Developing a Harmful Algal Bloom Integrated Observing System for the Gulf of Mexico

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- GCOOS is building a system that integrates coastal & ocean data from diverse sources and makes it available for many users and seeks to include needed HABs information as part of the Observing System

- GOMA seeks to provide coastal managers with improved information–about HABs & enhanced understanding of HABs ecology–as the basis for short- and long-term management decisions and to guide mitigation and control efforts.

Increase in HABs - Reasons

- Increasing coastal eutrophication
  - Increasing nutrient loads
  - Changing nutrient ratios
- Increasing shipping
  - Ballast water
  - Live fish and shellfish
- Increased aquaculture/mariculture
- Global change in climate

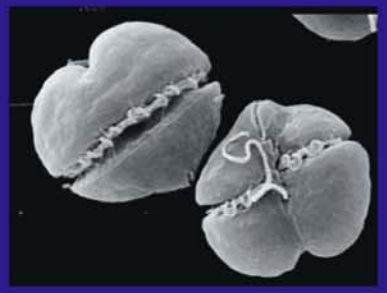
HABs of the Gulf of Mexico

1. *Karenia* species
2. *Ciguatera* species
3. *Pyrodinium bahamense*
4. *Dinophysis* species
5. *Pseudo-nitzschia* species
6. *Karlodinium veneficum*
7. Raphidophytes
8. *Alexandrium monilatum*
9. *Takayama pulchella*

Takyama pulchella

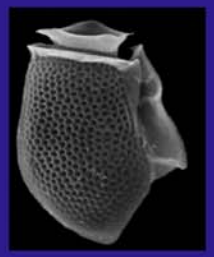
Chattonella subsalsa

Pyrodinium bahamense



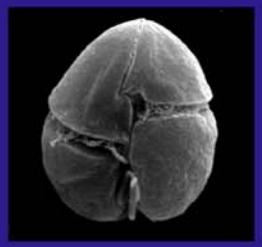
Karenia brevis

Gambierdiscus toxicus

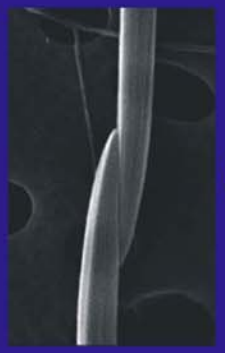


Dinophysis acuta

Gambierdiscus toxicus



Karenia mikimotoi



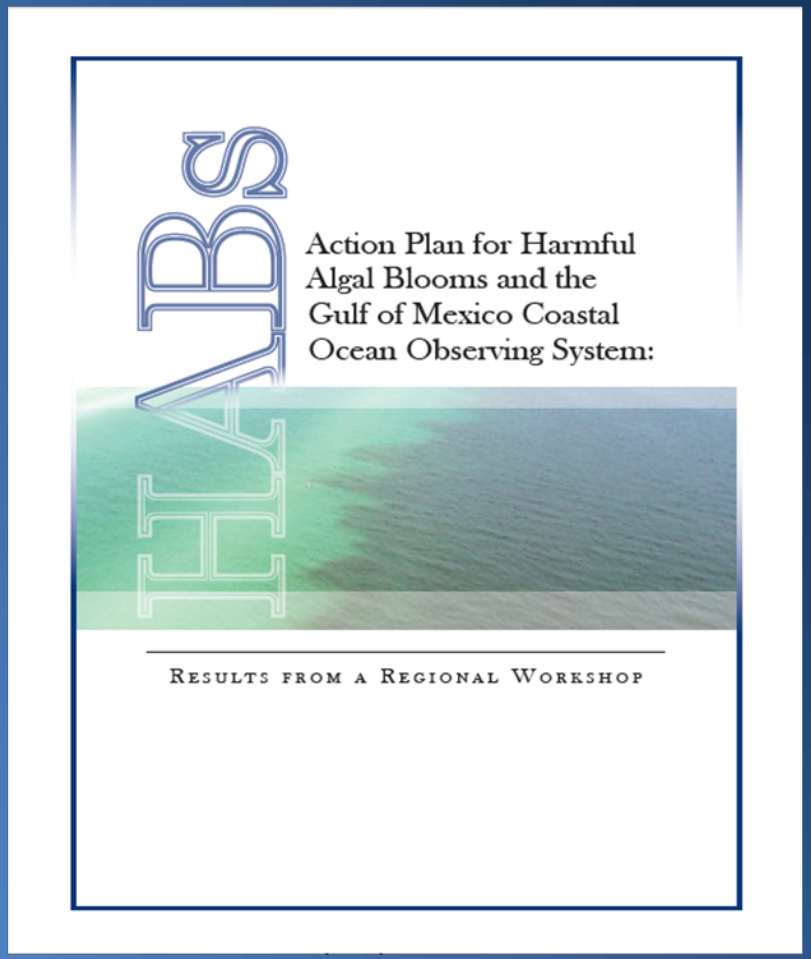
Pseudo-nitzschia spp.

Source: Dr. Cynthia Heil, Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institution

"Harmful"

- Human illness and mortality
  - Toxins consumed in food
  - Exposure to toxins in water or aerosol
- Fish, marine mammal, turtle, bird, invertebrate mortality
  - toxins in food or water
- Ecosystem effects, e.g., low oxygen
- Water discoloration, aesthetics
- Bad taste or smell to water or animals

2004 Regional Workshop



HABSOS-GCOOS

Regional Workshop

13-15 April 2004

St. Petersburg, FL

http://gcoos.tamu.edu/documents/HAB_GCOOS_report.pdf

Joint GCOOS/GOMA HABs Workshop Series

- Workshop 1 – Nov 2007: Created conceptual design for HABs monitoring system and initial system design.
- Workshop 2 – Apr 2009: Identified user needs for HABs information and gaps in existing monitoring system and technology.
- Workshop 3 – 2010: Complete HABS monitoring system design. Create HABs system implementation plan with implementation priorities.

Harmful Algal Bloom Integrated Observing System (HABSIOS)

Vision: Establish a sustained observing system to facilitate and enhance efforts to monitor, manage, and reduce detrimental effects of harmful algal blooms (HABs) on human health and living marine resources (non-human animals and plants) and to mitigate impacts of HABs on coastal communities.

Workshop #2 Tasks

1. Identify user groups needing HAB information
2. Identify data and information needs for each user group in four focus areas:
   a. prediction of bloom initiation,
   b. detection of bloom existence,
   c. tracking or monitoring of bloom, and
   d. forecasting bloom movement and effects.
3. Identify gaps in existing capabilities

http://gcoos.tamu.edu/meetingreports/2009_Apr/minutes.html

User Groups

- Commercial – including fisheries
- Education – K-20 & informal (aquariums, museums)
- Marine Operations – offshore industries & workers
- Government/Elected Officials – resource managers, utilities, policy managers
- Local Economy – businesses (e.g., tourism)
- Public Health – policy managers, health care providers
- Recreation – public
- Scientists/Researchers
- Media

Decision-Maker Information Needs

- Bloom Location, Scale, Species, Timing, Toxin, Counts, Historical Patterns by Species
- Impacts to Human Health, Seafood Safety, Economy, Animal Health, Ecosystem
- Model Results
- Data (3-D physical, biological, chemical)
- Technology
- Multi-lingual Information

http://gcoos.tamu.edu/meetingreports/2009_Apr/minutes.html

Unranked Highest Priority Needs: Observations

Aesthetically detectable

Animal stranding data

Area of effect (aerosols); HAB toxin abundance

Bloom location; Bloom spatial and temporal extent

Bloom species and cell counts, benthic and water column

Calls into poison control on respiratory, food poisoning incidents, skin rashes

In situ real-time data on physical, chemical, biological parameters

Epidemiology and surveillance

Meteorology; climatological data

Nutrient conditions of freshwater and groundwater and atmosphere

River runoff and precipitation and groundwater data

Existing Resources

- Gulf coast states have monitoring and management programs
  - "red tide" focus
  - shellfish safety
  - information for public health and recreation
- NOAA Harmful Algal Bloom Operational Forecast System
- EPA/NOAA Harmful Algal Blooms Observing System
- CDC Harmful Algal Bloom-related Illness Surveillance System
- NASA satellite imagery
- Marine Mammal Stranding Networks – federal/state
- Phytoplankton Monitoring Network – volunteer
- Oceanographic observations (e.g., currents, salinity, fluorescence, winds, etc.)
- Research programs: e.g., causation, new technologies

State Systems

- Monitoring conditions
- Adequate communication of risk and consequences without provoking undue alarm.
- Availability of good data that is easily accessible
- Data appropriate for the audience

http://research.myfwc.com/features/category_sub.asp?id=4434

State Systems

Harmful Algal Blooms (HABs)

Red Tide Status (Updated March 22, 2010)
Golden Alga Status (Updated April 20, 2010)

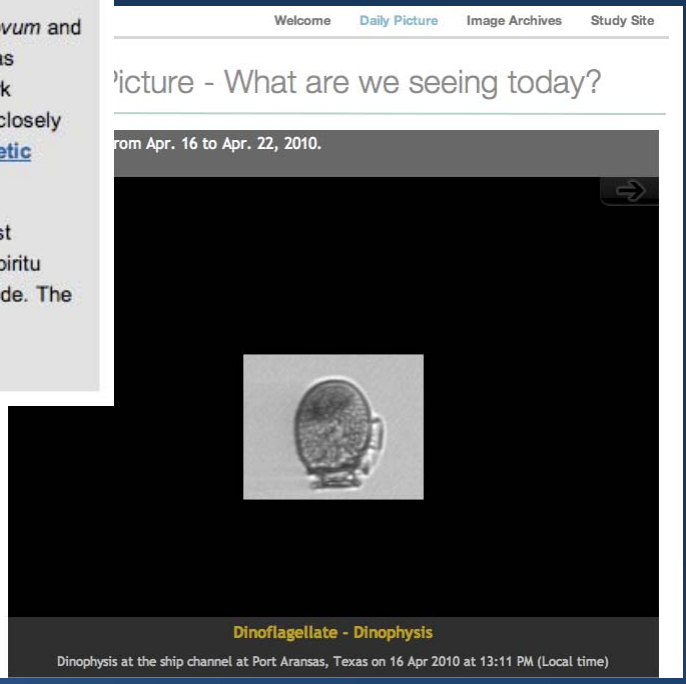
Dinophysis Bloom Closes Texas Shellfishery

In recent weeks, Texas A&M University's Imaging Flow CytoBot has detected increasing concentrations of *Dinophysis ovum* and *D. caudata* coming through the pass at Port Aransas. Dr. Lisa Campbell and her staff have been in contact with the Texas Department of State Health Services keeping them informed of the cell concentrations. Phytoplankton Monitoring Network volunteers also report high concentrations of *D. ovum* and *D. caudata* at Matagorda Bay Nature Park. TDSHS has been closely monitoring bays all along the Texas coast for the toxic alga, which causes a type of seafood poisoning known as Diarrhetic Shellfish Poisoning or DSP.

Effective Friday, April 23, the following bays have been closed due to levels of *D. caudata* and *D. ovum*: Galveston, West Galveston, Bastrop, Christmas, East Matagorda, Matagorda, Tres Palacios, Carancahua, Lavaca, Powderhorn Lake, Espiritu Santo, San Antonio, Mesquite, and Copano. St. Charles, Aransas and Corpus Christi bays all remain closed due to red tide. The Lower Laguna Madre and South Bay remain open.

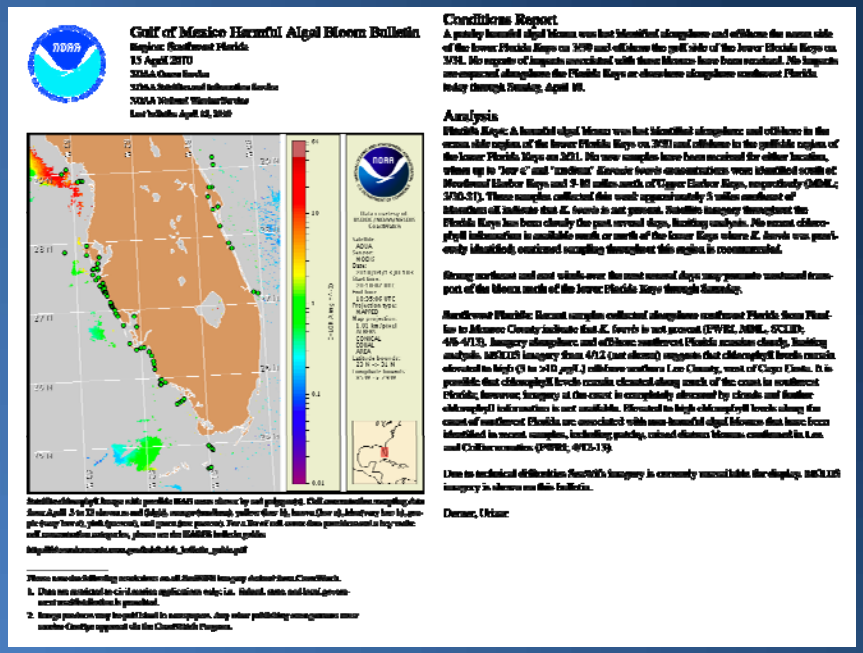
TDSHS Press Release

http://www.tpwd.state.tx.us/landwater/water/environconcerns/hab/



http://gcoos.tamu.edu/products/phytoplankton/Daily_Picture.html

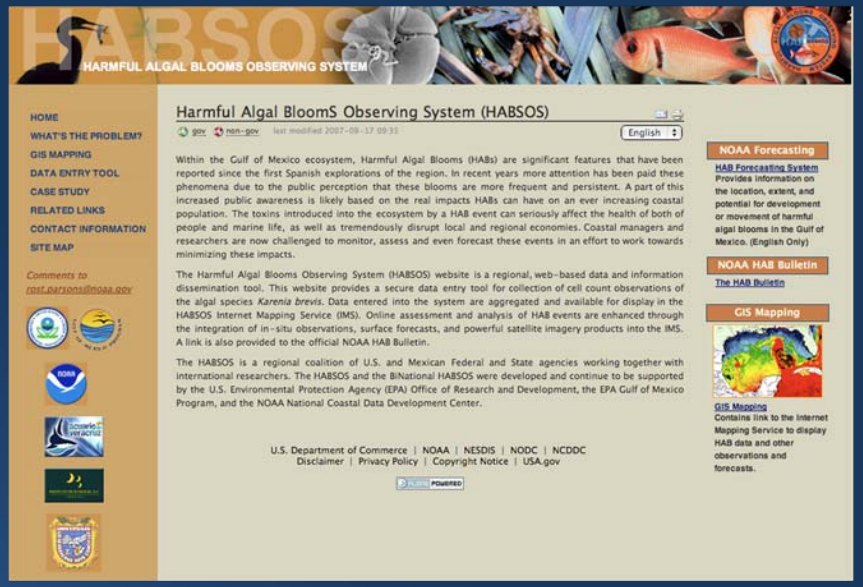
HAB-OFS and HABSOS



Gulf of Mexico Harmful Algal Bloom Bulletin

Conditions Report

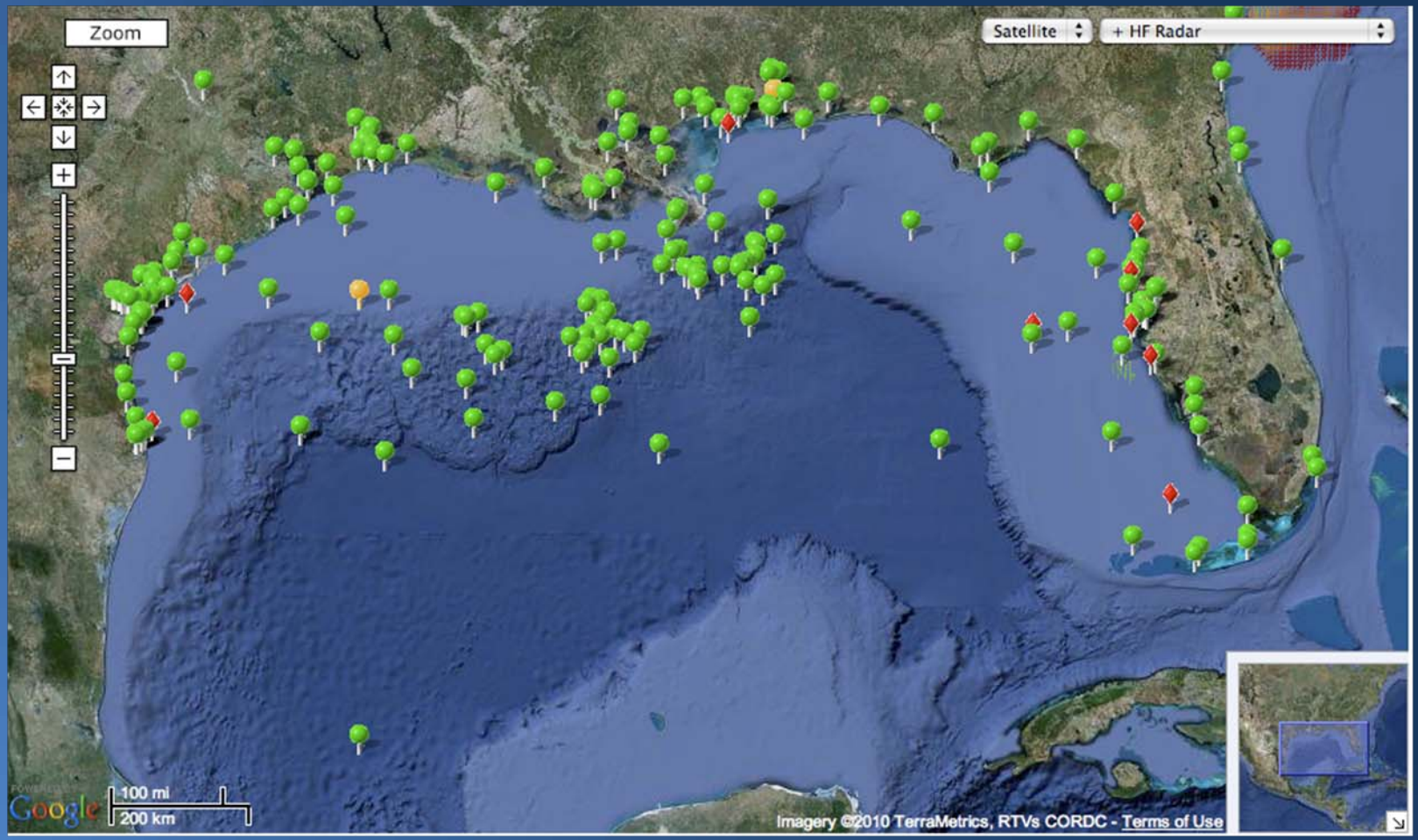
Analysis



http://tidesandcurrents.noaa.gov/hab/

http://habsos.noaa.gov/

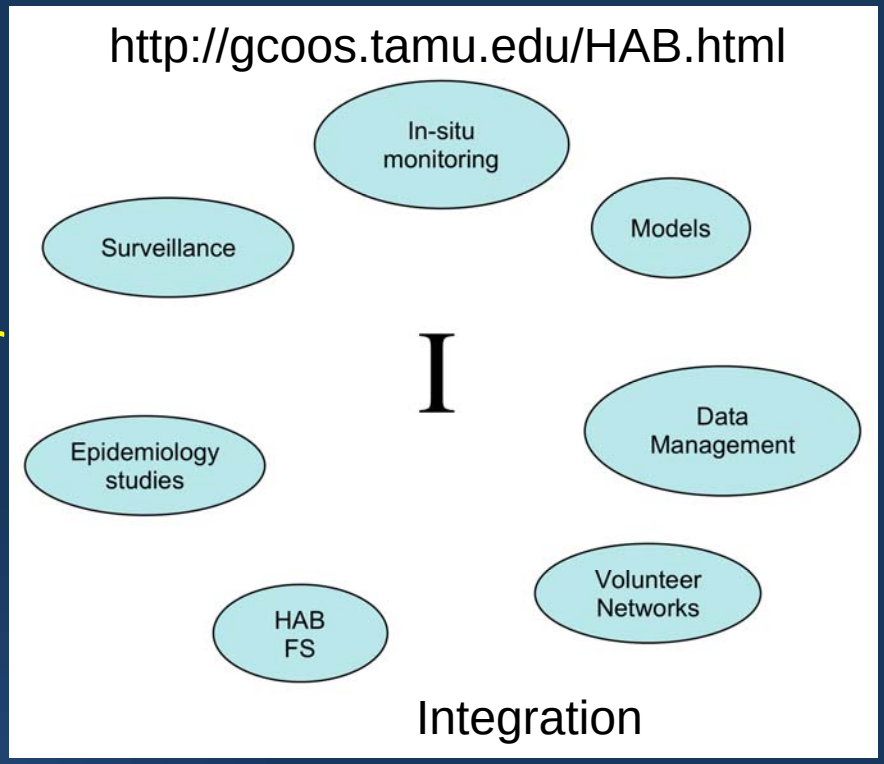
Real-Time Ocean Observations



http://gcoos.rsmas.miami.edu/

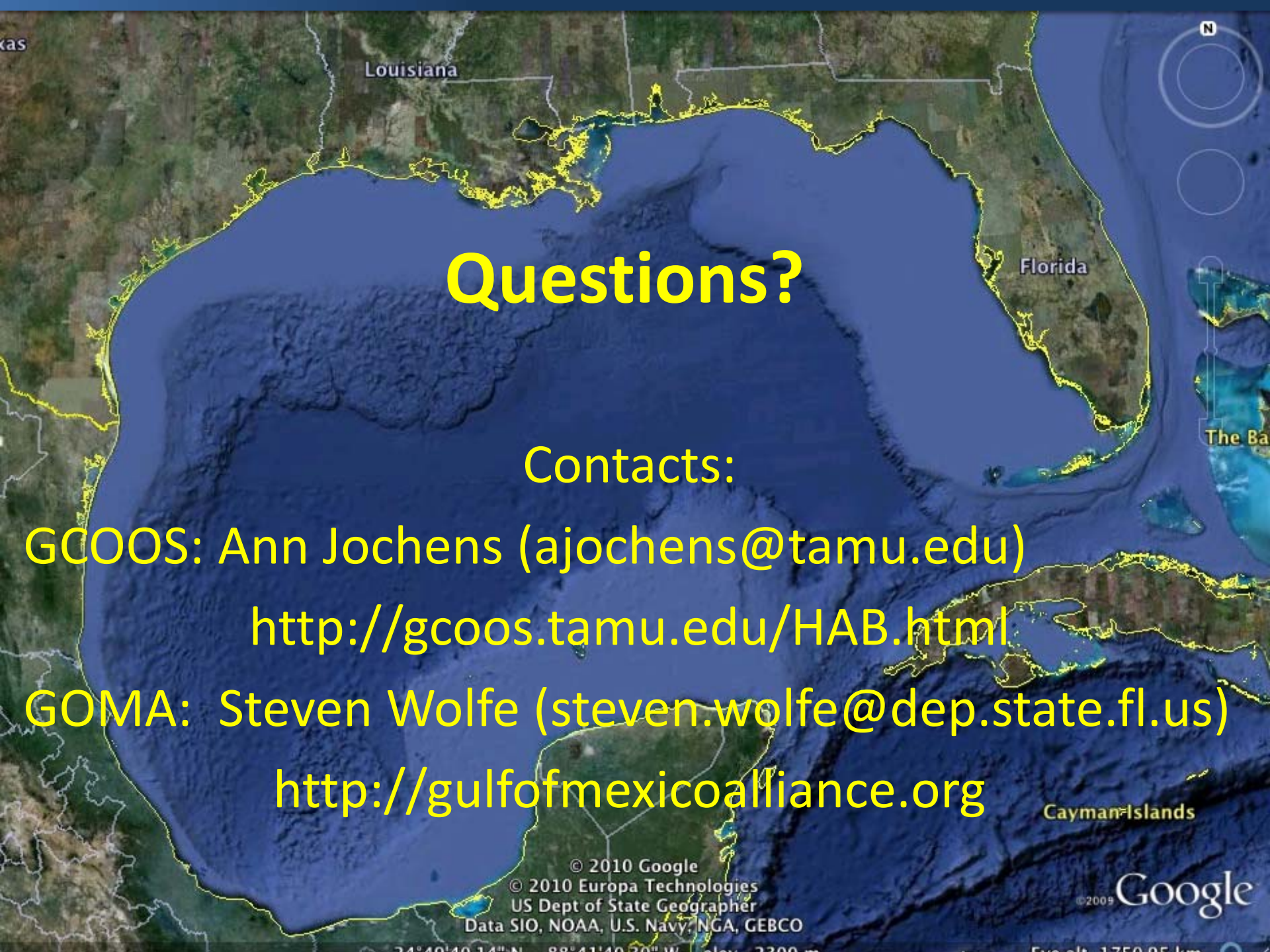
Implementation Plan Elements

- Observations
  - Environmental conditions
  - In situ HAB monitoring
  - Remote sensing HAB monitor
  - Adaptive sampling
- Models
- Data Man., Communications
- Performance Metrics
- Links of Public Health and Living Marine Resources to Ocean Observations
- Improve Operational Capabilities through Research
- Information Delivery for Specific Audiences



Future Actions

- GCOOS/GOMA Workshop #3 – 2010
- Complete Implementation Plan with priorities
- Maintain existing capabilities (presently diminishing in today's fiscal environment)
- Integrate existing capabilities
- Enhance capabilities through completion of GOMA action steps and GCOOS data acquisition plans



Questions?

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http://gcoos.tamu.edu/HAB.html

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http://gulfofmexicoalliance.org