone, Matt Howard		
	Models	Hettland, Justic, Bierman, Scavia, Fennel, Harris, Ko, Brandt, Chassignet, Hogan, Ortner		
	Education/outreach	Sharon Walker, Lee Yokel, Michael Spranger		

Table 1: Infrastructure Table

Infrastructure		Who?	Deliverable	Deadline
Structural	**Non-Structural**			
USGS Stream monitoring				
Corps of Engineers Discharge				
State and Federal Fish Surveys				
EPA Gulf Breeze Group				
Remote Sensing				
Bathymetry				
NDBC WAVCIS (wave measurements)				
Deep water platforms current profiles				
Modeling of causes and impacts				
Texas automated buoy system				
CENGOOS				
Improved modeling				
NLOM Water level network				
NDBC Weather buoys				
Texas COON				
Gulf States Marine Fisheries Commission				
DISL				
COMPS				

Table 2: Synergy Aspect

d. Individuals identified will put together a plan that has everything, but tiered. Here's what we would like and what we can do with funding and what we can't do now.

XIX. Sharon M, NCDDC

a. NCDDC & NDBC will provide data management at no cost. Providing access to data is our purpose, so no cost.
b. How we use data management & what we consider data management.
c. Defined the five data management functions
d. Reviewed data flow.
    i. One project - The principal scientist send the location of the stations & the data. High level QC, making sure there are no
    ii. Statistical analysis, metadata record, data file. Augment the files, so there is one record published at the end of the survey. Fisheries does a real data QC.
    iii. Several points of availability from one
    iv. There's a person on every step of this process.
e. West Coast Observing system project is more automated. End-to-End Data Management process. Divers collect data. Converted from a sensor format to an ASCII format. Automatically retrieve new data and create FGDC record. Same publishing steps that were done before. Packages are on the FTP server & NODC archival. Automated, so the computer archives it, not dependent on a person. Multiple access points for the information. This process is a conduit that has multiple standardized products coming out.
    i. Proposed how this would work for Hypoxia.
    ii. Repeatable process. Goal is to take the sting out of standardization.
    iii. It takes time to set this up, but there are many benefits. Routinely publish when you want

f. Questions and comments:
    i. **Where do things stand with being able to share data across agencies?** Strides are being made. There are some technology issues, but progress has been made through USGS and the federal government
    ii. **Have we gotten over the barriers?** Five things identified in the GOMA and have enabled the data for access and developed a common access portal. Some issues have been resolved. So there's hope.
    iii. **For the individual investigator, is there any sort of incentive?** If they were funded by project with a policy that requires it. We don't expect you to format the data and create the metadata. All of that is done automatically. We put the money in your hand to develop it, or we do it in-kind. We can't fund the sensor or the hardware end, but we can fund the five – discovery, access, etc. Sometimes its acquisition b/c they don't want to maintain it anymore. We adopt the datasets. Motivation is for the infrastructure working group, that we don't have to do data management ourselves. We can go to a center that does this. Two complementary groups are the quality assurance group Courtad and MMI.

XX. Plan to continue making progress
a. Core Group

i. Steering committee + Bill Walker (possibly)
ii. Alan is the Chair
iii. Nancy is co-chair

b. Stakeholder Group
   i. GCOOS, Alliance, and Task Force will provide the portal to the stakeholders.
   ii. Task: Assist with Education and Outreach portion of the plan.
c. MMR Work Group of the Task Force
d. Performance measures and timeline
   i. Define the products and timeline
   ii. Nancy will represent this group at the March GCOOS meeting.
   iii. Coordinate with GOMA to have a proposal for State leadership by late Spring/early Summer (target May).
e. Barriers to implementation
   i. Lack of new money.
   ii. Lack of coordinated state backing for this plan.

XXI. Summit concluded by Alan Lewitus, NOAA Center for Sponsored Coastal Ocean Research