

Gulf Monitoring Network

Overview

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Gulf Monitoring Network (GMN)

- 1) Why?
- 2) How was it developed?
- 3) What does it look like now?
- 4) What is happening next?

Gulf Monitoring Network (GMN)

Why it was developed.

1) Governors' Action Plan II:

- WQ-1.4, improve monitoring of Gulf water resources.

2) WQ Team's Tier 2 Action Plan

- WQ-4.3 Design a framework for a water-quality monitoring network for the Gulf of Mexico adequate to address Gulf Alliance needs.
 - 4.3.1 Identify the monitoring network objective, needs, and design. Work with other regional monitoring efforts (e.g., GCERTF, Hypoxia Task Force, Federal programs, etc.) in establishing these objectives.

Gulf Monitoring Network (GMN)

Why it was developed.

- 4) Deepwater Horizon oil blowout
 - the shortcomings of existing monitoring became abundantly clear
 - increased the need for improved monitoring to help assess Gulf recovery and the success of restoration efforts.

Gulf Monitoring Network

How it was developed.

- 1) Identify a structure to organize the development and implementation;
- 2) Identify the most important WQ monitoring issues;
- 3) For each of those issues, identify and rank the highest priority questions (that monitoring can address);
- 4) Design the minimum monitoring system necessary to address the priority questions;
- 5) Prepare an implementation plan, including funding, for putting a monitoring network in place to address GOMA priorities;
- 6) Implement.

GOMA Water Quality Monitoring Priorities Gulf Monitoring Network (GMN)

GOMA WQ monitoring priorities
identified at 2011 Monitoring
Forum in Pensacola

1. Nutrients
2. The GOMA human health priorities
(of equal rank): Harmful algal
blooms (HABs), pathogens, and
mercury in seafood.

GOMA Water Quality Monitoring Priorities

Gulf Monitoring Network (GMN)

- GOMA Nutrients Team: identified highest priority nutrient monitoring questions.
- GOMA WQ Team: appropriate workgroups identified the highest priority monitoring questions for the human health priorities.
- The two GMN design workshops focused on designing the minimum monitoring system needed to properly address those questions.
- The GMN is not designed to replace existing monitoring programs, but to support and build upon them wherever possible.

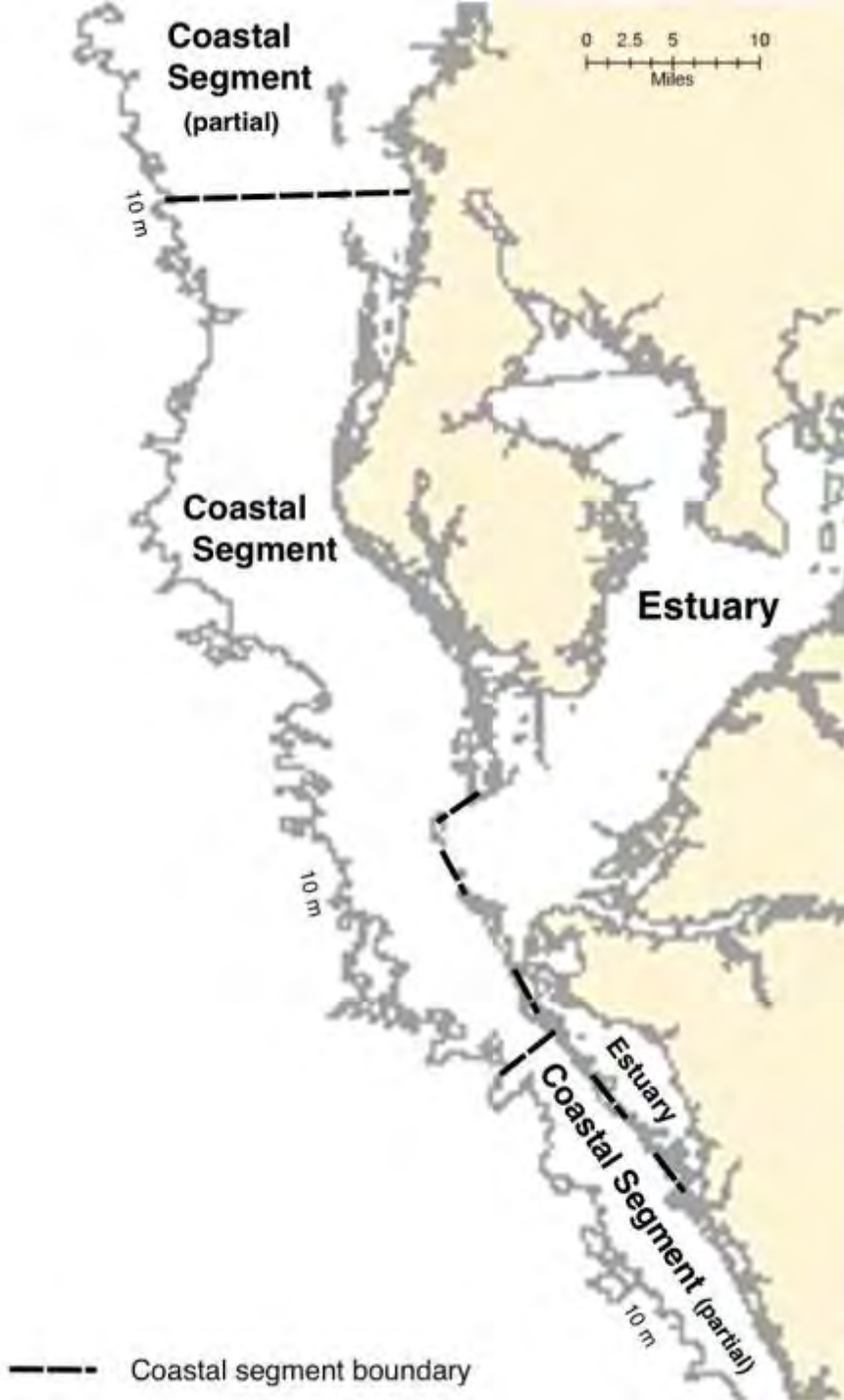
Gulf Monitoring Network

What it looks like now: GMN System Design

- Physical features have a major effect on monitoring system requirements.
- Resulting design evolved into a nested or meshed set of integrated models to predict the water quality between sampling locations.
 - Conventional water-quality status and trend monitoring sufficient for good management decisions is cost-prohibitive at this scale.
 - models must be employed to capture between-station conditions to address management needs.

GMN System Design

- The monitoring designs include a basic understanding of Gulf drivers, such as circulation patterns and vertical and horizontal processes.
- Designs for estuaries and coastal segments will take place locally, but contain core GMN “template” design elements to provide comparability across the Gulf for key elements.



Gulf Monitoring Network:

For nutrients, two primary components

1. Monitoring of nutrient flux.
2. Monitoring of environmental processes taking place between flux points.

1. Monitoring of nutrient flux.

- At mouths of primary tributaries;
- where significant changes in estuary dynamics take place, such as the flow “choke points”.
- At interfaces to adjoining waters (e.g., a coastal segment)

- Flux points depth integrated and tidally “aware”
- Relatively similar application to different systems



Gulf Monitoring Network:

For nutrients, two primary components

2. Monitoring of environmental processes taking place between flux points.

- To understand the factors affecting the concentrations of nutrients between flux points.
- To understand the effects of the nutrient forms and concentrations on biological communities.
- To provide information needed for good management decisions.
- Highly variable application in different systems. Much local input required.



Coastal

Coastal

<10m

<10m

10 m

10 m

0-10 meters in depth

200 m

Shelf

Shelf

Coastal

200 m

<10m

Deep Gulf

10 m

200 m

10 m

Deep Gulf

200 m

200 m

Shelf

10 m

200 m

10 m



125 62.5 0 125 250 375 500 Kilometers





These four monitoring regimes reflect the fact that the factors controlling circulation are significantly different in each.



As a result, the hydrodynamic and water quality models for each must be different and the monitoring systems that feed data to the models require different designs.



0-10 meters in depth

North Eastern
Gulf Shelf

Texas-Louisiana
Shelf

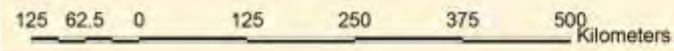
West Florida
Shelf

Gulf of Mexico

Dry
Zone
Shelf

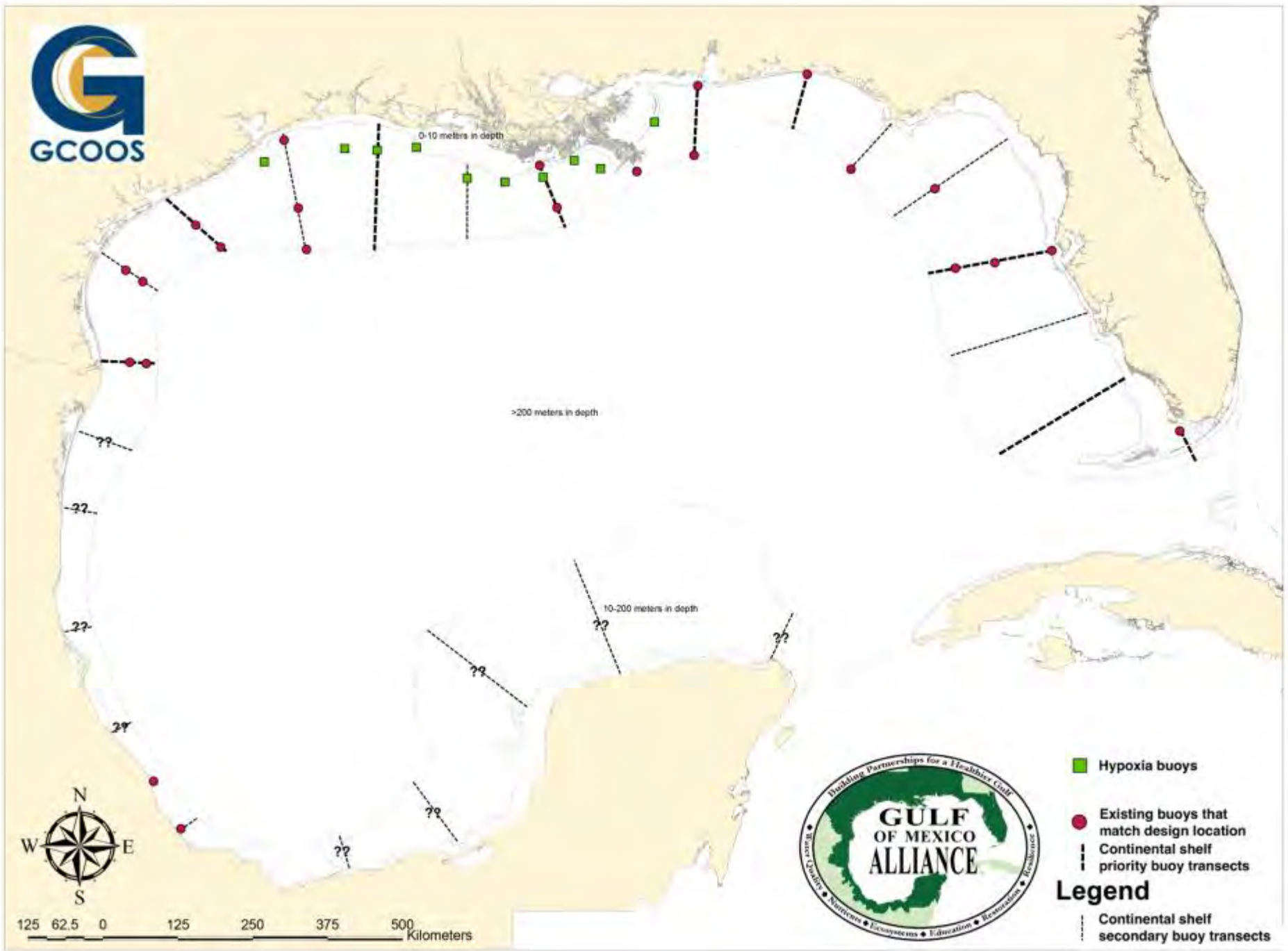
Yucatan
Shelf

Wet
Zone
Shelf

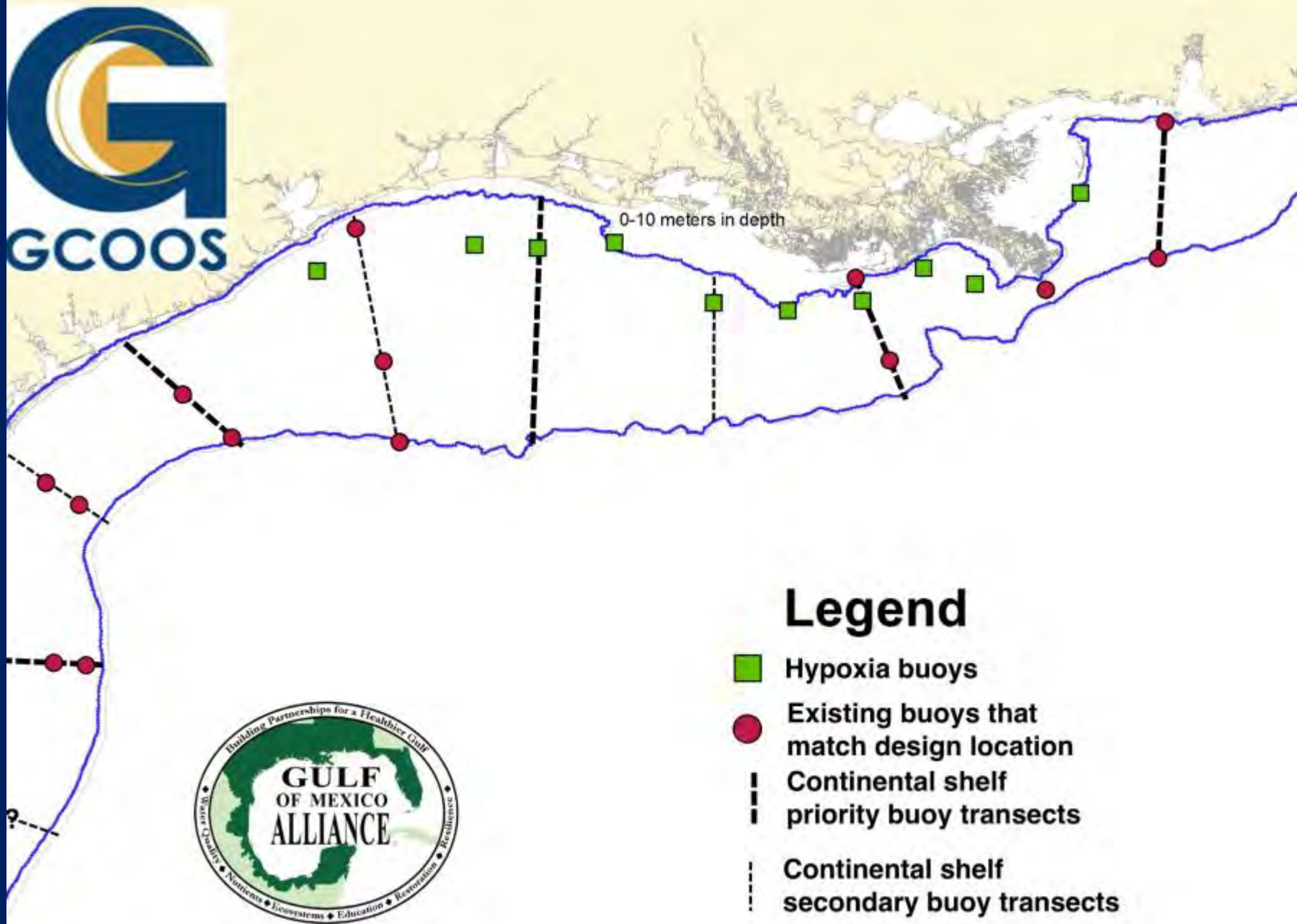


GMN System Design incorporates:





- Satellite remote sensing
- Fixed sampling structures (buoys, pilings), collecting continuous data.
- Mobile sampling equipment, collecting continuous data.
- Ship/boat-based sampling, collecting both intermittent samples and data at fixed and random sites as well as continuous flow-through samples and data while underway between sites.



- Legend**
- Hypoxia buoys
 - Existing buoys that match design location
 - Continental shelf priority buoy transects
 - Continental shelf secondary buoy transects



Legend

-  Hypoxia buoys
-  Existing buoys that match design location
-  Continental shelf priority buoy transects
-  Continental shelf secondary buoy transects



Gulf Monitoring Network: System for Shelf Monitoring

- Includes complementary deterministic (trend) sampling at and between the fixed stations (buoys and ship sites), and probabilistic stations sampled by ship.
- The rationale for using a variety of monitoring strategies, such as buoys, ships, remote sensing, is to provide interpolation of data between fixed stations and “ground-truthing” of both models and remotely-sensed data.
- Power analysis on Gulf Hypoxia Monitoring data to determine initial probabilistic sampling density for Shelf.
 - e.g., the density and frequency of monitoring required to detect a particular change, e.g. 25% change in nutrient concentrations over a 5-year period.

Gulf Monitoring Network Planning and Implementation Steps

- 1) Gulf of Mexico Monitoring White Paper
- 2) Gulf of Mexico Monitoring Network (GMN)
Design Report
- 3) Summary proposal to establish Gulf of Mexico
Monitoring Endowment.

Gulf Monitoring Network

Planning and Implementation Steps

- 1) * Identify a structure to organize the development and implementation;
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Gulf Monitoring Network (GMN)

Happening next: Implementation Plans

- First workshop to begin developing an implementation plan taking place in conjunction with All Hands.
- To include “gap analysis” comparing the necessary monitoring to that already in existence;
- Travel funding for participants is a problem

Funding

- Summary proposal to establish Gulf Monitoring Endowment submitted to Gulf Restoration Council via Florida portal.
- Cosponsors: GOMA, GCOOS, GOMURC.
- Asks for \$1B. The invested proceeds of the endowment would support all or part of the GMN as well as potentially other types of monitoring.

Funding

- The stable WQ monitoring thus funded would be called the Foundational Monitoring Network and would support other monitoring programs.
- Full proposal will be presented directly to Council.
- Also will go to other potential funding entities (including other RESTORE funding pathways)

Funding

- Final decisions on funding allocation from endowment is proposed as a two-step process.
 - independent technical review panel external to any Gulf of Mexico stakeholder or other interests would make recommendations on distribution of available funds.
 - Coordinating council composed of representatives from Gulf monitoring programs and key monitoring-data and monitoring-information users would make final decisions, based on the recommendations of the external review panel and explaining any differences.

Gulf Monitoring Endowment Benefits

- Stable consistent access to comparable data of known quality to assess the effectiveness of management and restoration programs, as well as contribute to other environmental-management decision making.
- Supports existing monitoring programs, reducing the burden on their budgets and allowing either previously-unanswered questions to be addressed or resources to be more effectively focused into new areas requiring them.
- A one-time use of Deepwater Horizon penalties will provide continuing annual cost savings to state, federal, county, local, and academic agencies for the foreseeable future.

Hypoxia Monitoring

- Hoping to come away from this Forum with information on how best to incorporate Gulf Hypoxic Zone monitoring needs into the Gulf Monitoring Network design.