

Beyond the Horizon:

*A Forum to Discuss a Potential Network of
Special Ocean Places to Strengthen the Ecology,
Economy and Culture of the Gulf of Mexico*

**Proceedings of the Forum: May 11-13, 2011
Keating Education Center
Mote Marine Laboratory, Sarasota, Florida**

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Foreword to the Proceedings of the Beyond the Horizon Forum

Sylvia Earle, Ph.D.

The Beyond the Horizon Forum represents a bold commitment to the Gulf of Mexico and to the Nation – a Nation whose economy depends on the abundant natural resources in the Gulf of Mexico. It is a flagship for engaging the communities, scientists and users of the Gulf of Mexico in an essential effort to identify and protect ecologically important places in the beautiful waters of the Gulf. This action will assist the restoration of the Gulf’s marine environment following the devastating oil spill in 2010 and enhance its resiliency to future disturbances. Most significantly, this effort is a collaborative process that involves the oil and gas industry, commercial and recreational fishermen, and the communities of the Gulf Coast to enhance the economic benefits and protection of the Gulf’s vital natural systems.

These proceedings compliment the Gulf Coast Ecosystem Restoration Task Force’s Final Ecosystem Restoration Strategy released in December 2011. The Task Force’s Strategy is a blueprint for long-term restoration of the Gulf drawn from extensive feedback from citizens along the Gulf Coast. This strategy recognizes that the health of coastal and offshore habitats of the Gulf of Mexico depends on the physical and biological connections that link the habitats and their communities to one another. It states that “protecting and managing a network of ecologically significant offshore sites will be important to the Gulf’s overall biological productivity and resilience.” Establishing such a network of protections will not only help to restore and preserve the Gulf’s ecological integrity, but also preserve the integrity of the relationships we have as a nation to the Gulf of Mexico. This commitment is one that all the people of the United States can rally behind. It will preserve our connections to the Gulf that are so essential to our history, culture and economy, and at the same time ensure that the Gulf environment and ecosystem are adequately compensated for all they have given us, and with care, will continue to give to us in the future.

The scientists, managers and educators of NOAA’s Office of National Marine Sanctuaries have dedicated themselves to the stewardship of our existing system of national treasures that are our National Marine Sanctuaries. Two of those sanctuaries are in the Gulf of Mexico and already protect some of the most important coral reef ecosystems in our nation: The Florida Keys National Marine Sanctuary off south Florida, and the Flower Garden Banks National Marine Sanctuary 100 miles off the coast of Texas and Louisiana. We need to harness the talent and experience of all who know the Gulf and entrust NOAA and its partners to use that expertise to bring new areas into the Gulf’s network of sanctuary sites. These sanctuary designations will be designed to allow activities that will not harm sensitive and important biological places and will protect their ecological role in maintaining the Gulf ecosystem. Sanctuary designation is not about excluding what we do in the ocean. It is about preserving the benefits we and our environment receive from the ocean.

Expanding sanctuary protection at important sites in the Gulf is already underway with the proposed addition of new sites to the existing Flower Garden Banks National Marine Sanctuary in the NW Gulf. That proposal is being made through a process that engaged stakeholders and the public, and from recommendations made by a council of sanctuary advisors that represent the users of marine resources in the region. The use of this consultative process to propose expanding the Flower Garden Banks National

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Marine Sanctuary into a larger network of sanctuary sites is a positive model that can be used to make sure that ecosystem protections are compatible with uses and vice versa.

These Proceedings of the Beyond the Horizon Forum are being released as the monetary settlement for the BP Deepwater Horizon oil spill is being discussed. Compensation for what was the most tragic event in our relationship with the Gulf of Mexico will help restore the Gulf's environment and communities. But the Gulf of Mexico deserves more than just money. The Gulf deserves our pride -- pride in what it has given to us and pride in what we can give back.

A handwritten signature in black ink that reads "Sylvia A Earle". The signature is written in a cursive style with a large, sweeping initial 'S' and a distinct 'A'.

TO PROTECT AND CONSERVE THE GULF OF MEXICO

Beyond the Horizon Forum Press Release, May 13, 2011

While representatives from scientific organizations, government, the oil industry, commercial fishing and water recreation sometimes have differing ideas of what's important about the Gulf of Mexico, most agreed on one thing during a recent two-day workshop at Mote Marine Laboratory: that the Gulf needs better conservation and protection.

"Beyond the Horizon," a two-day workshop convened by Mote, the Harte Research Institute, the University of South Florida College of Marine Sciences and the National Marine Sanctuaries Foundation, actually ended with a new beginning, organizers said.

"This was the first time we were able to bring this diverse group together to talk about unifying protections for the Gulf, so really, we're at the beginning stages of figuring out what additional conservation measures might be needed and how they could be implemented," said Dr. Kim Ritchie, conference organizer and manager of Mote's Marine Microbiology Program. "But everyone agreed that we need more protections — so that's a really good place to start." The Gulf of Mexico is arguably one of the Nation's — if not the world's — most important bodies of water.

- 14 million people call the Gulf Coast home
- The region provides jobs for 20 million people
- Oil and gas, tourism, fishing and shipping in the Gulf of Mexico generate \$234 billion annually
- The region's petroleum industry provides half of all the U.S. oil production and refining capabilities, employs 100,000 people and pays \$12 billion in wages
- Tourism generates 620,000 jobs and \$9 billion in wages
- The commercial fishing industry lands 1.3 billion pounds of seafood worth \$662 million
- 66 percent of the ocean-transported cargo shipped to and from the
- U.S. comes through the Gulf's six major ports
- The Gulf of Mexico provides habitat for 15,400 documented species —including 1,500 species that live only in the Gulf

Certainly there's a lot at stake in the Gulf of Mexico, says former U.S. Sen. Bob Graham, who co-chaired the National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling. "With the loss of 11 lives, the Deepwater Horizon was a human tragedy," Graham said. "It remains an environmental tragedy, both through the environmental havoc it wreaked and through the public's loss of confidence in the industry and in government. This conference was an important step in discussing the Gulf's resources and their national importance and in allowing all stakeholders to come together and work to preserve this irreplaceable treasure."

The key area of discussion during the conference focused on the way that locations and habitats within the Gulf are unified by the Loop Current — despite being separated by great distances — and the need for comprehensive use and protection plans that take this connection into consideration.

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These locations and habitats — sometimes referred to by scientists as the Gulf’s “special places” — are the relics of shorelines and barrier islands.

Once above sea level, they were flooded as sea level rose during the past 125,000 years. Today, they provide critical structure and habitat for the Gulf’s animal and plant species.

Connecting them all is the Loop Current — the Gulf’s major current. It flows north into the central Gulf then loops clockwise and flows south again along the west Florida continental shelf. The current passes the Dry Tortugas, heads northeast to the Florida Keys and then becomes the southern end of the Gulf Stream. As the current travels throughout the Gulf, it acts like a conveyor belt moving things from one “special place” to another. Sometimes those things — like life-sustaining plankton — are good and sometimes those things — like pollution — are bad.

“The Gulf of Mexico is dotted with extraordinary places rich in biodiversity and critical to the health of both commercial and recreational fisheries,” notes Dr. Larry McKinney, Director of the Harte Research Institute. “The best defense against future oil spills is a healthy and resilient Gulf and protecting these special places will be one key to that strategy.”

The two-day workshop provided an opportunity for differing groups to get to know each other and to discuss a shared desire: that of combining the best science available with input from the public to protect and conserve the Gulf of Mexico.

“We do indeed have differences and concerns but there is a remarkable congruity in our perspectives,” said Dr. John Ogden, a member of the conference’s executive organizing committee: “We’ve shown how connected and interconnected we are bio-physically, socially and economically. We need ecosystem-wide management that takes into account the integration of humans and nature. Now, the next step will be to pull together everyone’s ideas and then move the discussion forward.”

ACKNOWLEDGEMENTS

On behalf of the Beyond the Horizon Executive Committee, we thank John Armor, Donna Basso, Paula Clark, Sara Fangman, Rusty Holmes, Joe Nickelson, Nadine Slimak, Vicky Wiese, and Trisa Wintringham for their support before, during, and after this forum. We also thank John Ogden for preparing the “Summary and Synthesis.” Special thanks go to the Mote Scientific Foundation, University of South Florida, National Marine Sanctuary Foundation and Judy Graham who provided financial support for the Forum, and to the many participants who attended and contributed to discussions and content of the Forum’s outcome.

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ABOUT THESE PROCEEDINGS

The contributions in this document are from written submissions by the authors and from the transcript of the meeting. Discussion sections were transcribed from a recording of the meeting and the person speaking was identified where possible. Additional information about the Forum and copies of the PowerPoint presentations by the authors can be found on the Beyond the Horizon website. Together, these Proceedings and the documents on the website provide a detailed record of the Beyond the Horizon Forum: www.Mote.org/BeyondHorizon

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Summary and Synthesis of the Beyond the Horizon Forum

John Ogden, Ph.D.

Background

The Gulf of Mexico (GOM) is a deep basin of 1.5 million km² surrounded by a broad, shallow shelf (about 50% of its area) which is physically, biologically and socially connected to the Caribbean Sea and the U.S. East Coast to the Atlantic by the Loop Current, the Florida Current and the Gulf Stream, which are also the major ocean routes of commerce. Arguably, we know more about the ecology and biological diversity of the Gulf than any other comparable body of water on the planet. Thanks to the exploration research of the oil industry and the many universities and research institutions ringing the Gulf, there is a rich scientific background on the geological history and underlying structure, general ecological setting, and the biological diversity of the region. Much of this information can be made available in detailed, multi-layered maps of the region, providing dramatic visualization of the biophysical characteristics of the Gulf and the developing human disturbances. The existing marine protected areas of the Gulf are topographic high points that rise above the sediment-dominated coastal shelf and, like islands everywhere, are refuges for biological diversity which can replenish other areas after significant natural or human disturbances.

The GOM is the most industrialized body of water in the world, supporting nationally prominent industries, commercial fisheries, shipping lanes and ports. The GOM has the largest oil and natural gas fields supported by huge refining and transport capacity along the coast and in major ports. The offshore oil industry is particularly important with 4000 producing offshore oil wells; many thousands more capped wells and abandoned rigs; thousands of miles of oil and gas pipelines; chronic minor oil spills and natural oil seeps. Exploitation of proven deepwater petroleum reserves is just beginning in the U.S., Mexico and Cuba. The Mississippi River, draining more than 50% of the contiguous U.S. land area, delivers sediments and pollutants originating in the grain belt to the GOM. The “Dead Zone” an annual development of hypoxia from senescing phytoplankton blooms off the mouth of the Mississippi has increased in size and impact. The Loop Current carries these pollutants to the coral reefs of the Florida Keys and hence to the north along the east coast. The West Florida Shelf and the relatively wide shallow rim of the GOM support nationally important commercial and recreational fisheries for snapper, grouper, and sharks, which have a major economic and ecological impact. The region, particularly Florida, is economically dependent upon tourism, clean beaches, recreational fishing and boating and unpolluted waters.

Why isn't the GOM an open sewer? It has resisted these many disturbances and remains a key natural ocean habitat, for example, supporting the seasonal spawning and mating of bluefin tuna, whale sharks and sperm whales. It has large and diverse coastal wetlands, unique deep-sea brine lakes and methane ice fields, great biodiversity and the largest recreational fishing and boating industry in the US. While the GOM is demonstrably a resilient large marine ecosystem, its future health will depend upon increased human intervention, including ecosystem-based approaches to governance, networks of marine protected areas, marine spatial planning to delineate critical areas for both commerce and conservation and perhaps more active “agricultural” approaches to restore and maintain habitats damaged by natural and anthropogenic disturbances.

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The concept of the Marine Protected Area (MPA) emerged in the latter half of the 20th century from the perception, backed by decades of scientific studies, demonstrating that the marine environment was under threat and increasingly in decline from human disturbances. A MPA as defined by Presidential Executive Order 13158 is “*any area of the marine environment that has been reserved by Federal, State, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein.*” Thus, the MPA is one type of marine managed area that includes everything from seasonal fisheries area closures to legislated marine reserves from which all take is prohibited.

MPAs include protection but are multiple use areas where governance often through state and federal partnership works to sustain human use of marine resources. Unlike the current fragmented, overlapping, and redundant management of marine areas by sectoral interests, such as fishing, minerals interests and recreation, the MPA governance encompasses the regional marine environment, the multiplicity of human uses, and the ecosystem services which it provides to human society. The current accepted and most effective model for MPAs in the U.S. is the NOAA National Marine Sanctuary Program.

The Path Forward

The purpose of the Workshop was twofold:

- Build a consensus for establishing ecologically significant protections for key GOM sites to ensure that they continue to provide important ecosystem services to our society.
- Identify mechanisms that allow significant involvement of the public in decision-making on more comprehensive approaches to management.

The Deepwater Horizon (DWH) oil spill of 2010 provided a focal point of crisis for the GOM ecosystem. The extent of the known environmental damage was unprecedented and the extent of the unknown damage, particularly in deep waters offshore, prompted a major social dialog, which encompassed the economic value of all of the GOM resources and the need for adequate protection and governance to insure continued use of these resources. Part of this dialog included the long-standing proposal to create a network of MPAs in the GOM. The concept of Beyond the Horizon (BTH) is to link a number of marine managed areas – some already established, some new, and all vetted -- into a network.

The term “ecosystem” is a convenient human construct that places boundaries around a part of the human-natural world so that its internal structure and functionality, and external connectivity, which make it act as a unit, can be more easily understood and managed. The Gulf-wide DWH disaster was a convincing demonstration that the human footprint in the GOM makes the entire body of water the management unit. BTH will use the connectivity of social, economic and ecological systems to develop a network of MPAs, which will extend management to the scale of ecosystem processes and disturbances. The network will be greater than the sum of its parts for two main reasons. First, it is interconnected by human uses and interactions and physical, chemical and biological processes, which build regional ecosystem resistance and resilience to future disturbances. Second, the network will have administrative and regulatory uniformity, minimizing sectoral conflicts and administrative duplication and overlap.

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The regional approach to ocean governance was the main concern of the 2004 Commission on Ocean Policy Report (COP) to the nation and was the stimulus for the Gulf of Mexico Alliance (GOMA) that was established by the governors of the 5 GOM states. The Alliance has since taken a holistic view of the GOM and has been working effectively to integrate political and management efforts and focus them on the major environmental problems of the GOM. The National Ocean Policy Task Force further refined the governance issues and has laid out a framework for an approach to governance of ecologically distinct regions in the U.S., which is currently under review.

Consensus Framework for Implementation of Beyond the Horizon

The workshop came to a consensus on the following five points as a framework for continued discussions leading to the implementation of BTH. This framework was outlined in the presentation by Andy Radford, Senior Policy Advisor of the American Petroleum Institute and was expanded and modified in group-discussion.

1. *Perform Risk Assessment to establish need:* Much is known about the natural resources of the GOM and human needs for resources and services from the GOM ecosystem. But much is unknown. We are in an era of rapid and uncertain environmental change through relentlessly expanding human populations and uses and global climate change. Risk analysis is a way of dealing with this uncertainty by understanding what we are attempting to manage and to protect by assigning action priorities on the basis of a quantitative assessment of those risks and building public confidence in the actions. One positive spin-off of the DWH is the new funding for research and restoration and the abundance of new data on the GOM from damage assessment and impact studies.
2. *Support additional peer-reviewed science of connectivity:* The connectivity of all parts of the GOM of Mexico by ocean currents, particularly the now-famous Loop Current, is well-known in broad outline. For example, we know and can predict the annual incursions of the Loop Current into the GOM and the formation of persistent gyres, which travel west to the Texas coast. Similarly, we can also predict the penetration of episodic floodwaters from the Mississippi River via the Florida Current as far as the Florida Keys and beyond. But if the BTH is to function as a network, the fine details of the connections between its individual units must be better understood. Fortunately, an ocean observing system incorporating new methods of monitoring, assessing and modeling the dynamics of biological resources and human impacts may result from new funding provided by the Gulf Coast Ecosystem Restoration Task Force (GCERTF) and the National Resource Damage Assessment (NRDA) process.
3. *Establish use criteria prior to creating a MPA:* The large human population surrounding the GOM with its myriad interest in its resources mandates that the social sciences and public participation must play a major role in the implementation of BTH. We humans are political animals who don't like sudden involuntary changes in our lives, tend to distrust government and treasure our freedoms and our constitutional rights to make our points of view heard. Economics is the underlying driver of our society. Marine governance, conservation, and sustainability must be shown to serve our needs for economic opportunity. Most of the nation's existing marine sanctuaries were established by local people who recognized the importance of their marine

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resources and saw a problem that could be addressed by the governance framework of a MPA. BTH will use this experience in the considerably larger and more complex negotiations that must accompany the formation of a GOM-wide MPA network.

4. *Develop a plan for regulation and enforcement.* MPAs require regulations and effective enforcement, which tend to be a major part of the projected budget for governance. A corollary to our healthy distrust of government is that rules and regulations will not apply equally to all. One of the key outcomes of public involvement in every step of the process of creation of an MPA to its inclusion in a network is that people have a vested interest in the success of the MPA and self-governance, as in community-based fisheries management, will be the key to enforcement.
5. *Develop a performance monitoring plan.* Another corollary to good governance is that people want to know if it is working. This approach is broadly known as Adaptive Management where the actions of management are routinely assessed and measured and changed in response to knowledge gained. BTH will require a monitoring and assessment plan with periodic reporting requirements and milestones. As has been the case in most of the national marine sanctuaries, public involvement in assessment and monitoring has helped to gain acceptance and greatly assisted the outreach essential to local regulations and to enforcement.

Out of Adversity, Comes Opportunity

Just as the Deepwater Horizon disaster provided a focal point for consideration of the future of the GOM, it will also provide funding in unprecedented amounts for research, restoration and mitigation. Projected over the next 10 years, we will greatly extend our understanding of the scope of the oil spill, our basic understanding of the structure and functioning of the GOM ecosystem, and the human economic and social dependencies on the resources of the region. Through the NRDA process, the potential for future damage and punitive judgments against the responsible parties will likely provide a much-expanded opportunity.

As a top priority, the GOM needs an ocean observing system. This is called for in almost all the policy documents since the 2004 Commission on Ocean Policy. It is featured in the Gulf of Mexico Alliance reports and, for example, is a major recommendation of the Florida Ocean and Coastal Council in their annual research priorities report to the Florida Legislature. Fortunately, as part of a national discussion of ocean observing in sub-regions of the U.S., the scope and design of a Gulf of Mexico Coastal Ocean Observing System (GCOOS) and a parallel Southeast Coastal Ocean Observing Regional Association (SECOORA) has been going on over the past 5 years. Ocean observing, involving all the physical, chemical and biological indicators of ocean health as well as human uses and dependencies, is basic to tracking change in the GOM and regional waters and to adaptive management.

The NRDA process has shown that while damage from DWH can be relatively easily assessed and restoration measures implemented in the coastal regions of the GOM, assessment of offshore damage is difficult to impossible. BTH provides a viable way to mitigate these damages with a network of marine protected areas, covering the full range of the biodiversity of the GOM. Finally, BTH will provide replicate reference areas for adaptive management, allowing long-term studies to assess and mitigate future changes caused by human and natural disturbances.

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Day One

Welcome and Introductions

Michael P. Crosby

Senior Vice President, Mote Marine Laboratory

Mote Marine Laboratory was founded first and foremost as a research institution nearly 60 years ago and remains committed to its nationally and internationally respected research programs that are relevant to conservation and the sustainable use of marine biodiversity, healthy habitats and natural resources. As such, Mote is pleased to continue our support of forums such as “Beyond the Horizon” that seek to discuss a Potential Network of Special Ocean Places to Strengthen the Ecology, Economy, and Culture of the Gulf of Mexico.

In giving his name to our institution, William R. Mote was quoted as stating, *“For generations, we have been taking from the sea. Now, it’s time to start giving back.”* Indeed the mission of Mote Marine Laboratory directly supports the advancement of marine and environmental sciences through scientific research, education and public outreach, leading to new discoveries, revitalization and sustainability of our oceans and greater public understanding of our marine resources. As an independent marine research institution, we are somewhat unique in that we are not under any academic institution, state or federal agency. We are a non-profit, NGO. This allows us to have minimal administrative bureaucracy, great flexibility to be adaptive and responsive to rapidly evolving information needs with regional and coastal foci. However, Mote has a long history of partnership and collaboration with a variety of state, regional, national and international institutions and organizations.

It is great to again be with so many friends and colleagues with whom we have collectively share decades of significant effort and a few battle scars obtained during a sometimes-tumultuous evolution of marine and coastal protected areas. I have no doubt that you will agree that we have heard the same conversations at all the meetings we have been going to over these decades: How do we integrate all the protected areas management strategies? How do we integrate all the MPA networks? How do we promote long-term sustainable use of resources? How do we conserve and sustainably use marine biodiversity? Many of you have made significant contributions in addressing these questions over these past decades and have produced benchmark publications on these important topics. Yet we are here still asking the same questions.

Some colleagues and I also published a manuscript dealing with these questions in the journal *Oceanography* nearly 20 years ago. At that time, we made a few observations that are pertinent today and led us to make a conclusion that unfortunately still hasn’t been adequately addressed. We observed that at that time, as still exists today, several international, national, and state/local level mechanisms exist that serve to advance the management objectives of marine and coastal protected areas. In the international sphere these include the Man and the Biosphere program, the World Conservation Union (IUCN), the Biodiversity Convention, the Regional Seas program, and IMO Sensitive Sea Areas. In the United States, such mechanisms exist in NOAA's Marine Sanctuaries and National Estuarine Research Reserve System programs, and the National Park Service's marine and coastal parks. Nearly two decades ago we concluded that in the absence of a true, functional globally integrated network of marine and coastal protected areas that is essential for the comprehensive conservation and sustainable use of marine

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biodiversity, there was a critical lack of integration between and even within many of those programs. The challenge that continues to face the world today, as it did then, is to integrate these programs into a true and robust system for conserving marine and coastal biological diversity. This conference is seeking to pro-actively address this critical issue head-on in the Gulf of Mexico region. I respectfully challenge you to develop a realistic strategy that will achieve more than the type of incremental steps that have been achieved over the last several decades. My challenge for this group is to make a profound leap forward in establishing a functionally integrated network of marine and coastal protected areas that spans the Gulf of Mexico. You have my sincere best wishes and support for achieving this goal.

Billy D. Causey

Regional Director, Southeast Atlantic, Gulf of Mexico and Caribbean Region
NOAA's Office of National Marine Sanctuaries

INTRODUCTION

What a great day! I want to thank each and every one of you for taking the time out of your busy schedules to join us for this very important Forum. The Beyond the Horizon Executive Committee, whose names are in your handout materials, deserves a hearty “thank you” and congratulations for the vision they had in organizing this Forum and pulling together a stellar line-up of speakers, moderators and invited participants.

I want to take this time to recognize the hard and dedicated work of Dr. Kimberly Ritchie, Donna Basso, Nadine Slimak and all of the capable staff at Mote Marine Laboratory for making this Forum more than just a plan, but an extremely well-organized event.

Please join me in thanking Kumar Mahadevan, the President and CEO of Mote Marine Laboratory, and the Chairman of the Executive Committee for the Beyond the Horizon Initiative, for hosting and supporting this extremely important Forum. I want to recognize the Mote Scientific Foundation for their role in sponsoring the Forum. We also thank Dr. Jackie Dixon, Dean of the USF College of Marine Science, and Jason Patlis and the National Marine Sanctuary Foundation for their very important support of this special gathering.

We have a stellar line-up of speakers for you over the next day and a half. Thanks go to each and every one of you for taking the time to join us and share with us your very special experiences and knowledge about the Gulf of Mexico.

Every good Forum depends on an engaged and interested audience. Thank you all for your attendance and for being ready to listen and participate!

BACKGROUND

This Forum is the beginning of a dialogue to strengthen the economy, ecology and culture of the Gulf of Mexico.

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The Purpose of the Forum is to:

- Build a consensus for establishing ecologically significant protections for key Gulf of Mexico sites to ensure that they continue to provide important services to our society; and
- Identify mechanisms that allow comprehensive approaches to management as well as significant involvement of the public in decision-making.

The tragedy of the Deepwater Horizon accident, and the environmental disaster it produced, has created a national awareness of what is at stake in the Gulf of Mexico. If we are complacent in how we use the Gulf environment and its resources, we are destined to “clean-up” our mistakes instead of prevent them. We have seen how lives, economies and ecosystems in the Gulf can be disconnected. We now need a vision for how to reconnect and heal them.

This Forum is to explore a new relationship with the Gulf of Mexico: A relationship that uses the Gulf’s important products, which are essential to our economic prosperity, and a relationship that protects important places, which are essential to the Gulf’s ecological prosperity. These two goals are not incompatible. One only needs to look to the two places in the Gulf where ecological stewardship and compatible use co-exist.

The Flower Garden Banks and the Florida Keys National Marine Sanctuaries are biological gems amid some of the most heavily used ocean spaces in America. These sanctuaries embrace a public stewardship process that ensures their natural resources remain accessible, while their biological wonders and ecological integrity are monitored and protected.

The strength of this integrity and the vitality of species protected by the sanctuaries not only depend on the conditions within sanctuary boundaries, but also on the conditions at a series of other important reefs and banks that ring the Gulf. This network of places and the diverse populations of seafloor and oceanic species they attract, are united by the biological products they exchange, and by the flow of currents and species that move between them.

Using our public sanctuary process at these other special places would strengthen the Gulf of Mexico. Such a network of sanctuaries would function in unison to restore depleted species and damaged communities, as well as sustain the resources within our existing sanctuaries. It would also create a more resilient Gulf of Mexico ecosystem, better prepared to withstanding future impacts and environmental changes. Creating a sanctuary network is a way to give back to the Gulf what we have taken away.

And now, I am going to turn the podium over to Dr. Kimberly Ritchie and Dr. Steve Gittings who will be serving as the moderators of this Forum. They will explain the logistics and procedures for the presentations today and tomorrow morning and the breakout sessions for tomorrow afternoon.

Again, thank each of you for joining us for the Beyond the Horizon Forum!

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Sally J. Yozell

Director of Policy, Senior Advisor to NOAA's Under Secretary of Commerce for Oceans and Atmosphere

Our Nation receives tremendous economic, cultural, and ecological benefits from the Gulf of Mexico. Given its recent history with the Deep Water Horizon oil spill, the Gulf heightened our awareness of the challenges our nation faces to manage and protect those benefits both locally as well as on a national scale while also ensuring our marine and coastal ecosystems remain healthy. The oceans, coasts and Great Lakes of the US support tens of millions of jobs, contribute trillions of dollars a year to the national economy, and are essential to public health and national security. However, our oceans and coastal ecosystems are also in trouble. In response to this growing concern for the future of our ocean environment and our relationship to it, President Obama, acting on recommendations of the Interagency Ocean Policy Task Force, has established a National Ocean Policy to ensure that the Gulf and all our ocean, coastal, and the Great Lakes communities and environments are healthy and resilient, safe and productive, and understood and treasured.

As part of the *National Policy for the Stewardship of the Ocean, Our Coasts, and the Great Lakes* (<http://www.whitehouse.gov/the-press-office/executive-order-stewardship-ocean-our-coasts-and-great-lakes>), the National Ocean Council released a draft *National Ocean Policy Implementation Plan* (<http://www.whitehouse.gov/administration/eop/oceans/implementationplan>) in January 2012 to confront some of the most pressing challenges facing our ocean. This draft plan describes actions the Federal Government should take to address the priority objectives highlighted in the National Ocean Policy. The draft Implementation Plan was developed with extensive public and stakeholder input. The National Ocean Council agencies evaluated more than 850 specific comments from stakeholders and the public and incorporated them into the Plan.

The Final Implementation Plan will ensure the Federal Government targets limited resources effectively to deliver demonstrable results for the American people. These results include more predictability for ocean users; more efficient and coordinated decision-making on ocean uses; and improved sharing of data and technology for better stewardship of ocean resources.

To achieve its results, the plan highlights ecosystem-based management (EBM) as an essential approach to resource management and considers the entire ecosystem, including humans as part of the ecosystem. EBM embraces all the elements that are integral to ecosystem functions, and accounts for economic and social benefits as well as environmental protection. The concept of EBM is underpinned by sound science and a commitment to adaptive management as information or changing conditions present new challenges and opportunities. It also recognizes that ecosystems are not defined or constrained by political boundaries. As a result, it requires collaboration among Federal agencies and with other entities at local, State, Tribal, and regional scales.

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Steve Gittings

Science Director, NOAA's Office of National Marine Sanctuaries

Just before arriving at this conference, I was fortunate to attend a workshop in Bahia de Kino, on the eastern shore of the Sea of Cortez, and work with a number of our Mexican colleagues in marine protected area management. Our purpose was to understand better the factors that determine whether or not marine conservation efforts will be successful. The anticipated outcome was an improvement in the working relationships between the numerous protected areas in the Sea of Cortez, leading to resource and information sharing, and more effective resource conservation.

What I came away with from that meeting was a new appreciation for the value of thinking in terms of marine protected area networks over site-by-site approaches to establishing and operating MPAs. It stems from the three primary objectives for establishing MPA networks in the first place: recognizing biophysical and ecological connections, applying common governance principles, or strengthening social networks. While these can be considered separately, they are much more likely to produce effective MPA networks when they work together.

To summon a perhaps overused metaphor, if one thinks of an MPA network as a stool, the legs represent its biophysical, governance, and social underpinnings. The first two are the most commonly used justifications for MPA designation, and generally dictate operation. The social leg often is the most under-appreciated. Many are still learning the value of building relationships between stakeholders and engaging interest groups in every stage of development and operation of marine protected areas. Those who neglect these steps risk public opposition to designation as well as constant roadblocks to progress.

This workshop is designed specifically to focus on building an integrated social network among interest groups in the Gulf of Mexico. Our primary purpose is to build bridges between user groups and strengthen the social networks that ultimately facilitate communication, collaboration, consensus or compromise. And it's in that spirit that I'd like to welcome you Beyond the Horizon.

The Gulf of Mexico Restoration Task Force

John Hankinson

Executive Director, Gulf Coast Ecosystem Restoration Task Force

The Gulf of Mexico is an important economic engine of our nation and a dynamic, interconnected ecosystem. Nearly 1/3 of the seafood production in the continental US and more than 90% of the nation's offshore crude oil and natural gas comes from the Gulf of Mexico. The Gulf gives tens of billions of dollars to the U.S. economy through Gulf tourism and through commercial and recreational fisheries.

The Deepwater Horizon BP Oil Spill that occurred on April 20, 2010 released an estimated 4.9 million barrels of oil. Over 1.8M gallons of dispersant was used in the response and more than 80,000 square miles of the Gulf was closed to fishing for an extended period. This tragedy was a catastrophic and debilitating event for the Gulf of Mexico but was also the most recent in a series of significant, acute and chronic stressors that have impacted the region for decades. Sediment loads and freshwater input have decreased, and nutrient input has increased, from the Mississippi and other rivers that flow to the Gulf. Land and habitat loss has occurred from development, coastal subsidence and sea level rise. And several Gulf fish species are overfished. In addition, stronger storms in recent years and more people mean the Gulf Coast is more vulnerable and less resilient today than in the past.

Gulf Coast Ecosystem Restoration Task Force (<http://www.epa.gov/gcertf/>) is an interagency effort to develop a strategy to identify the critical elements that will restore the entire Gulf of Mexico. The Task Force was established by Executive Order on October 5, 2010 following the release of the Mabis Report "America's Gulf Coast," which is a plan for the long-term restoration and recovery of the region beyond addressing the impacts of the oil spill (<http://www.restorethegulf.gov/sites/default/files/documents/pdf/gulf-recovery-sep-2010.pdf>). The Task Force has no direct budget and is staffed by representatives from Federal and State agencies. Through a series of public meetings that sought the input of Gulf Coast communities, the Task Force has relied on the people of the Gulf to help formulate its strategy. (The Task Force's report was released in December 2011: http://www.epa.gov/gcertf/pdfs/GulfCoastReport_Full_12-04_508-1.pdf)

The Task Force has had the responsibility of supporting the Natural Resource Damage Assessment (NRDA) process by referring potential ecosystem restoration actions to the NRDA Trustee Council. It has also had the responsibility for coordinating science and management in support of ecosystem restoration, and encouraging health and economic benefits from the ecosystem restoration effort.

Penalties from the oil spill will come back to the Gulf and good governance of these funds will be essential. Ecosystems and environmental benefits will be directly linked to the economic stimulus of these funds. Investing in the science and monitoring of the environment is going to be essential if we are to understand and manage the Gulf's resources.

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The Beyond the Horizon Forum is right on target to assist the Task Force's effort. In particular, it will help to focus needed attention on the key places in the offshore and deeper parts of the Gulf and on their importance in sustaining the larger Gulf ecosystem.

Discussion:

Q: John Ogden: What is restoration in a Gulf that is already heavily industrialized?

A: EO directs the TF to bring sustainability and health to the Gulf and its resources.

Q: John Ogden: How is the Gulf of Mexico Alliance integrated into the TF efforts?

A: TF is drawing upon GOMA and will help bring resources to state programs.

Q: ? Is the TF limited by the Mabis report in defining its scope?

A: The Exec Order defines what the TF will do.

Q: Larry Mckinney: How can you be sure the result of the TF won't just focus on pet projects, but also address the broader needs of the Gulf?

A: Encouraged by the good vision for the broader ecosystem needs of the Gulf by the state and federal members of the TF.

Q: ? How can we engage the Florida Governor?

A: Restoration is an economic stimulus. A tourism-based economy is enhanced by supporting the environment.

Q: Porfirio Alvarez: Is Mexico and Cuba part of the strategy since it is being based on ecosystem-based management?

A: Very important and there are a number of existing international efforts that we can draw upon immediately.

Q: Miles Croom: Glad the TF recognizes that habitat conservation is complimentary to restoration. How can this be incorporated into the strategy?

A: It is a tough sell. Too often conservation isn't considered part of restoration. However, it is part of the Exec Order. TF is looking to the Habitat Conservation and Science working groups to provide important recommendation to protect specific habitats and places from the watersheds to blue water.

Natural Resource Damage Assessment Process

M.E. Rollé

NOAA Office of the General Counsel—Natural Resources Section

National Resource Damage Assessment (NRDA) is a legal process to determine injury caused by exposure to toxic materials. It assesses types of injury, amount of injury, and recovery period and determines the restoration needed to compensate the public for those injuries. Authorities include several statutes. The Oil Pollution Act came out of the Exxon Valdez spill. The U.S. Coast Guard first responds to a spill. If they determine there is likely to be natural resource injuries, they then engage other federal and state agencies (trustees) to accomplish the following:

1. Clean-up
2. Injury assessment
3. Restoration planning

Types of restoration under NRDA:

1. Primary restoration on injured resources themselves
2. Compensatory restoration on non-injured resources to compensate for loss of injured resource services between injury and recovery.
3. Emergency restoration to stop continuing injury.

NRDA provisions are not punitive, but compensate for actual losses. The DWH spill was unprecedented and has created new challenges for assessment of injuries due to the geographic scope and potential number of resources (species and habitats) and uses impacted.

Natural Resource Services are the services provided from one natural resource to another (including humans). All services have human-based values.

Categories of Services:

1. Ecological
2. Cultural and Historical
3. Sustenance (usually Tribal)
4. Recreational
5. Passive

A great number of technical working groups and people are active in the DWH assessment. These include many surveys and sampling programs:

- Water Column /fate and transport
- Fisheries and Plankton
- Submerged Aquatic Vegetation

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- Shorelines
- Subtidal habitats
- Shallow and Deepwater Corals
- Birds
- Marine Mammals and Turtles
- Terrestrial Wildlife
- Human Uses (e.g., fishing, hunting, and beach recreational closures)

Sample collection includes water, sediment and tissues for chemical analyses. Data are being collected via land and ship-based sampling and aerial surveys. The trustees are also assessing potential impacts from the response, such as those associated with dispersant use.

In April, the Trustees negotiated an early restoration cost agreement with BP for \$1 billion: \$100 million to each state for projects they choose, \$100 million each to NOAA and DOI, \$300 million to NOAA and DOI for projects put forward by the states (all to be approved by Trustee Council).

Again, the magnitude and complexity of the DWH case is unprecedented in the NRDA world. A public process is essential, and the public needs to understand how complex this case is.

Summary:

NRDA is restoration-focused. Its purpose is to determine the type and amount of restoration needed to compensate the public for injuries to, and lost use of, their natural resources. Restoration is considered early and throughout the process. Injuries and losses are balanced against, and directly scaled to, restoration

NRDA is a Legal Process. It is guided by the Oil Pollution Act and by NOAA regulations. Trustees are required to demonstrate exposure to oil, resource injury and lost use, and causation of those losses. The polluter pays for assessment and restoration. Getting to restoration requires a common vision and coordination with the response, co-trustees, the Responsible Party and the public.

Discussion:

Q: ? How will this case change the NRDA process?

A: More precautions to plan for this type of case will likely be put in place. Hopefully, a case like this will not occur again.

Q: ? Coordination of research?

A: Much research is occurring inside and outside of the NRDA process. It's not always easy to coordinate, but we're all attempting to do so.

Q: ? Policies in place to deal with potential spill from oil drilling in Cuba?

A: We're investigating this. International operations that impact natural resources of the US are generally subject to OPA.

PANEL 1 - Ocean Governance in the Gulf of Mexico

INTERNATIONAL GOVERNANCE

Richard McLaughlin, Harte Research Institute for Gulf of Mexico Studies, Texas A&M University
Corpus Christi

The 1982 United Nations Convention on the Law of the Sea (UNCLOS) was the largest and most complex international law-making conference ever undertaken. It represents the collective effort of every nation on earth to develop a comprehensive set of rules determining the rights and duties that nations may exercise throughout the world's oceans. 161 nations and the European Union are currently parties to the treaty. Mexico and Cuba became parties soon after it was finalized in 1982. The United States has still not become a party to the treaty. However, it has accepted all of the most important provisions as customary international law. So in reality, UNCLOS is the guiding legal framework in the Gulf of Mexico and is the starting point of any discussion concerning international governance of a network of special ocean places.

One of the central features of UNCLOS is the creation of marine juridical zones. These zones provide coastal nations with more legal rights close to shore and less authority as the zones move further seaward from the coastline. These zones begin at the low-tide baseline and extend seaward into the deepest parts of the ocean. The zone out to 12 nautical miles is called the Territorial Sea. Within this zone each coastal nation has the same authority over activities as it has on its land territory with the lone exception of innocent passage of vessels in navigation. This simply means is that nations have to allow foreign vessels to transit through their territorial seas as long as they are moving through on the way to some other area. Consequently, within twelve miles of each coast, Mexico, Cuba and the U.S. have almost complete discretion under international law to designate and manage special ocean places as they see fit.

Beyond 12 miles is the beginning of the Exclusive Economic Zone (EEZ), which extends out to 200 nautical miles.¹ In this area, the coastal state has exclusive authority over all living and non-living resources, as well as the conduct of all marine scientific research. In the 200 mile EEZ, while nations have exclusive authority over foreign fishing and offshore oil and gas development, they cannot hinder navigation, military activities, laying down marine telecommunication cables or other activities that do not involve economic exploitation of natural resources. While nations can protect the marine environment in their EEZs, any measures must be balanced against the rights and freedoms possessed by other members of the international community.

In the Gulf of Mexico there are also two areas located beyond the 200 mile EEZ known as the Western and Eastern Gaps. In theory, UNCLOS treats these areas as part of the high seas and the seabed as part of the common heritage of humankind that must be shared with the entire international community. Conversely, the water column above the seabed is deemed to be part of the high seas and open to exploitation by any party that may want to exploit it. However, it is much more complicated than that in

¹ There will be no discussion in this short piece about the Contiguous Zone, which extends between 12-24 nautical miles. This is a zone that overlays the Exclusive Economic Zone in which coastal nations are provided with a limited set of legal rights relating to customs, fiscal, immigration or sanitary matters. These issues are not relevant to this discussion about international governance of special ocean places.

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reality. For example, the U.S. and Mexico negotiated a boundary agreement in the year 2000 that divided the Western Gap into a U.S. and Mexican portion. UNCLOS allows this if the area is an extension of their respective continental shelves based on certain criteria laid out in the treaty. The U.S. and Mexico believe they have met the criteria and should be allowed to exploit the oil and gas resources in each of their respective zones. The Eastern Gap area, in contrast, is currently treated as being part of high seas and beyond national jurisdiction because political tensions between the U.S. and Cuba make negotiating potential maritime boundaries in the area too difficult to deal with at the moment.

From an international governance perspective, the legal ability of the U.S., Mexico, or Cuba to establish and exert legal authority over special ocean places within their respective 12 mile Territorial Seas is non-problematic. However, establishing such areas beyond 12 miles will require the nations to balance their management needs with the freedom of navigation needs of the international community. In this regard, a procedure has been established within the International Maritime Organization (IMO) to address these concerns. A Coastal State or group of Coastal States may request that the IMO designate certain areas as Particularly Sensitive Sea Areas (PSSA) and place special conditions on navigation in those areas. In order to create a PSSA the following criteria must be addressed: 1) the area must have the necessary ecological, social, cultural, economic, scientific or educational characteristics; 2) the area must be at risk from international shipping activities; and 3) there must be measures that can be adopted by IMO to provide protection to the area. There are currently eleven international PSSAs including two in the Gulf of Mexico. These are the Sabana-Camagüey Archipelago in Cuba, which was established in 1997 and the U.S. Florida Keys National Marine Sanctuary created in 2002.

Identifying and establishing a network of special ocean areas in the Gulf of Mexico based on factors such as biological connectivity and biodiversity would provide a scientific basis for improved cooperative international marine conservation and policy initiatives. The international governance structure, while complicating this process to some extent, presents few obstacles that cannot be overcome as the three nations move toward the important goal of sustainably managing the environmental integrity of the Gulf.

Summary:

Definition of governance: Not necessarily top-down intervention. Though laws are part of governance, non-governmental activities that influence human behavior are part of governance.

International governance: Most important focus is the 1982 UN Law of the Sea Convention. Involved every nation. It was a consensus agreement: every word was agreed upon. It is Customary International Law, so all nations must abide by the provision, even if they are not a Party (US is not a party, but is bound by the agreement).

Balances legal rights of coastal nations with the legal rights of all nations. Uses zones with varying degrees of legal authority with distance from shore.

1. Territorial Sea (12 NM): Anything the nation can do on land, but foreign flagged vessels can pass through.
2. Contiguous Zone (24 NM): Coastal nations controls immigration, health and safety issues.
3. EEZ (200 NM): Coastal nation can exploit natural resources. Authority for only economic activities.

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4. Extended Continental Shelf (350 NM): In certain instances, some nations can claim economic control.
5. High Seas: Common Heritage or Freedom of the Seas. Beyond national jurisdictions.

Two areas in the Gulf of Mexico fall outside the EEZs:

1. The Western Gap is an Extended Continental Shelf where the US and Mexico have an oil and gas exploitation agreement. Area above the seabed remains High Seas.
2. The Eastern Gap is High Seas. No negotiations with Cuba have been possible, so no agreements have been made.

Areas identified in the Gulf for possible special protections fall within the EEZs of the US and Mexico and would be subject to the IMO provisions under the Particularly Sensitive Sea Area process. Florida Keys and an area in Cuba already have these provisions. MPAs in the EEZ areas will require compliance with international agreements.

Discussion:

Q: GP Schmahl: Flower Garden Banks NMS is outside the Territorial Sea but is not a PSSA. Can designate a sanctuary, but what other provisions are necessary to designate protected areas outside the Territorial Sea?

A: It is possible to go through the process to make the FGBNMS a PSSA. Problem is the multiple uses in the area make it difficult.

Q: ?: Have Mexico made any claims on BP or the US under the Convention on Biodiversity or Precautionary Principles?

A: Not aware of any. (ME Rolle: One Mexican State may make a claim. Legal authority to do so is unclear though).

Q: Gene Shinn: Does the US have any influence over drilling activities in Cuba?

A: No. Only possibility is to form an international agreement with Cuba to cooperate, but it would be voluntary.

NOAA NATIONAL MARINE FISHERIES SERVICE AUTHORITY

Roy Crabtree, Administrator, NOAA NMFS Southeast Regional Office

Four Key Programs NMSF:

1. Sustainable Fisheries
2. Protected Resources
3. Habitat Conservation
4. Aquaculture

Most NMFS authorities fall under the Magnuson-Stevens Act, but also work under the Endangered Species Act and Marine Mammal Protection Act.

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States have varying jurisdictions in the Gulf. Texas and Florida have 9-mile jurisdiction. Other states have 3-mile jurisdictions.

MSA created Fisheries Management Councils around the nation. Fisherman, stakeholders and states have representatives on these Councils. An open, public Council process occurs and a detailed process takes place to implement Council proposals.

Provision in the reauthorization of Magnuson-Stevens Act: End overfishing immediately and shift management to annual catch limits. NMFS has been working over last two years to create catch limits and these have created controversy. Goal is to end overfishing.

In SE region NMFS mostly deal with reef fish plans (i.e. snapper and grouper). Gulf of Mexico fisheries are diverse, lack sufficient data and are subject to uncertainties. NMFS works with sanctuaries through gear restrictions at Flower Garden Banks and no-take reserves in the Florida Keys. Essential Fish Habitats are in place to control non-fishing activities to minimize impacts on habitats.

Considering all the areas in which NMFS provisions operate, nearly everywhere in the Gulf has some kind of placed-based management.

Endangered Species Act (ESA). NMFS and FWS work together and sometimes have confusing jurisdictions over species depending on where species are. NMFS is responsible for listing species in the ESA. We have been inundated since the oil spill with petitions to list new species. Also NMFS has responsibilities to ensure that federal actions do not harm listed species.

NMFS is responsible for ensuring that fisheries activities don't harm marine mammals under the Marine Mammal Protection Act. The challenge is to accurately estimate the level of take of endangered and mammal species in fisheries. This is compounded by low numbers of observers. Education programs are designed to change human behavior, particularly in the FKNMS.

Discussion:

Q: Larry McKinney. What process must you go through to designate special areas?

A: Through the Council process to amend a fishery management plan.

Q: ?: Regarding anchoring, what are the limits of the NMFS authority to whom you can regulate?

A: Authority limited to fishing vessels. Can regulate anchoring by the fishing vessel, but not a non-fishing vessel. If an endangered species were involved, such as *Acropora*, then authority is broader.

Q: Tom Shirley: Do you have the authority to regulate seismic surveys and acoustic disturbance of marine mammals?

A: Yes. Prepare Biological Opinions on these issues to regulate.

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NOAA OFFICE OF NATIONAL MARINE SANCTUARIES AUTHORITY

George R. Sedberry, Superintendent, Gray's Reef National Marine Sanctuary

The National Marine Sanctuaries Act (NMSA) authorizes the U.S. Secretary of Commerce to designate and protect, as national marine sanctuaries, areas of the marine environment with special national significance due to their conservation, recreational, ecological, historical, scientific, cultural, archeological, educational, or aesthetic qualities. The primary objective of the NMSA is to protect marine resources, such as coral reefs, sunken historical vessels or unique habitats.

The NMSA provides several tools for protecting designated national marine sanctuaries. The Act provides the program with the authority to issue regulations for each sanctuary and the system as a whole. These regulations can, among other things, specify the types of activities that can and cannot occur within the sanctuary. The NMSA requires the program to prepare and periodically update management plans that guide day-to-day activities at each sanctuary, evaluate effectiveness of regulations, and track progress toward management goals.

The NMSA authorizes NOAA and the program to assess civil penalties or violations of the NMSA or its implementing regulations, and damages against people that injure sanctuary resources. The NMSA requires federal agencies whose actions are “likely to destroy, cause the loss of, or injure a sanctuary resource,” to consult with the program before taking the action. The program is, in these cases, required to recommend reasonable and prudent alternatives to protect sanctuary resources.

Amendments to the NMSA over the years have modified the process of how sites are designated, given the Secretary the authority to issue special use permits, enhanced the ability to enforce the Act, and established civil liability for injury to sanctuary resources.

Although the NMSA is the primary legislation used to add marine areas to the National Marine Sanctuary System, other laws have been used as well. For example, The Florida Keys National Marine Sanctuary and Protection Act designated the Florida Keys National Marine Sanctuary subsuming the Key Largo and Looe Key national marine sanctuaries that were designated under the NMSA in 1977 and 1981, respectively. In the Gulf of Mexico, The National Marine Sanctuaries Preservation Act of 1996 added Stetson Bank to the Flower Garden Banks National Marine Sanctuary. The National Marine Sanctuaries Amendments Act of 2000 gave the President authority to establish a Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, which he did via Executive Order 13178 on December 4, 2000. The Antiquities Act gives the President authority to protect natural and cultural objects through designation of a national monument. Although this authority has been largely used to protect terrestrial resources, the President used it to designate the Papahānaumokuākea Marine National Monument (Presidential Proclamation 8031) on June 15, 2006.

The NMSA authorizes creation of Sanctuary Advisory Councils for each of the 14 sites managed under the Act. The Sanctuary Advisory Councils serve as a forum for consultation and deliberation for the community and as a source of consensus-based advice to the sanctuary superintendent. This is a community-based participatory process that assures continued public input to management decision-making, while at the same time expanding public awareness about the sanctuary and challenging marine resource management issues. The Sanctuary Advisory Councils guide individual sanctuaries in

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developing management plans and regulations that provide flexibility in management, which is well suited to a system of diverse and unique natural and cultural protected marine resources.

Summary:

National Marine Sanctuaries Act: Guiding legislation and source of authority over sites designated for their national significance. Resource protection is primary focus and community-based through Sanctuary Advisory Councils. Public participation in management issues that guided by research and science that is often conducted in partnership with other institutions.

Purposes and Policies:

1. Designate and Manage sanctuary areas
2. Provide comprehensive conservation and management plans and regulations
3. Maintain and protect biological communities
4. Restore natural habitats
5. Protect populations and ecological processes
6. Enhance public awareness
7. Support scientific research on sanctuary resources
8. Support uses compatible with the primary purpose of the sanctuary
9. Coordinated management with other agencies

Since 1972, mechanisms that have been used to designate sanctuaries:

1. Administrative processes outlined by the Act
2. Site Evaluation List nominated by the public (inactive at the moment)
3. Congressionally designated (ex. FK designation and addition of Stetson Bank to FGB)
4. Executive Order
5. Marine National Monuments designated through the Antiquities Act

Management Plans provide flexibility in regulations and management between individual sanctuaries.

Discussion:

Q: ? When was the last NMS designated?

A: Thunder Bay NMS was 15 years ago.

Q: Larry McKinney: How does Sanctuaries work with NMFS?

A: Varies between sites. Sanctuary staff and Advisory Councils work with Fisheries staff and Fisheries Management Councils to develop fishing regulations at sites.

Q: ? Are there any new sanctuaries being proposed?

A: There has been much interest by the public and proposals made. There is a Site Evaluation List that is public info. Expansion plans are in the works at several sites.

Q: ? What is the budget for sanctuaries?

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A: \$49 million

Q: Miles Croom: How do the cost recovery provisions in the Sanctuaries Act intersect with those within NRDA and ESA?

A: We can recover funds for damages, but not sure how they intersect with NRDA. Some flexibility on how money can be spent. Sanctuaries have penalty and national resource recovery provision, so there is a possible dual track in settling a case.

Q: ?: How are you dealing with the restrictions on designating new sanctuaries?

A: We are working to get reauthorization of the NMSA, which expired in 2005. Billy: New sanctuaries could be made by Congress, but as it stands Sanctuaries much show it can support a new sanctuary. For now, we are focusing on reauthorization.

OCEAN GOVERNANCE, AN OVERLAP: STATE OF FLORIDA PERSPECTIVE

Amber Whittle, Fish and Wildlife Research Institute, St. Petersburg FL

In Florida, marine resources are regulated on multiple levels, to multiple degrees, and by multiple agencies. At the Federal level, Gulf of Mexico fisheries are managed by the Gulf of Mexico Fisheries Management Council and, partially off the Dry Tortugas and the Florida Keys, by the South Atlantic Fisheries Management Council. At the multi-state level, Florida fisheries are influenced by the Gulf States Marine Fisheries Commission (non-regulatory) and the Atlantic States Marine Fisheries Commission (regulatory). And, finally, at a State level, the Florida Fish and Wildlife Conservation Commission manages fisheries to 9 miles off the coast on the Gulf side and 3 miles on the Atlantic side.

Approximately 7,063,570 acres of Florida waters are within a managed area. Federal areas, including the Florida Keys National Marine Sanctuary, National Park Lands, National Wildlife Refuges, and Marine Zones, total 5,609,890 acres. State managed areas, including aquatic preserves, state parks and National Estuarine Research Reserves, total 2,652,200 acres.

The nearly 1.2 million acres of overlap between Federal and State jurisdictions does not also demonstrate the statewide overlap between local municipalities and Departments within and among the State (State Parks, Coastal Zone Management, Environmental Permitting) and Federal (National Parks, Sanctuaries) agencies. As an example, the Florida Keys contain over half of the managed marine acreage in the State and, within the boundaries of the Federal Sanctuary, include State Parks, State Recreation Area, State Historic Sites, State Geologic Sites, State Botanical Sites, and State Aquatic Preserves; three National Parks abut the Sanctuary boundaries. Within the State of Florida marine waters, the ocean is heavily governed.

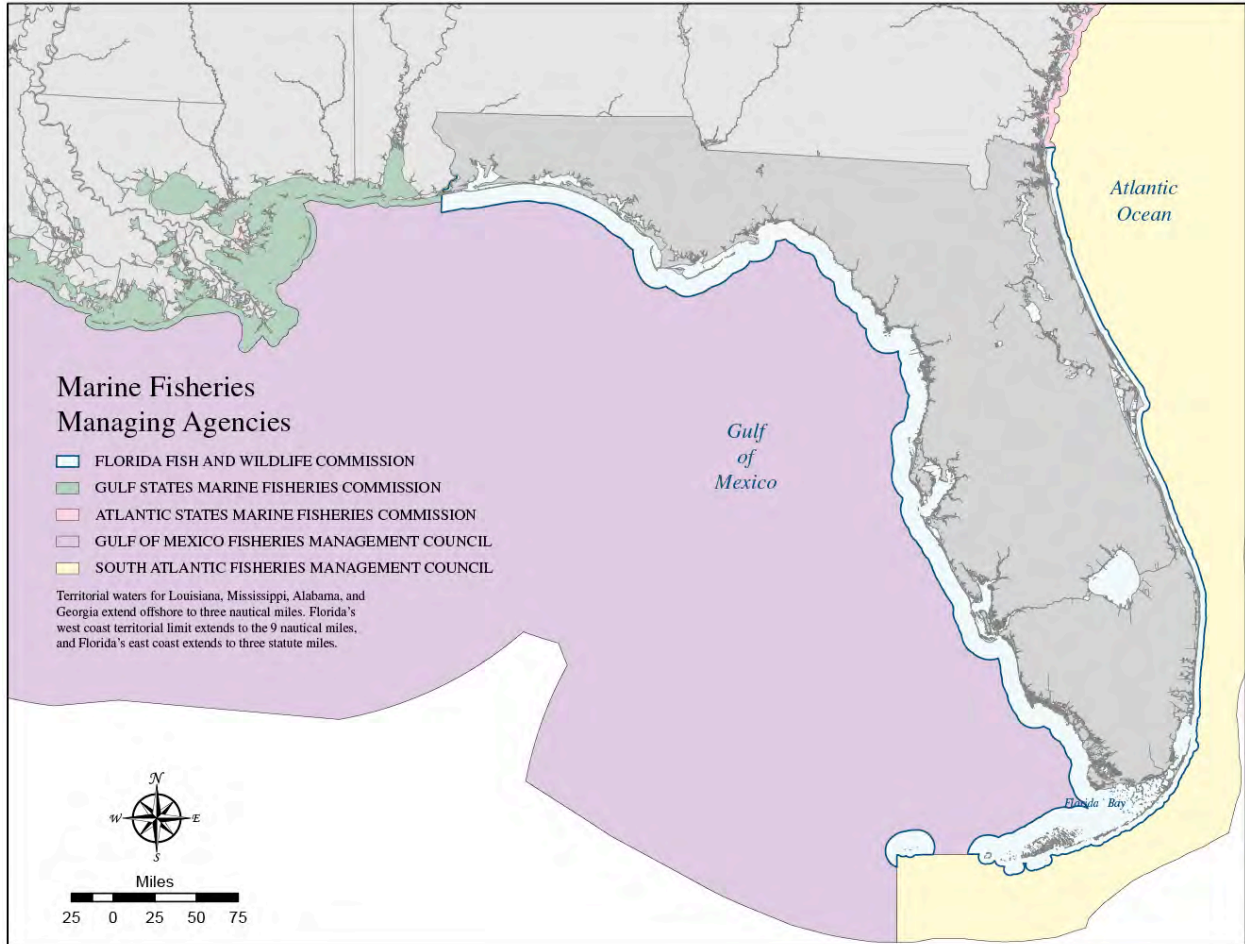


Figure 1: Marine Fisheries Management Jurisdictions

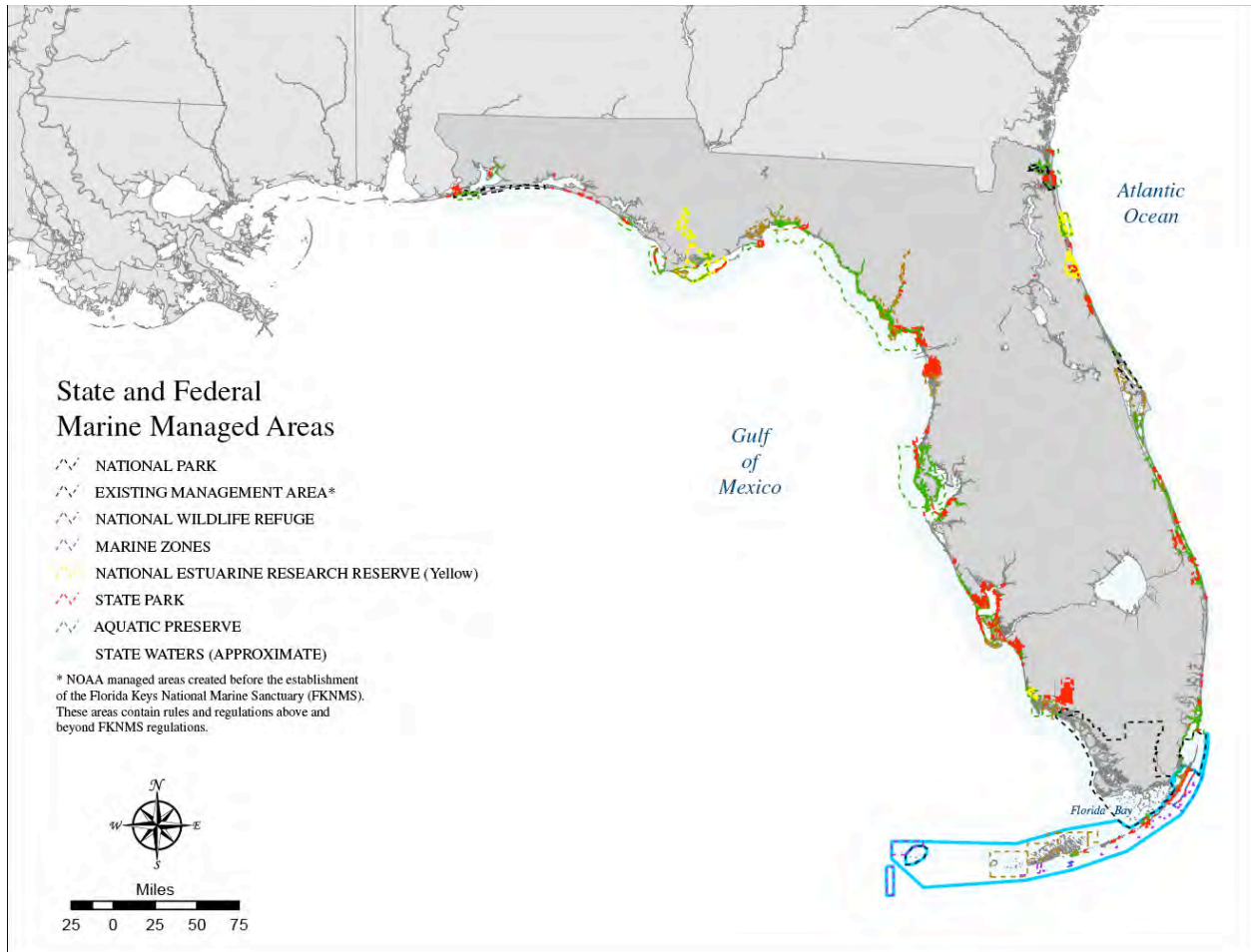


Figure 2: Statewide Managed Area

Discussion:

Q: John Ogden: Many governance proposals make a big deal about fragmentation of authority, overlap and duplication etc. Is there appetite to tackle this issue through new governance structures?

A: Yes. Legacy Initiative is the closest we have come to overcoming duplication and overlap. It has been somewhat successful.

Q: ?: What percent of state waters is fully protected?

A: Small percent. Billy: In Keys, six percent is within the reserve.

PANEL 1 DISCUSSION:

Q: ? Interested in how Climate Change impacts on coral reefs are being addressed and coral reef degradation is impacting fisheries.

A: Amber: Several initiatives in the Gulf, including related to OA and fisheries.

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A: Roy: Much concern throughout the Caribbean. GOM there is much concern about Climate Change and fisheries, but mostly hard-bottom fisheries in the Gulf rather than coral reef fisheries. GOM Fisheries Management Council is starting a study of this issue.

A: George: Data on coral reef conditions in sanctuaries is available, not necessarily linked to fisheries though.

Q: Why has the US not signed on to the Law of the Sea?

A: Richard: Mostly political over ideologies. Fear that the US will give up sovereignty over water. Until the US becomes a party to the Convention, it is left off many of the bodies that formulate ocean policies at the UN.

Q: Porfirio Alvarez: What is the best way to link the US, Mexico and Cuba in the Gulf?

A: Richard: Best way to start is through an oil spill response treaty that includes Cuba.

Q: How well are we coordinated with Mexico to end overfishing?

A: Roy: We work with Mexico on some migratory species like king mackerel and red snapper along border. Some efforts to share data to better understand the status of the stocks. Most discussions are on protected resources like turtles. Much more we can do though for migratory species.

Q: How do the authorities impact the ability of agencies to address the full range of issues that the Gulf is dealing with?

A: Roy: We work with states to achieve compatible fisheries regulations, but it is often a challenge. For example, red snapper fisheries regulations are complicated by recreational fishing that is difficult to regulate in state waters.

Q: Steve Gittings: What mechanisms can we use to manage Whale Sharks and other species that fall between the gaps in protected species management.

A: Roy: While Sharks are managed by highly migratory species in DC where shark plans are made for the SE. Where the challenge comes is in international jurisdictional issues. International management is done through ICAT, which is a complicated and challenging system to deal with.

A: George: Sanctuaries Act allows for managing species that are not protected under other authorities.

A: Roy: Fishery Management Councils can decide to include certain new species to management plans.

A: Richard: This is an area where the NGOs could assist. This type of governance can be most productive to address trans-boundary issues, including those with Cuba.

Q: John Ogden: Terminology is often an issue. To what extent does the term "sanctuary" describe what sanctuaries do and how does it interfere with what you do?

A: George: Very good question. Management plans vary between sites.

Q: John Ogden: Does the public understand what a sanctuary is?

A: Collective: No.

C: Billy: I have defined sanctuaries as "special places." Even more of a problem in Spanish.

C: George: This is a good topic for sanctuary programs to discuss. What does it mean to be a sanctuary?

C: ?: The term MPA has many interpretations in California. Need to establish a common language.

C: George: Maybe a good topic for the NOAA MPA Center to address.

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C: Roy: Another difficult term is “sustainability.” What fisheries management does isn’t building “sustainable fisheries.” We have many overfished stocks that are “sustainable” at a depleted state. This is all about rebuilding the fisheries to reach a MSY. This is confusing to the public because they have been fishing for “30 years” and may have seen their catch get better. We make a decision to close the fishery and it is interpreted as management saying what fishermen have been doing for 30 years is “unsustainable,” which conflicts with fishermen’s perception. Language does create problems with the public.

Panel 2 - Special Features and Diversity in the Gulf of Mexico

SHALLOW WATER BANKS AND REEFS OF THE GULF OF MEXICO: THEIR ROLE IN BIODIVERSITY

Thomas C. Shirley

Endowed Chair of Biodiversity & Conservation Science, Harte Research Institute for Gulf of Mexico Science, Texas A&M University-Corpus Christi

More than 200 shelf and shelf-edge banks and reefs occur around the Gulf of Mexico. Many of these features parallel paleo-shorelines, resulting in a ring around the Gulf. The reefs and banks have a variety of different geologic origins. Perhaps the most common represent drowned coral reefs that flourished during lower sea level stands approximately 18,000 to 12,000 years ago. Subsequent deglaciation resulted in rapid rise of sea level, decreased water temperatures, and increased turbidity, resulting in the demise of the existing hermatypic reefs. However, the skeletons of the massive corals of these extinct reefs have persisted to the present, providing hard substrate with high habitat complexity in water depths of 60-85 m. The sizes of these extinct reefs vary from 400 m to 1400 m in diameter, and they have a variety of different ovoid and elongate shapes. These drowned coral reefs comprise the South Texas Banks, but also the Pinnacles offshore of Mississippi, and the Alabama Alps off Alabama.

A number of lacustrine depositional remnants exist in inshore waters. An example is Seven and One-Half Fathom Reef, located approximately 3 km offshore of N. Padre Island. This rock reef is a calcium carbonate mold of a Paleocene lake bottom. The low-relief reef is in approximately 15 m water depth, with a maximum vertical relief of approximately 7-8 m and supports a diverse fauna and flora.

In the Northwestern Gulf of Mexico, salt diapirs or uplifted salt domes can be found 160 to 200 km offshore, arise from water depths of up to 140 m, and have high vertical relief. These unique geologic features sometimes have brine seeps, mud volcanos, and methane seeps. Their distance offshore results in them being in seawater with low turbidity, and relatively stable salinity and temperature. Many whose peaks are within 20 m of the surface support a diverse and healthy brain coral community.

Other features in the eastern Gulf include the Madison-Swanson Reserve, a low relief (approximately 2 m) limestone ridge, thought to be a remnant shoreline of a lowstand river delta; it is approximately 90 km south of Apalachicola, Florida. Steamboat Lumps is also a low relief structure comprised largely of carbonate sediments, which is thought to be another paleo-shoreline. The Sticky Grounds are a unique benthic habitat of carbonate mounds with up to 10 m vertical relief, located on the outer West Florida Shelf in 130 m depth. The Sticky Grounds are more than 1 km wide and extend more than 10 km along the shelf. The Florida Middle Grounds are large (>1190 km²) carbonate banks located 155 km NW of Clearwater Beach, Florida. Recent coring found the Middle Grounds substrate to be comprised primarily of vermetids, a tube-forming gastropod (Personal communication, Christopher Reich, USGS).

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All of the reefs and banks of the shelf of the Gulf of Mexico share a common feature: all are biodiversity hotspots. All provide hard substrate for attachment of sponges, solitary corals, gorgonian sea whips and sea fans, polychaete tubes, and many kinds of aborescent bryozoans and hydrozoans. This increased habitat complexity results in both increased abundance and diversity of benthic and water column communities. The almost ubiquitous ring of reefs and banks around the Gulf of Mexico provide habitat for a high diversity of mollusks, crustaceans, groupers, snappers, and solitary reef fishes, but also provide stopover points for migratory species and stepping stones for northward movements of tropical species. The increase in activity as one approaches a reef or bank is obvious even from the sea surface, with increased feeding activity of sea birds, turtles, marine mammals, and fast swimming fishes such as jacks and cobia.

Summary:

More than 200 shelf and shelf-edge banks and reefs in the GOM. Number depends on what you call a “bank” and “reef” and its amount of vertical relief. Different origins. Relict shorelines, coral reefs like the FGB, drowned coral reefs, ancient caliche lakebed deposits, deltaic features and vermetid worm reefs.

South Texas Banks. 18000-12000 year old drowned coral reefs. 60 km offshore 60-85 m depth. Largest has 20 m vertical relief. Good habitat complexity for biota and over 100 species of fish.

Seven and One Half Fathom Reef. 2 miles offshore. Fossil lakebed. Diverse and abundant biota. Abundance of life evident at the surface of the water.

NW Gulf banks including Flower Garden Banks. Salt diapirs. Mainly brain corals. Associated methane seeps. High vertical relief. Other inshore banks that are bivalve reefs.

Pinnacles and Alabama Alps. Drowned reefs 100 km offshore, 80-110 m deep, 25 m relief. Lots of diversity. Well studied. May have been impacted by oil spill. Research cruise to investigate was weathered out.

Florida Middle Grounds. 25-45 m water depth. Low relief. 43 species of hard corals. 170 species of fish. Structural foundation is made of vermetid gastropods.

Other features exist on the West Florida Shelf and shelf edge delta features.

All are biodiversity hotspots.

Discussion:

Q: Larry McKinney: What do we know about the linkages between deepwater coral communities and the shelf reef communities?

A: Deepwater fauna have planktrophic larvae that come to shallow water. Many same species occur in both deep and shallow water. Trophic connections are not well known.

C: Gene Shinn: There are 4000 artificial reefs – petroleum platforms.

A: “Steel Archipelago.” Somewhat different fauna from natural reefs.

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Q: Billy Causey: Previous Gulf Forum made recommendations for more focus on the vast amount of hard-bottom habitat on the West Florida Shelf. What do you think?

A: Agree. With more research I think once we have done the genetic studies, we will find much connectivity between species on these and other features around the Gulf. These hard bottom features serve as stepping-stones for species.

Q: Is Climate Change impacting deep reefs?

A: Immediate effects are likely to be in trophic relationships and climate impacts on planktonic larvae.

Q: John Hankinson: What do these areas need from us?

A: All features have in common a high abundance and diversity of fish, and also magnets for fishing. Suggest protection of some of the features to provide for outsourcing from the protected features to fished areas.

BIODIVERSITY, BIOGEOGRAPHY, AND CONNECTIVITY OF SEEPS AND COLD-WATER CORAL COMMUNITIES IN THE GULF OF MEXICO

Amanda Demopoulos, US Geological Survey

The seascape of the deep Gulf of Mexico (GOM) is composed of extensive mud bottom habitat, periodically punctuated by rich and diverse chemosynthetic cold seeps and cold-water coral ecosystems. Cold seeps are common deep-water habitats corresponding to areas where oil, gas, and brine percolate through sediments into overlying seawater. The geologic history of the GOM is directly responsible for seep occurrence and distribution on the seafloor (Fisher et al. 2007). Reduced sulfur and methane emerge from the seafloor, fueling dense microbial communities and megafauna (tube worms and mussels). These chemicals provide appropriate trophic resources for chemoautotrophy (inorganic chemicals) and methanotrophy (methane).

Seeps were first discovered in the 1980s in the GOM as a fortuitous consequence of exploration for oil and gas resources on the continental slope. Following their discovery, more seep sites have been documented in the GOM than anywhere on the globe, and GOM cold seeps have become among the best characterized seep communities in the world (Fisher et al. 2007; Cordes et al 2009).

Bacteria are the foundation of seep environments, serving as the important link between geological processes and biological communities. Microbes metabolize methane and sulfur compounds for energy and this activity leads to the precipitation of carbonate, which stabilizes the sediment and produces the essential hard substrate needed for encrusting fauna, including vestimentiferan tubeworms. Certain bacteria reside in tissues of megafauna performing as endosymbionts, providing the nourishment for tubeworms and mussels through chemosynthesis. When methane is abundant, mussel beds form extensive habitats supporting communities of associated fauna. Tubeworms contain endosymbiotic bacteria that use hydrogen sulfide as an energy source and these worms have been estimated to live for centuries (Fisher et al. 1997; Bergquist et al. 2000; Cordes et al. 2007). Microbes also form extensive mats on the sediment surface and are present at every seep investigated. These mats are a clear biological response to seepage in the Gulf.

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In situ sampling using submersibles and ROVs has facilitated quantitative collections of seep associates, including tubeworms and mussels, revealing diverse communities (Cordes et al. 2009). In addition to symbiont-containing species, at least 120 taxa have been collected with tubeworms and mussels (Carney 1994; Bergquist et al. 2003; Cordes et al. 2005, 2006). Seep endemic macrofauna and megafauna dominate these habitats and faunal diversity declines with increased depth.

While the GOM represents the best explored seep environment in the world, based on recent discoveries, it is clear that much remains to be learned and revealed in this well-studied area (Cordes et al. 2009). Continued exploration will most likely result in new discoveries, including new seep sites, new species of animals and bacteria, and unique types of communities. A vast majority of the process oriented studies of seeps in the GOM were conducted on the Upper Louisiana slope representing an extensive database for the region, and providing the foundation for understanding cold-seep communities at greater depths. Ongoing research within cold seeps is examining tubeworm and mussel population ranges (patterns of growth and longevity), associated community ecology, succession, diversity, biogeography, and bathymetric trends.

Gas Hydrates. Hydrates are a crystalline solid consisting of gas molecules, usually methane, surrounded by a cage of water molecules that resembles ice (Sassen et al. 2001). These hydrates form under the high pressure and low temperature conditions typically present at depths ranging from 440-2400 m. In the GOM, hydrates can cement sediments, forming thick structures up to several 100 m, that provide a habitat for organisms, including polychaete worms. Specialized polychaetes known as ice worms from the family Hesionidae, live on and within the methane crystals, possibly grazing chemosynthetic bacteria that grow on the methane (Fisher et al. 2000).

Brine pools. These pools are hypersaline environments that form when warm, salty fluids migrate through fissures in the sediment (Cordes et al. 2009). Because the fluid is denser than seawater, brines accumulate in pools on the sediment surface after cooling to ambient water temperature, forming distinct features on the seafloor. The center of these hypersaline pools is not hospitable for most organisms and only microorganisms can survive. However, larger organisms, including mussels and other seep megafauna, thrive on the shores and the edges of the pools.

Cold-water coral communities. In contrast to shallow water, tropical species, cold-water corals lack symbiotic zooxanthellae and require food to be supplied to them. They are extremely slow growing and long lived (Schroeder et al. 2005) and they typically occur in areas where high currents and high flux of surface production dominate. Thus, alternations in the quality and quantity of surface production likely will impact the condition of these sites (cf. Duineveld et al. 2004). Worldwide, deep-sea corals exceed shallow coral systems in overall area and number of species. In the GOM, limestone outcrops found on the west Florida Slope and Florida Straits, and authigenic carbonate deposits associated with seeps provide the hard substrate required by cold-water corals at depths ranging from 200 to greater than 1000 m. In 1955, a trawl deployed at the Viosca Knoll area in the northern GOM collected the reef-building scleractinian *Lophelia pertusa* (Moore and Bulis 1960). *Madrepora oculata* is another common cold-water scleractinian found in the GOM. Reef-building corals create three-dimensional habitat in the deep ocean that support diverse communities of other scleractinian corals, octocorals, black corals, sponges, fishes, crustaceans, mollusks, echinoderms, and other macrofauna (Reed et al. 2006). Cold-water corals in the GOM often co-occur with seep endemics, including tubeworms and bacterial mats (Cordes et al. 2006). The fauna associated with coral habitats include those found in background fauna communities in

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the GOM, some taxa that may be specifically associated with corals (possible endemics), as well as organisms common to seep habitats (Cordes et al 2008).

Long term, multidisciplinary research has been conducted at *L. pertusa* communities in the Viosca Knoll lease block 826 (VK826) (Schroeder et al. 2005; Reed et al 2006; Cordes et al 2008). A living black coral collected at VK 826 at 500 m was found to be 2000 years old (Prouty et al. 2011). Due to their slow, continuous growth, and longevity, these communities are extremely vulnerable to disturbance (Prouty et al. 2011). As exploration for deep-sea corals continues, cold-water coral sites in the west Florida slope as well as other parts of the GOM may be added to facilitate long-term monitoring and observation. Additional mapping with seafloor validation using ROVs and submersibles will help identify potential coral sites, providing data that would be useful in the development and identification of long-term monitoring areas and possible reserves.

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FISHERIES – RECREATIONAL & COMMERCIAL

Bonnie Ponwith, Director, NOAA NMFS Southeast Fisheries Science Center (SEFSC)

Pelagic habitat is dynamic and important in the connectivity of the fixed systems of the Gulf. Wide range of taxa that live in the pelagic realm and spend different parts of their life histories in different parts of the Gulf. SEFSC works on marine mammals through ship and aerial surveys and passive acoustics. Photo IDs and biopsies for genetic info also collected. Environmental parameters are measured to understand what drives the patterns of distribution.

Bottlenose Dolphin: Several different stocks based on location in the Gulf.

Sperm Whales: Trying to understand the food webs.

The second discovered Giant Squid was found in the Gulf.

Use satellite-based observations to document the distribution of Blue-fin Tuna.

Collaboration with Mexico to collect data on Tuna larvae.

Satellite tags of Billfish in Atlantic:

Hypoxia zones off Africa influence diving behavior of Billfish in Atlantic. Significance: Areas of hypoxia constrain the distribution of prey and predators. An example of how ocean environmental dynamics are important in the distribution of pelagic species.

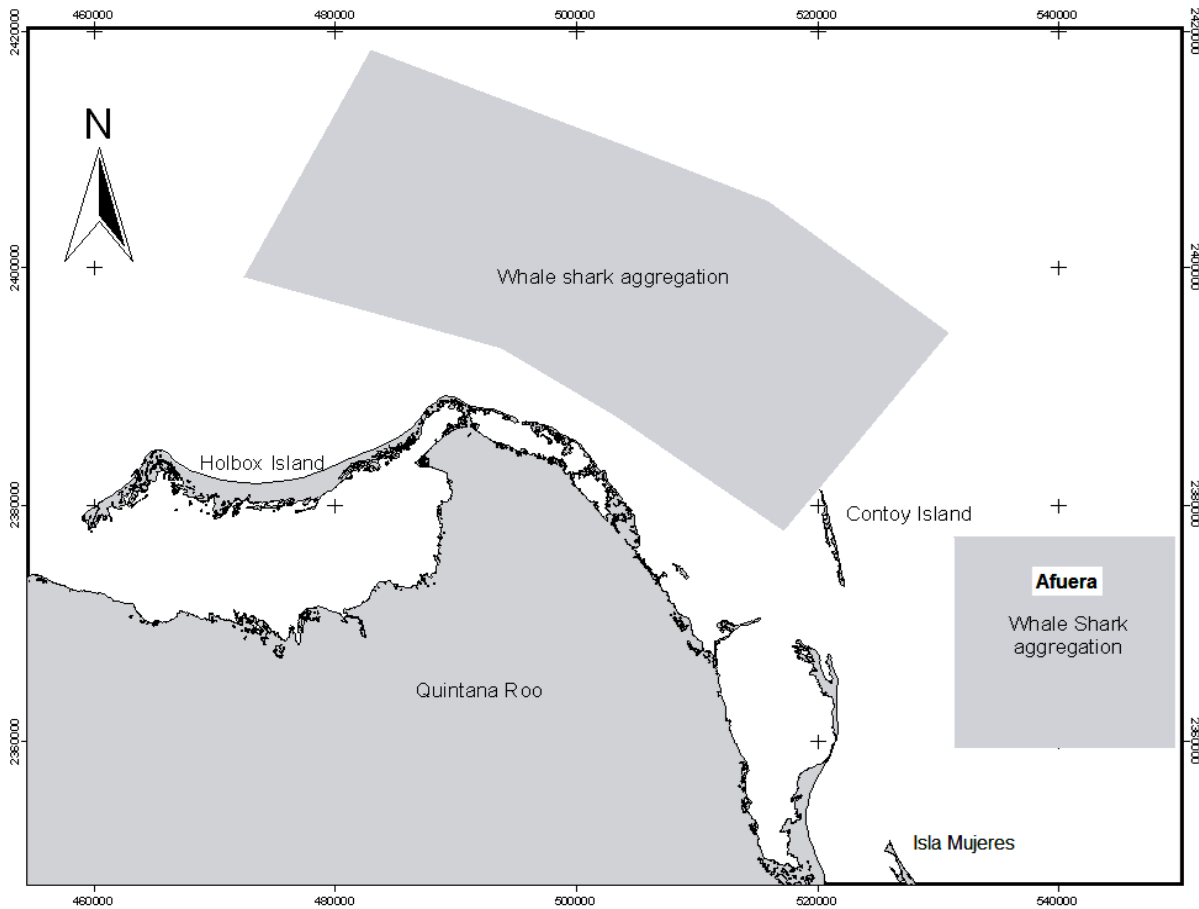
WHALE SHARK AGGREGATION AREAS

Bob Hueter, Mote Marine Lab

Special marine areas where species of animals aggregate to feed, reproduce or come together for other reasons exist in many regions of the world's oceans. Off Mexico's northeast Yucatan peninsula, where the Gulf of Mexico and the Caribbean Sea meet, large numbers of whale sharks (*Rhincodon typus*) aggregate to feed from May through September each year. An annual upwelling event, caused by currents passing through the Yucatan Channel, brings cooler, nutrient-rich water to this part of the Campeche Bank. This fuels a summer bloom of phytoplankton that leads to an increase in zooplankton, the main food for whale sharks. In addition, spawning aggregations of little tunny (*Euthynnus alletteratus*) in the region produce fish eggs that whale sharks prefer to feed on. These rich sources of food attract up to an estimated 1,400 whale sharks to the site during the summer, with as many as 420 sharks densely aggregated within a patch of ocean approximately 18 km² (de la Parra Venegas et al. 2011), making this area the site of the world's largest aggregation of whale sharks known to science. Ecotourism based on the whale shark aggregation was begun in 2003. This activity has grown significantly and Mexico has instituted standards and practices for the boats and snorkelers that visit the sharks. Mexico also has established a biosphere reserve

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that includes most of the whale shark feeding area. Tagging studies demonstrate that when the sharks leave the Yucatan region, they migrate throughout the Gulf of Mexico, the western Caribbean Sea, and even as far as the mid-Atlantic south of the equator where pregnant females may give birth. Tagging also has revealed that these sharks dive to depths approaching 2,000 m in the Gulf for reasons still under investigation. Because whale sharks are surface feeders, oil spills such as occurred in the 2010 Deepwater Horizon event pose serious dangers to the sharks' health and survival. In addition to whale sharks, the Yucatan area is also an aggregation site for other marine species such as: cownose, spotted eagle and devil rays and mantas; flyingfish, little tunny and billfishes including sailfish; sea turtles; marine mammals such as bottlenose dolphins; and marine birds. Clearly this part of the southeastern Gulf and northwestern Caribbean is a special marine area that warrants extended protection, perhaps as a World Heritage Site or other internationally recognized designation.







de la Parra Venegas R, Hueter R, Gonza'lez Cano J, Tyminski J, Gregorio Remolina J, et al. (2011) An unprecedented aggregation of whale sharks, *Rhincodon typus*, in Mexican coastal waters of the Caribbean Sea. PLoS ONE 6(4): e18994. doi:10.1371/journal.pone.0018994.

PANEL 2 DISCUSSION:

Q: Steve Gittings: Any connections between the Whale Sharks in Yucatan and Ewing Bank in the NW Gulf.

A: Bob: Yes. We are working with Eric Hoffmeyer, who works at Ewing Bank, to document this.

Q: ?: What is the genetic differences between the two Whale Shark populations?

A: Bob: No difference in genetics between the two Yucatan populations has been found. We have also observed animals moving between the main and Afuera areas.

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Q: ?: Are there geologic features where the sharks go in the Atlantic?

A: Bob: Yes, St Peter and Paul rocks. Remote area off Brazil. Birth area must be a remote area away from predators.

Q: Tom Shirley: Are the sharks diving deep to feed?

A: Dives have very shallow profile. May be a way to dissipate heat. Not clearly known why they dive like this.

Q: Gene Shinn: Harry Roberts at LSU has documented 1600 seep sites in the Gulf.

A: Amanda: Harry has been on cruises with us and has been very helpful in understanding these sites.

Q: Gene: What are the regulations on drilling around these seep sites?

A: James Sinclair: Drilling is prohibited within 2000 ft of a potential seep site identified by seismic images.

Q: ? What additional protections are needed at the sites talked about?

A: Tom: Some of the sites could be set-aside as larval source areas. How they would be protected would be subject to discussion among all those affected.

Q: ?: What are the indications of impact to these areas by the oil spill?

A: Amanda: Not all the results are in.

Q: ?: Are patterns of longitudinal biodiversity known in deepwater communities?

A: Tom: HRI's biodiversity database is a tool to start to explore this question.

Q: ?: Are deepwater corals feeding on live zooplankton?

A: Amanda: Yes. Some feeding on detritus may occur, but lab studies have shown corals feeding on live zooplankton.

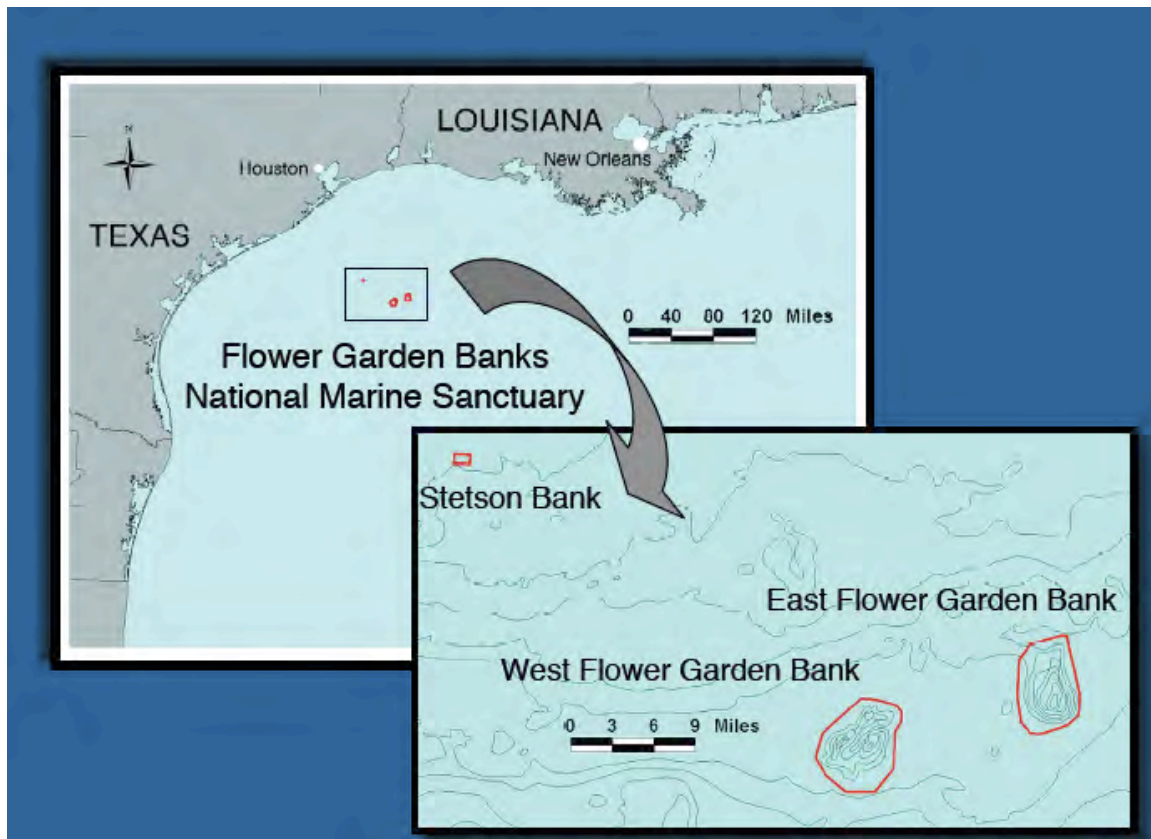
Panel 3 - Perspectives and Visions for Protection of the Gulf of Mexico

FLOWER GARDEN BANKS NATIONAL MARINE SANCTUARY - MANAGEMENT PLAN REVIEW

G.P. Schmahl, Superintendent, FGBNMS

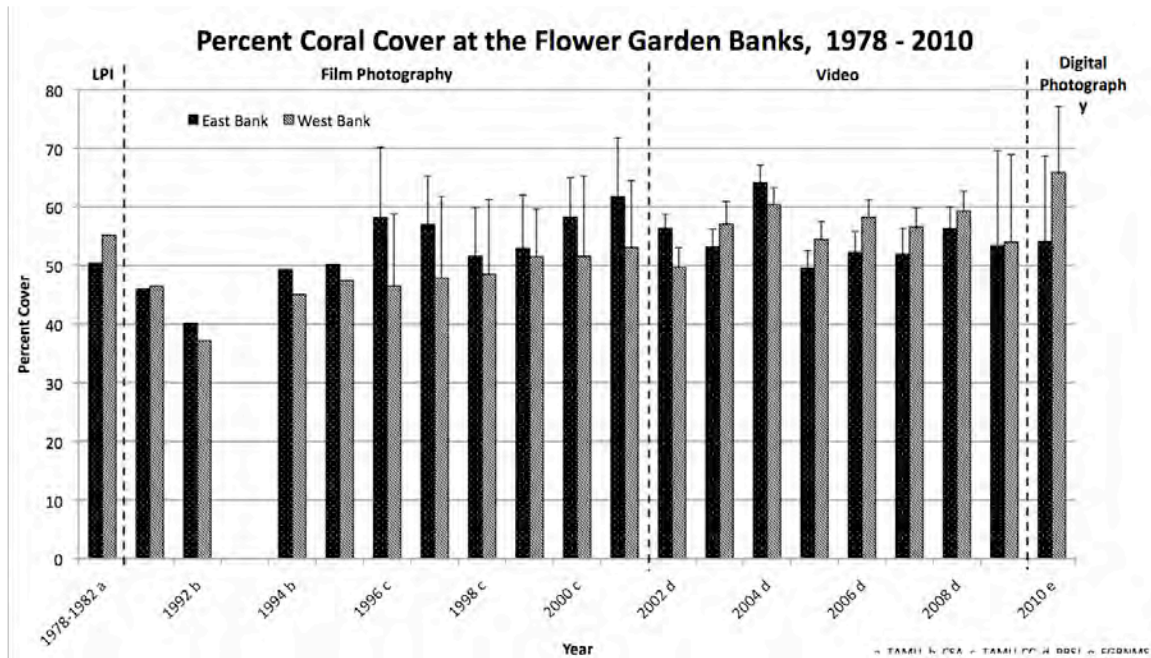
Gulf of Mexico does not get enough respect. I am surprised at the negative attitude and lack of knowledge that people around the country have about the Gulf of Mexico. The Flower Garden Banks are tremendous examples of how special the Gulf is. We know this, but as we develop ideas for protections in the Gulf, we need to sell this not only to ourselves, but also to the Nation.

Flower Garden Banks National Marine Sanctuary (FGB) was designated in 1992. It consists of three distinct banks: East and West Flower Garden Banks, and Stetson Bank, which was added in 1996. The sanctuary is located 93 to 104 nautical miles offshore from Galveston, Texas in the Gulf of Mexico. It has a combined area of 42.5 square nautical miles (56 square statute miles) and is in water depths from 55' to 500'.

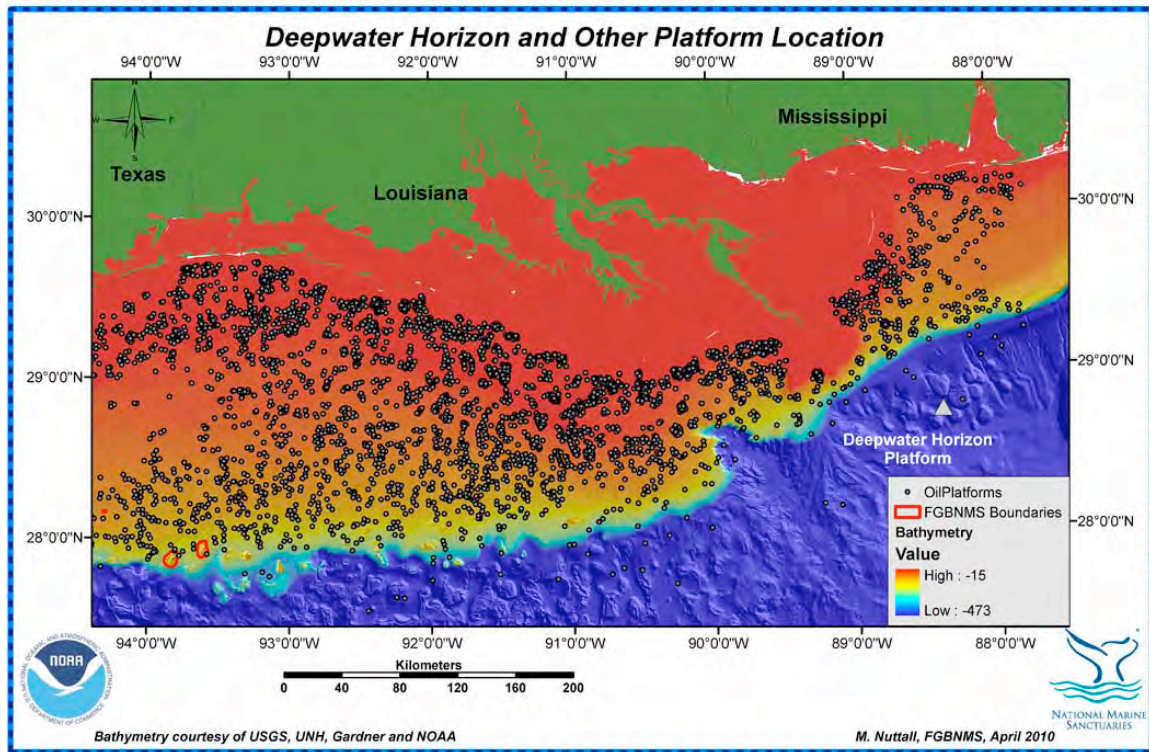


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The sanctuary protects one of the healthiest coral reefs in the Western Atlantic. Long-term monitoring of the coral cover at FGB has remained over 50% since the 1970s when monitoring began. This is in spite of being in the middle of a very active area oil and gas development: a good-news story that needs to be emphasized. Oil and gas development in proximity of sensitive natural resources can be compatible.



The different data collection techniques are indicated (LPI=Line Point Intercept). Data sources: a=TAMU, b=CSA, c=TAMU CC, d=PBS&J, e=FGBNMS



Regulations exist in the sanctuary that limit anchoring and disturbing coral. Commercial and recreational fishing is allowed, but only with hook and line.

All sanctuaries must undertake Management Plan Reviews every 5-10 years. FGB's Management Plan Review began in 2006. Milestones of the review include:

- Publication of State of the Sanctuary Report: Status of resources, trends and management challenges.
- A public process with the involvement of the Sanctuary Advisory Council, which represent the users of the sanctuary. Public scoping meetings were held to define priority issues. One priority the meetings proposed was to expand the sanctuary to include other banks. Also concern was expressed about fishery impacts and visitor use impacts. Although the sanctuary's distance offshore limits the number of visitors, visitor impacts accumulated over time were identified as a concern.
- Draft Management Plan released in October 2010. The public comment period was open until end of January 2011. These comments were reviewed, responses were prepared, and the plan was modified accordingly.
- Final Management Plan will be out in Feb 2012.

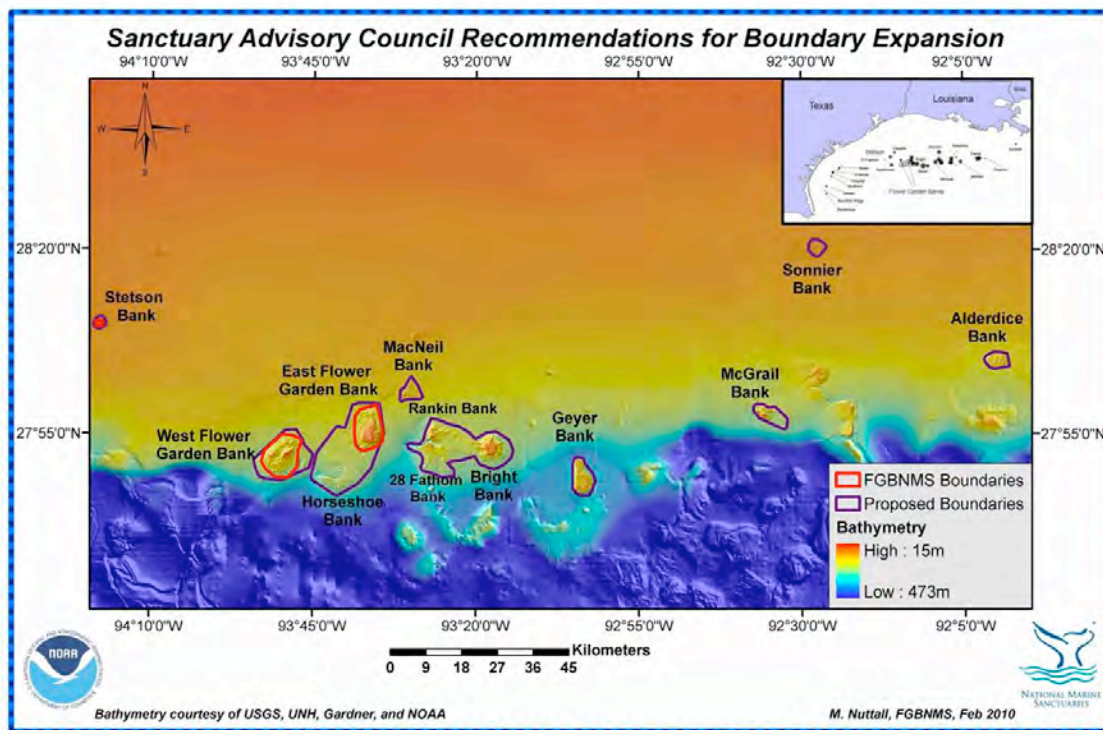
Six Action Plans in Management Plan:

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- Expansion (to include other banks with proposed discrete boundaries around the banks)
- Education and Outreach
- Research and Monitoring (includes proposal to evaluate the impact of fishing and diving, which may include a temporary closure to fishing)
- Resource Protection
- Visitor Use

New multi-beam mapping has shown that the banks are interconnected on the seafloor by topographic features that serve as “habitat highways.” Expansion proposal was mapped to get boundaries as close to the edges of these features as possible.

Bright Bank is a good example of why more comprehensive management of the banks is needed. Treasure salvaging has damaged the coral reefs of this bank. This activity is unregulated by any existing management authority. Including the bank into the sanctuary would protect it from such damage.



FUTURE OF THE GULF

Larry McKinney, Director, Harte Research Institute for Gulf of Mexico Science, Texas A&M University-Corpus Christi

The lesson from the DWH oil spill is the link between the Gulf economy and environment. The economic impacts of the disaster have been substantial, to fisheries and to the oil and gas industry. The Gulf will recover, to what state is unknown, but the Gulf is resilient. We need to focus on strengthening that resilience. Challenges remain. We are going to need the oil and gas from the Gulf. We need to find

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ways to develop these resources while protecting the environment. We need to make MPAs compatible with oil and gas, and with commercial and recreational fisheries. The difficulties of establishing MPAs in the Channel Islands have made the discussion of MPAs difficult everywhere else. MPAs and the broad spectrum of protections within MPAs need to be part of the tools that managers like federal and state fisheries managers are able to use. Problems arise when political issues outweigh the science of using these tools. We can't afford for individuals or institutions to talk about these tools in order to just fundraise. We need to get past the rhetoric and set goals for how to use the tools. We have enough science to know that MPAs do work, and arguments against MPAs just don't stand up. The Florida Keys and Flower Garden Bank National Marine Sanctuaries shows that we can work with stakeholders to use these tools on a small scale. We need to scale-up to the larger Gulf ecosystem and create a network of MPAs. Nowhere in the Gulf is out of reach to exploitation. The Whale Shark and spawning aggregations suggest that we are at risk of loving the Gulf to death. The Whale Sharks at Ewing Bank off Louisiana are feeding on bonito spawn. Obviously, such spawning and feeding areas have special significance and are places we need to look at to protect. How? Use a process and get the buy-in of stakeholders. Working together to find more efficient permitting of activities and find incentives for stakeholders to participate in the process. We need to get beyond the political debate and use arguments based on conservation and science if we will have the type of Gulf of Mexico we want in the future.

FLOWER GARDEN BANKS NATIONAL MARINE SANCTUARY EXPANSION

Clint Moore, Chair of Flower Garden Banks National Marine Sanctuary Advisory Council Boundary Expansion Committee

I am the oil and gas representative on the FGB Advisory Council and the chair of the Boundary Expansion Working Group. In 2006, we began to consider other areas adjacent to the FGB and other features in the NW Gulf. Seven alternatives were developed. A preferred alternative was recommended to the Advisory Council that included adding 8 new banks to the sanctuary. The threats that this expansion is to address include treasure hunting, anchoring and other harm to the biota. The academic research on the banks of the NW Gulf by Tom Bright and others is well respected by people in industry. This is a basis for BOEMRE protections to the features. Working with the Advisory Council that includes representatives from BOEMRE and fishing, through much trial and error, a very methodical and detailed effort was made to come up with the recommendation for expansion. Some of the criteria used were biological and geological significance and uniqueness (zone priority index), connectivity index (structural and biological), a threat index (known or perceived) and a public and sanctuary priority index. Designed to have as much inclusion, dialogue and participation as possible. These processes took time with multiple meetings and much discussion. Developing a criteria matrix was a useful way to approach the effort. Provided a numerical value for assessing risk. Evaluation of risk is only as good as the numerical value and the process that went into formulating that number.

Ranking Criteria

Legend	
Area or Bank	Area considered for incorporation into the FGBNMS
Zone Priority Index	Biological/Geological Significance/Uniqueness based on MMS criteria and FGBNMS recent acquisition of data
Connectivity Index	Connectivity to current FGBNMS features
Threat Index	Level of known or perceived threat
Public and Sanctuary priority	Level of interest through public scoping and sanctuary knowledge to incorporate site.

Zone Priority Index (Biological/Geological Significance)	High - 3 Med - 2 Low - 1
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Threat index	High - 3 Med - 2 Low - 1
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Structural Connectivity	Contiguous - 3 Connected - 2 In geographic region - 1
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Biological Connectivity	
0-10 km	3
11-20 km	2
21-30 km	1

Public and Sanctuary Priority Index (level of interest to incorporate site)	High - 3 Med - 2 Low - 1
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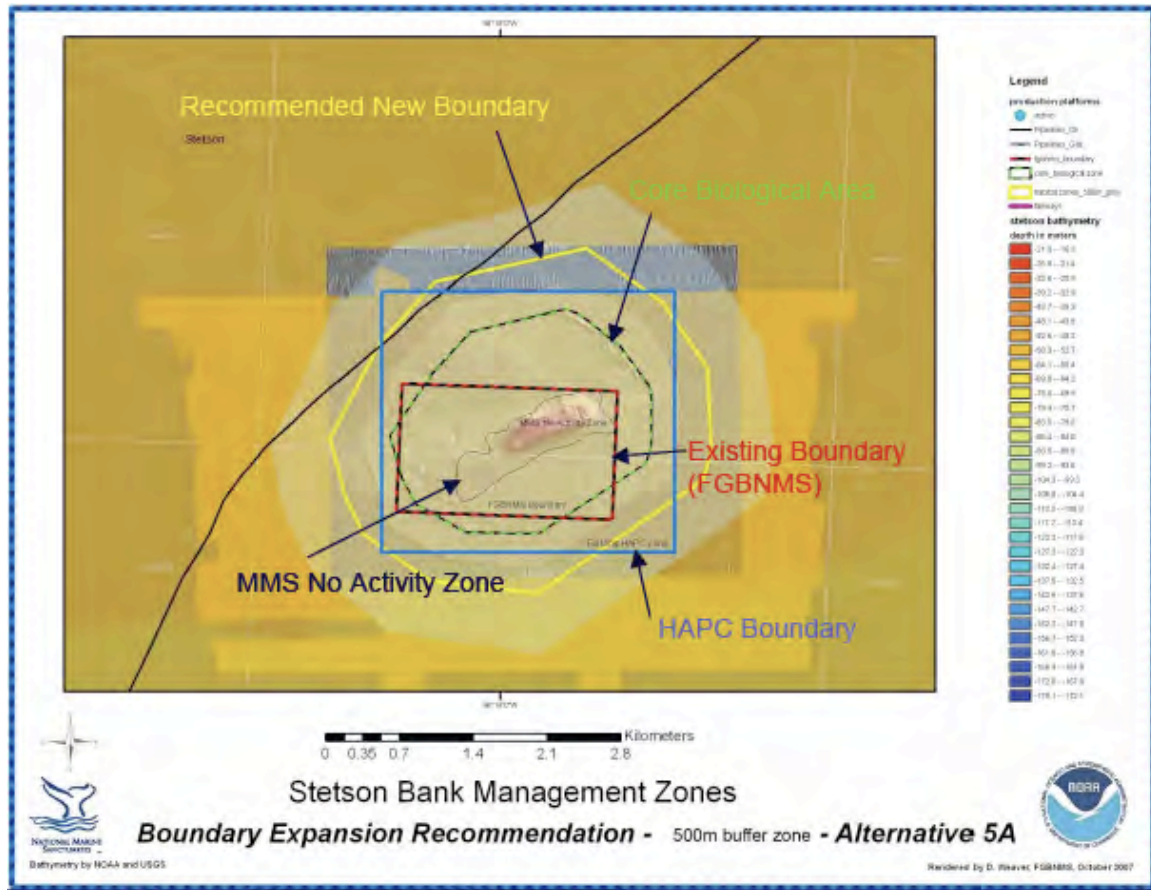
Criteria Matrix

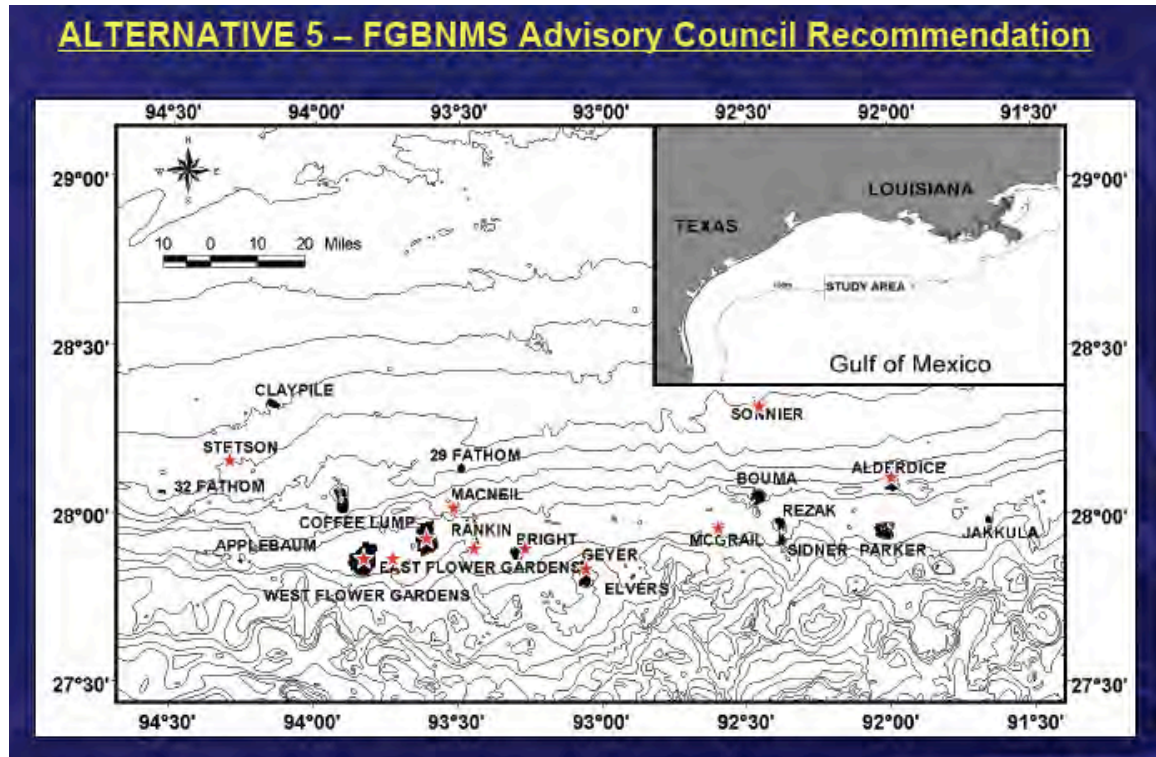
Area or Bank	Zone Priority Index	Structural Connectivity Index	Biological Connectivity	Threat Index	Public and Sanctuary priority	Overall ranking	Nearest Neighbor Distance (km)
Stetson Ring	3	3	3	3	3	12	23.3
McGrail	3	1	2	3	3	11	15.8
Geyer	3	1	2	3	3	11	18.25
Bright	3	2	2	3	3	11	14.8
Sonnier	3	1	1	3	3	10	29.8
"Horseshoe reef"	2	2	3	2	3	10	9.5
Alderdice	3	1	2	2	2.5	9.5	15.7
Rezak	1	1	3	1	2	7	5.9
Sidner	1	1	3	1	2	7	5.9
Rankin	1	2	3	1	1	6	3.4
28 Fathom	1	2	3	1	1	6	3.4
MacNeil	1	2	3	1	1	6	8.5
Bouma	1	1	2	1	1	5	11
Jakkula	1	1	1	1	1	4	23.1
Florida Middle Grounds	2	0	0	2	0	4	115
Alabama Pinnacles	1	0	0	1	0	2	219
Madison/Swanson	1	0	0	1	0	2	115

We used existing and new information. Boundaries and 500 m buffer zones were designated by drawing irregular shaped polygons that matched tightly with the features. By avoiding the use of the square

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HAPC boundaries on these features, oil and gas infrastructure was avoided. The inclusion of the 8 new discrete bank areas represents a 5x expansion of the existing area of the sanctuary.





Everyone involved brought scientific as well as policy viewpoints to the process. Face-to-face interaction is essential. We carefully and respectfully questioned reasoning and conclusions, and developed an attitude of balance and stewardship. This approach to balance was developed in the Western States in the 1980s. A bi-partisan group of Western Governors created a shared doctrine for a balanced approach to successful environmental management. The doctrine states that the environment can be protected while providing important social and economic benefits. The principles are:

- National standards, neighborhood solutions and adaptive policies
- Collaboration, not polarization
- Reward results and innovation, not necessarily programs
- Science for the facts
- Process for prioritization
- Markets before mandates
- Change a heart, you change a nation
- Recognition of costs and benefits
- Solutions transcend political boundaries

Probably easier to implement this in the ocean than on land, where so many public and private interests overlap. The Governors hoped this would be:

- A symbol for balance and stewardship in environmental management
- A widely used framework for solving difficult environmental problems
- A philosophic foundation for balanced legislation
- A roadmap for discussions between legislators and stakeholders

“ENLIBRA”

A SHARED DOCTRINE FOR ENVIRONMENTAL MANAGEMENT

ENLIBRA = “Balance and Stewardship”
A Balanced Approach to Successful Environmental Management

HISTORY: Utah Governor Mike Leavitt (R) and Oregon Governor John Kitzhaber (D) took the lead in developing this shared set of principles that were agreed upon in 1999, as policy of the Western Governors’ Association. Western states’ land use conflicts were very contentious.

PURPOSE: Today there is no symbol for the middle; for the majority of citizens who believe that the environment and its natural resources can be protected while at the same time providing recreational and employment opportunities. This doctrine provides a collection of tools that, if applied, can result in improved and expedited environmental decision-making and implementation.

(adapted from WGA 1999)

Panel 3 Discussion:

Q: John Ogden: Can we achieve an appropriate level of governance by establishing one MPA at a time.

A: Larry: Need a network approach to use how all the areas work together.

A: Clint: Also need adequate and in-depth science to prove the connectivity relationships. Each small step must be based on comprehensive science.

Q: Frank Wassen: Are people continuing to dynamite Bright Bank in search of a Spanish Galion?

A: GP: As recently as a year ago activity was occurring and there are rumors of on-going explorations.

Q: ?: What is the level of certainty we need to move forward with options?

A: GP: Can always add more info on an issue. You have to make a call at some point that the info you have is good enough to act.

A: Clint: The argument is not to get the last 10% of knowledge, but arguing over whether you have the 90% necessary to act. Science takes time. Policymakers are often impatient.

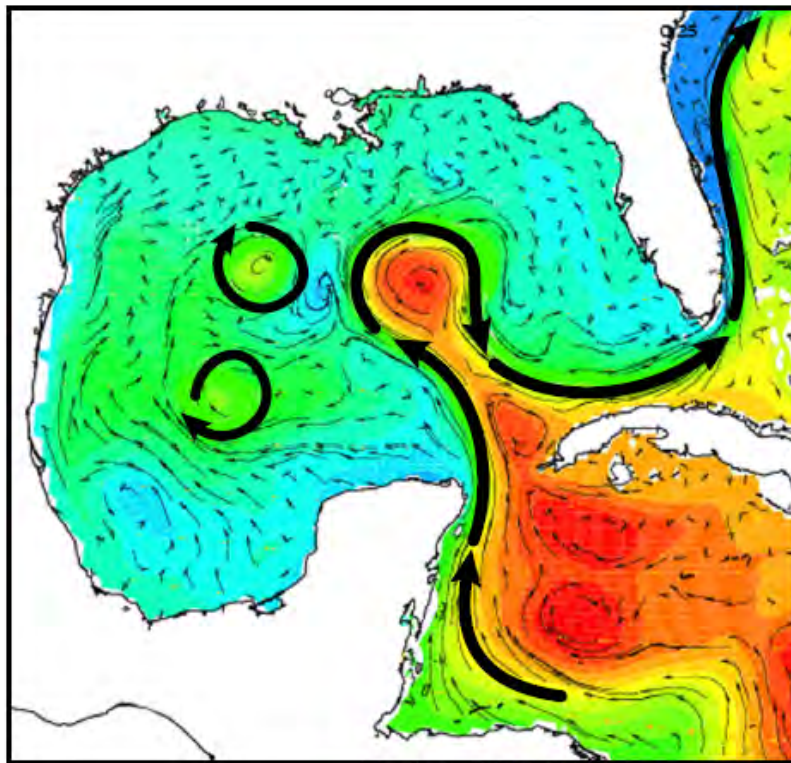
A: Larry: Let me counter that by saying that we usually say when we see a problem, it is said that we need to study it some more. This has been a tool to delay action until it is too late to accomplish anything. At some point you have to have confidence to make a decision and not to use more science as a delaying tactic.

Integrating Connectivity, National Ocean Policy and Coastal and Marine Spatial Planning in the Gulf of Mexico

John Ogden

University of South Florida

There is substantial science demonstrating that populations of marine organisms in the Gulf of Mexico are ecologically and evolutionarily connected to the Caribbean Sea upstream and to the North Atlantic Ocean downstream through the Loop Current and its gyres, the Florida Current and the Gulf Stream. Well over half of the species in the Gulf of Mexico have a planktonic larval life ranging from a few days to over a year in extent which transports them throughout the region. Others, such as whales, sharks and tuna along with many other migratory fishes use the Gulf as a spawning site or a way station on long annual migrations. There is also social and economic connectivity through the major industries in the Gulf and the ports, shipping lanes and commerce that connect it to the world. Under the terms of the developing U.S. Ocean Policy, the Gulf of Mexico is one of 9 regional ecosystems and our goal must be to understand these connections and to govern the Gulf at the geographic scale of the ecological, social and economic processes that sustain it and on which we depend.



Background Currents and Sea Surface Height (color): Oey et al.; Princeton Data from NOAA Data

Figure 1: Winter snapshot of the inter-connectivity of the Gulf of Mexico by surface currents, the Loop Current and its gyres, the Florida Current and the Gulf Stream. Color indicates water temperature.

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The term “*ecosystem*” is a convenient way to draw boundaries around an area in order to look at it as a unit. Thus, ecosystems can be small or large depending upon the extent of our knowledge or the degree to which people care about and depend on the products and services from a particular area. Perhaps a better definition of an ecosystem is “*the area of concern*” in which people recognize their dependencies and are willing to work to sustain it.

The U.S. Commission on Ocean Policy and the Pew Ocean Commission, both reporting to the Nation in 2004, made the emphatic point that existing ocean resources management was broken for three key reasons: (1) management authority was fragmented between agencies and programs with over-lapping, and often conflicting, goals and authority; (2) there were major spatial mismatches between recognized, large regional ecological systems and the relatively small scale of management; and, (3) there were temporal mismatches between management and ecological processes. Given this situation a key recommendation of both Commissions was that an ecosystem-based, regional approach was necessary in order to govern the ocean at the scale of the ecosystem processes that sustain biodiversity. Led by Governor Bush of Florida, the Gulf of Mexico Alliance was established by the 5 Gulf states in 2004 and has been working on a framework for an ecosystem approach to management and governance ever since.

More recently, the Obama Administration’s Interagency Ocean Policy Task Force has promulgated its final recommendations based on several key objectives:

1. Adopt ecosystem-based management as a foundational principle for the comprehensive management of the ocean, our coasts, and the Great Lakes.
2. Implement comprehensive, integrated, ecosystem-based coastal and marine spatial planning and management in the United States.
3. Increase knowledge to continually inform and improve management and policy decisions and the capacity to respond to change and challenges. Better educate the public through formal and informal programs about the ocean, our coasts, and the Great Lakes.
4. Better coordinate and support Federal, State, tribal, local, and regional management of the ocean, our coasts, and the Great Lakes. Improve coordination and integration across the Federal Government, and as appropriate, engage with the international community.
5. Strengthen and integrate Federal, state and private ocean observing systems, sensors, data collection platforms, data management, and mapping capabilities into a national system, and integrate that system into international observation efforts.

The key tool of ecosystem-based management is Coastal and Marine Spatial Planning (CMSP). As outlined by the Interagency Ocean Policy Task Force (2009) CMSP is: (1) ecosystem-based; (2) of sufficient geographic scale to encompass key ecosystem structures and processes; and, (3) integrates ecological, social, economic and institutional perspectives. CMSP uses geographic information systems (GIS) to organize what is known about the natural system and its human uses in geo-referenced layers. The electronic GIS maps which are web-based can be accessed by anyone and new information can be continually added from local knowledge. For example, a project known as Geospatial Assessment of Marine Ecosystems (GAME) has begun to organize information in this way for Florida and is extending the work to the wider Gulf.

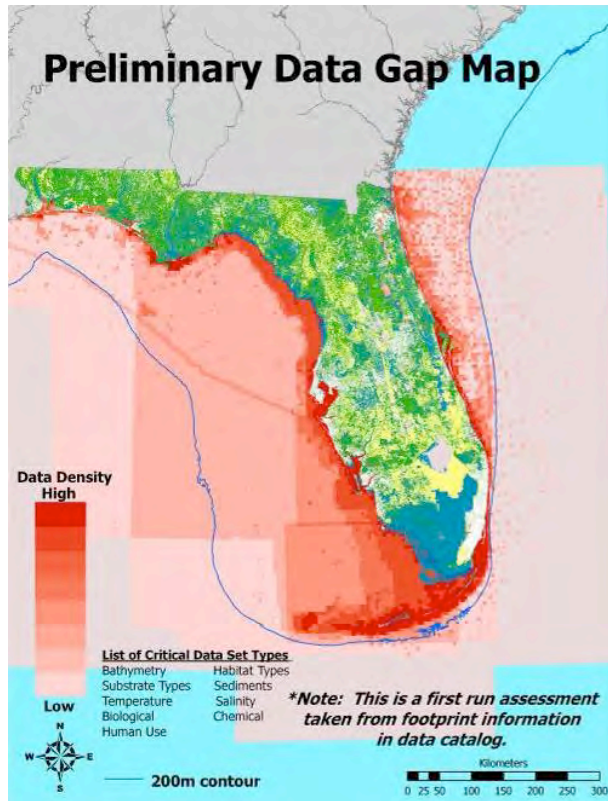


Figure 2: Preliminary data gap map of the GAME project, combining all information layers (bathymetry, physical data, chemical data, substrate types, habitat types, biological data, human uses) and indicating data density and potential gaps in knowledge. (after Carollo et al. 2009)

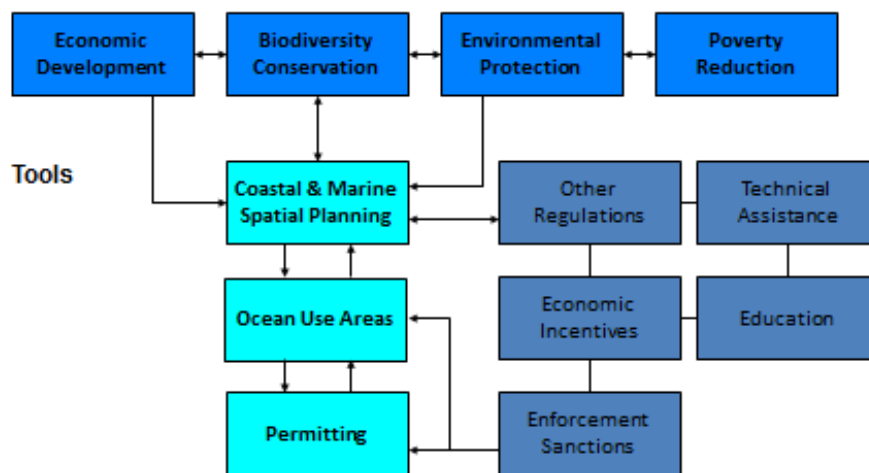


Figure 3: Framework for the application of Coastal and Marine Spatial Planning (CMSP) showing goals (dark blue) and the tools (light blue). After Ehler and Douvere (2009)

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We must use the resources of the Gulf, but we cannot afford to destroy them in the process. The BP Macondo oil spill provides an opportunity for ocean policy in the Gulf of Mexico to look ahead and to plan for the use and conservation of Gulf resources for the 21st century. In spite of heavy use and industrialization over the past century the Gulf is resilient and remains a spectacular and diverse ecosystem. The Ocean Policy Task Force and its focus on Coastal and Marine Spatial Planning acknowledges the whole system scale at which we need to approach managing the Gulf, and the social and economic connections that are the basis of any reasonable ocean management strategy.

Does the political will exist to begin the implementation of a Gulf-wide ocean policy? For example, a poll reported September 30, 2010 conducted independently by Republican and Democratic polling firms and funded by the Walton Family Foundation showed that there is a majority support in the Gulf states for making new investments in ecosystem restoration while continuing to develop offshore oil resources.

We have entered what some have called the first century of the “Anthropocene.” There is no natural system that does not already have a substantial human footprint. The challenge outlined by the Ocean Policy Task Force is to protect biodiversity while planning for human uses within ecosystem-based management at the scale of ecosystem, economic and social processes of the whole Gulf.

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Discussion

Q: ? : How can climate change be incorporated into the deliberations of how to manage the ecosystem?

A: Climate change is happening. Here is where our interests and those of ecosystems come together.

Q: ? : How do you feel about Sylvia Earle’s term “Hope Spots”?

A: The Gulf of Mexico is a Hope Spot.

Panel 4 - International Placed-Based Protection Strategies and Partnerships

MEXICO

AN OVERVIEW OF THE INTEGRATED ASSESSMENT AND MANAGEMENT OF THE GULF OF MEXICO LARGE MARINE ECOSYSTEM PROGRAM

Porfirio Álvarez-Torres and Orlando Iglesias, UNIDO Gulf of Mexico Large Marine Ecosystem Program.

Background

The Gulf of Mexico Large Marine Ecosystem (GoM-LME) is shared by Cuba, Mexico and the United States and represents a major asset to these countries, in terms of fisheries, tourism, agriculture, oil, infrastructure, trade and shipping.

The Integrated Assessment and Management of the Gulf of Mexico Large Marine Ecosystem Program is a Global Environment Facility partially-funded US-Mexico initiative that both countries first started crafting back in 2001.

The Global Environment Facility (GEF) is an independent financial organization that provides funds for projects that benefit the global environment and promote sustainable livelihoods in local communities. GEF projects address six complex global environmental issues (or Focal Areas), including International Waters (IW). The formal objective of the GEF Operational Strategy in the international waters focal area is to contribute, primarily as a catalyst, to the implementation of a more comprehensive ecosystem-based approach in managing international waters as a means to achieve global environmental benefits. Noticeable is the emphasis on acting as a catalyst. This means that the GEF programs act mainly to enhance and strengthen the many other national and international programs which have the primary responsibility for action.

After much discussion on what agency would implement the program, the GoM LME was finally placed within the United Nations Industrial Development Organization, UNIDO and officially launched its formal activities in June, 2009 with the establishment of a full-time staffed Project Coordination Unit hosted by Mexico's country focal point headquarters, SEMARNAT.

The GoM LME Program aims at removing identified constraints and barriers, developing a common vision, mechanisms and tools, and promoting reforms and investments, to set the bases for application of the ecosystem-based management (EBM) approach in the regional-scale management of the GoM-LME.

Objective

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To set the foundations for the Gulf of Mexico LME-wide ecosystem-based management approaches to rehabilitate marine and coastal ecosystems, recover depleted living marine resources, and reduce pollution and nutrient overloading.

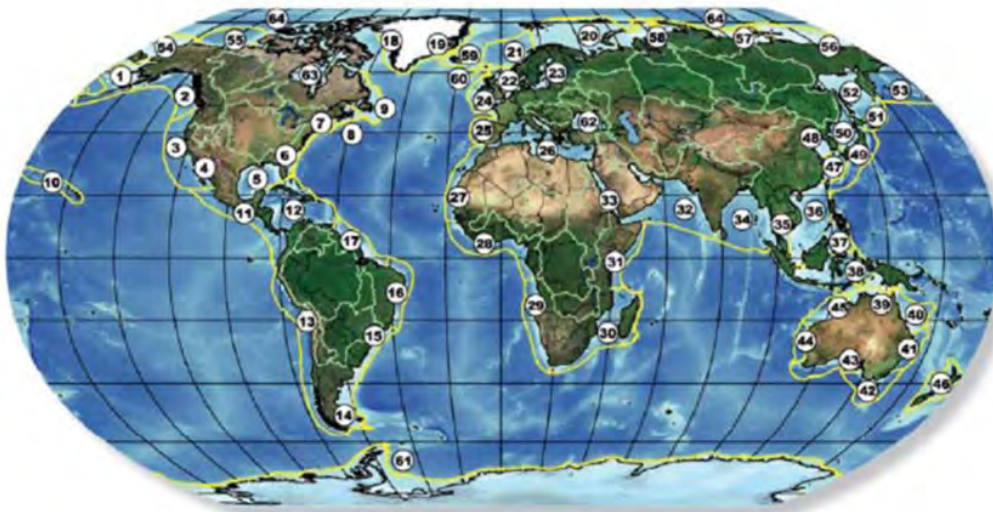
The program's global benefit will result in an enhanced understanding of LME functions, to serve as input into LME management strategies. The project seeks to respond to these threats through an ecosystem-based management framework, allowing countries to strengthen the Gulf's living resources, and address land-based and marine pollution, including the reduction of nutrient loads that contribute to hypoxic zones in the region.

This will be complemented through capacity-building activities and pilot projects in three critical aspects of the EBM approach: productivity, conservation and adaptive management, and cross-sectoral engagement, including solid monitoring and evaluation frameworks for each component.

The LME Approach

Large Marine Ecosystems (LMEs) as a concept was first conceived in the US by NOAA. LMEs are natural regions of ocean space encompassing coastal waters from river basins and estuaries to the seaward boundary of continental shelves and the outer margins of coastal currents. They are relatively large regions of 200,000 km² or greater, the natural boundaries of which are based on four ecological criteria: bathymetry, hydrography, productivity, and trophically related populations (Sherman 1994).

Marine ecosystems and their contributing freshwater basins are transboundary in nature by virtue of interconnected currents, pollution, and movement and migration of living resources. In 2005, LMEs were recognized in a scientific consensus statement by over 200 marine scientists, academics and policy experts as important global areas for practicing ecosystem-based research, assessment and management of ocean goods and services (McLeod et al. 2005). A movement is presently under way to assess and manage a growing number of the world's LMEs, with the support of financial grants, and donor and UN partnerships, in nations of Africa, Asia, Latin America and Eastern Europe. Eighty percent of the global marine fisheries catch comes from 64 globally identified LMEs delineated along the continental shelves and coastal currents that represent multi-country, ecosystem-based management units for reversing fisheries depletion (Duda and Sherman, 2002).

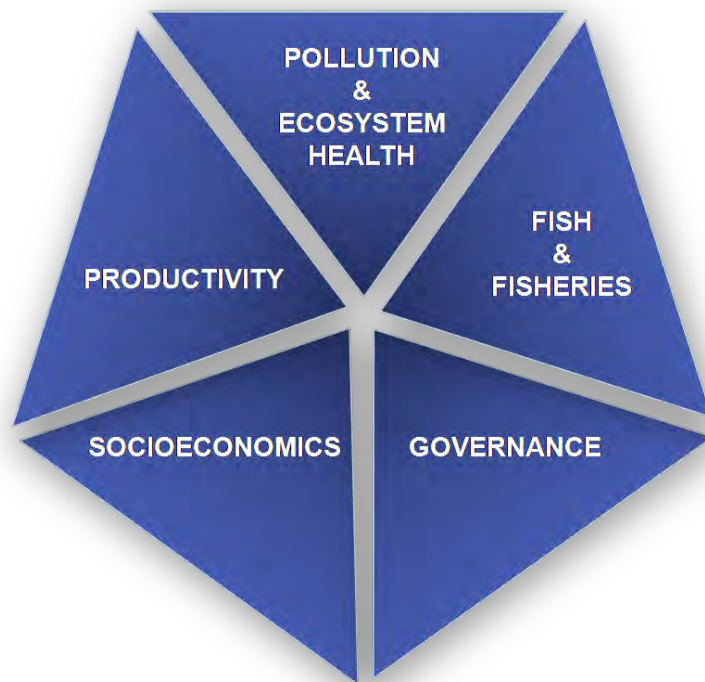


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Map of the 64 Large Marine Ecosystems of the world and their linked watersheds (Sherman et al. 2004).

LME Modules

A five-module indicator approach to the assessment and management of LMEs has proven useful in ecosystem-based projects in the United States and elsewhere (Duda and Sherman, 2002) using suites of indicators of LME productivity, fish and fisheries, pollution and ecosystem health, socioeconomics, and governance. The suites of LME indicators are used to measure the changing states of LMEs in relation to a driver-pressure-state-impact-response (DPSIR) system in support of adaptive management actions. Taken together, the modules provide indicators and metrics used to determine the changing states of LMEs and support actions for the recovery, sustainability, and management of marine resources and their habitats.



LME modules as suites of ecosystem indicators (Sherman et al. 2005)

GoM LME Components

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The five modules are adapted to LME conditions through a Transboundary Diagnostic Analysis (TDA) process to identify key issues, and a Strategic Action Program (SAP) development process for the groups of nations or states sharing an LME to remediate the issues.

The production of a Transboundary Diagnostic Analysis (TDA) followed by a Strategic Action Plan (SAP) is a requirement for most projects proposed for financing in the GEF International Waters Focal Area.

The TDA is a scientific and technical fact-finding analysis used to scale the relative importance of sources, causes and impacts of transboundary waters problems. It should be an objective assessment and not a negotiated document.

The analysis is carried out in a cross sectoral manner, focusing on transboundary problems without ignoring national concerns and priorities. In order to make the analysis more effective and sustainable it should include a governance analysis that considers the local institutional, legal and policy environment. Furthermore, the TDA should be preceded by a consultation with stakeholders, and the stakeholders are involved throughout the subsequent process. Four key points that underpin the TDA are Joint fact-finding, Prioritization, Participation, and Consensus. The TDA approach is not only a proven way of achieving progress, but it also acts as a diagnostic tool for measuring the effectiveness of SAP implementation.

The SAP is a negotiated policy document that should identify policy, legal and institutional reforms and investments needed to address the priority transboundary problems.

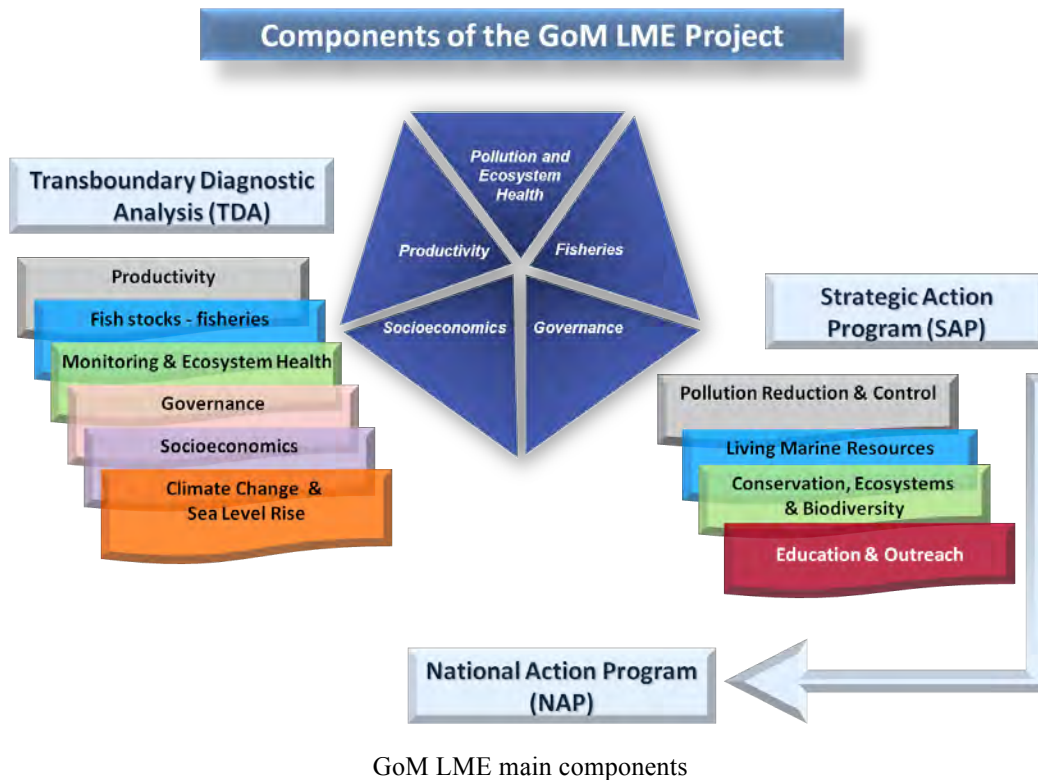
These processes are critical for integrating science into management in a practical way, and for establishing appropriate governance regimes to change human behavior in different sectors.

The SAP translates the shared commitment and vision into action, a process that has proven essential in GEF projects for developing and sustaining partnerships.

After updating the existing Transboundary Diagnostic Analysis developed during the program's preliminary phase in 2001 based upon scientific evidence, the GoM LME's major task is to develop a regional common Strategic Action Program for the Gulf that will address issues such as reduction of pollution, restoration, recovery of depleted stocks, environmental education, and climate change.

The five main components are listed below:

1. Updating the Transboundary Diagnostic Analysis (TDA) and confirmation of regional priorities.
2. Formulation and adoption of the Strategic Action Program (SAP) and associated National Action Programs (NAPs).
3. Strengthening of the LME-wide ecosystem based management approaches through the successful implementation and integration of the Pilot Projects.
4. Monitoring and Evaluation System for the Project.
5. Project effective and efficient coordination and management



Achievements

Since its inception in June 2009, the GoM LME Program has been actively working in different issues. One of the main tasks conducted so far is the updating of the Transboundary Diagnostic Analysis (TDA) in close collaboration with the Program's experts and consultants, as well as with information obtained from the several bi-national forums that the Program has organized to date.

Also, collaboration agreements and coordination efforts with several national agencies in both countries have been established in order to cover the following main issues:

- Coastal ecosystem rehabilitation (mangrove, sea grass beds, and sand dunes)
- Watershed management, coastal and marine pollution, nutrient over enrichment, eutrophication, harmful algal blooms and red tides
- Overexploitation of living marine resources
- Conservation of non-commercial living marine resources
- Crosscutting activities to ensure strong cooperation and engagement with other existing GEF funded projects in the GoM LME and Caribbean region.

Progress has been observed in capacity building through training courses, seminars and wide public participation throughout the GoM LME region, such as QA/QC for the monitoring of the ecosystem health, mangrove restoration and identification of management needs, etc.

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The development of a specific education and outreach program for the GoM LME region is under way and there is a first approach to an environmental educators' regional alliance.

In short, the GoM LME Program has served as a hinge to link the federal sector with states and municipalities, coordinating regional efforts, advancing effective regional collaboration, and fostering a permanent proactive bi-national dialogue.

Restoring Degraded Ecosystems & Habitats: Pilot Projects

A priority focus within the overall project is to deliver tangible global benefits within the participating countries through the selection and implementation of 'on-the-ground' activities. Consequently, clearly defined regional and national pilot demonstration projects to advance SAP implementation are being undertaken. Three priority pilot projects were jointly identified by participating countries. The pilot projects are fully incremental and will assist Mexico in participating more robustly in ongoing programs undertaken by the United States, and both countries to strengthen regional approaches to ecosystem-based management of the LME. The objectives of the Pilot Projects in respect to the overall GoM LME project are to:

- Target selected national and regional hotspots of watershed and coastal impacts and threats, as well as sensitive areas which are particularly vulnerable to similar impacts and threats.
- Deliver real and concrete improvements and mitigation to GoM LME constraints and impacts.
- Identify and promote reforms to policy, legislation and institutional realignment consistent with GoM LME objectives.
- Provide transferable lessons and best practices which can serve to replicate successes elsewhere both nationally and regionally.

The pilots are all sited in the same area, Terminos Lagoon, in order to achieve greater cost-effectiveness, maximize synergies and set the foundations for integrated, ecosystem-based approaches to natural resource management. By setting the pilots in the same location, the pilot strategies will generate practical experiences to address a complex baseline of overlapping policies and competencies for protected area conservation, social and economic development and threats to terrestrial, coastal and marine biodiversity.

The harmonized development of the three pilots will moreover contribute to defining a stronger baseline, and help enable the development of validated integrated approaches that will facilitate upscaling to other States and at a national level. Options for replication beyond the project area will also be enhanced. The three demonstration projects in Laguna de Terminos, Campeche, Mexico are:

- "Natural Habitat and Ecosystem Conservation of Coastal and Marine Zones of the Gulf of Mexico: Wetlands, Mangroves, Sea Grass Beds and Sand Dunes"
- "Joint Assessment and Monitoring of Coastal Conditions in the Gulf of Mexico"
- "Restoring Depleted Shrimp Stocks through Ecosystem Based Management Practices in the Gulf of Mexico Large Marine Ecosystem"

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Recovery of Commercial Living Marine Resources

Over-exploitation of fish stocks and non-selective fishing gear is a common problem in Mexico resulting in bycatch of non-target species, discards, and habitat damage.

Management of commercially harvested species is single species-based, focused on a maximum yield approach and it does not incorporate assessment or management uncertainties. Increasing illegal fishing and illegal fishing gear represent a significant problem that is aggravated by weak enforcement. In particular, the shrimp fishery is the most valuable for the Gulf of Mexico. This fishery is characterized as a sequential fishery. The industrial fleet targets adults in offshore waters, whereas the artisanal fleet catches juveniles in coastal lagoons or close to shore. Coastal and marine habitat modifications also contribute to the depletion of stocks that are further affected by other factors such as pollution.

This Pilot Project is an opportunity to integrate aspects of the shrimp fishery and ecosystem so far assessed separately. Assessing the management of the fishery as well as the role in it of public participation and science, is at least as important as assessing the status of the fishery itself. As with the other two Pilot Projects, Terminos Lagoon, Campeche is the study area.

Reducing Marine Pollution, Nutrient Over-enrichment, Hypoxia, and Dead Zones

The Gulf of Mexico Large Marine Ecosystem Program is working in close collaboration with the Louisiana Universities Marine Consortium (LUMCON) which was formed in 1979 to coordinate and stimulate Louisiana's activities in marine research and education. LUMCON provides coastal laboratory facilities for Louisiana universities, and conducts and facilitates research and educational programs in the marine sciences.

Hypoxia occurs naturally in many of the world's marine environments, such as fjords, deep basins, open ocean oxygen minimum zones, and oxygen minimum zones associated with western boundary upwelling systems. Hypoxic and anoxic (no oxygen) waters have existed throughout geologic time, but their occurrence in shallow coastal and estuarine areas appears to be increasing as a result of human activities (Diaz and Rosenberg, 1995) on the Louisiana/Texas continental shelf. The maximum areal extent of this hypoxic zone was measured at 22,000 km² during the summer of 2002; this is approximately the same size as the state of Massachusetts. The average size of the hypoxic zone in the northern Gulf of Mexico over the past five years (2004-2008) is about 17,000 km², the size of Lake Ontario.

Challenges

- Development of more and better ocean observing and monitoring platforms
- Weak funding policies to strengthen the oceanographic capacities of the country
- Failures in the enforcement of current legal framework
- Establish an ongoing institutional coordination
- Strengthen the links with local communities that use the Gulf's marine resources.

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Gulf of Mexico Mexico-US Potential areas for collaboration & partnership

- Agreement on a common long-term vision;
- Definition of a road map and goals;
- Development of specific collaborative actions;
- Definition of ecosystem quality objectives and indicators;
- Enhancement of effective collaboration;
- Strengthening exchange of expertise;
- Coordination of efforts towards long-term sustainable use of coastal and marine resources;
- Foster permanent proactive (rather than reactive) dialogue;
- Creation of a forum to address regional issues of common interest or concern;
- Increase capacity building for critical issues and areas.

Closing Remarks

Growing anthropogenic threats evidence tight interdependencies in terms of causes and effects, an LME-wide, ecosystem-based management approach is required to effectively mitigate them in the long-term. Current management approaches are not consistent with an ecosystem-based perspective and the lack of agreed coherent international programmes for managing the GoM resources increases the risk. Furthermore, the two countries have institutional frameworks for coastal and marine resources protection, but no effective regional inter-sectoral project coordination mechanism currently exists.

The Gulf of Mexico Large Marine Ecosystem Project represents an opportunity to build the bridge between the US and Mexico to enhance cooperative efforts under this concept of ‘international waters’, emphasizing mana The depletion of fisheries resources in coastal oceans is but one symptom of mismanagement, through a participatory process of binational and multinational ‘stakeholders’.

The depletion of fisheries resources in coastal oceans is but one symptom of mismanagement, along with land practices, the pollution of freshwater systems, and wasteful energy use that loads our atmosphere with climate changing carbon. The lack of attention to policy, legal, and institutional reform, low priority given to public investments, and lack of enforcement of many regulations now place at risk not only coastal and marine ecosystems but also human communities that depend on them for economic security and social stability.

Traditional sector-by-sector approaches to economic development have created this global crisis. Calls to establish environment programs focused solely on single marine sectors (e.g. fisheries, pollution, habitat, biodiversity) are doomed to fail if they do not incorporate the policies and programs of economic and other sectors.

Rather, an ecosystem-based approach to coastal and marine systems that can operate at multiple scales and harness stakeholder support for integrated management in synchrony with the improved management

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of other sectors is needed in both Northern and the Southern countries. The Gulf of Mexico Large Marine Ecosystem Program represents this opportunity.

The objective of the Gulf of Mexico LME Project is to contribute, primarily as catalyst, to the implementation of a more comprehensive ecosystem-based approach in managing international waters as a means to achieve global environmental benefits. The emphasis on acting as a catalyst means that the GoM LME program serves mainly as a hinge to foster the many other national and international programs, which have the primary responsibility for action.

The GoM LME project is ready to build the bridge for cooperation in the region, and its Transboundary Diagnostic Analysis (TDA) followed by a Strategic Action Plan (SAP) is a process that adds value and allows strengthening the concept of creating special places for conservation and sustainable use of the Gulf of Mexico coastal and marine assets.

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BELIZE

Melanie McField, Healthy Reefs for Healthy People Initiative, Belize City, Belize

Meso-American Healthy Reefs for Healthy People Initiative is an international and local collaboration to protect the coral reefs of the region, with common indicators and metrics to gauge the health of the reef system. A Report Card is made every two years. It also serves as a forum for local discussion and draws upon twenty-five years of MPA experience in region. As a result, communities are given more control over resources through protected area designations. Tulum Declaration of 1997 between the four countries calls for collaboration to work together. Science has shown good ecological connectivity in the region. More than 60 MPAs, many are fully-protected replenishment zones. The Report Card is able to describe coral reef health based on key indicators for the public and politician, and identifies a few "Hope Spots." There are new concerns regarding oil exploration and development. Economic development is important for Belize's future. The Healthy Reefs for Healthy People Initiative is a grass-roots effort meant to balance this development with environmental conservation.

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CUBA

John (Wes) Tunnell, Harte Research Institute for Gulf of Mexico Studies, Texas A&M University-Corpus Christi

Coastal and marine protected areas in Cuba are a subsystem of the National System of Protected Areas (SNAP, Sistema Nacional de Areas Protegidas). The Cuban Subsystem of Marine Protected Areas (SAMP, Subsistema de Areas Marinas Protegidas) has developed differently and a bit later than the terrestrial counterpart, but it now forms a strong and important part of protected areas within the island nation (Estrada et al. 2004).

The Cuban government enacted Law 81, known as the Law of the Environment, in 1997, and it establishes the legal framework for the formal National System of Protected Areas. The Ministry of Science, Technology, and the Environment (CITMA, Ministerio de Ciencia, Tecnologia y Medio Ambiente) is the lead ministry for protected areas and is in charge of the administration, management, and oversight of the SNAP. In 1999 Cuba enacted Decree-Law 201 to provide the details for the identification, proposal, establishment, and management of protected areas (CITMA et al. 2005).

Fortunately, before all of the official laws above were established Cuba began setting aside its special places as early as the 1930s. The amazing biodiversity, high number of endemics, and internationally recognized special places makes Cuba's natural environment known worldwide. The world famous Gardens of the Queen (Jardines de la Reina) coral reefs and Zapata Wetlands (Cienaga de Zapata) are widely known, published, and visited by conservationists.

Today the National Center for Protected Areas (CNAP, Centro Nacional de Areas Protegidas) manages and administers protected areas within CITMA. On a broad scale, protected areas are classified into three groups: 1) Protected Areas of National Significance (APSN); Protected Areas of Local Significance (SPSL); and, Special Regions of Sustainable Development (REDS). Management categories for protected areas follow the IUCN (International Union for the Conservation of Nature) categories and are established by Decree-Law No. 201:

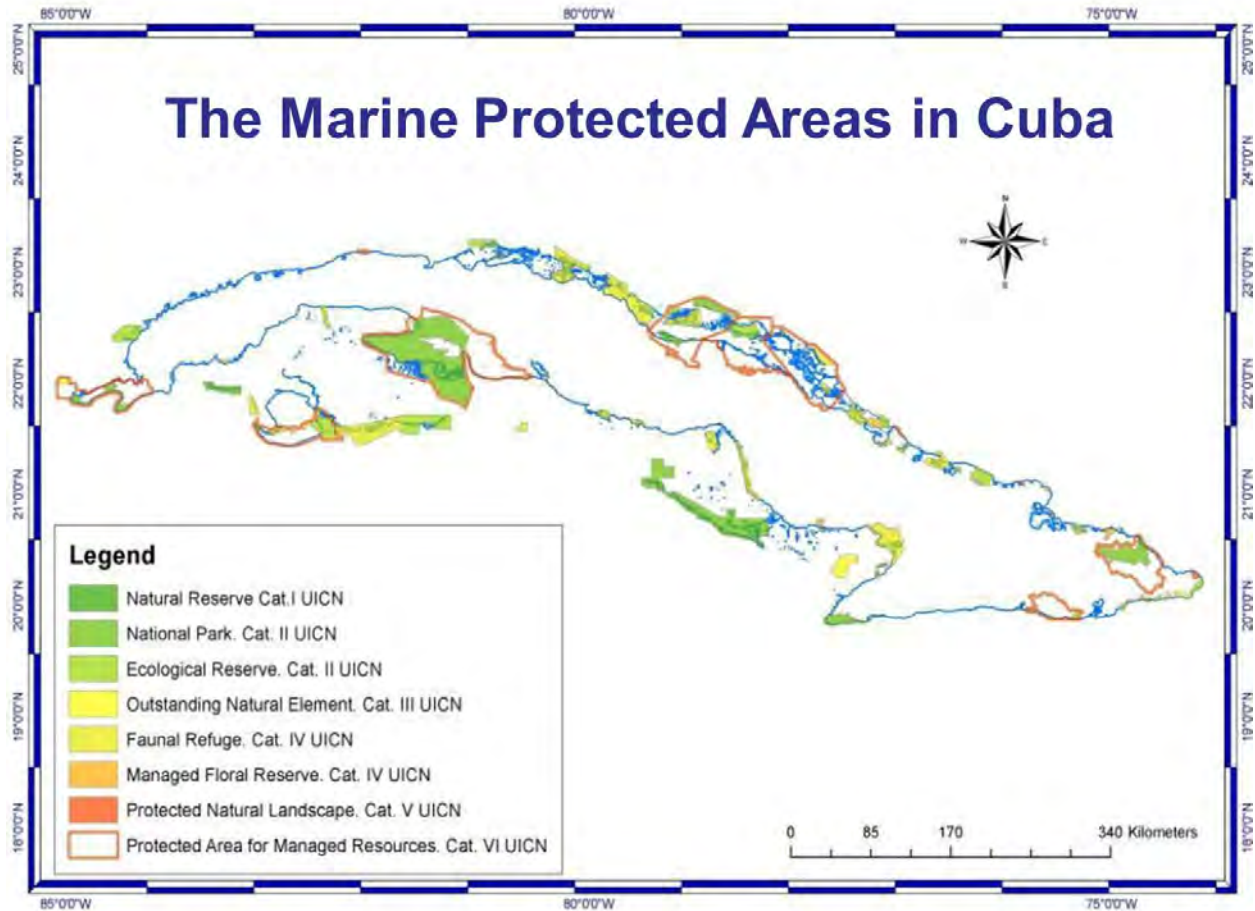
- 1) Natural Reserve (RN, Cat. I, IUCN)
- 2) National Park (PN, Cat. II, IUCN)
- 3) Ecological Reserve (RE, Cat. II, IUCN)
- 4) Outstanding Natural Element (END, Cat. III, IUCN)
- 5) Managed Floral Reserve (RFM, Cat. IV, IUCN)
- 6) Faunal Refuge (RF, Cat. IV, IUCN)
- 7) Protected Natural Landscape (PNP, Cat. V, IUCN)
- 8) Protected Area for Managed Resources (APRM, Cat. VI, IUCN)

Currently, over 100 Marine Protected Areas (MPAs) have been identified with over one third approved and over 20 in final approval (Figure 1). Conservation goals for the 2009-2013 system plan call for protecting: 22% of the Cuban insular shelf; 25% of the coral reef areas; and 25% of each subtype of wetland for each region. Guiding principles for establishing MPAs include: existence of well-conserved coral formations; sites critical to species of importance for conservation and economic value; and, enlarging terrestrial protected areas in order to embrace adjacent marine areas of high value.

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Plans are now being evaluated to protect new areas beyond the insular shelf to protect offshore waters within the Exclusive Economic Zone.

In summary, Cuba has a strong and well-managed system of marine protected areas, and they have one of the highest percentages of protected coastal and marine waters of any country in the world. Opportunities may exist to work with CNAP and CITMA personnel to include some of Cuba's special places along its northwest coast, that geographic area which is part of the Gulf of Mexico, as part of a larger network of Gulf protected areas.



(Thanks to Maritza Garcia, Director of the National Center for Protected Areas in Cuba for providing much of the information used in my presentation and in this abstract.)

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Panel 4 Discussion:

Q: How do the governance structures for establishing MPAs compare between the countries in the region?

A: Porfirio: Efforts are underway to make this comparison between nations and to find ways to simplify processes for creating protections. Also, Commission for Oceans and Coasts in Mexico has been setup to deal with multi-jurisdictions in marine spatial planning.

A: Melanie: Belize process is much simpler. Small country without state jurisdictions. Good enforcement.

A: Wes: In the past, Cuba had a top-down designation process. Someone just signed the paper. Now, stakeholder group are involved.

Q: ?: How do you deal with natural variability between years when creating report cards.

A: Melanie: Report based on abundance not trend. Fish are an important part of Index, but can be highly variable. Average of all the 100s of sites reveals the status.

Q: ?: How did the Cuban people accept the top-down designation of MPAs, and are they all no-take?

A: Wes: Experts were able to point out to the public and government the special value of certain areas in Cuba, and recommended protections be put in place. All types of MPAs exist, not all are no-take.

Q: ?: Do the proposed lease blocks for oil exploration overlap MPAs?

A: Melanie: Yes. One has been removed from exploration over concerns, but there is no consideration in the oil development legislation that would protect certain areas. Belize is planning to hold a referendum on the issue.

Q: ?: How is the science of ecological connectivity being used in creating MPAs?

A: Melanie: Re-examining existing MPAs and look for gaps in order to improve their effectiveness.

A: Porfirio: Gap analysis was done and Mexico is scientifically prepared to establish an ecological network and work with the US to integrate it into a concept of an interconnected Gulf of Mexico ecosystem.

Panel 5 - Understanding the Uses and Economics of the Gulf of Mexico

THE ECONOMIC ENVIRONMENT OF THE GULF OF MEXICO

David W. Yoskowitz, Harte Research Institute, Texas A&M University-Corpus Christi

The economic environment of the Gulf of Mexico is as involved and complex as any nation in the world. Maybe even more so since there are three countries that can claim at least part of the Gulf waters as their territorial sea: Cuba, Mexico, and United States. The Gulf and the land surrounding it are extremely productive in the areas of oil and gas, tourism, commercial and recreational fishing, and shipping. The commercial success also puts a strain on the natural resources that are enjoyed by so many. The challenge is to find that balance where a Healthy Gulf = Healthy Economy.

To understand the Gulf economy is to understand the driving sectors of its commercial economy: oil and gas, commercial fishing, tourism, and shipping. There are of course a number of other commercial activities, but focusing on these four critical industries offers a good overview of Gulf of Mexico economics. The *productive value* of these industries is the market value of the resources extracted from the Gulf, or in the case of tourism and port operations, it is the value of the services generated as a proximity to the Gulf (Yoskowitz, 2009). This value does not include any multiplier impacts and is a very conservative estimate given the narrow definition. The common year chosen for the data is 2003 when the price per barrel of oil was \$28.50.

Table 1. Productive Value (in billions of U.S. dollars)

	Mexico	United States	Total
Oil and Gas	\$37.9	\$39.8	\$ 77.7
Fisheries	\$ 0.381	\$ 0.683	\$ 1.064
Port/Shipping	\$ 0.0654	\$ 0.331	\$ 0.396
Tourism	\$ 9.965	\$34.888	\$ 44.85
Total Productive Value of the Gulf of Mexico			\$124.01

Source: Yoskowitz, 2009

The four sectors identified here create significant productive value from Gulf resources. As would be expected, oil and gas production and tourism are the major drivers for both the United States and Mexico (Table 1). What does a productive value of \$124 billion really mean? Better yet, if we make an upward adjustment to today's price per barrel of oil of around \$100, then the productive value jumps to \$234 billion. At this level the productive value:

- Is greater than the Gross Domestic Product (GDP) of Chile, or Peru, or Finland, or Venezuela
- would rank the Gulf of Mexico 29th out of 230 countries in terms of GDP
- is 27% of Mexico's GDP and 1.7% of U.S. GDP.

While the traditional commercial economy is important, and it is what we most readily identify with, the natural capital economy provides a tremendous amount of benefit that impacts our human wellbeing. More specifically, it is the *ecosystem services* generated by our environment which range from

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recreational opportunities and aesthetics to food and fiber provisioning along with climate and nutrient regulation, which contribute to our well-being (see Farber et al., 2006 for a complete list of ecosystem services).

Given that the potential supply of ecosystem services emanates from biogeochemical environments, it is the management of those environments that will most directly affect the provision of services. For example, the coral reefs of the Flower Garden Banks potentially supply numerous ecosystem services but these exist because of biophysical and ecological functioning. As Figure 1 illustrates there are critical connections between the habitat and the eventual impact on human wellbeing. Measuring the services provided by coral reefs, or any habitat for that matter, is not the domain of one discipline. For social scientists to properly assess the value of ecosystem services requires input from the natural scientists on the bio-physical and ecological functioning of a particular habitat.

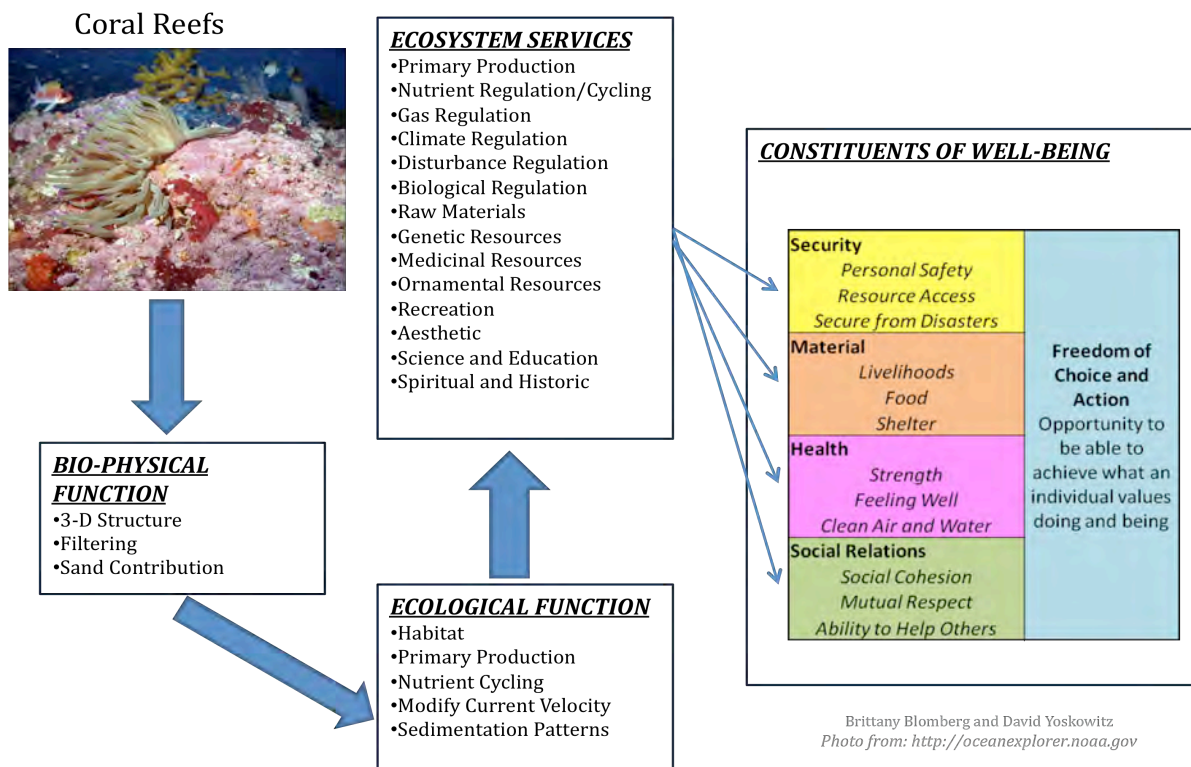


Figure 1. Provisioning of Ecosystem Services

Marine protected areas have the potential to deliver significant economic benefits, both market (commercial) and non-market (ecosystem services), to stakeholders in the regions that MPAs are located as well as the populous at large. In order to fully realize the potential of a series of protected areas in the Gulf of Mexico a balance must be struck between stakeholders. Oil and gas, fisheries, shipping, as well as offshore renewable energy such as wind are some of the important stakeholders.

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OIL AND GAS

Andy Radford, Sr. Policy Advisor, American Petroleum Institute

Background

Approximately one-third of US oil and gas production comes from the Gulf of Mexico. The platforms used by the industry in the Gulf are physically part of the ecosystem, serving a “vertical reefs” for a diverse range of aquatic species. Industry has a long history of working in and around sensitive areas of the Gulf, most notably the Flower Garden Banks National Marine Sanctuary where more than 400 oil and gas wells have been drilled within about a 30-mile radius. This work is successful because of effective cooperation with regulators of industry activity, including BOEM, BSEE and EPA.

The oil and gas industry is not opposed to additional protected areas in the Gulf. However, it is important to have an orderly process to thoroughly vet future recommendations for MPAs, and the regulations and restrictions that would be placed on them. Prior to any designations for new MPAs in the Gulf of Mexico, proponents should specifically define what is at risk, and where the risks are coming from. With regards to oil and gas, which is one of the most studied offshore commercial activities, it must be demonstrated how existing regulations are not adequately protecting the resources. If these inadequacies exist, then the next step would be to identify what changes can be made to current authorities to rectify the problems. It is not necessary to create a new bureaucracy, with the attendant costs, if solutions can be found by modifying existing regulations.

Concerns

Other concerns that industry has include the following:

- The methods used to determine if there is connectivity between sites,
- Are communities dependent on that connectivity?
- Maintaining multiple uses. Will the industry still be able to access resources under these protected areas?
- Establish a clear process for identifying the truly special places and what protections they need.
- Develop a plan for monitoring and enforcement.

Path Forward

The detail and complexity of criteria for selecting MPAs is extremely variable. In some cases, it requires little information, no budget, and the willingness for a regulatory body to approve the designation. In other cases, the process is detailed, and starts with a compilation of detailed scientific information that defines the characteristics of the ecosystems of interest.

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It is important to pursue a defined process, particularly because of new proposals and interests for designating large areas; for basing new nominations on regional issues such as “connectivity” over long distances; and for new ecosystem-based management concepts such as “resiliency.” A defined process not only ensures that the best science is used, but that potentially impacted stakeholders are part of the process, and that the true costs/benefits of the proposed action are taken into account before a designation is made.

The following series of categories, usually taken in a stepwise fashion, should be part of any designation process and should also be considered for planning purposes under the CMSP process.

1. Identification of Candidate Sites

The first step in the process is to identify those locations that have high significance (for natural or cultural heritage reasons) to the region and to the country, which might be at risk and need protective regulations. Information for a proposed candidate site has to define why the area is important and unique, and it has to provide a basis for conducting risk assessments on the threats. There has been much regarding connectivity between areas. In most cases, current science is not definitive in connecting area A to area B. Progress is being made, however, using genetic analysis, but limited definitive information is currently available. In the Gulf of Mexico, varying degrees of information is available about hard bottom areas scattered over the outer continental shelf, but the linkages between areas and the importance of associations among species are not known. What is not known is how much downstream areas may be dependent on upstream areas, and what contribution of species (planktonic, vertebrate, and invertebrate) are entrained in currents passing through the Yucatan Straits into the Gulf of Mexico, or that sweep up along the eastern coast of Mexico (and over its reefs), and work their way clockwise around the Gulf of Mexico coast.

2. Identification of Threats

It is necessary to identify and understand the type and magnitude of threats that can potentially stress and/or harm different ecosystems. Threats can be from natural phenomena (e.g., major floods bringing in freshwater and high sediment and pollutant loads) or from manmade causes. Human-caused impacts can occur from recreational as well as commercial activities.

3. Assessment of the Level of Risk

One of the aspects often overlooked is the actual level of a risk. What is the exposure of an area to the potential risks identified? For the past three decades, government, industry, academia, and the consulting community have been conducting environmental/oceanographic studies on the effects of offshore oil and gas in the Gulf of Mexico. The results confirm that the existing regulatory structure is appropriate and has been working. All hard bottom areas have zones that require limited or no activity per BOEM/MMS lease stipulations and/or Notices to Lessees. Discharges are regulated by EPA under the NPDES program. The regulations become stricter when the discharge location is within a specified distance from areas of ecological importance (e.g., hard bottom areas).

4. Risk Assessment

There are a wide range of risk assessment approaches that are already used extensively. EPA uses a variety of risk assessments, from those designed to estimating risks from chemicals and pollutants, to assessing risks to ecosystems. EPA has also developed a detailed framework for the

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risk assessment process related to ecological risk. The process has three basic phases: 1) problem formulation; 2) analysis; and 3) risk characterization. In the initial problem formulation step (which is the more technical step), an early part of this process is scoping to determine its ecological relevance, its susceptibility to known or potential stressors, and its relevance to management goals. Governmental entities that have authority for establishing MPAs should be held to the same standard, to conduct full spectrum risk assessments to determine what the threats are and what the levels of risk are to the proposed areas.

5. Determination of Current Protective Measures

As part of the open process of evaluating prospective new areas for MPA status, a thorough review should be done of all of the current regulatory measures currently in place. Which groups have regulatory authority? What protections do they provide? Do they have monitoring and enforcement programs? Do they have adequate budgets to carry out their mandate? Are the regulations working?

A significant portion of the Gulf of Mexico is currently under protective regulation by a range of federal and state agencies. On the federal side, these include NOAA, NMFS, BOEM, BSEE, USFWS, USCG, USCOE, and EPA. The individual states have a variety of oversight and regulatory authorities for their coastal waters.

6. Management Plan for Managing/Eliminating Risks

If an area is determined to need higher level of protective measures that are not currently met by existing regulations, then the MPA designation process should include a draft management plan that describes how the MPA would be funded, managed and staffed. This would provide detailed information so that potentially affected stakeholders can evaluate the proposal. The complete plan should contain elements that include 1) a monitoring program to determine whether there is compliance with protective measures; 2) monitoring to assess the health of the protected area, to evaluate if MPA regulations are achieving their goals, and to determine if corrective measures need to be taken; 3) what the enforcement policies will be, and how they will be carried out.

Stakeholders need to know the full implications of an MPA proposed for designation in their communities and this must be provided in a clearly defined MPA organizational plan that fully describes the proposed rules and restrictions. This information must be available and open to discussion prior to designation to allow the stakeholders to understand how they will be affected.

OIL AND GAS

Clint Moore, Oil and Gas Rep to Flower Garden Banks National Marine Sanctuary Advisory Council

US oil consumption dramatically exceeds production. Large percentage of imports comes through Gulf of Mexico ports.

Gulf is one of the most productive petroleum provinces in the world: 100 operating companies, 500 other partners, 50,000 offshore workers, 55,000 offshore wells drilled to-date.

Number of platforms varies -- up to 5000 have been in place at one time.

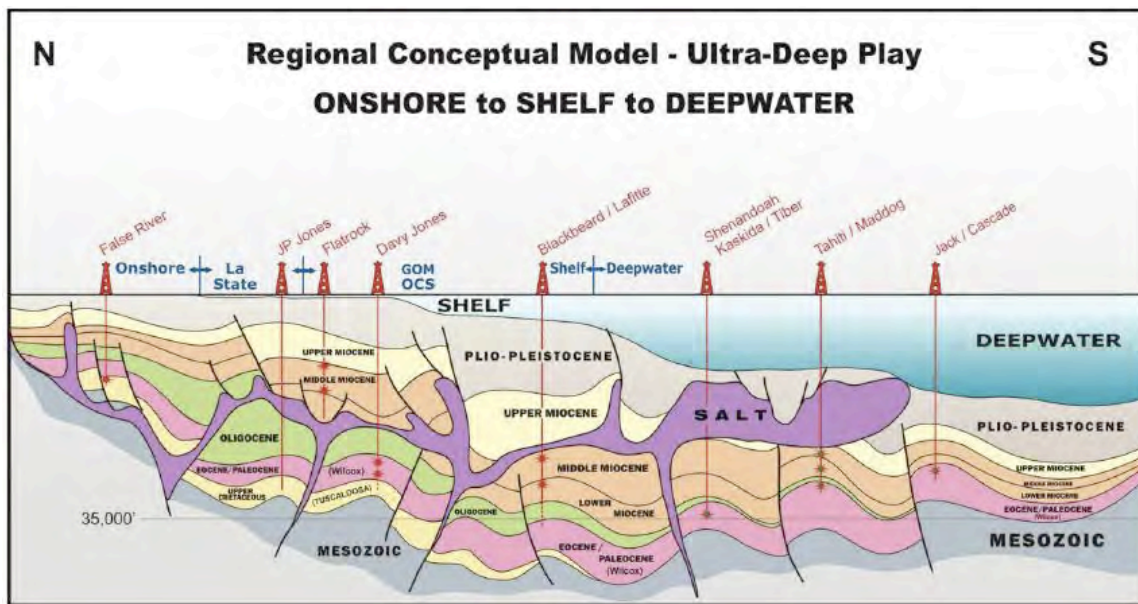
6000 active leases

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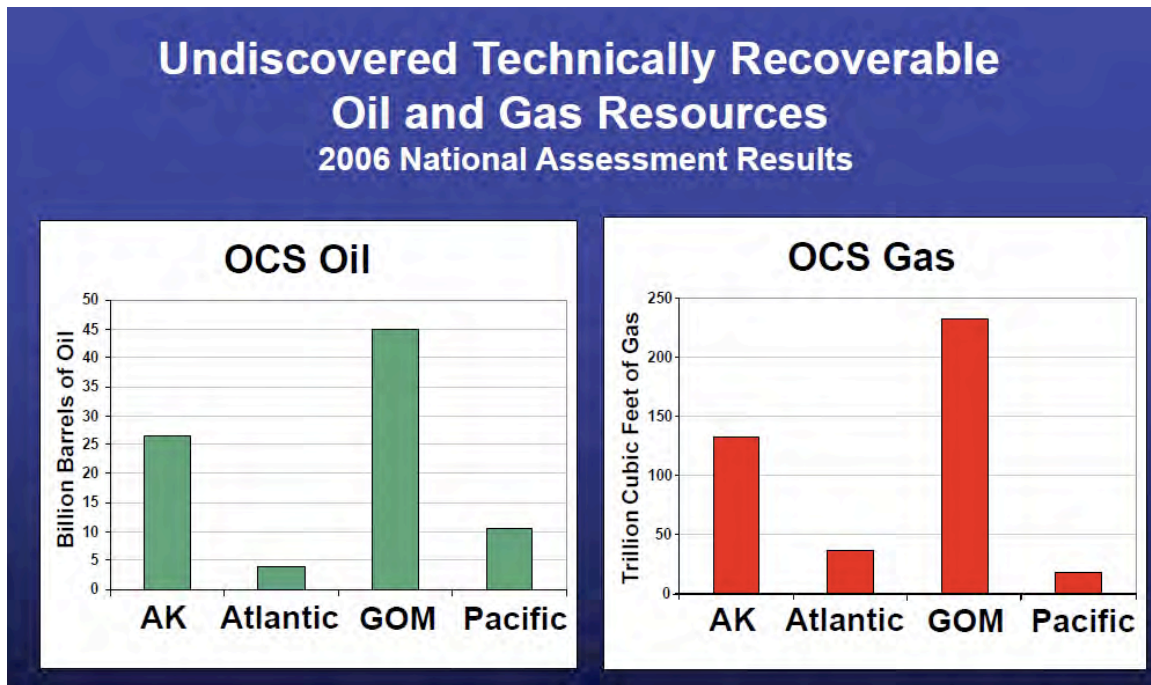
Gulf is a major salt basin. Salt deposits deep below the seafloor are mobile due to sediment that has been deposited on top of the sheets of salt. Drilling for petroleum occurs above and below these salt sheets. Wells have been drilled through up to 3 miles of salt in order to explore below the sheets. Shelf-edge banks result from domes of salt caused by the migrations of the salt upward through rock layers.

An estimated 2000 barrels of oil per day come from natural seeps into the Gulf. Salt movement creates faults that channel the oil to the seafloor.

Wells are being drilled to 30,000 ft now. Some new rigs are designed to go to 40,000 ft. There is much potential for deep drilling. Large petroleum potential geologically in unexplored areas on the shelves and in deepwater.



Source: McMoran IR



Source: BOEMRE 2010 Salazar

COMMERCIAL AND RECREATIONAL FISHING

Stephen A. Bortone, Ava Lasseter, and Assane Diagne, Gulf of Mexico Fishery Management Council, Tampa, Florida

Important to understanding the potential role that a large-scale system of marine protected areas may play in the ecological issues facing Gulf of Mexico resources, is an understanding of the relative position fisheries hold in the social and economic structure of both Mexico and the United States. Problematic, however, is the fact that any true comparison is a highly involved endeavor given that the socio-economic data are necessarily complex and incomplete between (and sometimes within) these countries. Nevertheless, this presentation offers at least a basic perspective of the relative role that fisheries play in their respective countries. Hopefully, advancing a greater appreciation and perspective of the importance that fisheries have in both countries will lead to the further development of databases that make future comparative work possible.

Mexico's commercial fisheries differ from state to state. For example, off Tamaulipas, commercial fisheries primarily focus on shrimp, crabs, mullet and oysters. Off Veracruz, groups such as clams, crabs, shrimp, jacks (*Carangidae*), tunas, wahoo and oyster aquaculture are the prime foci. In Tabasco, fishermen target primarily anchovies, cutlass fish, wahoo and oyster aquaculture. Off Campeche the focus of fishermen is octopus (chiefly *Octopus vulgaris*) and shrimp. Lastly, off Yucatán, commercial fishers target spiny lobster, red grouper and octopus (chiefly *Octopus maya*). Interestingly, and unlike the U.S. coastal areas of the Gulf of Mexico, fishing is primarily a commercial venture. This may be because Mexico's recreational fishery has only recently begun to develop. In fact, there are several laws that specifically restrict recreational fishing (perhaps to control the growth of a recreational sector and to reduce competition with fishers from commercial and artisanal fishers). Many communities, principally off Tamaulipas and Campeche, have developed a more large-scale, industrial approach to shrimping.

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Nevertheless subsistence fishing occurs for shrimp in all areas off the Mexican coast. Logically, larger boats in these areas fish greater distances offshore while smaller boats are more often found at inshore locations. This also reflects the availability of capital for investment that varies among regions along the Gulf coast.

More recently, recreational fishing has begun to develop, especially along the coast of Yucatán. Likely due to its proximity to the tourist hub of Cancún, the Yucatán coast is attracting recreational anglers from the U.S. and Canada. Inshore, these new fisheries are directed toward tarpon and several species of snook, while an offshore reef (Arrecife Alacrán) provides fishing opportunities for reef fish. The infrastructure to support recreational fishing is increasing in recent years as well. In addition it serves as a destination for eco-tourists interested in snorkeling and bird watching (e.g., flamingos).

One of the more significant differences between the U.S. and Mexico relative to its Gulf fishers is the dominance of artisanal fishers in most areas along Mexico's coast. These fishermen target inshore fisheries from small boats. Some fisheries (e.g., octopus, hand line, and small trap fisheries) are specific to these inshore artisanal fishers. The economic importance of this fishing activity is largely undocumented, although probably significant and underappreciated in Mexico's larger economic picture. Socially (and consequently economically) significant is the increase in injuries (the bends) experienced by hookah divers that pursue lobsters in increasingly deeper waters (Figure 1). Costs to local communities (rehabilitation, primary care, loss of man-power) can be debilitating.

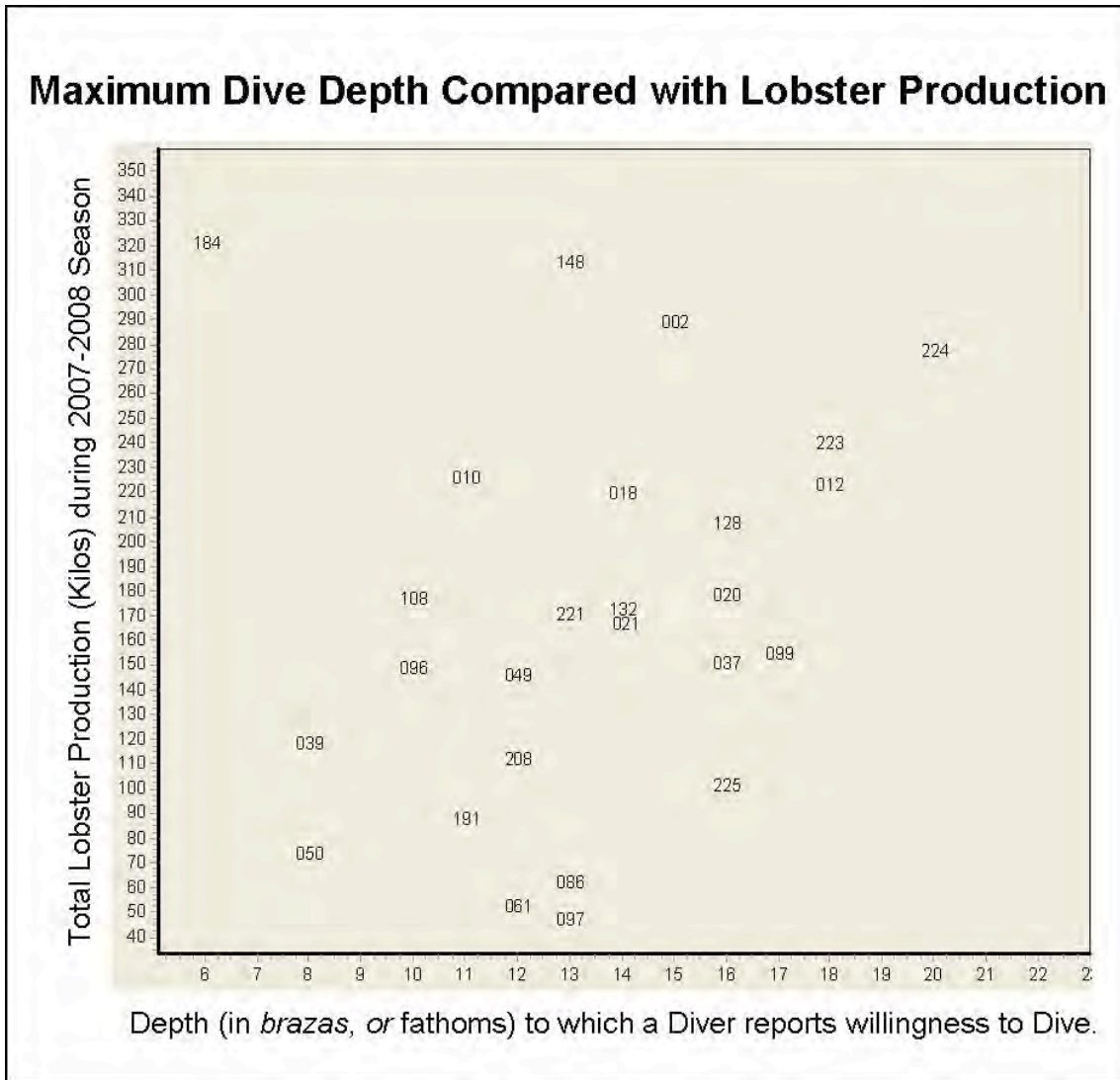


Figure 1. Scatter diagram indicating higher lobster production in deeper waters by divers (from Lasseter, 2010)

An important distinction between U.S. and Mexico is the organization of Mexican fishermen into cooperatives, which is a reflection of the nation’s political history. This is a significant, self-policing kind of management that enables fishing communities to define rights to their resources. Moreover, fishery regulation and governance in Mexico is centralized under Mexican federal law although regulations may differ by state; federal jurisdiction extends from the coastline. In contrast, especially with regard to inshore fisheries, U.S. fishing laws are centered on state governments. Interestingly, in the U.S., state fisheries jurisdiction differs by state: 3 nautical miles off Louisiana, Mississippi, and Alabama; 9 nautical miles off Florida and Texas.

Commercial fisheries in the U.S. waters of the Gulf of Mexico are directed toward a host of species but primarily toward: blue crabs, mullet, stone crab, oysters, crawfish, shrimp, groupers, menhaden, and red snapper. Recreational fishermen target mostly Atlantic croaker, southern flounder, Gulf and southern kingfish (Sciaenidae), seatrouts (sand, silver, and spotted), red drum (redfish or channel bass), Spanish mackerel, striped mullet, and porgies (sheepshead). Red snapper are targeted by both commercial and recreational fishers.

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Nationally, commercial fisheries in the U.S. Gulf of Mexico are hugely important, only trailing the Alaskan and New England fisheries landings in both pounds and value (Figure 2).

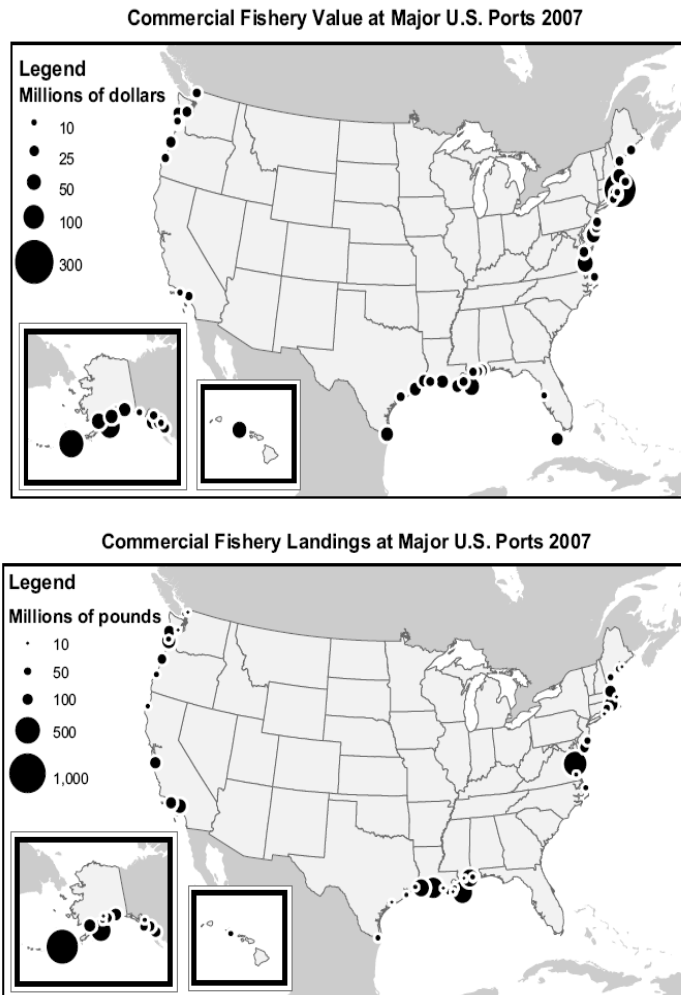


Figure 2. Commercial fishery value at major U.S. ports in 2007(above), and commercial fishery landings at major U.S. ports in 2007 (below); (U.S. National Marine Fisheries Service, 2009).

Within the Gulf, landings revenue is higher in Louisiana, largely due to menhaden and shrimp landings (Figure 3). Total economic impacts of fisheries in the U.S. Gulf of Mexico are higher in Florida with regard to recreational fisheries.

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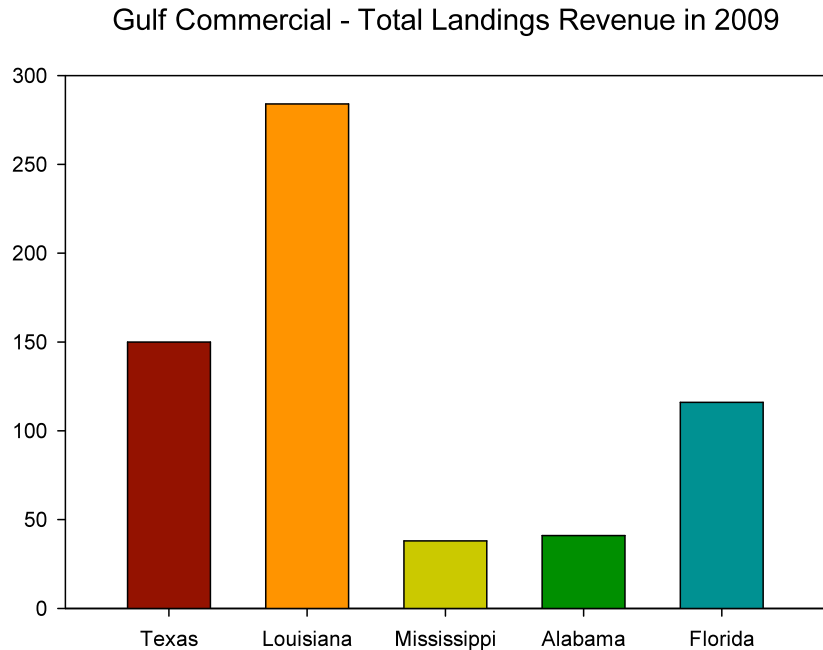


Figure 3. Total landings revenue in for U.S. Gulf States in 2009 (U.S. National Marine Fisheries Service, 2011).

There has been a long-term decline in trends in commercial landings and revenues in the Gulf. Between 200 and 2009, landings revenue decreased by 46% in real terms (U.S. National Marine Fisheries Service, 2011). Competition from Asian imports is often cited as the reasons for this decline but many economic and ecological factors probably interact on these trends. Ironically, price per pound has barely (if at all) kept pace with inflation so fishers are not able to appreciably improve their standard of living over time.

Notable in the U.S. Gulf of Mexico, is the importance of recreational fishing, both in terms of landings but also potentially in terms of economic impacts. Florida clearly stands above the other states with regard to recreational fishing activity (Figure 4).

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Recreational Fishing Trips in 2009

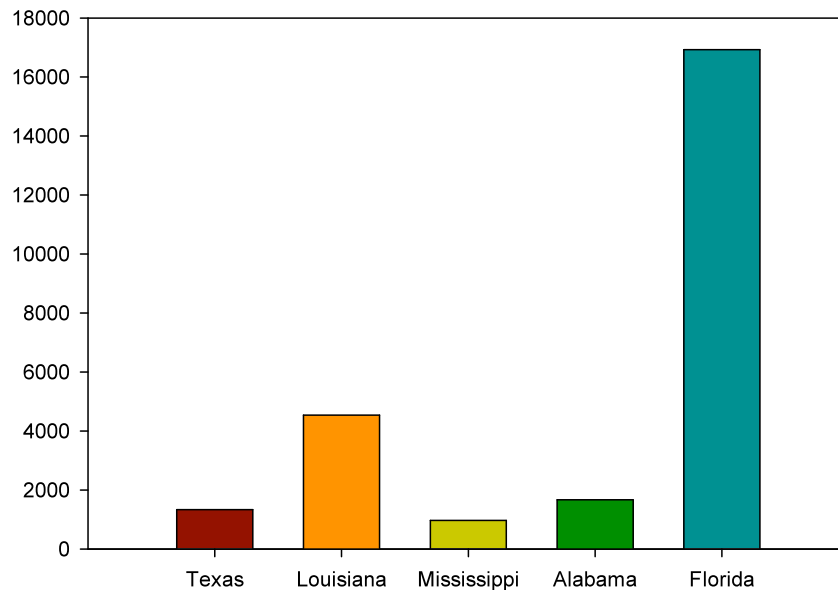


Figure 4. Total number of recreational fishing trips for U.S. Gulf states in 2009. (U.S. National Marine Fisheries Service, 2011).

Few data are currently available to fully assess the impacts of the recent oil spill (i.e., Deep Water Horizon) that occurred during the summer of 2010. Data on biological impacts and effects are only being gathered at present and a full, careful assessment of effects will not be completed for some time. Importantly, however, the “brand name” related to fresh Gulf seafood has been prejudged by the larger community of consumers and wholesalers, retailers, and fishers have all witnessed a decline in consumption of Gulf seafood products. Recreational fishing activities and associated infrastructure support infrastructure (bait stores, boat sales, and motel and restaurant sales) have also apparently suffered. While these economic sectors should rebound, recent reports of fish with sores coming from the northern Gulf of Mexico may delay this economic rebound.

In the larger picture of continuing restoration (off the U.S.) and sustainability (off both Mexico and the U.S.) of fisheries in the Gulf of Mexico, an astute plan may be to consider the management of the entire Caribbean Basin as a whole (i.e., the American Mediterranean). Such a plan would highlight the interrelationships of ecological and socio-economic components.

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RECREATIONAL DIVING

Frank Wasson, Gulf and Caribbean Dive Charters

Flower Garden Banks management plan review and boundary expansion has been done with a considerable amount of research. If you are considering new protections in the Gulf, you need to establish: The need for protection. All sanctuaries were designed to protect something, but not necessarily everything. Some people misunderstand what the term “sanctuary” means. Before you tell the public you are going to protect a resource, you need to tell them what you will protect it from. Once you protect it, you need to enforce your regulation. There has been great success in protecting the Dry Tortugas Ecological Reserve because regulations are enforced.

Panel 5 Discussion:

Q: Billy: As a dive operator, is there a benefit to operating in a National Marine Sanctuary.

A: Frank: Definitely, but sanctuaries don't advertise well. The outreach part of the program is not well funded and few people actually know about the Flower Garden Banks. More divers would come to the FGB, if they knew about them. The protections provided by the sanctuary are a great benefit to the health of the reef and allow you to operate there. Since 1999 the Dry Tortugas reef conditions and numbers of fish have improved greatly. In my opinion, sanctuaries are good for the economics of dive operators and for the economy of the entire Gulf.

Q: ?: To what extent does the fishing community recognize the benefit of sanctuaries?

A: Steve: There is recognition of the benefit, but also impatience. We are rebuilding fisheries now. Fishermen realize there are more fish, but they can't catch as many as they like. Fish are also getting bigger, but this means catch quotas are reached sooner. So fishermen must reduce the number of days they can fish, which is frustrating to them. They complain that if the fish populations have improved, why can't we fish more? Part of the problem is that we need to better communicate what they can expect from fishery management.

A: Frank: I hear from spearfishers that fish are increasing. We are seeing more red snapper in the Gulf than we have ever seen. Red snapper spawning aggregations in the Dry Tortugas have appeared where they were absent for 30 years. There are more red snapper in the Florida Keys and the Gulf than anyone can remember occurring in the past. However, those numbers may still be small compared to the way fish populations were 50 years ago. Roy Crabtree said they are striving to return populations to the way they were 50 years ago, but the public has not heard that. That is a NOAA PR problem.

First Day Summary

Steve Gittings, Science Director, Office of National Marine Sanctuaries

Everyone we heard from today has a lot of passion for what they do. They are also intelligent and reasoned people. As long as we continue to engage people like this in the discussion, we will continue to make progress no matter what the end point is.

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Mexico, Belize and Cuba have some great examples of governance, resource protection, and dealing with social aspects. We cannot overlook this great work and the connections we have to these places. International dialogue will help us in the long run.

Day Two

Recap of Previous Day

Wes Tunnell, Harte Research Institute

Yesterday we heard from leading experts and heard key information about special places in the Gulf of Mexico and impassioned pleas from some for protecting key special places and areas. The people that are here make as strong a statement as what was said. The time is right. Protections in the ocean are 100 years behind what we have on land. Some “pearls of wisdom” from yesterday:

We are lucky to have John Hankinson leading the Gulf Coast Ecosystem Restoration Task Force. It is great to have someone lead the effort who believes “the Gulf of Mexico is one of the most important ecosystems in the world.”

John Ogden pointed out that we have a hard time defining what a “sanctuary” is.

John Hankinson asked Tom Shirley “what do deepwater reefs need from us?” Tom’s answer was “protection.”

Amanda Demopoulos pointed out that the GOM has more deepwater chemosynthetic communities than any other body of water in the world. Also, that black coral can live for 2000 years.

Bonnie Ponwith identified the importance of protecting pelagic communities.

Bob Hueter showed that although whale sharks are rare in the world’s ocean, 1400 of these animals come together in the Gulf every year. His tracking data shows that the Gulf of Mexico is one big ecosystem.

GP Schmahl made a passionate case for how the public has misconceptions of the Gulf, and we need to do a better job of communicating its great value. He used the example of the coral cover at the Flower Gardens is the highest in the Western Hemisphere. With all the oil production that occurs around the Flower Gardens emphasizes the need to work with the industry.

Larry McKinney emphasized that we must have a healthy Gulf economy, we must have a healthy Gulf environment. As much as we wish we could change our society rapidly away from fossil fuels, the reality is that are dependant on the Gulf’s energy resources and we must work together with the oil industry.

Clint Moore emphasized the need for balance in our stewardship of the environment.

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John Ogden said the Gulf is probably the most industrialized body of water in the world, but it is also productive and resilient. He also said we are in the first century of the “Anthropocene.”

Profirio Alvarez challenged us to build a bridge and work together.

Melanie Mcfield showed the importance of Belize, which is known all over the world for its natural wonders and is the upstream source for the Gulf of Mexico.

David Yoskowitz showed how humans must be considered as part of the ecosystem.

Clint Moore showed the extraordinary oil and gas production and potential production that exists in the Gulf.

Andy Radford communicated the need to use a risk-analysis approach to conservation in the Gulf.

Frank Wasson knows the Gulf because he is out there more than anyone. He urged to need to know what you want to protect and what you want to protect it from.

Wes’s personal note: One hundred years ago we started setting aside special places on land. Where would be without Yellowstone or Yosemite. It is now time to set aside special places in the ocean. We have enough knowledge to move forward. I hope that this meeting can pick at least one place that needs greater protection.

Panel 6 - The Case for Connectivity in the Northern Caribbean and Gulf of Mexico

LARGE-SCALE CONNECTIVITY PATTERNS WITHIN THE CARIBBEAN SEA REGION

Digna Rueda and Frank Muller-Karger, University of South Florida, College of Marine Science

Objective

An important objective of our research at the University of South Florida is to understand connectivity patterns within the Caribbean Sea and Gulf of Mexico whereby organisms and chemical elements are transported between one part and another of the region. In this summary we highlight some of the most important mechanisms of connectivity that span the Caribbean Region. Please refer to Inia Soto et al.’s contribution to the Proceedings (*Tracing Oceanographic Connectivity in the Mesoamerican Barrier Reef System and the Gulf of Mexico using Ocean Color Imagery*). We try to detect, pinpoint, and understand how the patterns vary seasonally and between years. A critical tool are time series of observations that cover large regions rapidly, repeatedly, and over long periods of time and that allow us to measure and monitor river plumes and ocean currents. Specifically we seek to understand:

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- Identification of locations where biological material is high and which may serve as nurseries and areas where organisms reproduce. We are particularly interested in the transport of materials related to or originating in coral reefs, upwelling, and river plumes. This includes nutrients, plankton, colored dissolved organic matter, sediments, and fresh water, to the Gulf of Mexico through the fast moving Caribbean Current.
- Detection and monitoring of the dispersal of materials within the region from one location to another, using river plumes as tracers (e.g. Orinoco, Amazonas and Magdalena rivers).
- Detection and assessment of transport of natural and of human waste and industrial discharges such as chemical spills (oil, temperature plumes, other contaminants) or biological elements (bacteria, eggs, larvae, red tide cells).

Background

The southern Caribbean Sea is characterized by strong seasonal changes, expressed in a variety of ways. A major change is effected on regional winds, ocean circulation, precipitation and riverine discharge by the north-south migration of the Intertropical Convergence Zone (ITCZ). The ITCZ position changes seasonally, and it is typically found at its southernmost position near the equator during northern winter, and at its northernmost position over the southern and central Caribbean (12 to 15 °N) during the northern summer. The ITCZ position also is thought to vary over long time scales, as a regional expression of climate change. These changes are associated with marked variations in the intensity of the Trade Wind. Seasonally, strong winds are observed over the southern Caribbean in the December-June timeframe. These intense winds, when sustained over 6 m s^{-1} over a few days, lead to strong coastal upwelling along the margin of the southern Caribbean. This upwelling produces important increases in phytoplankton biomass observable as an increase in the chlorophyll concentration of surface waters; these changes can be seen in ocean color satellite imagery (Figure 1). Surface waters are typically transported in a direction 45° relative to the prevailing wind direction (from east to west). The phytoplankton blooming within the upwelling plumes trace the spreading of the cooler and nutrient-rich upwelling plume into the interior of the Caribbean Sea. The images allow us to visualize the prevailing current directions by following the patterns of dispersal of a biological variable, the phytoplankton concentration (Figure 1), or by following sea surface temperature also from satellite sensors.

The “color” of phytoplankton pigments and associated organic matter provides a very useful tracer of surface current patterns. In the southern Caribbean we can see that waters and biological material generated near the coast of the continent flows toward the string of islands located a few tens of kilometers off the coast of Venezuela (Margarita, Coche, Cubagua, La Tortuga), and several others that are about 100 km away or farther (Aves, Los Roques archipelago, La Orchila, and also Aruba, Curaçao and Bonaire). These islands are continuously “connected” with upstream islands and with the mainland.

Another important link is through river discharge. The tropical Atlantic receives the discharge of several major rivers and a myriad of small rivers. Of particular importance to the region are the Orinoco, Amazon, and Magdalena Rivers. These generate plumes of colored water that extend hundreds to thousands of kilometers offshore into the Caribbean and Atlantic Ocean (Figures 1 and 2). These rivers discharge important amounts of fresh water, sediments, and dissolved organic and inorganic materials into the region (Muller-Karger et al., 1989). In the mid-1980's we discovered the full extent of the Amazon and Orinoco river plumes in the Atlantic Ocean and the Caribbean Sea (Muller-Karger et al., 1988;

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Muller-Karger and Varela, 1988). The largest river plumes, and particularly those of the Amazon and Orinoco Rivers, are clearly visible from space using satellite-based measurements of the color of the ocean. Both plumes are always present in the region, are over 100 km wide, and extend over 1,000 km into the adjacent ocean. One plume originates at the Amazon River mouth near the equator, and the other at the Orinoco River mouth near 9° N. The Amazon plume flows around the North Brazil Current retroflection near 5-10° N, and is carried eastward in the meandering North Equatorial Countercurrent. The Orinoco plume flows into the Caribbean Sea and drifts toward the northwest across the Caribbean, reaching Puerto Rico around October. Another large river that discharges directly into the Caribbean is the Magdalena, and its thin plume can be observed in ocean color images to extend from the coast of Colombia to Jamaica (Muller-Karger, 1993).

The Orinoco plume shows large seasonal variations in its size and dispersal pattern, tracing the circulation of surface waters in the Caribbean Sea (Muller-Karger and Aparicio, 1994). During the first half of the year, when winds are strong and precipitation is minimal over the Caribbean, the Orinoco plume tends to disperse in a westward and northwestward direction from Trinidad and Dragon's Mouth (Figure 1 and 2a). Early in the year, in the February-March timeframe, the Orinoco water can reach Aruba, Bonaire and Curaçao. During the second half of the year, and in particular during September and October, the Orinoco plume covers a very large fraction of the eastern Caribbean Sea and its influence reaches over 800 km, as far north as Puerto Rico in the northern Caribbean Sea.

The Amazon plume flows north along the Brazilian coast and, depending on season can also enter the Caribbean or flow to the northwest into the subtropical Atlantic, but a large fraction of this plume is entrained seasonally into the North Equatorial Counter Current and traces how this current meanders eastward across the Atlantic between about May and October every year (Figure 2a; see Muller-Karger et al., 1988; Muller-Karger et al., 1995; Hu et al., 2004; and references therein). The weaker influence of the Amazon River can be seen throughout the year in the eastern and northeastern Caribbean Sea. The Amazon plume is so rich in colored dissolved organic matter that its presence is clearly detected and its movements traced in the ocean color satellite data for distances exceeding 2000 km (Figures 2a and 2b). Clearly this plume bathes the Lesser Antilles.

The Caribbean Sea features a fast-moving current that we call the Caribbean Current. This current moves westward in a meandering manner at speeds that can at times exceed 80 cm s^{-1} (about 70 km per day). The Caribbean Current is generally strongest in the southern Caribbean and during the first half of the year. This current is an important and expeditious way for organisms and to move from the Atlantic and Caribbean to the Gulf of Mexico. Closer to the coast, along the entire southern margin of the Caribbean, there is strong evidence for countercurrents that flow from west to east hugging the coast (Phinney et al., 2001; Alvera-Azcárate et al., 2008) – these currents can be at the surface or at mid-depth, between the surface and about 100 m.

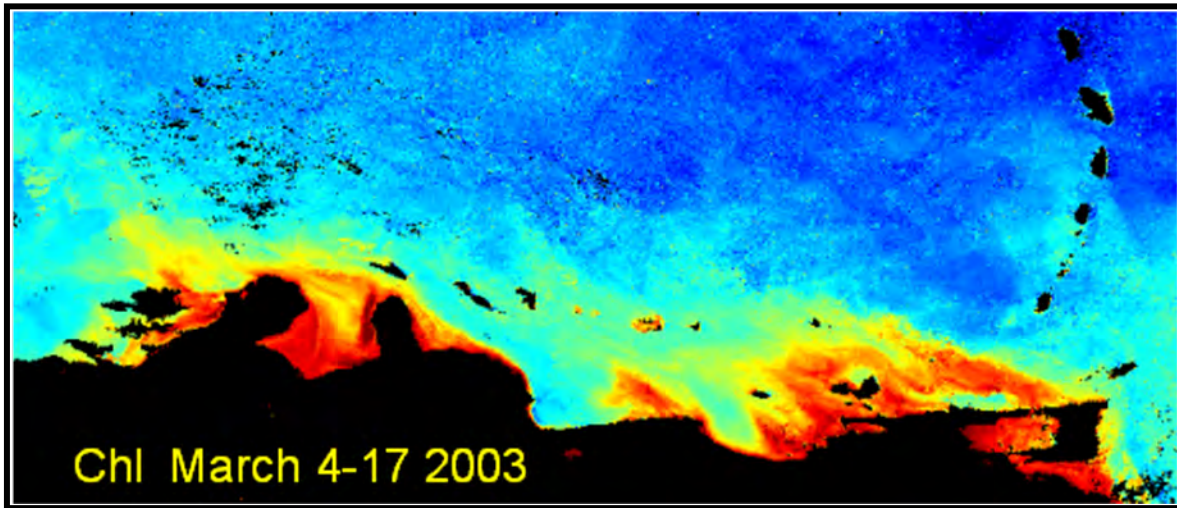


Figure 1. Satellite image from NASA's SeaWiFS sensor showing patterns that represent phytoplankton pigment and colored dissolved organic matter along the southern Caribbean margin in a typical March scenario, when Trade Winds and upwelling are strong. Areas in red, orange and yellow show high pigment concentrations. The Gulf of Paria and the plume extending to the northwest from Dragon's Mouth between Trinidad and Venezuela is the plume of the Orinoco River. High concentration patches farther to the west along the coast are all primarily high chlorophyll patches marking upwelling areas.

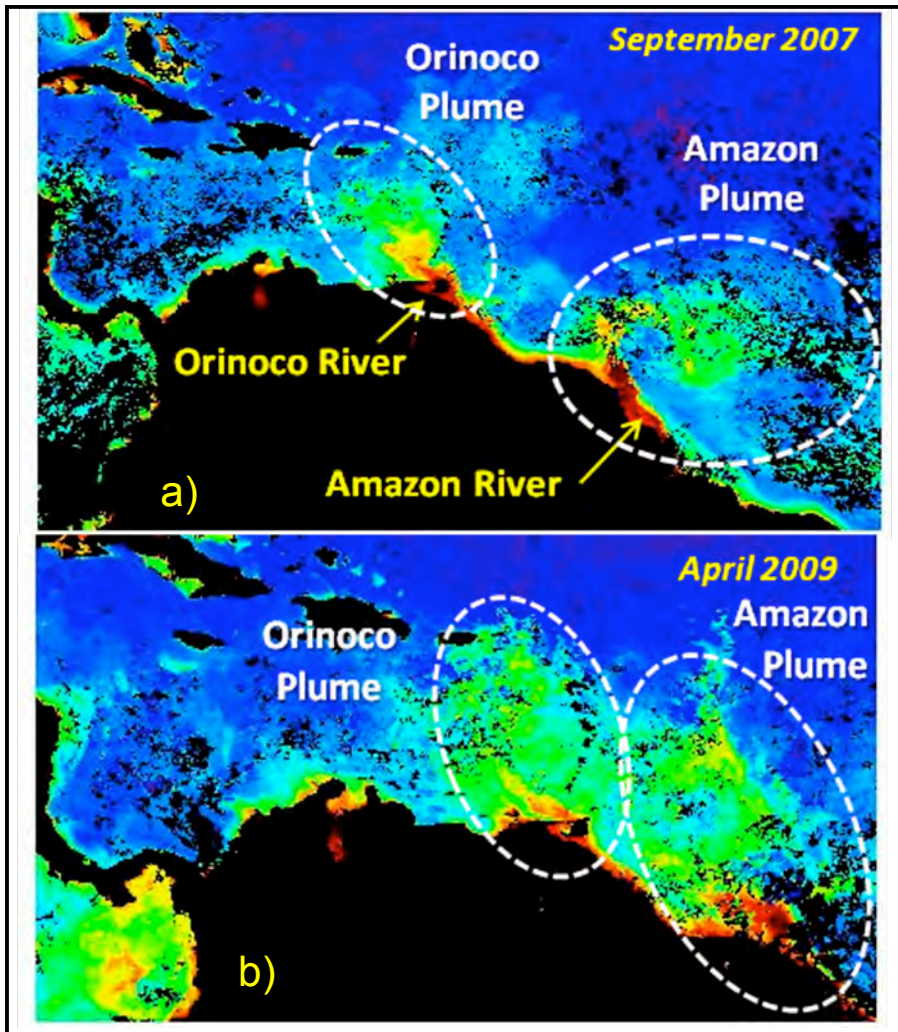


Figure 2. Ocean color imagery (Chlorophyll, SeaWiFS) of the Caribbean Sea and the tropical Atlantic. The plumes of the Orinoco and Amazon rivers are evident (because their content of chlorophyll and CDOM) and the normal (a) and extreme (b) extension of the river plumes are showed.

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Tracing Oceanographic Connectivity in the Mesoamerican Barrier Reef System and the Gulf of Mexico using Ocean Color Imagery

Inia Soto, Frank E. Muller-Karger, Chuanmin Hu, College of Marine Science, University of South Florida

The term connectivity has different definitions depending on the discipline, but in biological oceanography it has been widely used to imply the interaction between different parts of an ecosystem in terms of larval dispersal, population gene flow, and the dispersal of nutrients, pathogens, pollutants and phytoplankton, or any other materials (Cowen et al., 2000; Andréfouët et al., 2002; Cowen et al., 2006; Paris and Chérubin, 2008). The study of these patterns helps understand the real dimensions of a marine ecosystem, as in many instances it becomes clear that areas that appear to be far from each other can indeed be connected. Understanding these connections is important to enable ecosystem-based resource management across the land-ocean interface or across national and international political jurisdictions (Birkeland 1997; Ogden 1997, Heyman and Kjerfve, 1999; Hatcher and Bradbury, 2006; Soto et al., 2009).

Over large spatial scales, oceanographic connectivity is driven in part by ocean circulation, atmospheric events (e.g., hurricanes), bathymetry, and land discharge (e.g., rivers, groundwater discharge, and erosion). Connectivity is also a function of the migration patterns of organisms, and how this is modulated by climate variations in variables such as temperature. Connectivity patterns related to physical oceanography can be generally predicted by ocean circulation models. However, connectivity between land and ocean environments, like the effect of river plumes in coral reef ecosystems, depends on ocean circulation and rainfall, watershed processes and discharge, and land management practices. Unfortunately, this information is not always available. Traditional oceanographic *in situ* sampling is insufficient to cover the large spatial scales necessary to understand connectivity. Simulations and numerical models have been used to study connectivity in the Mesoamerican Barrier Reef System (MBRS; e.g., Cowen et al., 2006; Tang et al., 2006; Chérubin et al., 2008; Paris and Chérubin, 2008) and the Great Barrier Reef (e.g., Cappo and Kelley, 2001 and references therein). Such models can be validated using synoptic satellite data such as ocean color imagery. Studies of time series of ocean color imagery also are an effective technique to study the connectivity associated with river discharge and coral reef ecosystems in the MBRS (Andréfouët et al., 2002; Soto et al., 2009).

The color of the ocean is driven by the interaction between sunlight and water constituents, such as phytoplankton, sediments, colored dissolved organic matter (CDOM), detritus, pollutants, and bottom reflectance in shallow areas. Riverine waters can be rich in nutrients, colored dissolved organic matter (CDOM), sediments, and phytoplankton. These change the color of the water over large distances. Phytoplankton blooms can change the color of the water differently, depending on species and their associated pigments. The changes in the color of the ocean can be measured from satellites over large spatial scales and high temporal resolution. This technique, in combination with models and knowledge of ocean currents, allow us to trace patterns of connectivity between coral reefs, land discharge and reefs, phytoplankton blooms, and the dispersal of pollutants between different regions within an ecosystem.

To illustrate connectivity within the Meso-American Barrier Reef System (MBRS) and the Gulf of Mexico (GOM) and discuss implications, we examine several examples of ocean color imagery of the western Caribbean Sea and Gulf of Mexico.

CASE 1: Physical Connectivity in the MBRS

The MBRS is located in the northwestern Caribbean Sea. It is the longest barrier reef in the western hemisphere, with the system of reefs and atolls covering an area larger than 870, 000 km² in four countries (Mexico, Belize, Honduras, and Nicaragua). The ocean circulation in the region is dominated by the Caribbean Current, which flows westward in the central Caribbean and then northward towards the Yucatan Peninsula. The circulation in the region also contains numerous mesoscale eddies. Both the main current and eddies interact with shelf and coastal waters, affecting coastal circulation and connectivity within the reefs (e.g., Ezer et al., 2005; Chérubin et al., 2008).

Andréfouët et al. (2002) described the connectivity patterns associated with high river discharge after Hurricane Mitch (October 1998) impacted the Caribbean coast of Honduras. They identified connectivity patterns that were established after this extreme meteorological event, and speculated that connectivity between areas far apart in the MBRS region was a phenomenon that perhaps was more common than

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previously noted. Soto et al. (2009) then described the seasonality of connectivity patterns in the MBRS and created a connectivity matrix for the region for 1998-2006 using a nine-year monthly climatology and weekly means of satellite-derived chlorophyll-a concentrations from the Sea-viewing Wide Field-of-view Sensor (SeaWiFS). The climatology analysis suggested the presence of recurrent connectivity patterns. These were not random events resulting from extreme meteorological phenomena. Rather they were seasonal. Connectivity was established regularly between the Uluá River and nearby reefs in the Belizean Barrier Reef (BBR) on a seasonal basis; however areas separated by longer distances, such as the Patuca and Sico Tinto River (Honduras) and Cozumel reefs, were also observed to be connected regularly (See Figure 2, 3 and Electronic Supplementary Material included as part of Soto et al., 2009).

Soto et al. (2009) quantified the frequency of occurrence of connectivity patterns in the nine-year period. A total of 446 images were used to examine connections between 17 defined sub-domains within the region; these included rivers and reefs within the MBRS. The connectivity patterns determined in the weekly time series were summarized in a connectivity matrix (Figure 7, Soto et al., 2009). The results showed that rivers emanating from Honduras contributed over 60% to connectivity events counted. In the nine-year period, Honduran river plumes reached the Utila Island reefs and the Southern BBR over ~50% of the time, and Glovers ~20% of the time. Sometimes the river plumes reached as far as Cozumel, Mexico (~5-10%). Connectivity between the BBR and atolls was observed over 20% of the study time. The results were consistent with circulation models for the region (Tang et al., 2006) and with previous connectivity studies for the region (Chérubin et al., 2008; Paris and Chérubin, 2008).

CASE 2: The eastern Gulf of Mexico: The Mississippi River and the “Green River” and “Black Water” in the West Florida Shelf

When synoptic ocean color satellite data became available in the late 1970's and 1980's, many patterns of biological connectivity between distant ocean regions became apparent. For example, Muller-Karger et al. (1991) studied the seasonal changes of apparent chlorophyll concentration traced by rivers in the Gulf of Mexico, and observed entrainment and transport of Mississippi River water into the eastern GOM. The ocean color data showed that most Mississippi river waters flowed west of the Mississippi delta, but a fraction roughly estimated to be in the order of 30% was observed to flow east or sometimes southeast, entrained in the Loop Current or its eddies. The phenomenon was particularly recurrent during summer months, after the spring freshet (Hu et al., 2005). The Mississippi river plume has often been observed to reach the Florida Keys National Marine Sanctuary (FKNMS; Figure 1), and has been detected in the Gulf Stream flowing north along the east coast of United States (Atkinson and Wallace, 1975; Hu et al., 2005).

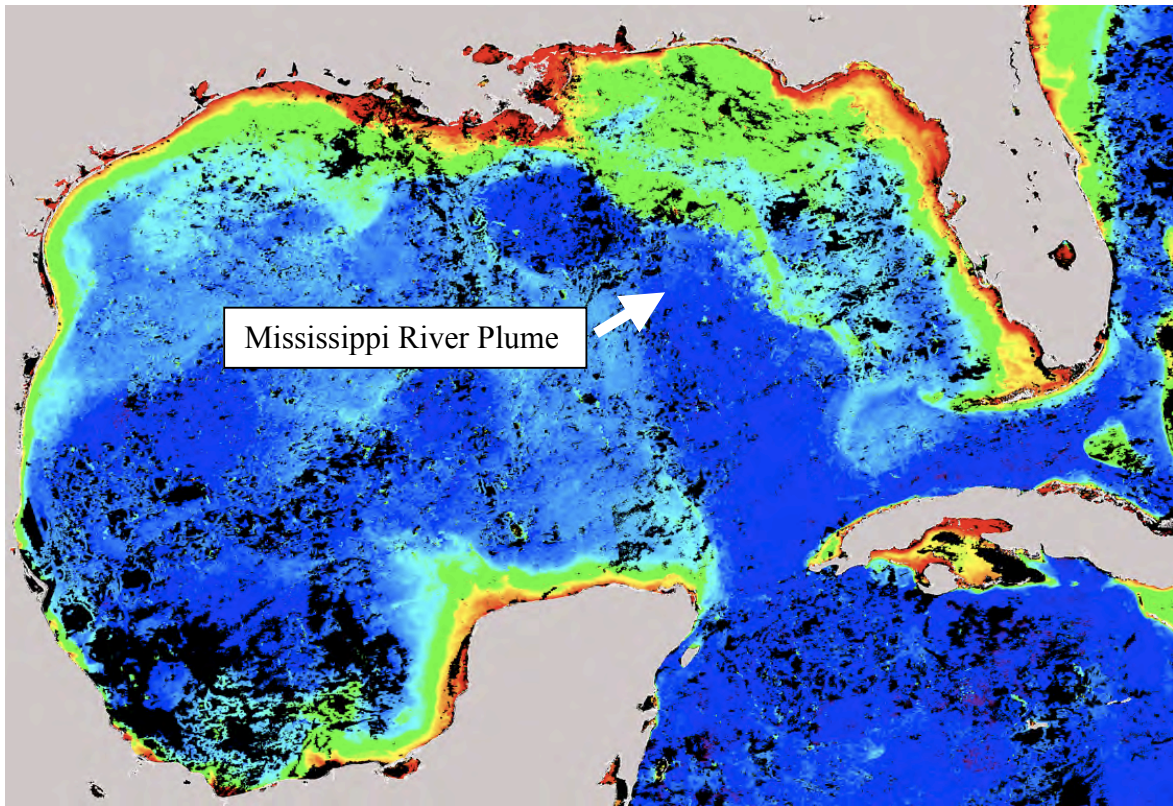


Figure 1. IMaRS-USA MODIS chlorophyll-a weekly mean image of August 19-25, 2003. Dispersal of the Mississippi River Plume

A phytoplankton bloom that occurs on the West Florida Shelf (WFS) every winter-spring, and most clearly in February-March, has been affectionately named the “green river”. This pattern was initially observed and described by Gilbes et al. (1996). The increment in chlorophyll concentration generally lasts from two weeks to over several months. The phenomenon has not yet been completely studied in situ, but numerical models suggest that it is a dynamic feature driven by seasonal differences in density between offshore and coastal waters on the WFS (Weisberg and He, 2003). The discharge of the Apalachicola River also plays a role in tracing the green river plume in ocean color imagery (Gilbes et al., 2002). The green river plume is observed in the satellite imagery every year, and it is often seen reaching the FKNMS.

River plumes and blooms due to upwelling are not only pathways of nutrients, organic matter and sediments, they can also carry pathogens, pollutants and toxic phytoplankton that sometimes can be harmful for marine life, seagrasses, coral reefs and other coastal ecosystems. The dark plume event in the southern WFS described by Hu et al. (2003; 2004), is an example of how river plume dispersal and connectivity can harm coral reef ecosystems. From January to April 2002, a dark water patch dominated by a non-toxic Rhizosoloniaceae diatom and the presence of the toxic dinoflagellate *Karenia brevis* moved along the southwestern coast of Florida and extended into the Florida Bight (Hu et al., 2003). Hu et al. (2003) speculated that this feature was associated with a possible *K. brevis* bloom that originated in the area of Charlotte Harbor and then was advected south towards the Florida Bight. With availability of nutrients from river runoff and *K. brevis* decay, a Rhizosoloniaceae diatom formed. The stagnation of this black water patch was associated with high mortality of clionids and corals in northern reefs in the FKNMS (Hu et al., 2003).

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The following year a similar dark water plume that originated in the vicinities of Charlotte Harbor was seen reaching the Dry Tortugas region (Hu et al., 2004). The upstream part of the bloom contained a phytoplankton bloom (including *K. brevis*), and the lower part was rich in CDOM. These events confirmed that the FKNMS is connected to the rivers of southwest Florida and to rivers far north in the GOM, such as the Apalachicola and Mississippi river.

CASE 3: Connectivity of Harmful Algal Blooms (HABs) in the GOM

There are over 50 species of toxic phytoplankton in Florida waters (Abbott et al., 2009). Among those 50 species, *K. brevis* is well-known for long-lasting and frequent blooms that cause massive fish and marine mammal mortality along the coasts of the GOM. *K. brevis* blooms have been reported in every coastal state in the GOM (Magaña et al., 2003), and massive blooms have been reported in the WFS, the northern GOM, as well as in the western GOM off Tamaulipas and Veracruz.

In 2005, a bloom of *K. brevis* lasted for almost a year and covered thousands of square kilometers in the WFS. Again, ocean color imagery was useful to trace and track the movement of this bloom and define connectivity patterns in the area. During this period, *K. brevis* blooms were also reported off Texas, Tamaulipas, Veracruz, and Tabasco (Alvarez-Góngora and Herrera-Silveira, 2010). The movement, displacement and possible connectivity of *K. brevis* blooms in the GOM remains poorly understood. These blooms move with the ocean circulation in the GOM, but they also depend on the availability of nutrients. The connectivity patterns of HABs therefore provide insight on the factors that trigger large blooms and the sources of nutrients that sustain them.

Other HAB species like *Scrippsiella* spp. are frequent every year in the offshore waters of the Yucatan Peninsula. These blooms are often seen moving from the eastern part of the Yucatan Peninsula towards the Campeche coast. In Figure 2, a *Scrippsiella trochoidea* bloom observed in late summer 2003 moved from the upwelling area of Holbox towards coastal waters of Dzilan. There, it mixed with a diatom bloom and then moved south toward the State of Campeche (Herrera-Silveira et al., 2005, Soto et al., 2010). Other HABs and non-toxic blooms move along the coasts of the GOM. Public safety and local economies are affected by these blooms. Therefore, understanding connectivity patterns helps improve alert systems for issues affecting states of both the US and Mexico.

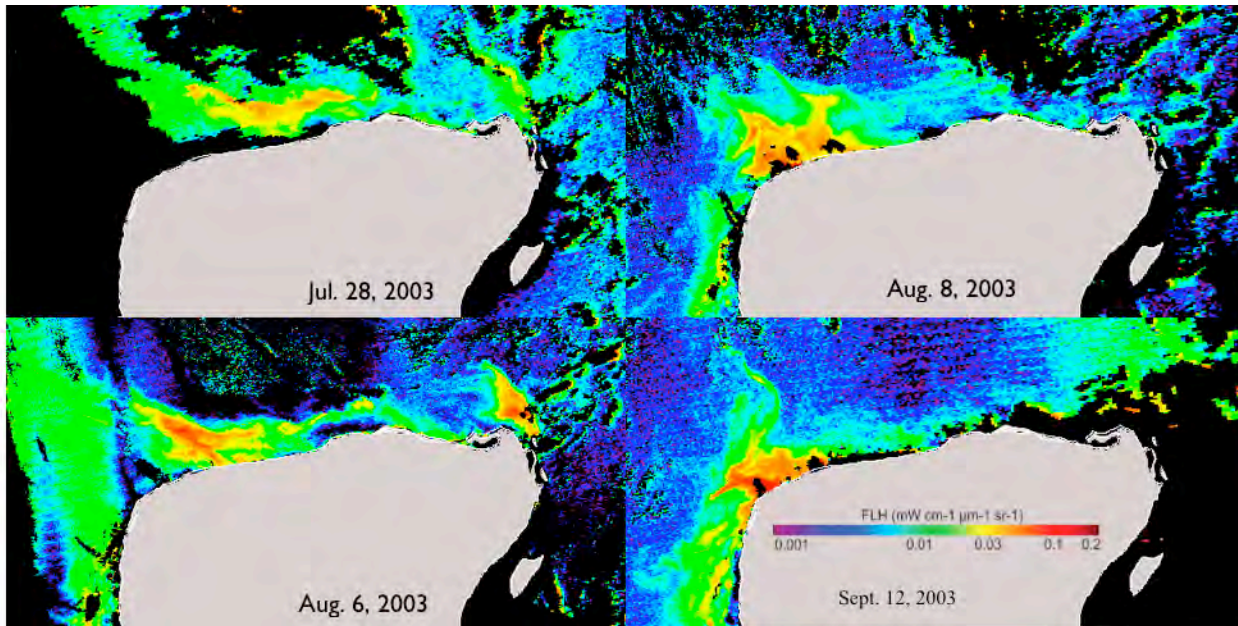


Figure 2 . Modified from figure 2 in Soto et al., 2010. Sequence of MODIS fluorescence line height (FLH) daily images showing the sequence of a HAB in the Yucatan Peninsula.

Summary

This brief summary does not address the many aspects of oceanographic connectivity that are important, including larval dispersal, oil spills, and gene flow, among many others, that are very important and need to be considered in defining ecosystem-based management plans.

The GOM waters connect the three countries that bound it, and it is also connected to the wider Caribbean. Connectivity is a way that the ocean influences, replenishes, and affects our coastal marine resources. It is a beneficial and necessary condition to sustain ecosystem resources, but it also connects threats that affect public safety and the economy of coastal states.

We use satellite-detected ocean color patterns to study connectivity, trace patterns and variability of the connectivity. The use of this technique in the MBRS complements the output of models and ocean circulation in the region. It illustrated connectivity patterns within the region, their seasonality and frequency.

Satellites provide important tools to study the connectivity pathways, visible in color images for the dispersal of river plumes and convergences and divergences, and that lead to phytoplankton blooms and the concentration or dispersal of pollutants. The use of these tools, however, requires trained technical skills and oceanographic knowledge of the region, and the ability to access various ocean and atmospheric data as well as numerical simulations for the understanding of the three-dimensional ocean circulations and processes. Ultimately, an integrated observation system that includes both observations and modeling is required to fully understand the connectivity between the various ecosystems around the Gulf of Mexico.

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DEVELOPING A REGIONAL MARINE PROTECTED AREA PLAN FOR THE GULF OF MEXICO

Ryan Young, Marine Protected Area Specialist/Project Coordinator, Rookery Bay National Estuarine Research Reserve, Naples, FL

A grant has been in progress over the past year to develop a regional Marine Protected Area Plan for the Gulf of Mexico. The project is being funded by the National Fish and Wildlife Foundation and the National Marine Protected Areas Center in partnership with the Friends of Rookery Bay National Estuarine Research Reserve. Project coordinator, Ryan Young, with guidance from Rookery Bay staff members Tabitha Stadler and Gary Lytton, were required to address the goal of the grant goal which called for the “*development of a regional plan and functional network within coastal states of the Gulf of Mexico, highlighting priority actions and common interests.*” The objectives of the grant called for the project coordinator to “*Identify parameters and develop a draft framework needed to establish a functional MPA network to increase communication, collaboration, coordination and effective sharing of resources in the Gulf of Mexico.*” The grant was written and received by the Friends of Rookery Bay.

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In order to achieve this goal and complete the project's objectives, several methods were used including an audience needs assessment survey of MPA managers in the Gulf of Mexico, MPA site visits and staff interviews, management plan research, and holding a regional meeting at Rookery Bay Estuarine Research Reserve to further identify common issues in the Gulf. The following document gives an overview of the project's initial research, the regional planning meeting, the challenges associated with the creation of a regional network, the benefits to creating the Gulf of Mexico MPA Network, results of the regional meeting, and next steps for the Gulf of Mexico MPA Network.

Survey, Research, and Regional Meeting

To identify common issues and opportunities for collaboration among Gulf MPAs prior to the regional planning meeting, there were discussions among the project's Advisory Committee, site visits and meetings held by the project coordinator, research of Gulf MPA management plans and websites, and finally an audience needs assessment survey sent out to MPA managers around the Gulf. The survey identified areas of overlap in MPA management for which we would be able to discuss joint plans.

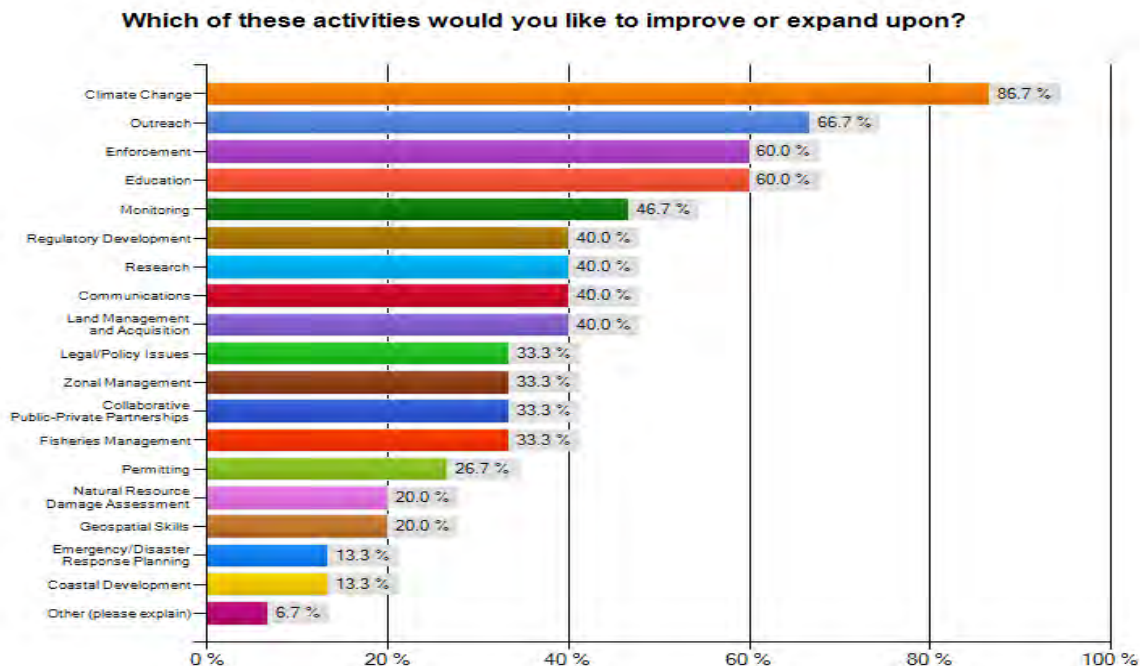


Figure 1. The above figure shows data collected from the audience needs assessment survey that was used to identify focus areas for discussion during the Gulf of Mexico MPA Network Planning Meeting.

As a result of the methodologies used for collecting information from MPA managers and data collected from the audience needs assessment survey (Figure 1), four topics were discussed during the Gulf of Mexico MPA Network Planning Meeting. The focus areas that Gulf MPA's found most important, would like to improve or expand upon, and often lack the resources to pursue to the desired extent based on the pre-meeting discussions, site visits, and the survey included:

- Communications Strategy

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- Climate Change
- Education and Outreach
- Disaster Response

These categories were then discussed in depth at the regional meeting held at Rookery Bay National Estuarine Research Reserve (RBNERR).

The Gulf of Mexico MPA Network Planning Meeting

The meeting held at Rookery Bay included 22 managers from MPA's around the Gulf from various agencies including US Fish and Wildlife, the National Park Service, and NOAA as well as NGOs such as The Nature Conservancy. MPA's that were represented at the meeting included National Wildlife Refuges, National Parks, National Marine Sanctuaries, and National Estuarine Research Reserves. Also present were representatives from the Florida Fish and Wildlife Commission, and the National MPA Center. The meeting was held in a round table discussion format in which issues were discussed as a group using facilitators to help guide the discussions. Attendees also participated in breakout group sessions addressing the focus areas mentioned and decided on main issues, goals, activities, and outputs for each category. Participants voted for their top three choices for each category in each focus area in order to identify the most important issues and how they need to be addressed. These issues, goals, and objectives are being condensed and written into an implementation plan that will guide the formation of the Gulf of Mexico Marine Protected Area Network.

Challenges to Network Creation

The desired outcome of a regional network for the Gulf Coast comes with many challenges that must also be addressed. As a result of discussion during the Planning Meeting and interviews with MPA managers during site visits, many of these challenges were identified. Coastal managers are often very busy managing individual MPA sites and fail to see the bigger picture and the importance of working together to address certain issues. Public perception of Marine Protected Areas also poses a challenge to an effective MPA Network. Lack of understanding and a misinterpretation of the term "MPA" creates dissent towards MPAs. This issue can be addressed using outreach and education activities. Changes in public administration and political will provide a constant challenge to an MPA network as well. Developing a common message and a single voice will help to overcome this issue. Another main issue to Network formation is the amount of work involved in facilitating its implementation. This issue is being addressed by shifting the responsibilities to a graduate student who will be able to put time and focus into completing the project's goals and objectives.

Meeting Results: The Gulf of Mexico Marine Protected Area Network

Based on the goals and objectives developed from the first phase of network creation and implementation provided us with a vision and a mission for the Gulf of Mexico MPA Network:

Vision

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Develop a site-based network of coastal and marine protected areas using the 'power of place' to cooperatively conserve and restore a shared ecoregion, and to raise awareness of the value and importance of these areas to our quality of life, environment and economic vitality.

Mission

To improve coordination, cooperation, communication, and collaboration among Gulf coastal and marine protected areas by creating opportunities for collective environmental planning and response; information sharing; leveraging resources; and conveying a common message.

Benefits to a Gulf Network of MPAs

Benefits to creating a gulf-wide MPA network include, but are not limited to; developing a single collective voice; taking advantage of existing resources and regional initiatives around the Gulf; easy communication and sharing of information and expertise between MPA sites around the Gulf; leveraging agreements through the power of a collective voice; and continuity between MPAs in regards to their management, research, and education and outreach programs. The power of a collective group will provide numerous benefits to MPA sites.

"None of us is as strong as all of us." -Anonymous

Next Steps

Phase two of the project involves implementing this mission and vision through goals, objectives and activities developed throughout the first phase of the project relating to the four focus areas identified. This implementation plan will be put into effect over the next year with leadership from the project coordinator and the advisory committee. While continuing to build the structure of the network through developing by-laws and defining roles, sub committees will be formed to address the goals and objectives of the implementation plan. For more information about becoming a member, becoming a partner, or receiving updates about the Gulf of Mexico Marine Protected Area Network, please feel free to contact Project Coordinator, Ryan Young. Contact information is listed below:

"Coming together is a beginning. Keeping together is progress. Working together is success."

-Henry Ford

Panel 6 Discussion

C: ?: Atmosphere should be included in your connectivity models. Three-dimensional flow is also important.

Q: Ryan, why is monitoring ranked so low in your list when it is important in determining climate change impacts?

A: Ryan: It is essential and is part of the issue draft we have now prepared in the section on climate change.

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Q: ?: What was the metric of connectivity matrix?

A: Inia: Weekly means of ocean color/chlorophyll over an 8-year period.

Q: Barbara: How can we use the connectivity data in policy decisions?

A: Inia: We are using workshops for educators and policy makers to understand the harmful algal bloom connections.

C: Porfirio: We are building a transboundary network in the LME project. These international collective efforts and international agreements can help.

Q: Barbara: How can we incorporate adaptation issues into climate change?

A: Ryan: Trying to combine issues to see how ecosystem and climate change interact. Also develop a centralized database that can be used to answer these questions.

C: Steve Gittings: A communications network should be an outcome of this meeting. Ryan's program provides for this. This communication is able to make this concept real.

Q: Carl: Need to define connectivity. River plumes are not what I would call connectivity. I see connectivity as species migrations using different habitats.

A: Inia: Movement of water is the basis for connectivity as I define it.

C: But this may not be the type of connectivity that is needed by a network of MPAs.

C: Barbara: New book on connectivity came out in Dec 2010 defines connectivity in four ways: Evolutionary Connectivity, Species Connectivity, Ecosystem Services Connectivity, and Human induced connectivity.

C: Billy: As a manager, I use HAB data constantly to be aware what may be coming our way and link it to our water quality monitoring.

Panel 7 - Other Relevant Ongoing Activities

SPORTFISHING CONSERVATION ALLIANCE

Tom Raftican, President, Sportfishing Conservancy

The Sportfishing Conservancy recognizes that with privilege comes responsibility and works accordingly. The mission of The Sportfishing Conservancy is to empower sportsmen to fulfill and celebrate their commitment to their sport and to real world conservation. The latest project is drawing together like-minded groups within the Sportfishing Conservation Alliance. Anglers financially support conservation through licenses, permits and taxes contributing \$380 + million in 2010 through Sport Fish Restoration Act alone. However, millions of anglers with millions of hooks in the water need also be aware of their individual impacts, then ensure that consequences are minimized. Sportfishing (Alliance) Conservancy is working to eliminate destructive commercial fishing gear, but also recognizes that many recreational

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fishing lines in the water can have a big impact. One way to address this is not only in doing a better job of fishing, but getting data on what we catch back to those that can use it.

Tom also recognized that while Teddy Roosevelt is considered the US's pre-eminent conservation hero today, he and his party had issues a hundred years ago. Regarding CMSP and MPAs, California has led and learned: Do your homework and use "lessons learned" from other processes. Language is critical – terminology must be consistent. Advocacy and science need remain separate. Work on a 2-way street. Whether fishing, energy or conservation, providing a measure of certainty for the interests of all constituents goes a long way in building trust.

Learn that you will be shot in the back more than in the front if you do a good job.

Do homework on lessons learned.

Language is important.

Be inclusive.

Develop new tools for fishing that help fish survive when released.

Recreational fishing is a big economic driver and provides a lot of revenue for state programs through licenses and permits.

Science cannot be advocacy.

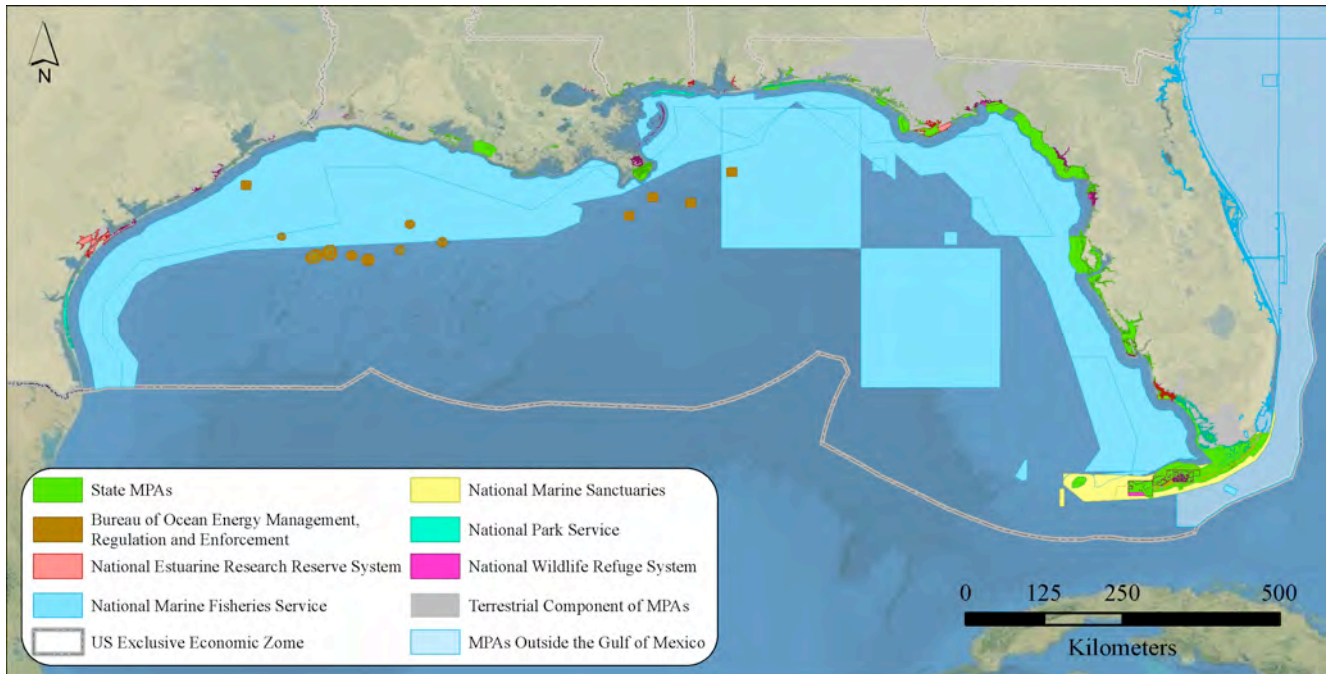
Be a good partner

UNDERSTANDING EXISTING MARINE PROTECTED AREAS AND OCEAN USES IN THE GULF OF MEXICO

Lauren Wenzel, NOAA National Marine Protected Areas Center

Building a National System of Marine Protected Areas

Over the past century, MPAs have been created by a mix of federal, state, and local legislation and regulations, each established for its own specific purpose. As a result, the nation's collection of MPAs (reserves, refuges, preserves, sanctuaries, areas of special biological significance, and others) is fragmented and complex, potentially missing opportunities for broader regional conservation through coordinated planning and management. In 2000, Presidential Executive Order 13158 directed the Department of Commerce to work with the Department of the Interior, other federal agencies, states, territories and stakeholders to establish a national system of MPAs to integrate and enhance the nation's MPAs, bringing these diverse sites and programs together to work on common conservation objectives. The order defines an MPA as "any area of the marine environment that has been reserved by federal, state, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein." Key terms within the definition -- area, marine, reserved, lasting, and protection -- are defined in the *Framework for the National System of Marine Protected Areas of the United States of America*. There are currently 297 members of the national system, of which 33 sites are located in the Gulf of Mexico. The MPA Center works to enhance coordination and management of MPAs in the national system through technical assistance, training, and linkages to other ocean management, education and science programs.



MPA Inventory

The Marine Protected Areas Inventory (MPA Inventory) is a comprehensive geospatial database designed to catalog and classify marine protected areas within US waters. The Inventory contains information on over 1,600 sites and is the only such comprehensive dataset in the nation. The MPA Inventory was developed with extensive input from state and federal MPA programs and drawn from other publically available data. The MPA Center is currently expanding the inventory to include additional information on the natural and cultural resources within MPAs as well as authorities, objectives, and prohibited activities. In addition, the MPA Center has completed a national inventory of “de facto” MPAs – areas that are set aside for purposes other than conservation, such as military security zones, oil and gas transfer areas, and shipping lanes.

MPAs in the Gulf of Mexico

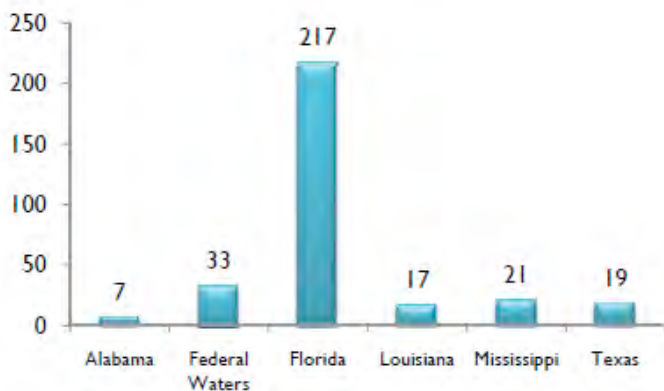
Gulf of Mexico MPAs at a Glance:

- There are currently 295 MPAs in the region
- About 40% of the Gulf of Mexico is in some form of MPA, but these include large fishery management areas
- Nearly all (278) Gulf of Mexico MPAs are multiple use
- “No take” MPAs occupy only about 0.5% of all Gulf waters
- State governments manage approximately 77% of the Gulf of Mexico’s MPAs, but most MPA area in the region is managed by federal agencies
- Gulf of Mexico MPAs account for 6% of the total area of MPAs in U.S. waters

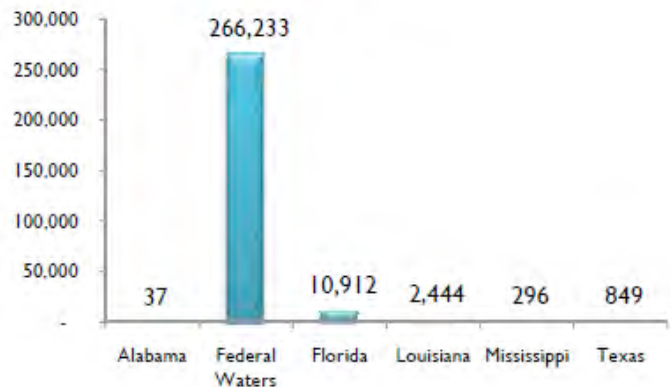
About two thirds of the region’s MPAs are in Florida. Over 100 of Florida’s 217 MPAs are Outstanding Florida Waters, overlay zones established to protect water quality in sensitive areas. These often overlap with other MPAs. Florida also has a 41-member system of aquatic preserves, 21 of which are MPAs in the Gulf. Ninety-five percent of the MPA area in the Gulf is in federal waters, most of this is in fishery MPAs managed by the National Marine Fisheries Service with the Gulf of Mexico Fishery Management Council.

MPA managers in the Gulf are faced with many common challenges, including adaptation to climate change, responding to emergencies such as the BP/Deepwater Horizon spill, habitat loss and invasive species. In April 2011, the MPA Center sponsored a meeting hosted by Rookery Bay National Estuarine Research Reserve (NERR) to identify key issues and initial strategies for collaboration among the region’s MPAs. This network of federal and state MPA managers and staff will work with existing regional bodies and initiatives to address these challenges and identify opportunities to enhance the conservation of the region’s natural and cultural marine resources.

Number of Gulf MPAs By Jurisdiction



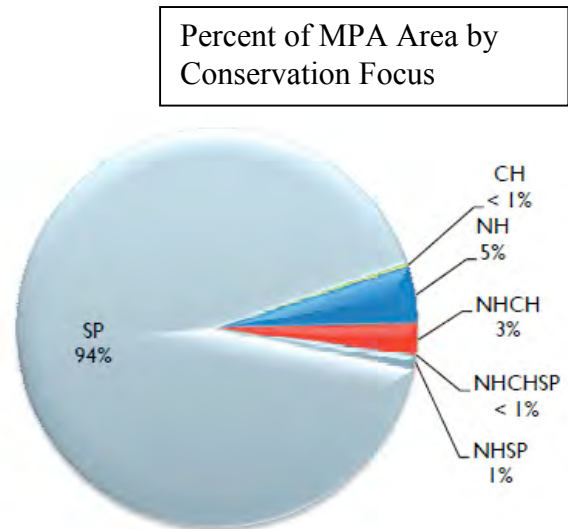
Area of Gulf MPAs By Jurisdiction



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Gulf MPAs By Conservation Focus

Many Gulf MPAs have more than one conservation focus. Ninety-one percent were created primarily to conserve natural heritage (NH) values such as biodiversity, ecosystems, or protected species. Approximately 6% focus on primarily on sustainable production (SP), and 3% focus on conserving our nation's cultural heritage (CH). However, because the MPAs created for sustainable production are so large, approximately 94% of the MPA *area* in the region has this conservation focus.



Gulf MPAs by Level Of Government

State agencies manage 77% of the MPAs in the region, but because these are typically quite small, these amount to 4% of the MPA area. By contrast, federal agencies manage 21% of the region's MPAs, accounting for 97% of the MPA area. Partnership programs, such as the National Estuarine Research Reserves, make up the remainder.

Gulf MPAs By Level of Protection

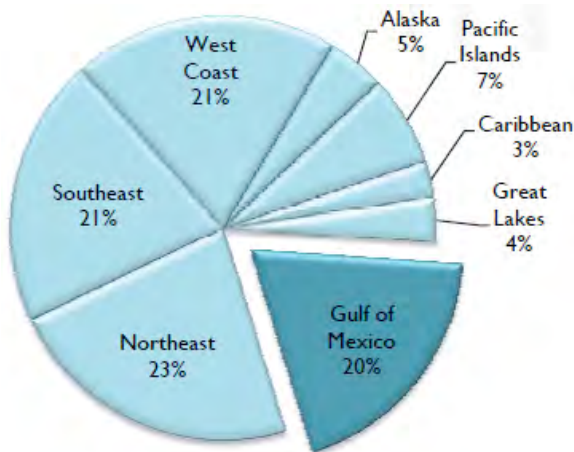
Almost all (99%) of the area in the Gulf's MPAs is multiple-use, in which a variety of human activities, including fishing and other extractive uses, are allowed. In contrast, only 0.5% of the area is no take, where the extraction or significant destruction of natural or cultural resources is prohibited.

Gulf MPAs Within the National Context

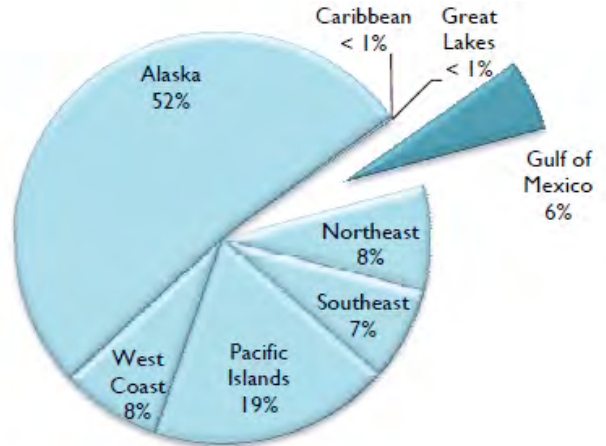
There are 1,681 MPAs in place in the U.S. These areas cover more than 40% of U.S. marine waters, and vary widely in purpose, legal authorities, managing agencies, management approaches, level of protection, and restrictions on human uses. Approximately 20% of U.S. MPAs are found in the Gulf of Mexico region. The Alaska region has the largest MPA area while the Great Lakes and Caribbean regions combined have the least MPA area. Six percent of U.S. MPA area is located in the Gulf of Mexico region.

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Number of U.S. MPAs by Region



Percent of U.S. MPA Area By Region



Mapping Ocean Uses – Critical Information for MPA Planning and Coastal and Marine Spatial Planning

Understanding human uses of the ocean is an essential component to successful marine resource planning and management. As highlighted in the National Ocean Policy’s final recommendations and the Framework for Effective Coastal and Marine Spatial Planning, “human uses of our ocean, coasts, and the Great Lakes are expanding at a rate that challenges our ability to plan and manage them under the current sector-by-sector approach.” In particular, recreational uses of our oceans, coasts and Great Lakes are critical to millions of users and to the economic health of coastal communities, but are poorly understood and often under-represented with respect to resource planning and decision-making.

For the past three years, the MPA Center has been working with regional partners to address this key need for areas on the West Coast, New England and the Pacific Islands. Through a participatory GIS process, spatial data on ocean uses are gathered through a series of workshops that engage local and regional ocean experts to map ocean use patterns in a live, interactive mapping environment. With this participatory, expert-driven approach, the MPA Center has successfully mapped nearly 30 distinct uses of the ocean at multiple scales for a variety of marine management applications in different regions around the country.

This approach focuses on a comprehensive range of ocean uses (recreational, consumptive, industrial, etc.) and helps bring untapped expertise and knowledge to inform decision making. Through these efforts, the MPA Center has:

- Pioneered a standardized, yet flexible protocol to gather use data using modern GIS tools
- Engaged hundreds of ocean experts and resource stewards to provide ocean use patterns
- Published various map books, GIS databases and custom cartographic products on ocean uses
- Built new online interactive tools to provide access to and visualization of ocean uses data
- Created a best practices document detailing our method and lessons learned

Conclusion

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The MPA Center has developed several geospatial databases and tools to support MPA planning and management. These provide a broad picture of existing MPAs in the region, as well as “de facto” MPAs that have been designated for reasons other than conservation, but may have a conservation benefit. The MPA Center hopes to work with partners to map ocean uses in the Gulf, filling a key data need. Together, these information resources will help us better protect sensitive areas in the Gulf.

COASTAL AND MARINE SPATIAL PLANNING: A RESOURCE PLANNING TOOL FOR THE GULF OF MEXICO

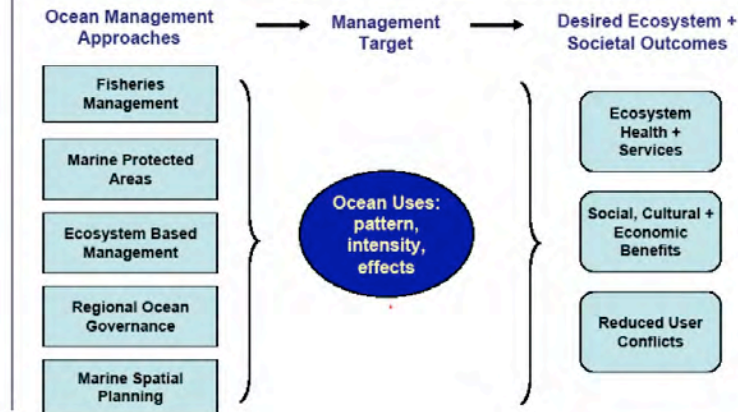
Cathy Tortorici NOAA NMFS, and **Laurie Rounds**, NOAA Ocean & Coastal Resource Management

Coastal and Marine Spatial Planning (CMSP) is an important new approach to implement ecosystem-based management and the other objectives identified in the National Ocean Policy to achieve the sustainable use of the nation’s ocean and coastal resources. Spanning the U.S. Economic Exclusive Zone (EEZ) and the Outer Continental Shelf (OCS), implementation of the National CMSP Framework will engage a range of stakeholders, including the public, oil and gas industry, coastal businesses, Federal and state governments, non-governmental organizations, and the academic community. To succeed, the CMSP process will require new collaborative, inclusive and transparent means to work across organizations to leverage capabilities for regional spatial planning, science, and management to achieve the National Ocean Policy objectives. Built on a foundation of sustaining ecosystem services, CMSP represents a public planning process for achieving the goals of ecosystem-based management with increased efficiency through rational, objective spatial planning for future sustainable uses.

Although the National CMSP framework was developed as a key component of the new national policy for the sustainable management of the nation’s oceans and coasts, CMSP emerged and will continue to unfold at the regional level (see Figure 1).

Coastal and Marine Spatial Planning

Effective Ocean Management Increasingly Requires Planning For All Ocean Uses



The principal output of CMSP is a **comprehensive plan** for a marine area or ecosystem that looks at resource uses and sustainability. This can take the form of more **comprehensive planning and management** to achieve specified objectives.

CMSP Sectors: Maritime Transportation, Alternative Energy, Marine Reserves, Dredging/Ocean Disposal, Beneficial Use of Dredged Material, Commercial/Recreational Fishing, Military Defense, Oil/Gas, LNG, Aquaculture

Figure 1.

The National Ocean Council defines CMSP as:

“CMSP is a comprehensive, adaptive, integrated, ecosystem-based, and transparent spatial planning process, based on sound science, for analyzing current and anticipated uses of ocean, coastal, and Great Lakes areas. In practical terms, CMSP provides a public policy process for society to better determine how these areas are sustainably used and protected – now and for future generations.”

CMSP has a number of important characteristics that make it an effective tool for ecosystem based management. These include:

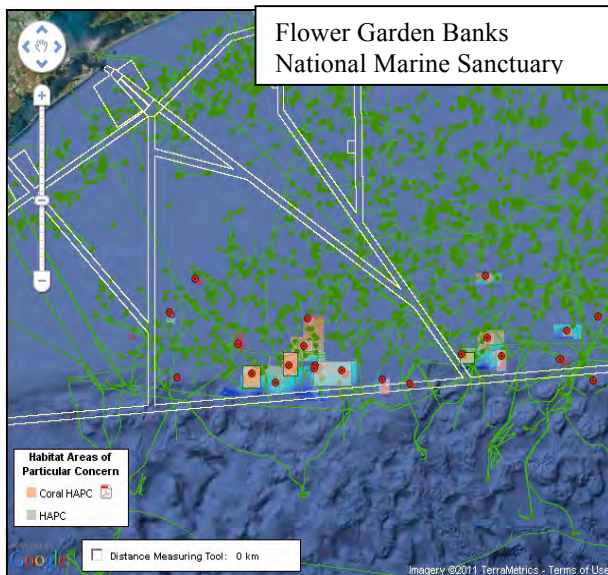
- 1) The CMSP process provides a planning framework to balance ecological, economic, and social goals and objectives toward long-term, sustainable development.
- 2) CMSP is a science-based assessment that ties best available information to place-based management goals. It also provides a process for the integration of best available science and data to address regionally developed objectives.

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- 3) The CMSP process is adaptive, by integrating steps for consultation, evaluation, and plan revision through stakeholder involvement in the planning process. The CMSP process seeks to integrate planning across multiple users, sectors, and levels of government (Federal, state, and local) through transparent stakeholder participation and consultation.

CMSP can facilitate the vision of healthy and resilient ecosystems that support human uses, coastal communities and economies and the development of collaborative strategies to achieve that vision. CMSP is sometimes mistakenly equated as “zoning in the oceans”; however, the “P” in CMSP stands for “planning”. On land, there is an important distinction between a planning board and a zoning board. In an analogous fashion, land-based planning boards help a community plan and prepare for change, rather than react to it. CMSP has NO new regulations and is NOT an additional layer of bureaucracy. The CMSP process provides a proactive approach to collaboratively identify a future regional vision by projecting changing conditions, future needs, and goals. It then uses this vision to evaluate strategies to achieve that desired future condition.

The CMSP process for the Gulf of Mexico will work to balance the sometimes competing uses and activities in the coastal and offshore environment. Existing policies and regulations were often developed on a sector-by-sector approach. To plan for and balance these uses, the CMSP process is designed to provide greater certainty in how industries manage for investments in the Gulf of Mexico, improve and consolidate the regulatory review process, and better integrate data to be able to plan and manage resources.



The ability to develop and share data across disciplines, agencies, sectors, and the public is a major strength of the CMSP process. The CMSP planning process in the Gulf of Mexico will include spatial analysis of ecosystem-based data (habitats, species, and connectivity among areas; oceanographic and ecological processes; cumulative impacts); ocean uses data (projections of future uses; conflicts and compatibilities among co-occurring uses;

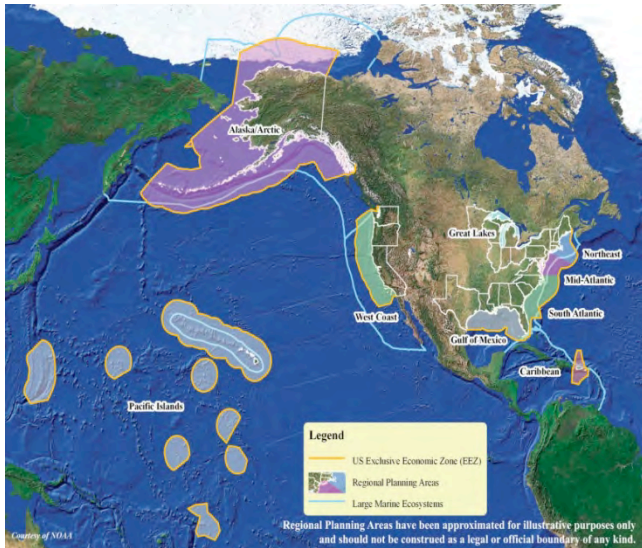
Figure 2.

socioeconomic drivers and benefits of uses); potential interactions and tradeoffs (among competing uses; among desired ecosystem services); and management strategies (security/safety zones; place-based management measures; leases and corridors; vessel traffic controls; jurisdictional overlap) [see Figure 2]. A new data portal supported by the National Ocean Council, <http://www.data.gov/ocean> is now available to provide data, information, and tools to support people engaged in planning for the future of the ocean, our coasts, and the Great Lakes. The portal’s goal is to be a one-stop hub to support planners and to provide useful information to the public about CMSP. This also affords the opportunity to share data and information with Mexico, as they continue to advance their work in marine spatial planning.

The CMSP process will be organized through Regional Planning Bodies (RPB) to be made up of representation from States, Federal agencies, like, NOAA, the Environmental Protection Agency, the US

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Fish and Wildlife Service, the National Parks Service, the Bureau of Ocean Energy Management, Federally recognized Tribes, and Fishery Management Councils.



Because no two regions are exactly alike, there is not a one-size-fits-all recipe for CMSP. The Gulf of Mexico RPB, in conjunction with its stakeholders and partners, will have the opportunity and responsibility to tailor the process, ensuring that all interests and ocean, coastal users are adequately represented (see Figure 3). This bottom-up approach will ensure that CMSP serves and responds directly to community needs. Each RPB will have a Federal co-Lead, State co-Lead and Tribal co-Lead (as appropriate). The geographic scope that the RPB will consider stretches from the mean high water mark, inland bays and estuaries, to the EEZ/OCS.

Figure 3.

CMSP does not change or supersede existing authorities; rather it relies upon existing authority to plan. RPB members will sign an agreement, to work cooperatively to plan and implement CMS plans within the limits of their statutory and regulatory authorities.

One of the significant benefits of CMSP is to improve the ability of these authorities to seamlessly coordinate their objectives with broader planning efforts by participating in the CMSP process for areas within and beyond their jurisdictional waters. Many States and regional governance structures such as the Gulf of Mexico Alliance have already engaged in some form of regional planning that CMSP can build upon and incorporate.

Cross-Initiative Planning, Collaboration, and Implementation



Gulf Coast Ecosystem Restoration Strategy: Enhance Community Resilience; Restore and Conserve Habitat; Restore Water Quality; Replenish and Protect Living Coastal and Marine Resources.

Gulf of Mexico Alliance Governors' Action Plan: Water quality, Habitat conservation and restoration; Ecosystem integration and assessment; Reducing nutrient impacts; Coastal community resilience; Environmental education.

Coastal & Marine Spatial Planning: Ecosystem and science- based; Integrated across sectors and agencies, and among levels of government; Place-based and area based.

Figure 4.

While membership on RPB is reserved for Federal, State, and Tribal entities with authorities relevant to CMSP, the policy

is explicit about the importance of stakeholder participation throughout the key steps of the process. Organizations that will play a key role in the development and implementation of a CMS plan include the Gulf of Mexico Ecosystem Restoration Taskforce and the Gulf of Mexico Alliance (see Figure 4). Both these entities have planning/implementation actions and strategies that directly relate to and support the CMSP process envisioned for the Gulf of Mexico.

CMSP Framework: A Regional Planning Process

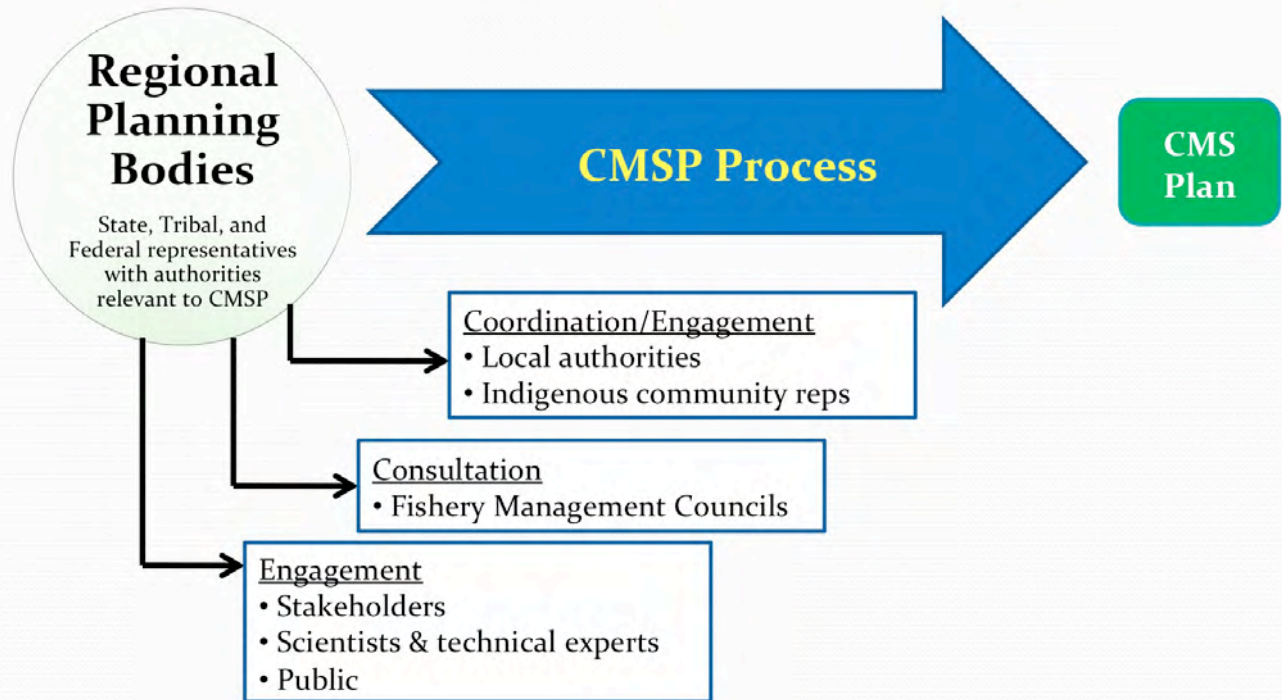


Figure 5.

In order for CMSP to be successful, CMSP, will take the collective effort of Federal agencies, states, tribes and other partners and stakeholders. While coordination to implement the National Framework for CMSP will reside with the National Ocean Council, it is the work of those entities sitting on RPBs that will make CMSP a reality (see Figure 5). More information on the CMSP process, including the draft National Ocean Policy Implementation Plan and can be found at the National Ocean Council website –

<http://www.whitehouse.gov/administration/eop/oceans>.

THE GULF OF MEXICO COASTAL OCEAN OBSERVING SYSTEM (GCOOS)

Barbara Kirkpatrick, Mote Marine Laboratory, and Ann Jochens, Texas A&M University

Introduction

Empowering people, communities and businesses to improve decision making about our lives, work, and play along the Nation's Gulf Coast requires science-based information, including biological, chemical and

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physical data and the tools to generate forecasts, graphics and products to inform the impacted stakeholder community. One effective tool is a sustained, integrated operational ocean observing system—the Gulf of Mexico Coastal Ocean Observing System (GCOOS). The GCOOS is being developed to serve data and products of many types, being freely shared by diverse providers, in an interoperable way. The GCOOS will provide data, information and products on coastal, marine and estuarine systems deemed necessary to the users in a common manner and according to sound scientific practice.

To build the GCOOS requires the partnership of many organizations—from governments to industry to academia to educators to the public—to integrate the measurements already being made and to fill gaps where necessary to meet regional, as well as national, requirements. Being an integrated system, the observations that form the basis for the GCOOS come from many sources—federal, state, local, and tribal governments, academics, NGOs, and private industry. The implementation of the GCOOS build-out is based on engaging these entities and integrating their observations and products to the greater benefit of our society.

The GCOOS is being built by a partnership of entities that comprise the GCOOS Regional Association (RA). GCOOS and its RA are part of the U.S. contribution to the international Global Ocean Observing System—U.S. Integrated Ocean Observing System (IOOS). The goal of the U.S. IOOS is to provide societal benefits that will (a) Improve predictions of climate change and weather and their effects on coastal communities and the nation, (b) Protect and restore healthy coastal ecosystems more effectively, (c) Reduce public health risks, (d) Enable the sustained use of ocean and coastal resources, (e) Improve the safety and efficiency of maritime operations, (f) Improve national and homeland security, and (g) Mitigate the effects of natural hazards more effectively. The GCOOS is aimed at meeting the national goal for the Gulf of Mexico region.

The northern Gulf of Mexico provides our Nation with many valuable resources: energy from oil & gas, wind and waves; abundant seafood; transportation waterways; beautiful beaches and extraordinary recreational activities; and vibrant coastal communities. One significant resource, for example, is the extensive Gulf shipping industry, which includes 6 of the top ten US ports (in tonnage), two of the top ten busiest global ports, and 48% of all the ports in the United States. At the same time that the regional resources are sustaining a thriving Gulf Coast economy, the region faces significant challenges including Harmful Algal Blooms, hurricanes and storm surge, search and rescue needs, and sea level rise. Gulf coast citizens and ecosystems have endured both natural and manmade catastrophes, including the 2005 Hurricane Katrina, which remains the most costly U.S. natural disaster, and the 2010 BP Deepwater Horizon Macondo well blowout, which became the world's largest accidental marine oil spill.

The GCOOS Action

With the occurrence of the Deepwater Horizon oil spill, the need for a fully developed coastal ocean observing system in the Gulf became evident. To develop a detailed implementation plan for such a system, the GCOOS Board of Directors began in summer 2010 to prepare detailed plans for needed observations and estimates of associated costs. Using information gathered over the past decade on the needs of the stakeholders for data, information, and products about the Gulf of Mexico, its resources, and its ecosystem, the Board met in December 2010 to identify the key elements of the GCOOS Build-Out Plan. The Board identified 17 key elements needed for the Gulf observing system. Board members were

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assigned elements for which they were to prepare a detailed, 10-year build-out plan describing the recommended system for the element, complete with estimates of costs and needed personnel. Board members contacted community members to assist with the plan. The Board reconvened in March 2011 to review and discuss the elements. In April, a small group assigned to consolidate the plan met, with a goal of having the complete plan ready in 2011. Version 1.0 of the summary document is now available for review and comment at http://gcoos.tamu.edu/BuildOut/GCOOS_BuildoutPlan_V1.pdf. This plan will evolve through time to meet changing user needs.

The Plan

The base case plan for the northern Gulf of Mexico consists of a selection of observing stations that fill the most important gaps in the existing observing system at a relatively modest cost. The base plan, while a substantial step forward, is really just a foundation and ultimately should be expanded in all aspects into the full case plan. The base case plan focuses on populating the shelf, slope, and deepwater portions of the northern Gulf of Mexico with stations sufficient to fill the gaps in the federal system of measurements. Shallow water measurements, such as in estuaries and bays, are not included in the base case plan because, although very important, these are specific local measurements targeted for specific requirements (e.g., monitoring for compliance with nutrient criteria) that depend on agreements of the local community to determine what measurements are necessary.

The base case plan consists of 3 key steps. The first step is to maintain existing observing systems for surface currents, subsurface currents, hypoxia, and HABs, including both the federal (e.g., NDBC buoys, C-MAN weather stations, PORTS[®], satellites, river discharge stations) and non-federal data sources (e.g., state agencies, academic/research institutions, nongovernmental organizations, private industry). Figure 1 shows the major existing observational stations. The second is to enhance existing stations with needed new measurements, such as hydrocarbon detection parameters for Gulf Restoration monitoring. The third step is to add stations to fill the largest gaps (see Figure 2 for an example). The added stations consist of a suite of fixed assets including moorings in critical ‘blank’ spaces, high frequency radar, and the Beach Conditions Reporting System, as well as mobile assets primarily composed of an autonomous underwater vehicle (AUV) fleet. The estimated start up costs for the system are \$20-25 million dollars for new capital assets and annual operation and maintenance costs of \$20 million dollars. The operational observing system, being a long-term investment, will also create stable jobs in technical and scientific fields, as well as in manufacturing (instrumentation) and operational support.

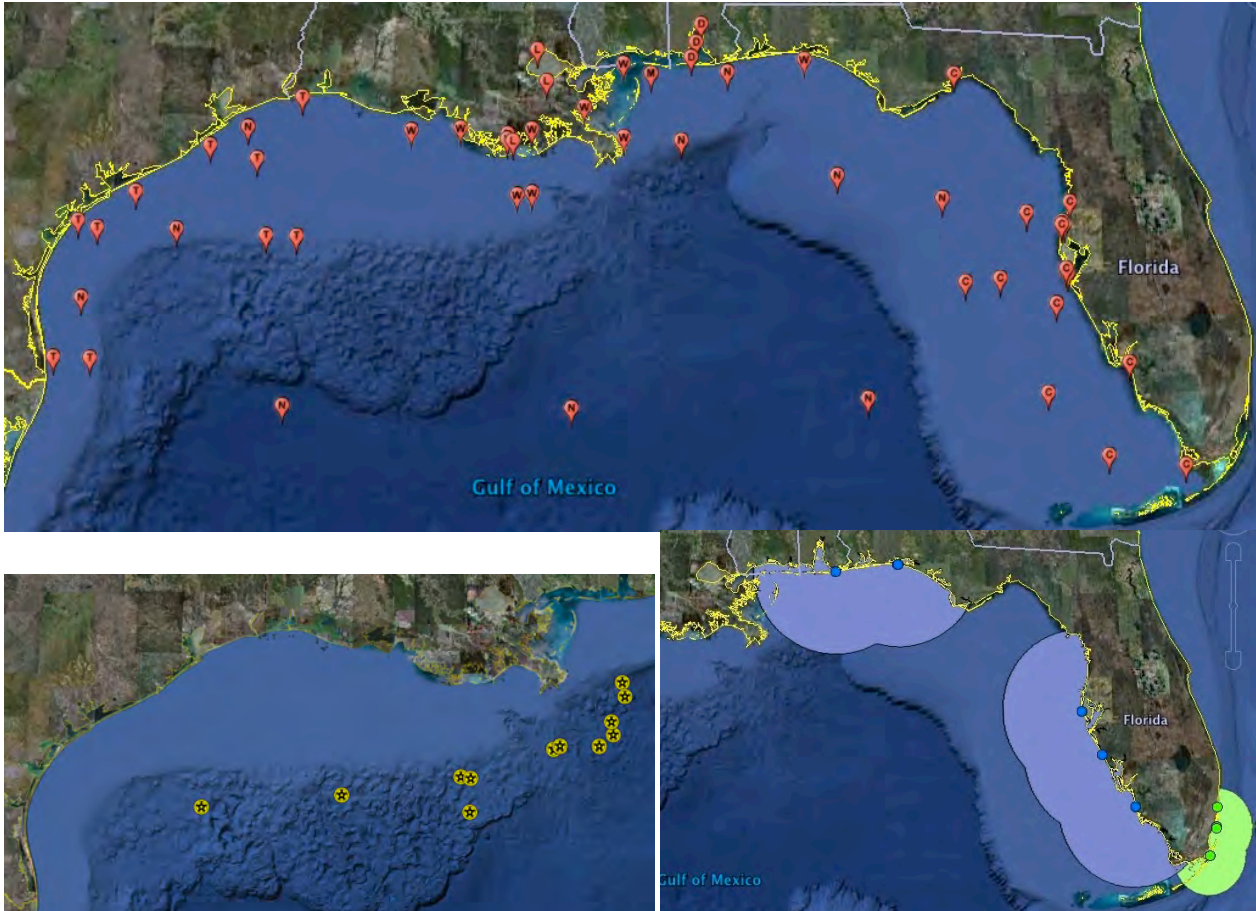


Figure 1. Locations of existing observing assets of GCOOS partners. (a) Moorings (red with letter where N = NDBC, W = WAVCIS, M = USM, D = DISL, T = TABS, C = COMPS, L = LUMCON). (b) ADCP stations on oil/gas platforms as well as drilling rigs (which are temporary). (c) HFR stations and their footprints (blue=long range footprint; green=standard range footprint).

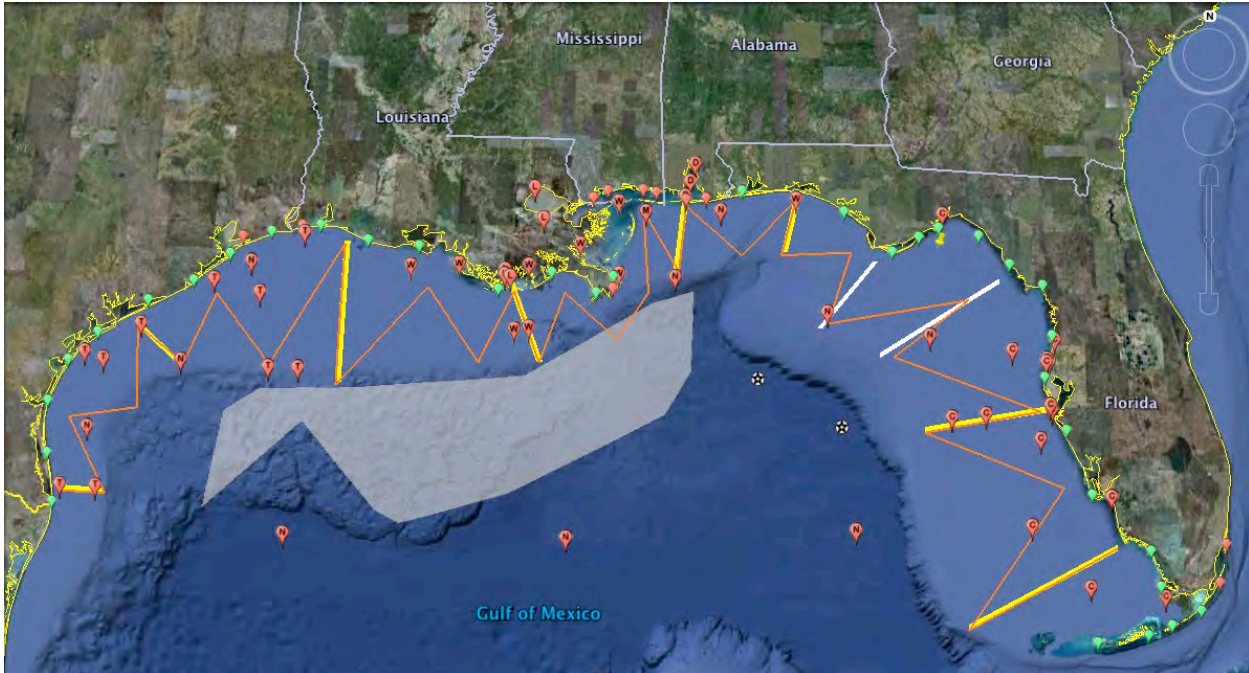


Figure 2. Locations of observing assets for the base case GCOOS. Cross-shelf transects (lines) will have moorings located near the 200, 100, 50, and 10-m isobaths. Existing moorings are shown in red. New deepwater moorings are shown as stars. The region in which current measurements are made from oil and gas platforms is shaded grey. Orange lines are schematic AUV tracks. HFR locations are shown as green dots.

Panel 7 Discussion

C: Steve Gittings: There is a NOAA app for your iPhone that will alert you to weather related info. Should be something like this for ocean observing.

C: ?: The GCOOS plan needs to have more coverage on the Florida Shelf. Also, your startup costs are likely too low.

Q: Gene Shinn: Tom said “advocacy science always fails.” Are we not here to be advocates for MPAs and look to science to support our advocacy.

A: Tom Raftican: Often, when science advocates, its data matches its advocacy. Difficult line to getting good science as a result.

C: Gene: John Ogden advocates MPA and then gets the science in support of it.

A: John Ogden: Yes, but in the context of science and federal programs that are trying to tackle a problem that the nation has. One does not abdicate their rights as a citizen because they are scientist. There are times when you have to come to a personal decision about it.

Q: ?: How are all of your programs being applied to adapting to climate change that are going to be so important in the long-term?

A: Lauren: We are looking across all the MPA programs and their capacity building efforts to share resources.

A: Tom: Fishermen provide a source for tracking change.

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Q: ?: Have acoustics been planned for in the Ocean Observing System?

A: Barbara: What I presented was the basic “Ford Fairmont” and luxury packages can be added as can be afforded.

C: Billy: It is refreshing to hear someone like Tom Raftican from the recreational fishing community to work with and to even consider MPAs as part of the toolbox. We need to have more like him.

Q: Billy: Lauren, many of the large areas on your map of “MPAs” are actually “managed areas” that control things like fishing gear type, and are not strictly MPAs, but some have said this indicates much of the gulf is already “protected” by MPAs. Can we change the way MPAs are described by the MPA center?

A: First MPA Center used “marine managed areas,” but public process wanted to use MPAs. We should consider making subcategories of MPAs though. In reality only one half of one percent of the Gulf is “protected” by MPAs, but I recognize this gets lost in the way the MPAs are shown. We need to have a better way of getting the message across.

Q: Vicki Nichols: How can NOAA work around the contentious and emotional issue of “zoning” in the ocean?

A: Kathy: The problem comes with traditional uses in the ocean. CMSP process provides an open discussion of places and spaces in the ocean and allows people to determine how to best use the space, and whether zoning is part of that.

A: Tom: Much need for defining terms such as “zoning” and “MPA” to get around the problems that these terms create. Also, keep the discussions as a two-way street.

Q: Miles Croom: Is the value to society of just having undisturbed places in the ocean something that is part of the CMSP approach?

A: Kathy: Yes, it is something that should be considered. It is similar to the Native American communities on land and their spiritual connections to places.

A: Laurie Rounds: Certainly is part of the broad spectrum of uses that needs to be considered. This and the previous question speak for the need to have a wide participation in the CMSP process.

C: Jeb Berman: Budget challenges created by the political climate. To be successful will require significant public engagement and understanding of the value of the actions.

C: Barbara: The penalty phase of the Cleanwater Act will have funds that could be used for an ocean observing systems.

C: Tom: Legislation for decommissioning of oil platforms in California is used to establish an endowment to do science. This is a model for what could help fund efforts in the Gulf.

Breakout Sessions – Report Out

1. GOVERNANCE IN THE GULF

(Facilitator: **Barbara Lausche**, Mote Policy Institute)

Focus. This Group was asked to address the following: identify gaps in governance in the Gulf and how to improve Gulf governance; and make recommendations for the future.

General Discussion. The group began by discussing what is ‘governance’ – a concept that goes beyond ‘government’. This was important context for identifying gaps and areas for improvement. A two-pager on governance as defined by different international institutions was available for reference (Attachment 2). The following general points were made:

- two dimensions to governance: 1) who makes decisions (the formal and informal structures with powers to decide, e.g., governments, private sector, community leaders, resource users), and 2) how those decisions are made (this relates to principles of ‘good’ governance such as public participation, access to information, opportunity for stakeholders to make meaningful comments, etc.);
- another principle of good governance is that distribution of resources should be fair and equitable for those affected or involved;
- governance includes three tiers of formal instruments: policies, laws, and regulations.

Gaps in governance in the Gulf. The following points were highlighted:

- insufficient communication between government authorities and Gulf communities about the environmental, economic, and cultural values of the Gulf and how they are connected;
- communities do not fully understand the benefits they receive from well-functioning natural resources and ecosystems in the Gulf, and the potential impacts when its resources and ecosystems are not sustainably managed;
- there is not enough involvement of all stakeholders in programs or proposals for planning and managing the Gulf’s resources; in particular, oil and gas, and commercial and recreational fisheries;
- monitoring, evaluation, and enforcement of laws and regulations for existing marine protected areas and fisheries reserves do not have sufficient resources
- current laws for marine protected areas do not adequately control treasure hunting or address corridors and creating new sanctuaries or other marine protected areas;
- coordination and collaboration across public institutions at all levels (transnational, national, state, local) uneven and under-developed.

Key principles and areas for improving governance. The group identified several actions they felt were important for strengthening governance of the Gulf, particularly in view of the above gaps:

- provide more scientific information to local communities on a regular basis and in a form they can understand concerning the Gulf’s ecosystems and living resources and the importance of maintaining a healthy Gulf for the well-being of those communities;

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- to the extent possible, build on and strengthen existing laws and institutions to make needed improvements in the governance of the Gulf and its resources; creating entirely new laws and institutions in the current political environment may not be timely enough or feasible;
- continue to build on existing regional and Caribbean initiatives, including especially with Mexico and Cuba, because of the connectedness of those waters and natural resources with the Gulf;
- broaden stakeholder participation to include all stakeholders (e.g., oil and gas industries, industrial and recreational fisheries, academics, scientific institutions, NGOs) and build and expand partnerships with stakeholders for planning and implementing programs;
- increase financial and resource support for implementing existing marine protected areas and resource management programs in the Gulf;
- initiate more two-way communications between local resource users and government agencies, giving emphasis to bottom-up communications;
- strengthen monitoring and evaluation of existing MPAs in the Gulf (both protected fisheries areas and formal marine protected areas);
- promote and develop more coordination and collaboration among transnational, national, regional, state, and local agencies with planning, implementation, enforcement and monitoring of marine protected areas, and sustainable resource and ecosystem management in the Gulf.

Recommendations: The group considered that the gaps and areas for improvement identified during the discussion, as noted above, all translated into recommendations in their own right. In addition, the group singled out three main recommendations for emphasis in the group's report to the forum:

- Re-authorize the National Marine Sanctuaries Act using a robust public process and strengthen or improve this legislation where needed, especially to fill gaps in the MPA network for the Gulf;
- Strengthen the trilateral coordination and collaboration that has begun between the USA, Mexico, and Cuba with respect to management of the Gulf ocean waters and inter-connected aspects of the Caribbean Sea;
- Intensify efforts through all possible means, including education and communication, to build political support and enthusiasm at the constituent/community level for expanding the network of special ocean places and undertaking other conservation actions to maintain and, as needed, restore resource productivity and ecosystem services of the Gulf of Mexico.

2. SPECIAL FEATURES AND DIVERSITY IN THE GULF OF MEXICO

(Facilitator: **Dr. Jyotika Virmani**, Florida Institute of Oceanography)

Participants: Diana Webber; Amanda Demopoulos; Anni Dalglish; James Reinhardt; Clint Moore; Jackie Dixon; Karen Burns; Laurie Rounds; Matt Love; Thomas Shirley; Digna Rueda; Jim Culter; George Schmahl; (Chris Kellogg – notes submitted ahead of time).

Charge to the group: Make recommendations for the future.

- 1) What other areas/features need to be noted?
- 2) What areas/features do you feel deserve special consideration for ecosystem-level protection?
- 3) What characteristics warrant their consideration?

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Additional charges proposed by the facilitator:

- 1) Are there any areas that may eventually be eligible but we need more data – scientific, observational, economic, social, current governance?
- 2) Are there any areas that are important for protection, but may also be important for other uses e.g. oil and gas, ports, etc.
- 3) There are almost 300 MPA's of assorted protection levels in the Gulf – are there any that need beefing up? Do we want to add recommendations to change some areas? For example, almost 40% of the GOM are MPA but only 0.5% are no-take areas.

Captain Frank Wasson summed it up nicely:

- A. What are we protecting and what from? (don't overprotect)
- B. Why are you going to protect it?
- C. Have to have the ability to enforce your regulation, therefore need funds for science and regulation.

Comments from the Group regarding protection:

Seek protection for whale sharks at Afuera gathering. Limit number of boats at any given time and require propeller guards. This will minimize harassment and injury of sharks. (Needs enforcement)

Increased protection for Viosca Knoll, which is a HAPC. This is the greatest known concentration of *Lophelia pertusa* coral and site of the 2000 year old black corals, and this area provides larvae that may reseed parts of the Gulf and provides essential fish habitat from some commercial species, (orange roughy perhaps?). This is where the Royal Red Shrimp fishery is and there is evidence of fishing gear (nets, longline) and a number of trawlers go out into deeper waters. It is already protected from drilling by BOEMRE and too deep (300-500m) for diving or anchors.

Seek protection for large ship wrecks that we know have huge strands of Lophelia Coral growing on them (e.g. the Gulf Oil and the Gulf Penn). Thereby protecting not only the corals but also the archeological value of the shipwreck. BOEMRE protects from drilling and they are in depth >500m so they are protected from divers. Mostly impacted by salvagers and anchors but the main issue may be entanglement and damage from fishing gear (there is some fishing evidence at the Gulf Penn). However, archeological sites (of historical value) are not usually revealed, so maybe not all shipwrecks need protection.

Future needs: There is very little benthic info around Florida. We know about Pulley Ridge and Middle grounds, but there may be more out there. There are no really good maps available. The only pre-leasing data the oil and gas industry collects are in shallow waters. The Gulf Stream pipeline would have done some survey so there may be some information available there. We need to look at caves, springs etc. and determine their importance to the ecosystem, and maybe protect one or two such areas to begin with. They may be aggregation sites for amberjack and grouper off the Florida Shelf, carbon sinks, inputs for sulphur compounds. There is elevated chl. and Tube worms.

The Gulf of Mexico Fisheries Council is looking to protect The Edges, which connects Steamboat Lumps and Madison Swanson. This area is about 62m deep, parallel to the shore, near the Big Bend. They want it protected for gag grouper. There are big problems in the assessments for gag grouper. Other species

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would also be protected, including red grouper. It is a no-take area for benthic fishing. Fishermen currently can trawl at certain times of the year, but it is closed for bottom fishing. The proposition has gone out for scoping and is currently under Amendment 32, which means they are asking the public what they think.

We should protect the Ewing Bank area for Whale Sharks. No drilling is allowed here. Whale Sharks feed on bonita eggs, so it is also a bonita aggregation site, but we need more information on this area.

The Mississippi Canyon is a Bluefin Tuna spawning area, which is a really important to species to protect although the EU does not want to list it on CITES. It is also an area for Mississippi river outflow, so other spawning occurs there as well. This area should be protected during time periods of spawning, i.e. May and June. King Mackerel are there from April to September, Spanish Mackerel are there from April to Sept/Oct. Protecting from May to June would allow some protection for these species as well. Science question that we don't know the answer to is: What impacts Bluefin spawning in terms of fishing? We need this information before we know what size to protect. The problem is that May-June is also the time to fish for Bluefin Tuna because they have aggregated in this area, so it is also important for the fishing industry. The general region is already a big oil and gas production area.

There is no clear MPA we can identify for Sperm Whales because they migrate along the slope/shelf boundary of the Gulf and concentrate around the Mississippi Canyon. A lot of acoustics work has been done on Sperm Whales, what times of the year they are in Mississippi Canyon, what their migratory pathways are etc. We need to protect them as a species. We should, at least, protect female calves off the Mississippi Delta.

Every time USGS and other go out to look at corals in the Gulf, they make new discoveries. One site at 1370m depth had a 500 year old coral that has been affected by "some" event. It was 25mX25m in size. There are similar corals that occur at deeper depths. There are a lot of unanswered questions. Genetic analysis is ongoing about how these species are connected around the Gulf. We don't know where the source populations are to reseed these areas and a lot of effort is being made to identify these source populations. The deep corals are still unknown; we don't even know what species are out there. There are corals that grow close to seep environments, so it would be beneficial to protect some seeps because of their ecological significance. There are over 1600 seeps in the Gulf. We may need to protect those deeper areas from oil and gas development in those deeper areas, to protect source population areas. The hard bottom environments have the potential for corals and seeps, but not all such habitats have these.

The West Florida Slope has been studied and a number of species are thriving here. There are lots of crabs (e.g. Golden Crabs). Sections should be protected until the full ecosystem is known.

Pulley Ridge is currently a HAPC, which means there are some restrictions such as no anchoring, no trawling or bottom equipment. There is nothing in the GOM Fisheries Council to make it into a MPA at the moment. We would recommend a potential enhancement of existing protection, and put under the Sanctuaries Act if possible.

7 1/2 Fathom Reef off Texas is a fertile environment with lots of turtles, dense mat of polychaete tubes, fish etc. It is a small area, 500m in length, in 50 ft. of water. There are other similar ecosystem pockets in this general area of the Gulf. We should protect at least one so trawls don't damage it, and make it a "no-

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take” zone. However, this is also an important for commercial and recreational fisheries, so if we protect one or two of these reefs but allow access to the others, the protected ones can help to replenish nearby populations. There are deeper reefs, but they need more study.

More general discussion comments:

Just a note that under the OPA process, conservation is part of restoration.

An Ocean Observing System is important for ecosystem monitoring and protection. Money to include such an ocean observing system would include mapping, ship time for biological sampling, stock assessment, as well as environmental monitoring.

Maybe we could recommend that we protect say 15% of the Gulf for protection, and maybe rotate the protected areas every 5 years so the other areas could have a chance to recover. We could propose two tiers of protection. Tier 1: would be to protect our hotspots and recommendations. Tier 2: would be to take 15% of the Gulf, say 5% are deeper stations + 10% are shelf and slope regions and protect those on a rotating basis.

We need more research as to what is needed. This would allow us to protect communities we don't know much about.

Some migratory species such as King Mackerel, Spanish Mackerel, Sharks, Grouper are trans-boundary species, so we need to work more closely with our international neighbors to protect them.

There are a lot of questions concerning Sargassum as well. We don't know if this would be important for other species. We don't know if the sargassum in the Gulf is a healthy natural community. We might not have the right expertise at this table to talk about some sort of protection for Sargassum. It might be an active area of research rather than protection recommendation for now.

There are 2600 oil platforms in the Gulf. 100 are removed per year and about 50 are added per year because engineers expect platforms to last > 20-30 years, but >50 years and they might collapse. We need to have broad studies on the species that live around these man-made structures and their impact on fisheries. If there were no steel structures then what would fisheries look like out there. We need an evaluation on the robustness of fisheries because these structures are out there. We know that fishermen don't want all platforms to vanish In LA, they move old platforms into 300m depth. In TX they topple them, but they are not visible above water. We should leave some that are 20ft above sea level so we can instrument them.

3. UNDERSTANDING THE USES AND ECONOMICS OF THE GULF OF MEXICO (Facilitator: David Yoskowitz, HRI)

What socio-economic info is needed?

Recommendations:

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- Centralized information clearing house
- Spatial info on Gulf uses
- Socioeconomic costs of proposed MPAs and stakeholder impacts
- Reach-out to the public (primary). Public needs to understand. Use compelling images.
- Science-based
- Include cultural and spiritual values
- Why connectivity is important
- Address what people value
- Address potential concerns

What are the options for allowing oil and gas development in association with MPAs? As it is now, you can't drill directionally under a lease block that can't be leased. Removing this restriction could help to eliminate this concern by industry.

Recommendations to GCERTF:

- Take ecosystem services into account in evaluating restoration options.
- Advance protection of special places as a component of restoration.
- Protect resources as mitigation. Example: Protect freshwater inflow so they stay in the system (quantity and quality).

4. PERSPECTIVES AND VISIONS FOR PROTECTION OF THE GULF OF MEXICO

(Facilitator: **Vicki Nichols Goldstein**, Founder Colorado Ocean Coalition)

We began the session by discussing a NOAA map that had been shown in a previous presentation, which depicted 297 marine protected areas (MPAs). We agreed that many of these MPAs were not truly protected areas, but rather were places where U.S. fishery regulations are in place. That ignited a conversation that focused on, "What is protection and what is an MPA?" People strongly support MPAs and felt that if you have MPA designations, then you need clarity on goals, funding, monitoring, and enforcement. The group felt that a clear definition of MPAs is critical, since without this marine protected areas lose credibility and support.

The conversation shifted to how to implement MPA education and enforcement, focusing on the question, "How can we utilize the broader community to both help educate others and be the eyes and ears on the water?" The group agreed that conservation is culturally defined and in order to be effective, we need to understand regional differences. We were encouraged by Belizian efforts to incorporate local community members in education and enforcement as well as utilize cultural ties through family histories. This has broadened participation and connected communities with shared stewardship goals. We confirmed that we support community based education and stewardship partnerships to instill a cultural norm of compliance and monitoring where people are protecting ocean ecosystems as a way of life.

Recognizing that enforcement is a critical and often-difficult factor in managing MPAs, we discussed creative partnering with citizen and non-profit groups. Collaborating with innovative marine research and education programs can provide volunteer eyes and ears in regions where there are obstacles to agency monitoring and enforcement. However, this does not negate the fact that agencies mandated to enforce and protect MPAs should have high expectations and performance requirements for all staff. We support

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additional enforcement and monitoring funding so agency capabilities are in-place to improve the MPA system.

Our vision is to create awareness around important ocean ecosystems and publically identify the value. Culturally, we have a patriotic passion for National Parks as areas to be proud of. We hope to see the same values transferred to MPAs and encourage education efforts to link these marine treasures, with our majestic land icons. We should be conveying that, “even if we can’t see marine protected areas, they are there, and worthy of protection.” This effort should be a public campaign and includes schools, youth programs and community groups. Outreach should be extended inland to include watershed communities that have ties to the Gulf of Mexico. This could include teaming up with travel agents and community groups to arrange voyages and on the water experiences to potential and designated MPA areas that will help people realize the importance and value of these special places.

We also discussed watersheds and upstream activities on MPAs and agreed that those connections need to be highlighted locally as well as internationally. We had the benefit of an international group and everyone endorsed the need for governments to work together to prioritize resource protection. Ideas included staff and student exchanges between the countries, cross connections with US and Mexico federal and state agencies, and the need to determine clear and strong working relationships. Cross boundary cooperation for species and watershed protections and education should be prioritized and supported by both countries.

The group identified a number of opportunities:

- 1) Create a high-level commitment from both countries to look at existing authorities and forge a formal cooperative agreement.
- 2) Use the Gulf of Mexico Alliance or another body to expand state/federal/international efforts to establish a Marine Protected Areas Working Group.
- 3) Annually or biannually, reconvene the *Beyond the Horizons* group to maintain the efforts of “Creating a Network of Special Ocean Places to Strengthen the Ecology, Economy and Culture of the Gulf of Mexico”.
- 4) Establish a Task Force to implement the recommendations of *Beyond the Horizons*. This would include establishing a network of MPAs in the Gulf of Mexico, developing a communication plan, creating media and public outreach strategy, and articulating a vision for designing an international MPA network in the Gulf of Mexico.

In summary, our Vision for the Gulf of Mexico includes protection strategies, international cooperation, innovative community involvement, story-telling as a way of communicating, multi-faceted enforcement approaches and numerous opportunities to monitor our success.

Appendix 1

WHAT IS GOVERNANCE?

Barbara Lausche, Deputy Director, Marine Policy Institute, Mote Marine Laboratory

Governance is a main consideration for ensuring restoration and sustainability of the marine resources and ecosystem services of the wider Gulf of Mexico over the long-term.

The terms ‘governance’ and ‘good governance’ have been steadily entering policy and social discourse, particularly in relation to development. Apart from its recent popularity, the concept of governance is as old as human society. Simply put, governance refers to the process of decision making and the processes by which decisions are implemented (or not implemented). It is the means by which society defines goals and priorities, and advances cooperation. This broad meaning of governance has ‘government’ as only one of the actors. It embraces both the formal and informal actors involved in decision making and implementation, and both formal and informal structures that have been set in place to arrive at and implement decisions. It includes policies, laws, decrees, norms, instruments, institutions and processes—all the means by which society defines and achieves its goals and priorities. Governance has become an important concept in the context of societies’ relationships to their governments and the associated responsibilities of governments to the societies they represent.

While the concept has seen a surge of interest in recent years at the international and national levels, among academics, donors and civic organizations there is no internationally agreed definition. Some organizations have developed definitions useful for their own operations (see Box I-4).

Box I-4: Definitions of governance used by international organizations

African Development Bank

A process referring to the manner in which power is exercised in the management of the affairs of a nation, and its relations with other nations (AfDB, 2010).

Asian Development Bank

Governance is about the institutional environment in which citizens interact among themselves and with government agencies/officials (ADB, 1999).

Commission of the European Communities

Governance means rules, processes and behaviour that affect the way in which powers are exercised at European level, particularly as regards openness, participation, accountability, effectiveness and coherence (Commission of the European Communities, 2001).

Good Governance: As the concepts of human rights, democratization and democracy, the rule of law, civil society, decentralized power sharing, and sound public administration gain importance and relevance as a society develops into a more sophisticated political system, governance evolves

into good governance (Commission of the European Communities, 2003).

Council of the European Union

Good governance is the transparent and accountable management of human, natural, economic and financial resources for the purposes of equitable and sustainable development (Council of the European Union, 2003).

Organisation for Economic Co-operation and Development

Governance is the exercise of political, economic and administrative authority necessary to manage a nation's affairs (OECD, 2007).

United Nations Development Programme

Governance is the system of values, policies and institutions by which a society manages its economic, political and social affairs through interactions within and among the state, civil society and private sector. It is the way a society organises itself to make and implement decisions - achieving mutual understanding, agreement and action. It comprises the mechanisms and processes for citizens and groups to articulate their interests, mediate their differences, and exercise their legal rights and obligations. It is the rules, institutions and practices that set limits and provide incentives for individuals, organisations and firms. Governance, including its social, political and economic dimensions, operates at every level of human enterprise, be it the household, village, municipality, nation, region or globe (UNDP, 2007).

United Nations Economic and Social Commission for Asia and the Pacific

Governance means the process of decision-making and the process by which decisions are implemented, or not implemented. United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP, 2010).

World Bank

Governance consists of the traditions and institutions by which authority in a country is exercised. This includes the process by which governments are selected, monitored and replaced; the capacity of the government to effectively formulate and implement sound policies; and the respect of citizens and the state for the institutions that govern economic and social interactions among them (World Bank, 2009).

'Good Governance': Governance has two dimensions: quality of governance (how one governs) and type of governance (who governs). Key principles of 'good' governance are associated with 'how one governs'. Just as there is no single or exhaustive definition of 'governance', there is no single definition of 'good governance' in international law and policy. Nor is there a delineation of its scope that has universal acceptance. The term is used with great flexibility and is commonly defined in the context of the organization or individual doing the defining. In the broadest sense, as characterized by the UN Office of the High Commissioner for Human Rights, a test of good governance is the degree to which it delivers on the promise of human rights—civil, cultural, economic, political, social and environmental (see OHCHR, 2007).

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Good governance in government decision-making has been recognized as essential for sustainable development by such international policy instruments as the United Nations Millennium Declaration (2000) and the WSSD Plan of Implementation of (UN, 2002), and more recently it has been recognized by the Convention on Biological Diversity in the context of biodiversity conservation and protected areas management. Several governance principles, such as accountability, transparency, participation, rule of law and effectiveness, have been recognized by most major institutions involved in this issue. It should be noted that these organizations may have different formulations for their governance principles as well as for other principles considered within the scope of governance, for example, access to information and justice, and equity.

Appendix 2

SPEAKERS AND MODERATORS



STEPHEN A. BORTONE, Ph.D.

Dr. Stephen Bortone is Executive Director of the Gulf of Mexico Fishery Management Council. Dr. Bortone received the B.S. degree (Biology, 1968) from Albright College in Reading, PA; the M.S. degree (Biological Sciences, 1970) from Florida State University, Tallahassee; and the Ph.D. (Marine Science, 1973) from the University of North Carolina, Chapel Hill. For the past 45 years, he has conducted research on fisheries and the life history of aquatic organisms, especially fishes, chiefly in the southeastern U.S. and the Gulf of Mexico.

BILLY D. CAUSEY, Ph.D.

Billy Causey is the Southeast Regional Director for NOAA's National Marine Sanctuary Program and served as the Superintendent of Florida Keys National Marine Sanctuary from August 1991 to September 2, 2006. He has managed National Marine Sanctuaries in the Florida Keys since 1983. Billy is a marine biologist, specializing in coral reef ecology, with interest in MPA management and policy.



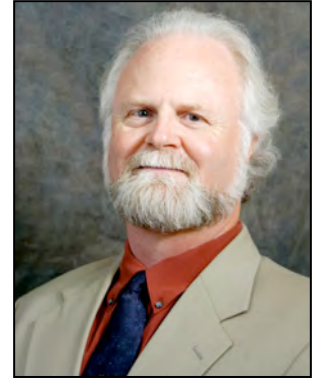
ROY CRABTREE, Ph.D.

Dr. Roy E. Crabtree has served as the regional administrator of NOAA Fisheries Service's Southeast Regional Office since January 2003. He has served these state and federal fishery management agencies for over 15 years, after beginning his career as a self-employed fishing guide in the Florida Keys and Everglades National Park.

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MICHAEL CROSBY, Ph.D

Dr. Crosby is Senior Vice President of Mote Marine Laboratory and has over 30 years of diverse research, teaching, science management and leadership endeavors. During a great deal of his career, he played an active role in directly leading national and international multi-disciplinary research programs, as well as developing national policy and administrative aspects for our country's science programs.



AMANDA W. J. DEMOPOULOS, Ph.D.



Dr. Amanda W.J. Demopoulos received her B.S. degree in Oceanography from the University of Washington-Seattle (1996) and a Ph.D. in Biological Oceanography from University of Hawaii-Manoa (2004). After her post-doctoral fellowship at Scripps Institution of Oceanography (2004-2006), she was hired into her current position as a Research Ecologist with the USGS Southeast Ecological Science Center in Gainesville, FL. Her research program spans from coastal wetlands to deep-sea environments, where she examines benthic invertebrate community structure and function, including food webs, and impacts of natural and anthropogenic disturbance on benthic

ecosystem health. Dr. Demopoulos is a principal investigator within the USGS Lophelia II project and chief scientist for the USGS Mid-Atlantic Canyons OCS project, and both projects fall under the USGS DISCOVERE program.

SYLVIA EARLE, Ph.D.

Dr Sylvia Earle is an oceanographer, explorer, author, lecturer and currently Explorer-in-Residence at the National Geographic Society. She is executive director for corporate and nonprofit organizations, including the Aspen Institute, the Conservation Fund, American Rivers, Mote Marine Laboratory, Duke University Marine Laboratory, Rutgers Institute for Marine Science, the Woods Hole Oceanographic Institution, National Marine Sanctuary Foundation, and Ocean Conservancy. Dr Earle is former chief scientist of NOAA, founder of the Mission Blue Foundation and chair of the Advisory Council for the Harte Research Institute for Gulf of Mexico Studies. She has a B.S. from Florida State University, an M.S. and a Ph.D. from Duke University, and 15 honorary degrees. She has authored more than 150 scientific, technical, and popular publications, lectured in more than 60 countries, and appeared in hundreds of television productions.





STEVE GITTINGS, Ph.D

Dr. Steve Gittings is Science Coordinator for NOAA's National Marine Sanctuary Program. He facilitates research in the nation's twelve marine sanctuaries, with emphasis on strategic planning, program development for regional and system-wide monitoring and research, and partnership building. Between 1992 and 1998 he was Manager of the Flower Garden Banks National Marine Sanctuary. Prior to 1992 he was an Assistant Research Scientist in the Geochemical and Environmental Research Group at Texas A&M University. He remains on the graduate faculty of Texas A&M.

VICKI NICHOLS GOLDSTEIN

Vicki Nichols Goldstein is the founder of Colorado Ocean Coalition. Vicki has worked in the non-profit and ocean conservation field for over twenty-five years addressing a multitude of issues including vessel traffic, sustainable seafood, and oil spill contingency plans. While working for NOAA she co-wrote the Monterey Bay National Marine Sanctuary Designation Documents. During her 10 years as ED of Save Our Shores, she initiated and organized the first Central California Fishermen's Forum on MPAs. She is a board member of the Blue Frontiers Campaign and recently formed the Colorado Ocean Coalition where she is protecting oceans from a mile high.



JOHN H. HANKINSON, JR

John H. Hankinson, Jr. is the executive director of the Gulf Coast Ecosystem Restoration Task Force, and brings more than 30 years of government service in environmental policy and regulation. From 1994-2001 he served as the Regional Administrator for EPA's southeastern regional office in Atlanta, covering eight southern states, directing a staff of almost 1200 people and a budget in excess of \$500 million.

ROBERT HUETER, Ph.D.

Dr. Robert Hueter is Senior Scientist and Director of Mote Marine Laboratory's Center for Shark Research. Bob's current research includes field and laboratory studies of life history, behavior, ecology, fisheries and conservation of sharks and rays in the Gulf of Mexico and Caribbean Sea.



WILLIAM E. KIENE, Ph.D.

Dr. Bill Kiene is Associate Science Coordinator for the Southeast, Gulf of Mexico and Caribbean Region of NOAA's Office of National Marine Sanctuaries. He has a 30-year international career in marine research, education and management, particularly in shallow and deepwater coral reef ecosystems. He has worked on marine science and conservation initiatives throughout the Pacific, Caribbean and Gulf of Mexico.

BARBARA KIRKPATRICK, Ph.D.

Dr. Barbara Kirkpatrick is a Board member for the Gulf of Mexico Ocean Observing System (GCOOS). Dr. Kirkpatrick is a senior scientist at Mote Marine Lab in the Environmental Health program. Her primary research focus is on the human health impacts from harmful algal blooms.



BARBARA LAUSCHE, J.D.

Barbara Lausche is Marine Policy Institute Deputy Director at Mote Marine Lab. She is an environmental lawyer with some 30 years of experience with governmental and non-governmental organizations in the US and abroad. Her work has concentrated on conservation aspects of environmental law including international law and, since 2000, her focus has been mainly on marine and coastal issues. She has extensive experience working with multidisciplinary teams of scientists in helping build institutional capacity and legal frameworks and also working with law and policy issues where environmental science plays an integral role.

KUMAR MAHADEVAN, Ph.D.

Dr. Kumar Mahadevan is President and CEO, Mote Marine Laboratory, Inc. Dr. Mahadevan joined Mote Marine Laboratory in 1978 and has served as CEO since 1986. Currently he manages an overall budget of \$18 million and supervises more than 191 professional staff, 33 of who have doctoral degrees, and 1,300 volunteers at the main campus and three field stations.



MELANIE McFIELD, Ph.D.

Dr. Melanie McField is the Director of the Healthy Reefs for Healthy People Initiative based in Belize City, Belize. She is employed by the Smithsonian Institution and serves on a number of national and international marine conservation and research committees, including the Council of the International Society of Reef Studies. Melanie has lived and worked in Belize since 1990; first as a field biologist with the Hol Chan Marine Reserve (and Peace Corps volunteer), then with and Coastal Zone Management Authority and Institute, and later with World Wildlife Fund. Melanie earned a PhD in 2001 at the College of Marine Science, University of South Florida, after receiving the first International Society of Reef Studies Coral Reef Ecosystem Science Fellowship for her dissertation research exploring the role of disturbance events and the impact of marine protected areas on coral reef community structure in Belize.

LARRY McKINNEY, Ph.D.

Dr. Larry McKinney is the Director of the Harte Research Institute for Gulf of Mexico Studies, at Texas A&M University-Corpus Christi. Prior to working at HRI, he was the Director of Aquatic Resources with the Texas Parks and Wildlife Service. In that position, Dr. McKinney was involved in various activities, working towards water quality and conservation in Texas, establishing sustainable fisheries in the Gulf and surrounding waters, guiding seagrass task forces, monitoring the health and status of Texas bays and estuaries, and performing other general resource protection activities.



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RICHARD McLAUGHLIN, Ph.D

Dr. Richard McLaughlin joined Harte Research Institute in June 2005. As the first of the Endowed Chairs to join the team, his knowledge of marine policy and legal issues including the international law of the sea, ocean energy policies, ocean governance, and marine ecosystem-based management provide an important context for application and integration of his colleagues' scientific findings. Incorporating well-developed public policy into scientific, economic, and social issues offers decision makers an added framework in which to work.

CLINT MOORE

Clint Moore is President of Moore American Resources LLC, and has worked on many oil & gas drilling projects across the offshore GOM for over 30 years. He's held positions from geoscientist to executive at four public companies: Anadarko, Diamond Shamrock, Murphy, and ION Geophysical. He's recommended and participated in the drilling of hundreds of wells offshore in the GOM, which resulted in the discovery and production of over half a billion barrels of oil & gas so far. He is oil & gas industry representative on the Flower Garden Banks National Marine Sanctuary Advisory Council, and Chairman of its Boundary Expansion Working Group.



JOHN C. OGDEN, Ph.D.

John Ogden is Emeritus Professor of Integrative Biology at the University of South Florida (USF). He was Director of the Florida Institute of Oceanography from 1988-2010. He serves on the boards of SeaWeb and the Florida Ocean Alliance and is a Fellow of the American Association for the Advancement of Science.

BONNIE J. PONWITH, Ph.D.

Dr. Bonnie Ponwith has been with NOAA since 1998 and became the Director of NOAA Fisheries Service's Southeast Fisheries Science Center in 2008. She and her interdisciplinary team of scientists conduct research and provide scientific advice to guide management and policy decisions on living marine resources and their habitats in the Gulf of Mexico, South Atlantic and Caribbean.





TOM RAFTICAN

Tom Raftican is a lifelong recreational boater, angler and diver actively involved in sportfishing restoration, education, promotion and conservation since the eighties. Tom is a founding member and president of The Sportfishing Conservancy and serves as president of United Anglers. In addition to these duties Tom represents the recreational angling community on the Marine Fish Advisory Committee, advising the Secretary of Commerce on fishery issues.

ANDY RADFORD

In 1996, Andy joined the API as a Drilling Standards Associate. Over the next 10 years Andy focused his work in the offshore arena, assuming responsibility for the Subsea Equipment and Offshore Structures subcommittees and selected offshore regulatory policy items, including coordinating industry's technical response to the Gulf of Mexico hurricanes of 2004 and 2005. In 2005, Andy was named Manager for Upstream Standards, and in 2007 moved into the Upstream Department as a Policy Advisor. Andy served as leader of the API Access Team, and is currently the Senior Policy Advisor for Offshore Issues where he provides policy guidance on offshore technology and exploration, development and production activities.



KIM RITCHIE, Ph.D.

Dr. Kim Ritchie is Senior Scientist and manager of the Marine Microbiology program at Mote Marine Laboratory, Florida. She is a molecular biologist investigating the microbial community structure of Florida coral reefs and its role in disease resistance. Her current studies include molecular-based characterizations of symbiotic microfauna in multiple coral species as well as culture-based studies on the production of anti-microbial and anti-fungal compounds produced by bacterial symbionts.

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M.E. ROLLE

M.E. Rollé is an Attorney-Advisor in NOAA's Office of General Counsel for Natural Resources (GCNR). She received her BA from the University of Wisconsin-Milwaukee, JD from the University of Wisconsin-Madison, and LLM in Environmental Law from Vermont Law School. Ms. Rolle has been with NOAA's Office of General Counsel for nine years. She spent five years with NOAA's Office of General Counsel for Ocean Services before moving to GCNR in July of 2007. In GCNR, Ms. Rolle handles Natural Resource Damage cases under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); the Oil Pollution Act (OPA); and the National Marine Sanctuaries Act (NMSA); and is part of the team handling the Deepwater Horizon Oil Spill case.

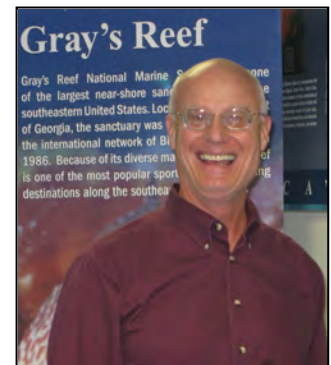


DIGNA RUEDA

Digna Rueda is a Marine Biologist (M.Sc. Universidad de Oriente, Venezuela) working on her Ph.D (Oceanography) characterizing the southern Caribbean upwelling system using satellite imagery (sea surface temperature, chlorophyll, sea-winds and sea surface height) at the Institute of Marine Remote Sensing (IMaRS), USF College of Marine Science.

GEORGE R. SEDBERRY

George Sedberry is Superintendent of Gray's Reef National Marine Sanctuary, one of 14 National Marine Sanctuaries and Monuments that protect special ocean places under U.S. jurisdiction. His interests and experience are in the biology, conservation and management of reef fishes and highly migratory oceanic fishes, as well as deep-sea biology and coral-reef ecology.



GEORGE P. ("G.P.") SCHMAHL

G.P. Schmahl is the superintendent of NOAA's Flower Garden Banks National Marine Sanctuary. As Sanctuary superintendent, he is involved with an array of Marine Protected Area management issues including research, education and resource protection. After obtaining a Masters degree in Zoology from the University of Georgia, G.P. held a variety of positions relating to marine research, coastal management, resource planning and environmental regulation. His primary interest is the ecology and management of coral reefs and associated ecosystems.

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THOMAS SHIRLEY, PhD

Dr. Tom Shirley was named HRI's Endowed Chair for Marine Biodiversity and Conservation Science in August 2005. He studies the systematic and ecology of marine organisms from the Arctic, Antarctic, Gulf of Mexico, Mediterranean, Philippines, and Alaska. He has been the Principal Investigator on 12 manned submersible projects, including the DSV Alvin, Pisces V, Delta and Deep Worker subs.



INIA SOTO

Inia Soto earned a bachelor's degree in Biology and Education at the University of Puerto Rico, a master's degree in Biological Oceanography from the University of South Florida, and is currently a Ph.D. candidate in Biological Oceanography at USF. Her research is focused on the use of satellite remote sensing to study coral reef ecosystems, physical connectivity and harmful algal blooms in the Gulf of Mexico. Inia's doctoral dissertation aims at understanding the frequency, geographical distribution, movement and connectivity of harmful algal blooms in the Gulf of Mexico.

PORFIRIO ALVAREZ TORRES, Ph.D.

Dr. Alvarez is currently the chief technical advisor and coordinator of the MEX-US Gulf of Mexico Large Marine Ecosystem program. He has worked in the public sector at the Ministry of Fisheries since 1983, served as General Director for Research in Aquaculture (1995-2001) at the National Fisheries Institute, and Director for Regional Integration at the Ministry of Environment and Natural Resources (SEMARNAT 2004-2009). Main achievements include the design and implementation of management strategies and policies for the conservation of marine resources and the integrated management of coastal areas. He developed the national environmental policy for oceans and coasts, lead the creation of the National Inter-ministerial Commission for the Sustainable Development of Oceans and Coasts (CIMARES). Lead the development of the Marine Spatial Planning process, particularly in the Gulf of Mexico and Caribbean Sea region. Dr Alvarez has represented Mexico and the Mexican government in several international forums and international conventions related to ocean, coastal and maritime affairs.





CATHY TORTORICI

Cathy has worked for the Federal Government – NMFS and the EPA - for 23 years. While at EPA Region VII, she served as the Missouri River Coordinator on water resource issues. She was first hired by NMFS’ Northwest Region as a Water Quality Policy Analyst and then became their Columbia River Estuary Coordinator, and served as the Branch Chief of the Oregon Coast/Lower Columbia River Branch. She was directly involved in estuary, nearshore and ocean related activities. Cathy now works for the SE Regional office of NMFS and is focused on

Gulf of Mexico restoration and recovery and coastal and marine spatial planning for the Gulf. Cathy holds a Bachelor’s degree in biology from the University of South Florida and Master’s degree in entomology from the University of Kansas.

JOHN W. (WES) TUNNELL, JR, Ph.D

Wes Tunnell is Associate Director of the Harte Research Institute for Gulf of Mexico Studies, Regents Professor, Fulbright Scholar, and Professor of Biology. He earned his Ph.D. from Texas A&M University (1974) in biology. Dr. Tunnell is a broadly trained marine biologist/ecologist, and his primary research interests lie in coral reef ecology of Mexican coral reefs, mollusks (seashells) of Texas, oil spill impacts, and most recently, biodiversity of the Gulf of Mexico.



JYOTIKA VIRMANI, Ph.D.

Jyotika has a B.Sc. (Hons.) degree in Physics from Imperial College, University of London and a M.S. in Atmospheric Science from SUNY at Stony Brook. In 2005 she received her Ph.D. in Physical Oceanography from the College of Marine Science, University of South Florida (USF) in St. Petersburg, Florida on Ocean-Atmosphere Interactions on the West Florida Shelf. After getting her Ph.D. in 2005, she continued working at the College of Marine Science, USF, as a Post-

Doctoral Research Associate, researching hurricanes, climate, and ocean circulation. In 2006 she took the position of Coordinator of the Florida Coastal Ocean Observing System Consortium, and became the Executive Director of the Consortium in 2007. She has recently taken the position as Associate Director of the Florida Institute of Oceanography.

CAPTAIN FRANK WASSON

Frank is the president and co-owner of Spree Expeditions, Inc, a liveaboard diving operator conducting operations on the Gulf of Mexico, Southeast Atlantic, and US Caribbean. Gulf of Mexico operations include charters to protected areas such as the Flower Garden Banks National Marine Sanctuary, Florida Keys National Marine Sanctuary, and Dry Tortugas National Park, as well as non-protected areas such as offshore Pensacola and the Florida Middle Grounds. He holds a Bachelor's degree in Environmental Science.



LAUREN WENSEL

Lauren Wenzel is the Acting Director of the National Marine Protected Areas Center at NOAA in Silver Spring, Maryland. The Center's mission is to develop an effective, comprehensive and representative national system of MPAs. Prior to her work at NOAA, she worked to develop and implement Chesapeake Bay nutrient reduction strategies and Smart Growth practices at the Maryland Department of Natural Resources.

DAVID YOSKOWITZ, Ph.D.

Dr. David Yoskowitz is the HRI Endowed Chair for Socio-Economics at the Harte Research Institute for Gulf of Mexico Studies and Professor of Economics in the College of Business, Texas A&M University-Corpus Christi. His work focuses on elucidating the link between environmental well-being and human well-being, and moving practice into policy.



RYAN YOUNG

Ryan Young is currently a graduate student at Florida Gulf Coast University studying Environmental Science. He earned his Bachelor's of Science at Florida State University in Environmental Studies in 2010. After working as a sea turtle monitoring intern in the summer of 2010 at Rookery Bay NERR in Naples, Florida, Ryan was offered a position working on a grant funded by the National Fish and Wildlife Foundation and the National MPA Center to coordinate the formation of a Marine Protected Area Network for the Gulf of Mexico.

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SALLY J. YOZELL

Sally Yozell is NOAA's Director of Policy and Senior Advisor to the Under Secretary of Commerce for Oceans and Atmosphere. She oversees a team that develops and evaluates policies, strategies, budgets and long-range plans for the Administration's initiatives as well as improvements to existing programs. She has led NOAA's policy efforts on Administration priorities such as National Ocean Policy, Coastal and Marine Spatial Planning, Gulf Coast Restoration, and climate change adaptation.

