

Testimony before the Committee on Transportation and Infrastructure, U.S. House of Representatives

RE: Restoring Jobs, Coastal Viability, and Economic Resilience in the Gulf of Mexico: H.R. 3096, the Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economics of the Gulf Coast States Act of 2011.

Robert H. Weisberg
Distinguished University Professor
Professor of Physical Oceanography
College of Marine Science
University of South Florida
St. Petersburg, FL 33701

December 7, 2011
(submitted December 5, 2011)

Honorable Representatives on the Committee on Transportation and Infrastructure, U.S. House of Representatives; participants, staff, and associates, it is my privilege to be here with you today to address the matter of establishing what damages occurred in the Gulf of Mexico coastal states as a result of the Deepwater Horizon oil spill for which compensation required under Section 1012 of the Oil Pollution Act of 1990 is not being received, and to comment on this as regards H.R. 3096, the Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economics of the Gulf Coast States Act of 2011.

While there is no doubt that the Deepwater Horizon oil spill was and continues to be very costly for the Gulf of Mexico coastal states, I must concur with the recent draft interim report by the National Research Council: "Approaches for Ecosystems Services Valuation for the Gulf of Mexico After the Deepwater Horizon Oil Spill" that the full impacts of the spill are unknown, expected to be considerable and will be expressed over years to decades. I must also question whether the provisions of H.R. 3096, as written, will facilitate, along the lines of an Ecosystems Services (defined as the benefits that people receive from ecosystems) approach advanced in the NRC interim report, arriving at a definitive answer on damages. Whereas I appreciate the intent of H.R. 3096, I find certain shortcomings that require discussion. I will attempt to explain these and offer suggestions for improvements on this topic, which is of great importance for the Gulf states and for the nation.

I found H.R. 3096 to be very precise with its definitions pertaining to administrative matters, but less precise with its definitions pertaining to matters of ecology, or more generally with matters pertaining to the workings of the ocean as a complex, multifaceted system. Definitions of geography, using maps and physical features, are simpler than definitions of natural processes that occur within a geographical setting. For instance, fisheries do not organize as simply as the Magnuson Stevens Act

“regional councils” are organized, nor by the boundaries of state and federal waters. More specifically, the Caribbean, Gulf of Mexico and the Southeastern United States are not separate large marine ecosystems because they are connected by the Loop Current, Florida Current, and Gulf Stream. Similarly, while three (or nine) mile limits may denote state waters as being separate from federal waters denoted by the offshore extent of the EEZ, fish spend portions of their life histories in both of these regions. Moreover, many commercial and recreational species also utilize the estuaries. Ecology is therefore all about connectivity, connectivity in space, time and across trophic levels.

Discussions of ecology (and therefore an ecosystems services evaluation of damages as recommended within the NRC draft interim report) must therefore begin with the ocean circulation, which unites nutrients with light, facilitating plant growth similar to how homeowners care for their lawns. Without the ocean circulation there would be drastically reduced primary and higher trophic level productivity. From these concepts it follows that the Gulf of Mexico is a very complex, multifaceted system that must be studied as a system if we are to better understand how it works, assess damages to it and facilitate improved environmental stewardship going forward. An automobile provides a useful analogy. With mechanical, electrical, and fuel systems, an automobile cannot be fixed if one does not know how its pieces work both individually and together as a system. H.R. 3096, albeit motivated by environmental assessment of damages and environmental stewardship, falls short of facilitating the defensible science necessary to establish how the Gulf of Mexico ocean system works and hence for achieving its goals.

An important theme repeated throughout H.R. 3096 references “projects and programs that would restore and protect natural resources, ecosystems, fisheries, marine and wildlife habitats, beaches, coastal wetlands and economy of the Gulf Coast.” Toward such end, a plan is to be developed, which includes and incorporates the findings and information prepared by the President’s Gulf Coast Restoration Task Force (preliminary report dated October 5, 2011). The Task Force Report itself lists four goals:

1. Restore and Conserve Habitat,
2. Restore Water Quality,
3. Replenish and Protect Living and Marine Resources, and
4. Enhance Community Resilience,

and major actions for achieving these goals are itemized. However, these actions are almost entirely directed toward regions peripheral to the Gulf of Mexico (river inflows, wetlands, marshes, beaches), versus the Gulf of Mexico itself. As such, they will not (in my opinion) lead to the desired results. For instance, the water quality at a particular beach oftentimes has nothing to do with what happened locally in the immediate vicinity of the beach. Instead, the water quality may be due to the transport of materials from the coastal ocean at points quite distant from the beach. Red tide along the west Florida shoreline offers a case in point; so does the movement of Gag Grouper larvae from adult spawning regions along the shelf break to the sea-grass beds either near-shore or within the estuaries. The reality is that few coastal ocean processes are local; most entail remote connections. If these connections are not understood, and thereby made predictable, then

the Task Force Report goals cannot be met. Even the order of oil deposition on the northern Gulf beaches followed certain rules of connectivity. Simply stated (and paraphrasing the Taylor-Proudman theorem), water originating over deep water isobaths (and the oil carried by it) tends to stay in deep water, and conversely for shallow water isobaths. It is for this reason that the Mississippi River Delta was the first landed area to be oiled (it extends out closest to deep water isobaths). It then took some 1.5 months for beaches in the vicinity of Pensacola Florida to be oiled next (Pensacola is located at the head of DeSoto Canyon where deep water isobaths again come close to the coast. With oil in shallow water off the coast of the Florida Panhandle, the beaches both to the east (to around Panama City Florida) and west (to Alabama and Mississippi) of Pensacola then received oil. There was a predictable progression based on the physics of the ocean circulation. But these concepts are neither included in the Task Force Report, nor in H.R. 3096, whose actions are to be guided the Task Force Report. Whereas a “robust scientific foundation” is referenced, the basis for such foundation is missing throughout most of the Task Force Report. An exception is toward the end under “Research Programs,” where it is stated that: “It is essential that monitoring, modeling, and research development activities are integrated from the initial stages of restoration and protection planning in order to support adaptive management decision-making.” While I agree (and may have influenced the inclusion of such language in that report), I cannot derive much confidence that this will occur in view of the short shrift given elsewhere to the study of the Gulf of Mexico as a complex, multifaceted system.

The shortcomings discussed above are reflected to some degree in the National Research Council draft interim report previously cited. The NRC report states, for instance, “A mechanistic understanding of and model for the complex linkages and interdependencies of the ecosystem being studied would be of immense value in analyzing ecosystems services.” Achieving this is neither simple, nor inexpensive nor short term. It requires a sustained, multidisciplinary approach to describing and understanding the workings of the Gulf of Mexico as a complex, multifaceted system. This will require a coordinated ocean observing and modeling program, a rationale for which now follows.

The coastal ocean is literally where society meets the sea. It is a complex, interconnected system, the workings of which must be understood if we are to predict the consequences of human actions and distinguish these from natural occurrences. Such understanding comes through adequate observations and hypothesis testing via science-based models; in other words, the application of the scientific method. Priority must therefore be given to implementing a coordinated, multidisciplinary program of coastal ocean observing and modeling, including the interactions that occur between the coastal ocean and the deep ocean and between the coastal ocean and the estuaries. That was the essence of my testimony before the U.S. House of Representatives Committee on Natural Resources, Subcommittee on Insular Affairs, the Oceans and Wildlife on 6/15/10 (at the height of the Deepwater Horizon oil spill), and it remains valid today. This is the pathway toward becoming better coastal ocean environmental stewards, and only in this manner will we be better prepared to deal with the ocean environmental consequences of future, unintended accidents such as the Deepwater Horizon oil spill.

In view of the above context, how should we be advancing our knowledge of the Gulf of Mexico? Two phrases taken from the present administration's approach to ocean sciences provide guidance. These are: Ecologically-Based-Management and Marine-Spatial-Planning. To accomplish these we must first ask what is meant by marine ecology and marine spatial planning? The key word in answer to this question is connectivity, connectivity across space and time and connectivity across trophic levels. In other words, we must understand how the ocean system works if we are to manage it, plan for its utilization, and predict consequences of human actions.

The ocean circulation is the fundamental determinant of connectivity. The circulation unites nutrients with light, fueling primary productivity and thence all higher level trophic interactions. The circulation also determines Earth's climate. Owing to these connections there is no aspect of Florida's economy that goes untouched by the ocean, and similar can be said to varying degrees for the other Gulf States.

The Gulf of Mexico consists of three interconnected regimes: 1) the deep-ocean, seaward from the shelf break (beyond which water depth plummets to the abyss), 2) the coastal ocean, which is the continental shelf region between the shelf break and the shoreline, and 3) the estuaries, where the rivers transition to the sea. The workings of the coastal ocean depend on the connections between these three regimes.

The deep Gulf of Mexico is governed by the Loop Current-Florida Current-Gulf Stream system, which connects the Caribbean, the Gulf of Mexico, and the Southeast United States. The coastal ocean is governed by local wind, heat and fresh water forcing and subtle deep-ocean and estuary interactions. The estuaries are governed by density differences between the river and ocean waters, with tides being important in how these waters mix. Thus, with different sub-system workings, we are challenged to understand and predict the workings of the overall Gulf of Mexico system. Nevertheless, the problem is tractable if approached in a systems-wide, scientifically defensible manner.

Where do we start? Whereas there are many societal relevant reasons for understanding the overall workings of the Gulf of Mexico, fisheries provide a rallying point because fisheries must integrate all of the sciences. Thus if we can understand fisheries well enough to engage in ecologically-based-management of fisheries resources (we presently do not) then we can also make application to harmful algal blooms, safe and efficient navigation, search and rescue, hurricanes, climate, and the tracking of hazardous spills such as occurred during the Deepwater Horizon event. In other words, to do fisheries right we must do all else right. Only then will we be in a position to engage in scientifically defensible marine-spatial-planning. All is predicated on understanding how the ocean system works and the connections thereof.

The problem is big, but there are guiding principles. First, we must combine extensive observations with science-based models. There can never be enough observations, and this requires models for integration; but, models, without observations, are nearly useless. The two must go hand in hand. Second, no single sensor (for

measuring state variables like temperature, salinity, velocity, nutrients, light, plankton, fish, bottom types and habitats, or other state properties) or sensor delivery systems (moorings, profilers, gliders, ships, side scan sonars, satellites, etc.) are adequate. A judicious mixture of these is needed, plus new technologies. Third, and similarly, no single model is adequate. In analogy to hurricane landfall prediction, we require an ensemble of models for ocean-atmosphere interactions, circulation, and the complex biological interactions that, together with the circulation, comprise ecology. There is much to do, and this requires many partners, each with individual expertise and brought together in a truly multidisciplinary, multi-institutional manner.

The starting point is with existing observing and modeling resources, which must be sustained and built upon. Numerical weather forecasting provides an example of how such approach can succeed. When first initiated in the 1950's, the results were terrible. But as observations were steadily added and sustained, model workings were better understood, and, as computational power increased, our ability to predict weather steadily improved to the point where most television viewers now eagerly await the evening report. The same can be applied to the development of ocean observing, modeling, and prediction systems for the Gulf of Mexico.

The time to do it is now, and the proceeds from compensation for the Deepwater Horizon oil spill required under Section 1012 of the Oil Pollution Act of 1990 provide the vehicle. Expertise for the required research and development is within the purview of the academic community and the private sector in support of the operational expertise of the state and federal agencies. The Gulf states, the nation and the associated industries and agencies all stand to benefit from empowering those who actually pioneered such studies and demonstrated performance through rigorous peer reviewed publications. This provides a starting point to be systematically added to in a capacity building endeavor. In other words, we need to sustain what is scientifically defensible and systematically add to these (observing, modeling and management) resources in a scientifically defensible manner.

All of the above can be accomplished (if scientific defensibility is mandated) within the framework of the Integrated Ocean Observing System (IOOS), which is broken into Regional Associations (RA), each with Regional Coastal Ocean Observing Systems (RCOOS). For the Gulf of Mexico there are two such RAs: SECOORA and GCOOS, with SECOORA extending from the westernmost portion of Florida to Cape Hatteras (i.e., it includes the entire State of Florida) and with GCOOS including the entire Gulf of Mexico. While these two entities cooperate, SECOORA is predicated on the fact that the Loop Current - Florida Current - Gulf Stream System provides the connectivity between the Caribbean, the Gulf of Mexico, and the Southeastern U.S. It is for this reason that the development of the RCOOS for the west coast of Florida is largely within the purview of SECOORA.

Given the economic, strategic, and societal value of the Gulf of Mexico, and the fact that much of the societal risk owing to commercial offshore activities (e.g., Deepwater Horizon oil spill) and tropical storms (e.g. Hurricane Katrina), funding for the

existing Gulf of Mexico through either SECOORA or GCOOS is disproportionately small and grossly inadequate. For instance, the 2010 annual budgets for different combined coastal regions within IOOS (see: <http://www.ioos.gov/partners/regional.html>) are:

- West Coast, \$10.1million
- Atlantic Coast, \$6.0 million
- Great Lakes, \$3.7 million
- Gulf Coast, \$1.4 million

Why the Gulf Coast, the coastal state region of the nation with the greatest present risk and where increased oil and gas exploration will focus in the future, has the fewest resources is questionable; but, regardless of previous actions, the need for remedy seems obvious.

Two other specific funding deficiencies of H.R. 3096 warrant mention. Whereas I readily recognize the need for funds utilization other than scientific research and development (the 35% and 60% distributions described in the bill), I am concerned about the level of funding identified with Gulf of Mexico research and development, in essence my preceding written testimony. Funding for this is specified at 5% of the Gulf Coast Restoration Trust Fund, and this is to be split equally between the “Program” and the “Fisheries and Ecosystems Endowment.”

The Program, entitled: the “Gulf Coast Ecosystems Restoration Science, Observation, Monitoring and Technology Program will have five Centers of Excellence, one in each of the Gulf coast states, and it will award competitive grants to be administrated by NOAA. The Centers of Excellence will have foci within at least one of the following five areas:

- Coastal and deltaic sustainability
- Coastal fisheries and wildlife ecosystem research and monitoring
- Offshore energy development
- Sustainable and resilient growth, economic and commercial development in the Gulf of Mexico
- Comprehensive observation, monitoring and mapping of the Gulf of Mexico

Of these five areas, the only one that partially gets to the heart of my testimony (the need for a comprehensive multifaceted systems-wide approach to how the Gulf of Mexico works) is the last one. With funds so diluted [$0.8 \times 0.05 \times 0.5 \times 0.2 = 0.004$], even if the penalty monies amounted to 20B there would only be some 16M per state, and with only a small percentage to be used each year to ensure funds in perpetuity (for instance, using a 0.05 expenditure rate per year) this would result in 0.8M to be spent by each state. In the event that only 2B is available then the amount per year for each state would be some 80K, hardly enough to do much of any comprehensive observation, monitoring and mapping of the Gulf of Mexico (plus the necessary modeling that must be coordinated with the observations to fully employ the scientific method). My point is that a higher

percentage of the penalty monies must be apportioned toward understanding how the Gulf of Mexico works so that we can better assess long term damages, become better environmental stewards and be better prepared for any future unintended events. Moreover, the emphasis for the Centers of Excellence must be placed where it belongs (a comprehensive, multidisciplinary, systems-wide approach to the workings of the Gulf of Mexico), not diluted by ancillary verbiage.

The Fisheries and Ecosystem Endowment, in my opinion, is equally troublesome. Throughout my testimony I emphasized the need to understand how the Gulf of Mexico works. I even used fisheries as an example: if we can understand and predict the fish, we must be able to understand and predict many other aspects of the Gulf of Mexico. But we cannot understand the fish by merely studying the fish. We must instead study the fish in the context of the more complex system in which they make their living. The problem is one of state variable estimation with the fish being but one of the state variables (velocity, sea level, temperature, salinity, nutrients, phytoplankton, zooplankton, fish, etc.), and with the fish depending on all of these.

As a remedy to the concerns provided above, I am suggesting two modifications. The first is to substantially increase the percentage of penalty money to be provided for long term research and development specifically targeted at developing a comprehensive, multifaceted program of research and development for the Gulf of Mexico as a system. Such program would include scientifically defensible, coordinated observing and modeling elements, beginning with the ocean circulation and hence the connections that exist between the deep Gulf of Mexico and the continental shelf and between the continental shelf and the estuaries, and continuing with all of the trophic level interactions that comprise the ecosystem, or ecosystems. The second is to remove preconceptions and preconditions on how these monies are to be spent, other than mandating that they be used in a scientifically defensible manner to be developed by a science steering committee selected from amongst the academic community, with input from the agencies. Business as usual will not be helpful. It will be possible to generate plans within 180 days as asked for in H.R. 3096, but these plans must be generated with inputs from by those who are familiar with the science and who have demonstrated commitment (by their own actions), productivity (by publications in refereed professional journals) and understanding (through their contributions to how the Gulf of Mexico and its sub-regimes work). To do this there can be no disqualification of those serving on a science steering committee from engaging in the science being proposed. Perceived conflict of interest should not preclude getting the right people to engage.

My intention is not to be critical of the task forces charged, the agencies engaged or the drafters of a bill having laudable intent. Becoming better versed in the workings of our complex natural environment will not only make us better stewards of the environment, but will also help to facilitate the competing utilizations of environmental resources in ways that will best serve the Gulf coast states and the nation.

I thank you for your invitation to speak and for you attention.