



CAPITOL HILL  
OCEANS WEEK

— 2004 —

**Summary Report**



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## Symposium Overview

Capitol Hill Oceans Week 2004, a two-day, bi-partisan symposium designed to highlight ocean issues, was held on Capitol Hill June 9-10, 2004. The event brought together a wide-range of stakeholders to discuss issues relevant to managing marine resources, exploring and monitoring the ocean, and educating the public about the importance of the marine environment. Speakers included Members of Congress, representatives of the Executive Branch, other government entities, industry, academia, and nonprofit organizations.

The first day, entitled "Managing Our Marine Resources," focused on ecosystem-based management with panelists addressing topics, including *What is an Ecosystem and Why is it Important*, *Managing Multiple Uses of Ocean Resources*, and *Strategies for Success: Managing for the Future*. The second day, entitled "Wonders of the Ocean World: Exploring, Monitoring and Educating," focused on a wider range of issues with panelists addressing topics, including *Exploring Our Oceans; Observing, Monitoring and Managing Ocean Data*; and *Creating an Ocean Literate Society*. Panelists were asked to keep in mind the reports of the U.S. Commission on Ocean Policy and the Pew Oceans Commission. Several of the panelists had served on one of the two commissions.

This summary report captures the highlights of all of the panelists' presentations, as well as their challenges and recommendations, many of which were a result of one or the commission other reports. (For a full transcript of the symposium go to [www.NMSFocean.org](http://www.NMSFocean.org).)

Capitol Hill Oceans Week was hosted by the National Marine Sanctuary Foundation in partnership with members of the Senate Commerce, Science and Transportation Committee; the House Science Committee; and the House Oceans Caucus. Federal partners included the Department of the Interior's Minerals Management Service; the Office of Water at the U.S. Environmental Protection Agency; and several National Oceanic and Atmospheric

Administration offices, including the National Marine Sanctuary Program and the Office of Ocean Exploration.

The National Marine Sanctuary Foundation is grateful for the support of the many sponsors of Capitol Hill Oceans Week, including:

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# Day One

## Managing Our Marine Resources

“In the end, we conserve only what we love. We will love only what we understand. We will understand only what we are taught.”

**Baba Dioum, Senegalese poet**



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## What is an Ecosystem and Why is it Important?

**Moderator: Mr. Daniel J. Basta**, Director, National Marine Sanctuary Program

**Panelists: Dr. Andrew Rosenberg**, Professor, Institute for the Study of Earth, Oceans, and Space, University of New Hampshire

**Mr. Dave Fluharty**, Associate Professor, School of Marine Affairs, University of Washington

**Dr. Jeffrey M. Reutter**, Director, Ohio Sea Grant College Program, Ohio State University

**Dr. Jane Lubchenco**, Distinguished Professor of Zoology, Oregon State University

### Panel Overview

Panelists discussed both the scientific definition as well as the socio-economic valuation of ecosystems. Panelists also addressed the importance of managing marine resources from an ecosystem perspective.

**DAN BASTA:** Mr. Basta provided a framework for the discussion of ecosystems by posing the questions: “What is an Ecosystem?,” “Why do I care?,” and “How does it relate to the fundamental issues of problem solving and governance?” He noted that knowledge of ecosystems is not total and complete and that we need a better operational understanding of ecosystems in order to improve management and governance. He further pointed out that ecosystems are a hierarchy—systems within systems that operate in a synergistic way. “Ecosystems are dynamic elements of nature. Their spatial boundaries vary over time in three dimensions...so it is a fairly complex process of organizing geography, space, and time.” Mr. Basta further stated, “We don’t manage ecosystems anyway. We never have; we never will. We manage people... So it is equally important as we go through this process that we clearly understand how people and communities organize themselves.”

**ANDY ROSENBERG:** Dr. Rosenberg shared his perspective as both a member of the U.S. Commission on Ocean Policy, and as Professor at the Institute for the Study of Earth, Oceans, and Space at the University of New Hampshire. Dr. Rosenberg defined ecosystem management as “multi-species and across physical boundaries, including watersheds, oceans and coastal regions, not just looking at localized management issues for a single sector.” Dr. Rosenberg noted that in order to gain further knowledge about the impacts of human activities in marine ecosystems both main effects and ‘second order’ effects must be examined. Dr. Rosenberg further noted that, with the exception of some natural impacts, the loss of fishery resources is due to poor management. To address this challenge, an appropriate governance structure such as that recommended in the U.S. Commission on Ocean Policy is needed. Dr. Rosenberg further recommended reviewing current pieces of legislation, such as the National Marine Sanctuary Act and various fisheries legislation, and cross-referencing their resulting actions in order to get a more coherent overall picture.

**DAVE FLUHARTY:** Professor Fluharty shared his perspective as a voting member of the North Pacific Fishery Management Council (1984-2003) and as Associate Professor of Marine Affairs at the University of Washington. Professor Fluharty defined good fishery management as preventing overfishing, enforcing regulations, accurately monitoring harvest, monitoring bycatch and applying those bycatch to total allowable catch. Fluharty used Alaska as a positive example noting that science is integrated into management, conservation and allocation decisions. Fluharty noted that “shifting to an ecosystem-based approach means fish stocks will be managed for abundance and not scarcity.”

**JEFF REUTTER:** Dr. Reutter shared his perspective as a Great Lakes expert and as the Director of the Ohio Sea Grant College Program. Dr. Reutter defined biology as “the science of life,” ecology as the “science of interrelationships between living organisms and their environment,” populations as “groups of the same kind of organisms (species),” and community (or biotic community) as “all of the populations occupying a given area.” The community or biotic component interacts with the non-living or abiotic, physical environment as an ecological system or “ecosystem.” In ecosystem management, attempts are made to manipulate the populations and the abiotic environment to achieve desired outcomes. To be successful, we must understand the biology and life history of each species and their needs and movements throughout their life cycles. We must also understand the impact of environmental alterations on each species. Dr. Reutter showed how successful ecosystem management allowed Lake Erie to go from being the poster child for pollution problems in this country in the 1970s (the Cuyahoga River burned in 1969), to one of the best examples in the world of ecosystem recovery. This recovery was brought about by managing both the physical environment and fish populations and allowed the annual Ohio walleye harvest to increase from 112,000 to 5 million with an annual economic value of \$650 million. Small businesses expanded from 34 to 1200 as a result of the improvement in the ecosystem. The zebra mussel then invaded, altered the ecosystem, and reduced the value of the walleye fishery to about \$250 million.

**JANE LUBCHENCO:** Dr. Lubchenco shared her perspective as a member of the Pew Oceans Commission and as the Distinguished Professor of Zoology at Oregon State University. Dr. Lubchenco opened with a “message of hope” noting, “ecosystem-based management is a mechanism to tap into the natural resilience of nature to recover much of the bounty that has been lost and restore balance.” Dr. Lubchenco further stated, “If we want healthy fisheries, we have to have a healthy, intact, resilient ecosystem. If we want vibrant coastal communities, if we want clean beaches, abundant wildlife, healthy seafood...all of those depend on having intact, functional, resilient ecosystems.” Dr. Lubchenco noted that if social and economic goals are to be achieved, it is necessary to give priority to ecological goals. When priority is given to maintaining the resilience, health and diversity of marine ecosystems, then those ecosystems will provide the goods and services that further economic and social goals. “It takes an ecosystem to produce a fish.” Using the Partnership for Interdisciplinary Studies of Coastal Oceans as an example, Dr. Lubchenco advocated cross-disciplinary approaches to research that incorporate ecologists, oceanographers, molecular biologists, physical oceanographers and others in the process.

## **CHALLENGES**

- Ecosystem-based management has only recently been defined, and is still poorly understood.
- Resource management is not coordinated.
- With more scientific information, more progress could be made.
- Artificial boundaries, such as political jurisdictions, are not consistent with ecosystem ‘boundaries.’
- Enthusiasm is being generated for taking action on ocean issues, but people are often unclear on WHAT actions to take.
- Research has been ‘atomized,’ not integrated. Ecosystem-based management needs to include more than just biology.
- There is very little long-term monitoring, so little knowledge is gained of how things change over time.

## RECOMMENDATIONS

- Look at management systems on a regional basis, focusing on Large Marine Ecosystems, and using national goals.\*
  - Create a National Ocean Council charged with implementing national ocean policy.\*
  - Manage for resilience, not just a specific static state—build an ‘insurance’ cushion into the equation since management will never be done perfectly.
  - Make more and better use of marine reserves as a management tool.
  - Ecological, social and economic factors should not automatically be considered on an equal footing as social and economic goals. The former must proceed the latter two and, when done appropriately will contribute to economic and social success.
  - Utilize the recommendations in both the Pew Ocean Commission and U.S. Commission on Ocean Policy reports to provide specific actions for the public to take to help promote marine conservation.
- \* Denotes reference to a recommendation in the U.S. Commission on Ocean Policy Report and/or the Pew Oceans Commission Report

## Managing Multiple Uses of Ocean Resources

**Moderator:** Mr. Tom Fry, President, National Ocean Industries Association

**Panelists:** Dr. Walter D. Cruickshank, Deputy Director, Minerals Management Service  
Capt. David MacFarland, PORTS Program Manager, NOAA National Ocean Service  
Mr. Patten D. White, CEO, Maine Lobstermen’s Association  
Mr. Roger T. Rufe, Jr., President and CEO, The Ocean Conservancy

### Panel Overview

Panelists discussed current ‘uses’ of the ocean ranging from energy to conservation, and from commercial and recreational fishing to commercial and recreational boating.

**TOM FRY:** Mr. Fry provided a framework for the discussion by posing the questions “What is multiple use and what do we mean by multiple use?” and “What are the economic benefits that come from the ocean?” Mr. Fry stated, “As we look to the oceans in the future we’re going to have to start thinking about how we complement the different uses for the oceans and also protect the oceans.” He noted that the area of responsibility is large—the Exclusive Economic Zone (EEZ) extends to 200 miles off shore, an area that is 30 percent larger than the entire land mass of the United States.

**WALTER CRUICKSHANK:** Dr. Cruickshank shared his perspective as the Deputy Director of the Minerals Management Service, the federal agency charged with managing mineral exploration and development activities, such as oil and gas leases, in U.S. federal waters. Dr. Cruickshank noted that currently the Outer Continental Shelf (OCS) accounts for approximately one-quarter of the natural gas produced in the U.S. and more than 30 percent of the oil. As underwater drilling technology improves, Dr. Cruickshank predicts that the OCS share of domestic oil production will rise by another 10 percent in the next several years. In addition to oil and gas leases, the Minerals Management Service is also responsible for managing sand, gravel and other minerals. Dr. Cruickshank noted that beach renourishment, barrier island restoration, and coastal wetland protection are among the uses for offshore sand. Another management issue facing the MMS and other agencies is the growing

demand to use the oceans and seabed for a variety of activities, potentially creating conflicts among competing uses. A subset of this issue is the growing potential to convert inactive oil and gas platforms to other uses instead of decommissioning them. Other uses for these structures, including as artificial reefs and as monitoring and/or research stations, can in some cases provide more benefits to the public than dismantling and scrapping.

**DAVE Mac FARLAND:** Captain MacFarland shared his perspective as the manager of NOAA's PORTS program, which provides real-time data to a variety of marine users. Captain MacFarland stated, "Marine transportation can be thought of as a highway system around the world," and noted there are 25,000 miles of navigable channels in the U.S., with more than 300 public and private ports, supporting 13 million jobs, which constitutes three-quarters of a trillion dollars of U.S. Gross Domestic Product. In the recreational arena, Captain MacFarland noted that there are some 78 million boaters who spend an average of \$26 billion annually.

**PAT WHITE:** Mr. White shared his perspective as a member of the Pew Oceans Commission and as the CEO of the Maine Lobstermen's Association. Mr. White noted "Fishing communities are as diverse as the people in them...small lobster boats in Maine to large factory trawlers in Alaska, the lone fisherman on the side of a river to the huge, expensive sport fishing boats. One of the things we all have in common is the challenge of catching fish." Mr. White further noted that "the punishment system of management has not worked. Our industry is composed of some very conscientious and talented people. Rewarding fishermen for modifying gear and changing fishing practices which reduce mortality, as well as adverse impacts on habitat, would be far more successful." Mr. White also encouraged residents of inland areas to embrace a stronger ocean ethic, noting that inland river systems all connect to the ocean. "Every state is a coastal state, and every town is a coastal town because it all affects what happens to us out there in the ocean."

**ROGER RUFÉ:** Mr. Rufe shared his perspective as a member of the Pew Oceans Commission and as the President and CEO of The Ocean Conservancy. Mr. Rufe stated, "We need a new ocean ethic, an ocean ethic that's based on managing this largest of our natural resources in the public trust for the common good of all of us...we need to shift the burden of proof. I think for too long we assumed that, unless forbidden, that the oceans were open to everybody." Mr. Rufe introduced the concept of marine zoning, noting that certain activities, such as bottom-trawling, should be prohibited in certain areas. Mr. Rufe also highlighted the existence of marine sanctuaries as an example of marine zoning in action and suggested that as new ocean policies are implemented that sanctuaries are a good place to start strengthening protection

## **CHALLENGES**

- There are multiple uses of ocean resources, sometimes in conflict with each other.
- Marine transportation is expected to double in the next 20 years.
- Much of the U.S. infrastructure that supports marine transportation is crumbling.
- Concerns about safety and security are increasing.
- As ships continue to get bigger, more accommodations will need to be made—both in terms of harbor size and depth, and also in the infrastructure (highways etc.) used to offload and distribute those goods.
- Overfishing is only part of the problem—there are many factors contributing to the decline of the oceans.
- There are an increasing number of dead zones developing off the coasts each year, due, in part, to agricultural runoff.

- As more people move to the coastal zone, more chemically fertilized lawns are created, allowing the leaching of fertilizers and pesticides into the waterways.

## RECOMMENDATIONS

- More dredging of ports is necessary.
- Increase investment in technology for tools such as electronic navigational charts.
- Pollution run-off from land-based sources of marine pollution must be reduced.
- Steps must be taken to reduce the introduction of invasive species.
- Marine reserves must be established to protect fragile habitats in areas of national significance.
- More money is needed for ocean research and exploration.

## Strategies for Success: Managing for the Future

**Moderator:** Mr. John Berry, Executive Director of the National Fish and Wildlife Foundation

**Panelists:** Mr. Christophe Tulou, President, Center for SeaChange  
Mr. Michael Crye, President, International Council of Cruise Lines  
Mr. Glenn Prickett, Executive Director, Center for Environmental Leadership and Business, Conservation International  
Mr. Mike Shapiro, Deputy Assistant Administrator for Water, U.S. Environmental Protection Agency  
Mr. Bill Douros, Superintendent, Monterey Bay National Marine Sanctuary  
Mr. Paul Sandifer, Senior Scientist, NOAA National Center for Coastal Ocean Science

### Panel Overview

Panelists discussed how ecosystem management could be approached in the future, sharing recommendations from the U.S. Commission on Ocean Policy and the Pew Oceans Commission reports. Panelists also discussed current examples of successful ecosystem management efforts. (Note: this session was interrupted by an unexpected evacuation of Capitol Hill. Presentations by Bill Douros and Paul Sandifer were made the following day. Mike Shapiro was unable to make his presentation due to these extenuating circumstances.)

**JOHN BERRY:** Mr. Berry provided a framework for the discussion by posing the question “How do we best engage our involvement through our ecosystems, through our management practices, so that we can co-exist with the wild world—the wildlife and the fish—so that we AND the fish gain the benefits and the resources that flow from it?” Mr. Berry noted that the National Fish and Wildlife Foundation focuses much of its grant making efforts on developing and supporting new management practices and market-based approaches that highlight improvements in ecosystem functions.

**CHRISTOPHE TULOUL:** Mr. Tulou shared his perspective as the former staff director for the Pew Oceans Commission and as President of the Center for SeaChange, which was created as a result of the Commission’s report. Mr. Tulou summed up the challenges facing the ocean with one simple formula, “We’re taking more out of the ocean than it can replace, and we’re putting more in the ocean than it can assimilate.” On the positive side of the equation, Mr. Tulou noted that the public’s potential to engage in these issues is enormous. “Over half of

us live on our coastlines, and the other half, it seems, comes to visit during the summer” he stated, “thus providing extraordinary potential power for change.”

**MICHAEL CRYE and GLENN PRICKETT:** Mr. Crye, President of the International Council of Cruise Lines, stressed the commitment of the cruise lines to the protection and preservation of the marine environment, and outlined the environmental initiatives that the ICCL member cruise lines have taken to date; in particular, the adoption in 2001 of voluntary Waste Management Practices and Procedures for onboard waste streams. He then shared his perspective of a new partnership that ICCL had formed with Conservation International’s Center for Environmental Leadership and Business to look at how the cruise ship industry can manage for success in the future. Mr. Prickett shared his perspective as the head of the latter organization. Mr. Prickett stated that, “Some of the regions [of the world] that are most important to us from a biodiversity standpoint are also the most important to industry from a business standpoint.” Mr. Prickett noted that partnerships with local governments and business around the world, are critical to achieving this goal. Tourism, specifically cruise ships, are an important place to start examining how economics and ecology can begin to work more harmoniously. Mr. Prickett noted that the partnership with the cruise industry has several goals—including review of waste water management practices and examining the environmental impacts of the tourists that come into ports—especially in the developing world. (NOTE: Mr. Prickett’s presentation was interrupted due to the evacuation of Capitol Hill.)

**MIKE SHAPIRO:** (NOTE: Mr. Shapiro was unable to make his presentation due to the evacuation of Capitol Hill.)

**BILL DOUROS:** Mr. Douros shared his perspective as Superintendent of the Monterey Bay National Marine Sanctuary, which, as the largest of the national marine sanctuaries, encompasses numerous governmental jurisdictions and a large variety of constituents and users of sanctuary resources. Mr. Douros highlighted the value of partnerships when managing from an ecosystem-based approach, noting the existence of the Sanctuary Advisory Council, which represents the perspectives of a variety of users. Whether it be dealing with vessel traffic issues or kelp harvesting, Mr. Douros noted the value of these partnerships in management decisions—especially in terms of buy-in when the ultimate decision is made.

**PAUL SANDIFER:** Dr. Sandifer shared his perspective as a member of the U.S. Commission on Ocean Policy and as Senior Scientist at NOAA’s National Centers for Coastal Ocean Science. Dr. Sandifer noted that finding more successful strategies for management in the future is critical given that more than half the nation’s GDP is created in the coastal zone and more than half the population lives in the coastal zone. He further noted that successful strategies need to consider both land and ocean-based resources and the implications of uses in each are inter-related. Successful strategies will involve adaptive management, public participation in governance at all levels, and accountability for individual as well as collective actions. Dr. Sandifer noted, “The largest threat to maintaining diversity on all three scales—the genetic level, the species level and the ecosystem level—are human impacts and those are things that we CAN DO something about.” He outlined a seven-point process for moving the country toward ecosystem-based management via establishment of common, scientifically-defined eco-regions that connect inland reaches of watersheds to coastal and ocean environments.

## **CHALLENGES**

- Development in the coastal zone has resulted in the paving over of critical coastal habitats and watersheds.
- More resources (primarily fish stocks) are being taken out of the ocean than can be replaced.

- Natural resource management often occurs in response to a crisis, resulting in public policies that may be enacted too late to address the core problem.
- Ocean policy is ad hoc and disjointed. There are more than 140 federal statutes dealing with operations, activities and conditions of the coast.
- Conservation of biodiversity and natural resources needs to be made more compatible with economic development.
- Water quality is generally poor—two-thirds of our estuaries are moderately or severely degraded by nutrient pollution.

## **RECOMMENDATIONS**

- Create the nation's first comprehensive ocean policy.\*
- Inspire, educate and activate the American people.
- Create more integrated long-term monitoring programs like the Monterey Bay National Marine Sanctuary's SIMON program.
- Move away from current single-focus restrictive management to a more adaptive approach that takes new information into account.\*
- Motivate people to participate in the governance process at all levels.
- Create a national coordinating council to deal with governance and ocean policy issues.\*
- Identify and create eco-regions.\*
- Double the investment in science and research to support better decision making.\*
- Invest in and implement a comprehensive ocean observing system.\*
- Direct the relevant federal agencies to coordinate their activities on an ecosystem basis, with a goal of protecting, maintaining and restoring the health of marine ecosystems.\*

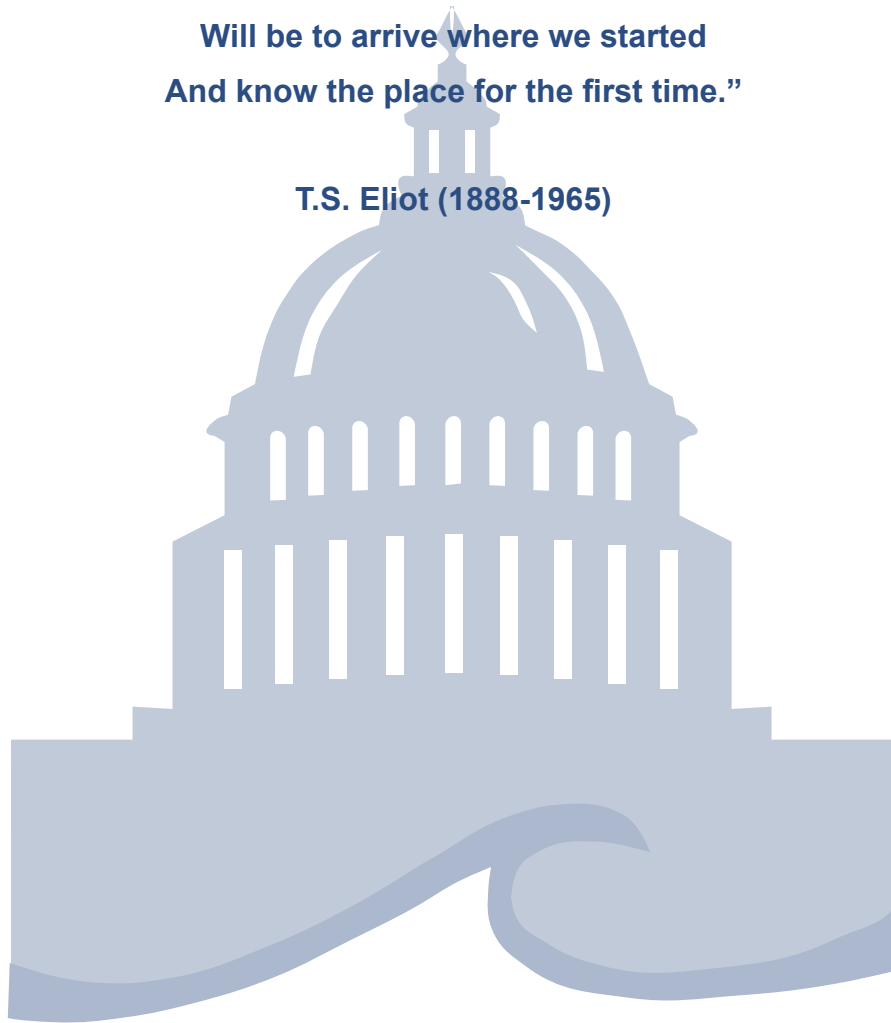
\* Denotes reference to a recommendation in the U.S. Commission on Ocean Policy Report and/or the Pew Oceans Commission Report

# **Day Two**

## **Wonders of the Ocean World: Exploring, Monitoring and Education**

**“We shall not cease from exploration  
And the end of all our exploring  
Will be to arrive where we started  
And know the place for the first time.”**

**T.S. Eliot (1888-1965)**



# CAPITOL HILL OCEANS WEEK

———— 2004 ————

## Exploring Our Oceans

**Moderator:** Dr. Steve Hammond, Chief Scientist, NOAA Office of Ocean Exploration

**Panelists:** Dr. Larry Mayer, Director, Center for Coastal and Ocean Mapping, University of New Hampshire

Dr. Bob Embley, Senior Scientist, NOAA Pacific Marine Environmental Laboratory

Dr. Jim Kendall, Chief Scientist, Minerals Management Service

Mr. Paul Kelly, Senior Vice President, Rowan Companies

### Panel Overview

Panelists addressed a variety of aspects of ocean exploration, from the latest results of the exciting 'Ring of Fire' expedition, to collaborative efforts with industry, to mapping previously uncharted waters.

**STEVE HAMMOND:** Dr. Hammond provided a framework for the discussion by noting that the ocean is not well understood, whether from a charting perspective, or the physical, chemical and biological processes that take place within it. Panelists were asked to participate based on their experiences with various aspects of ocean exploration.

**LARRY MAYER:** Dr. Mayer shared his perspective as the Director for the Center for Coastal and Ocean Mapping at the University of New Hampshire. Dr. Mayer noted that mapping provides the basic framework and structure for exploration, and that recent advances in technology have led to a revolution in ocean mapping and, in turn, a revolution in ocean exploration. Dr. Mayer described and provided examples of many of these technologies, from the lead line dating back to 2000 B.C., to the single beam echo sounder developed during the Second World War, to multi-beam sonar technology, to dynamically-focused sonar that provides even greater resolution by taking hundreds of discreet measurements at once. Along with the increase in data, commensurate increases in computer technology have provided the ability to handle and translate this data into valuable information for a wide variety of users.

**BOB EMBLEY:** Dr. Embley shared his perspective as a Senior Scientist for NOAA's Pacific Marine Environmental Laboratory and as Chief Scientist for the Ring of Fire cruise. Dr. Embley reported on discoveries from the recent Ring of Fire expedition which explored active submarine volcanoes on the Marianas Arc in the western Pacific. Among the new and exciting discoveries made during the expedition, financed by NOAA's Office of Ocean Exploration, was an active submarine volcanic eruption that coated the remotely operated survey vehicle with molten sulphur. At another volcano, scientists found a large summit area venting carbon dioxide both in liquid form and as a supercritical fluid at a temperature of about 100 degrees Centigrade. On this same volcano, scientists also found vast fields of mussels, measuring up to a half foot in length, feeding off of hydrothermal fluids that also produced huge quantities of seafloor bacteria. At another site marked by a large region of high-temperature hydrothermal venting, the cruise scientists discovered a never before observed coexistence between photosynthetic and chemosynthetic ecosystems. Dr. Embley concluded his presentation with an image of a sunrise instead of a sunset, calling attention to the fact that there is still much to be explored in the ocean and that the ocean remains largely unknown.

**JIM KENDALL:** Dr. Kendall shared his perspective as the Chief Scientist for the Minerals Management Service as to the role of a regulatory agency in ocean exploration; something which, at first glance, may not be obvious. To do this, Dr. Kendall used three MMS research efforts as examples of ongoing work directly supporting the agency's mission, but clearly exploratory in nature: chemosynthetic communities; deepwater gas hydrate deposits on the Outer Continental Shelf (OCS) and slope; and investigations of WWII shipwrecks and their

biological and archaeological significance. He briefly discussed the discovery and subsequent study of chemosynthetic communities of tubeworms and clams that feed on the bacteria that break down natural gas and oil from naturally occurring seeps. As a result of the findings of this research, these communities are now protected from the types of operations occurring on the OCS, which is regulated by MMS. Dr. Kendall described research designed to locate and investigate gas/methane hydrates, which could contain “five to ten times more energy” than from the other deposits of natural gas and oil. “It could be a phenomenal energy source.” Finally, Dr. Kendall discussed the benefits of artificial reef communities created on, and around, stationary oil and gas structures and how WWII shipwrecks were currently being studied to learn about the potential of a “deepwater artificial reef effect.”

**PAUL KELLY:** Mr. Kelly shared his perspective as a member of the U.S. Commission on Ocean Policy and as Senior Vice President of Rowan Companies, Inc. He noted that “95-percent of the ocean floor remains unexplored, much of it located in harsh environments such as the polar latitudes and the southern ocean. Experience teaches us, however, that these vast and remote regions teem with undiscovered species and resources...on virtually every expedition, oceanographers discover fascinating new creatures.” Mr. Kelly further stated, “Given the importance of the ocean in human history and in regulating climate change, guaranteeing food security, providing energy resources, and enabling worldwide commerce, it is astounding that we know so little about it.”

## **CHALLENGES**

- Less than five percent of the ocean has been mapped with modern technology.
- Public perception of the extent of ocean knowledge is greater than reality.
- Spending for ocean exploration is \$15 million, or about one tenth of one percent of space exploration, at \$15 billion.
- The availability of tools for exploration, such as research ships bound for remote regions, tethered and autonomous vehicles to image and explore the ocean, are limited in availability.
- Technology advances and investments for the development of new tools for exploring the ocean are needed. Currently, no nation has the tools to reach the deepest part of the ocean.
- A staggering number of species in the oceans, including fish, invertebrates, and bacteria, await discovery and have the potential of biomedical and other technical applications.

## **RECOMMENDATIONS**

- Congress should appropriate significant funding for expanding an ocean exploration program.\*
- NOAA and NSF should be designated as lead agencies for ocean exploration with involvement from the U.S. Geological Society and the U.S Navy’s office of Naval Research.\*
- Public outreach and education should be integral components of ocean exploration.\*
- The oil and gas industry should be partners in integrated ocean observing systems.

\* Denotes reference to a recommendation in the U.S. Commission on Ocean Policy Report and/or the Pew Oceans Commission Report

## Observing, Monitoring and Managing Ocean Data

**Moderator:** Dr. Rick Spinrad, NOAA Assistant Administrator for Ocean Services and Coastal Resources

**Panelists:** Brig. Gen. D.L. Johnson, NOAA Assistant Administrator for Weather Services  
Mr. John Englander, President and CEO, International Seakeepers Society  
Mr. Jeff Rosen, Senior Consultant, Perot Systems Government Services  
Dr. Steve Lyons, Tropical Program Manager, The Weather Channel  
Mr. Mike Hemsley, Deputy Director for Coastal Operations, Oceans.US

### Panel Overview

Panelists addressed state-of-the-art techniques for capturing ocean observations and data, monitoring data, and making data available to a variety of users for management decisions.

**RICK SPINRAD:** Dr. Spinrad shared his perspective as NOAA's Assistant Administrator for Ocean Service and Coastal Resources and provided a framework for the discussion noting that ocean observations can potentially benefit health, safety, national security, homeland security, economics, and environmental sustainability. Dr. Spinrad noted that all sectors have something important to contribute: government has a responsibility for sponsorship of research and operations, as well as maintenance; academia plays a critical role in researching and developing current and future systems; non-governmental organizations help set criteria for environmental sustainability and oversight; and the private sector which uses, and helps develop and provide data and specific tailored, value-added products.

**D.L. JOHNSON:** Brig. Gen. Johnson, USAF (Ret.) NOAA Assistant Administrator for Weather Services, presented the agency perspective on ocean observations. He discussed the linkage between atmosphere and oceans -- from white water to blue water, and a variety of systems already in place, including the Physical Oceanographic Real-Time System (PORTS); the Marine Observation Network; the National Water Level Observation Network of tide gauges; the Continually Operating Reference Stations (CORS); and the Tropical Atmosphere Ocean (TAO) array, along with the Polar Orbiting and Geostationary Environmental Satellites. He suggested that an International Ocean Observing System is a critical priority whose chief goals would be managing and communicating data. He stressed the importance of partners within and outside the federal government working together to make this system a success.

**JOHN ENGLANDER:** Mr. Englander shared his perspective as President and CEO of the International Seakeepers Society, whose mission is to work with luxury yachts and other vessels and platforms internationally to develop and deploy ocean and atmospheric monitoring sensors and then transmit that data via satellite on a real-time basis. Measurements include sea surface temperature, salinity, dissolved oxygen, pH, and RedOx. The 42 existing 'plug-and-play' systems provide 'point data' via buoys, repeatable data via cruise ships and freighters traveling pre-determined routes, and 'random walk' data from privately-owned vessels traveling, in some cases, to places where data has never been recorded.

**JEFF ROSEN:** Mr. Rosen shared his perspective as a Senior Consultant to Perot Systems Government Services, noting that a wide variety of data, including weather, physical oceanography, chemistry, biology, water quality, geology, cultural resources and administrative information is all available. The challenge, he highlighted, is integrating the data in a format and at a level that has meaning for end-users. Mr. Rosen suggested that knowing the questions that need to be answered makes creation of a database management system much more effective. He also underscored the value of doing exploratory analysis by bringing information together in new and different ways and seeing what can be extracted and learned from it. Private industry can play an important role as 'data agents,' supplying state-of-the-art analysis and expertise.



**STEVE LYONS:** Dr. Lyons shared his perspective as the Tropical Program Manager at the Weather Channel, noting that the media is both an end-user of ocean data and also a purveyor of value-added products geared toward the public. In addition to the general public, emergency managers are also a critical audience for this value-added information. Dr. Lyons pointed out that there are certain challenges when dealing with the majority of media, primarily that journalists are not generally trained as meteorologists; that competition drives coverage; and that it can be difficult to pro-actively present a story, such as rip currents, to members of the media who may have other ideas about what constitutes a good story.

**MIKE HEMSLEY:** Mr. Hemsley shared his perspective as Deputy Director for Coastal Operations at OCEAN.US, focusing on immediate as well as long range next steps within the ocean observing community. With respect to an Integrated Ocean Observing System, Mr. Hemsley noted that a 'national backbone' incorporating satellites and in-situ observations along with data buoy, water level and stream gauging networks, is critical to success. Taking this a step further, Mr. Hemsley discussed the creation of the National Federation of Regional Associations which would oversee ocean observing on a regional basis and to represent all of the data providers and users in their region. The association's primary functions would be communication and coordination of information, certification of regional entities, and advocacy—especially at the federal level.

## **CHALLENGES**

- Existing infrastructure and systems are not well coordinated.
- Data is plentiful, even over-abundant, but well-designed systems to interpret them for the benefit of the end-user are few and far between.
- Consistent documentation as to the integrity of the data gathering process—particularly with older data—is not always available.
- A great deal of data, particularly older information, is still contained on paper and needs to be entered into an electronic format.

## **RECOMMENDATIONS**

- Create multi-disciplinary teams with professional capabilities.
- Create information management systems for primary users—don't try to build a 'one-size fits all system.'
- Create and use more relational databases.
- Create and use more data visualization.
- Apply more standard statistical design and analysis.

## Creating an Ocean Literate Society

**Moderator:** Dr. Kumar Mahadevan, President, Mote Marine Laboratory

**Panelists:** Dr. Steve Coan, Executive Director, Immersion Institute  
Rear Adm. Richard West, President and CEO, Consortium for Oceanographic Research and Education  
Ms. Barbara Chow, Vice President, Education and Children's Programs, National Geographic Society  
Mr. Paul Bartishevich, President and CEO, Finger Lakes Productions

### Panel Overview

Panelists addressed creative efforts to educate the public about the value and importance of our ocean and its resources through a variety of formal and informal educational processes.

**KUMAR MAHADEVAN:** Dr. Mahadevan shared his perspective as President of Mote Marine Laboratory, and framed the discussion by noting the need to connect all segments of society, young and old alike, to the coasts and oceans. Dr. Mahadevan provided several examples of how Mote Marine Laboratory staff engage children through classroom learning opportunities and adults as volunteer docents. He also underscored the importance of connecting to major information gatekeepers, such as journalists, and engaging them in pro-active ways to become more knowledgeable about ocean issues.

**STEVE COAN:** Dr. Coan shared his perspective as Executive Director of the Immersion Institute and as former Education Director for the JASON Foundation. Dr. Coan shared two hypotheses: first, that most learning takes place outside of the traditional structured school environment, and second, that most learning occurs through the art of storytelling. He further noted that ocean literacy needs to be identified as a priority, that efforts to do so need to be targeted at the fourth to sixth grade levels--the average reading level of most Americans--that technology needs to be refined to facilitate human interaction with the oceans, and that we need to find interesting ocean-oriented stories to tell. Dr. Coan proceeded to share examples of how these elements are being pursued by the Immersion Institutes and the JASON Foundation, in conjunction with Mystic Aquarium's Institute for Exploration.

**RICHARD WEST:** Admiral West shared his perspective as President and CEO of the Consortium for Oceanographic Research and Education (CORE) whose members include colleges and universities, aquaria and non-governmental organizations, and private companies—all of whom have an interest in ocean science and ocean issues. Admiral West noted that the U.S. Commission on Ocean Policy report highlights the importance of having a strong, well-trained and diverse workforce of scientifically and technically-oriented individuals who can help translate scientific research into practical applications. In order for this to happen, Admiral West said two major obstacles must be overcome. The first is the lack of funding and the second is lack of public knowledge or understanding about the ocean.

**BARBARA CHOW:** Ms. Chow shared her perspective as Vice President of Education and Children's Programs at the National Geographic Society. Ms. Chow provided several examples of the depth of ocean literacy, noting that in a 1988 Gallup poll one in four Americans could not locate the Pacific Ocean on a map. To combat this problem National Geographic worked to ensure that geography was named a 'core' academic subject—a subject under which an ocean curriculum could be carried out. In recognition of the fact that most education policy is carried out at the state and local levels, the Society also created state-based Geographic Alliances to provide professional development for teachers and materials tailored to meet state and local needs. The Society also helped foster public awareness for geography by working with Congress to develop an annual Geography Awareness Week during the third week of November.

**PAUL BARTISHEVICH:** Mr. Bartishevich shared his perspective as President and CEO of Finger Lakes Productions International, which produces a variety of long and short-form radio programs, including Our Ocean World. Mr. Bartishevich pointed out the power of multi-media platforms, including radio and television, by highlighting several examples of public service campaigns. Mr. Bartishevich advocated working with a group such as the Ad Council to create an ocean awareness campaign designed to reach the public via radio, TV, newspapers, magazines and the internet. He also advocated creating an annual ocean issues summit targeting producers and editors, as well as reporters, in order to have an impact on all the decision makers in the news business.

## **CHALLENGES**

- The public is largely illiterate when it comes to understanding the ocean's importance, whether it be geographically or ecologically.
- The federal investment in ocean research is not adequate.
- In order to educate students about the oceans, there are many hurdles to overcome, not the least of which is the multitude of testing standards now being enacted—most of which do not include the oceans as a core subject.
- Education standards are focusing more on math and English, making it harder to have other topics such as ocean-related curricula, included in core curricula.

## **RECOMMENDATIONS**

- Establish a national education office to coordinate all federal ocean education activities.\*
- Create closer connections between federal ocean education programs and informal education centers, such as aquariums, science centers, marine parks etc.\*
- Include ocean-related topics into existing core curricula such as geography, math, science and literature.
- Create a multi-media public awareness campaign by partnering with the Ad Council.
- Hold an annual summit for reporters, editors and producers to educate them about ocean issues.

\* Denotes reference to a recommendation in the U.S. Commission on Ocean Policy Report and/or the Pew Oceans Commission Report

## Speaker Biographies

### **Paul Bartishevich, President and CEO, Finger Lakes Productions International**

Paul Bartishevich is President of Finger Lakes Productions International (FLPI), which produces and distributes five daily syndicated radio series: Our Ocean World, NatureWatch, the Environminute, Animal Instincts, and MicrobeWorld. Now entering its 16th year of operation, FLPI provides daily programming to more than 500 radio stations in more than 50 countries. The company has established formal business relationships with the National Oceanic and Atmospheric Administration (NOAA), The American Society for Microbiology, The National Geographic Society, the American Veterinary Medical Association and the Teresa and H. John Heinz III Foundation to produce its programming. Prior to founding FLPI, Mr. Bartishevich served as drive time news anchor for WSYR AM in Syracuse New York, and as a senior news editor for the Mutual Radio Network in Washington, D.C.

### **Dan J. Basta, Director, National Marine Sanctuary Program**

Dan Basta leads the federal program, which is charged with the mission to protect and conserve the unique ecological and cultural marine resources contained in the sanctuary system. He joined the National Ocean Service in 1979 and has applied his training as an environmental engineer to a variety of disciplines, including land use planning, living marine resource assessment, and resource economics. Previously, Mr. Basta held positions at Resources for the Future, the Environmental Studies Board of the National Academy of Sciences, and Johns Hopkins University. He is co-author of more than 50 publications, including textbooks on modeling, atlases of U.S. coastal and ocean regions, and various reports, books and articles on environmental issues.

### **John Berry, Executive Director, National Fish and Wildlife Foundation**

John Berry joined the National Fish and Wildlife Foundation as its Executive Director in November 2000. Prior to joining the Foundation, he served as the Assistant Secretary for Policy, Management and Budget for the U.S. Department of the Interior and was the architect of the President's Lands Legacy Initiative. Mr. Berry has also served as Director of Government Relations and Senior Policy Advisor for the Smithsonian Institution, Deputy Assistant Secretary for Enforcement at the U.S. Department of Treasury, and Legislative Director and Associate Staff to the House Appropriations Committee for Representative Steny Hoyer.

### **Barbara Chow, Vice President, Education and Children's Programs, National Geographic Society**

Barbara Chow is Vice President of Education and Children's Programs at the National Geographic Society. Much of her career has been spent in the federal government, working on economic and legislative issues, including eight years in the White House. Most recently, she was Deputy Director of the White House Domestic Policy Council for the Clinton administration, responsible for policy development, communications and legislative strategy to advance key domestic presidential priorities, such as education, youth and family. In addition to her White House duties, Ms. Chow was Associate Director for Education, Income Maintenance and Labor in the Office of Management and Budget from 1997-2001. From 1993-1997, she was Special Assistant to the President for Legislative Affairs.

### **Dr. Stephen M. Coan, Vice President and Executive Director Mystic Aquarium and Institute for Exploration**

Stephen M. Coan, Ph.D., is Executive Vice President of Mystic Aquarium & Institute for Exploration with responsibility for all operations of the organization. He previously served as Vice President of Education. Dr. Coan is Principal Investigator of numerous grants focused on bringing telepresence from National Marine Sanctuaries and oceanographic expeditions. He is also Executive Director of Immersion Institute, a nationwide partnership of 16 informal learning institutions including Boys and Girls Clubs of America. Prior to joining Mystic Aquarium

& Institute for Exploration, he was Chief Education Officer at the JASON Foundation for Education for 11 years. At JASON he led the development of award winning curriculum, Internet systems and telepresence programming. Dr. Coan is best known for his work with at-risk youth and has served as a Senior Advisor to the Charles Stewart Mott Foundation on after-school issues.

**Dr. Walter D. Cruickshank, Deputy Director, Minerals Management Service**

Walter D. Cruickshank, Ph.D., was designated Deputy Director of the Minerals Management Service (MMS) in 2002. Previously, he served as Associate Director for Policy and Management Improvement for MMS. As Deputy Director, Dr. Cruickshank assists the MMS Director in the administration of programs that ensure the effective management of mineral resources located on the nation's outer continental shelf, including the environmentally safe exploration, development, and production of oil and natural gas and the collection and distribution of revenues for minerals developed on federal and Indian lands.

**Michael Crye, President, International Council of Cruise Lines**

Michael Crye is a former Captain in the U.S. Coast Guard and an expert in maritime, environmental and administrative laws and regulations. His Coast Guard career included shipboard, legal and congressional assignments, as well as federal court experience as a Special Assistant U.S. Attorney in Miami. Mr. Crye spent five years as the Coast Guard's legislative counsel, where he represented the agency on Capitol Hill and shaped the development and implementation of several maritime laws, including the Oil Pollution Act of 1990, a series of Coast Guard and Defense Authorization Acts and annual Appropriations Bills. He also worked with the Senate Foreign Relations Committee on ratification of six International Maritime Organization treaties on the environment, merchant vessel safety, marine conservation, and international maritime rights and responsibilities.

**William J. Douros, Superintendent, Monterey Bay National Marine**

William J. Douros has served as Superintendent of the Monterey Bay National Marine Sanctuary since January 1998. In 1985, immediately after graduating with a Master's degree in Marine Ecology from U.C. Santa Barbara, he began working for, and for seven years managed, Santa Barbara County's Energy Division, which regulates offshore oil and gas development in that county. Mr. Douros has performed well over 500 research dives. His past work and education experience combine coastal policy, marine science and operational management.

**Dr. Bob Embley, Senior Scientist, Pacific Marine Environmental Laboratory**

Bob Embley has been with the Pacific Marine Environmental Laboratory in Newport, Oregon since 1984, where he has served as the Team Leader for Marine Geology in the NOAA VENTS Program. His scientific publications include studies of a wide range of deep-sea features, including submarine canyons, sediment slides, fracture zones, and the mid-ocean ridge. Dr. Embley has participated in more than 70 oceanographic expeditions in the Atlantic, Pacific and Antarctic Oceans since 1966. As Chief Scientist for the Submarine Ring of Fire 2002-2004 Ocean Exploration Expeditions, he had overall responsibility for organizing and planning the expeditions and for leading the scientific team during the expeditions.

**John Englander, President and CEO, International SeaKeepers Society**

John Englander was appointed CEO of the International SeaKeepers Society in January of 2004 and brings a diverse background of environmental not-for-profit and entrepreneurial success. SeaKeepers was started in 1998 with the mission of using luxury yachts as innovative ocean monitoring systems. After three full years of operation, the SeaKeepers weather and ocean monitoring system now functions in roughly 50 locations, including cruise ships, freighters, sea buoys, a ferryboat and a lighthouse. Originally, Mr. Englander

comes from the diving industry. He developed the world's largest sport dive operation in the Bahamas, where he was based for 27 years. Prior environmental and non profit experience includes the CEO position at Ocean Futures and The Cousteau Society.

**Dave Fluharty, Associate Professor, School of Marine Affairs, University of Washington**

Dave Fluharty has an interdisciplinary background in marine resource management and planning. He has been involved in the study and evaluation of living marine resource protection and management in the North Pacific, Northeast Asia and West Africa since 1976. Professor Fluharty's recent research projects at the University of Washington have concerned economic assessment of critical habitat designation and recovery planning for salmon on the West Coast. He served nine years as a voting member of the North Pacific Fishery Management Council that manages the fisheries in federal waters off Alaska. In addition, he chaired the National Marine Fishery Service's Ecosystem Principles Advisory Panel, which generated a report to Congress on ecosystem-based fishery management.

**Tom Fry, President, National Ocean Industries Association**

Tom Fry has served as President of the National Ocean Industries Association since December 2000. Prior to joining NOIA, he served as the Director of the Department of the Interior's Bureau of Lands Management, a position he took in 1998. Mr. Fry first joined the Department of the Interior as the Director of the Minerals Management Service in July 1993, where he was responsible for regulatory oversight of the exploration, development, and production of oil, gas, and other minerals on the nation's Outer Continental Shelf. He has also served as Regional Counsel for the U.S. Department of Energy in Dallas, as the Director of the Houston Oil Field Office of the Economic Regulatory Administration, and as Assistant Attorney General of Texas.

**Dr. Stephen R. Hammond, Chief Scientist, NOAA Ocean Exploration**

Stephen R. Hammond is Chief Scientist for the NOAA Ocean Exploration program and Division Leader for the Ocean Environment Research Division of the NOAA Pacific Marine Environmental Laboratory. His research during the past 20 years has focused on geological and geophysical processes associated with volcanic and hydrothermal processes at seafloor spreading centers. During this time, he has been the Program Manager of the NOAA Vents Program, which is dedicated to discovering and quantifying the physical, chemical, and biological impacts of submarine volcanism on marine environments and ecosystems.

**J. Michael Hemsley, Deputy Director for Coastal Operations, Ocean.US**

Mike Hemsley works for the University of Southern Mississippi Department of Marine Science and is currently funded by NOAA to serve as the Deputy Director for Coastal Operations for Ocean.US. After graduating from The Johns Hopkins University with a degree in geophysical fluid mechanics, Mr. Hemsley served as an officer in the US Army Corps of Engineers, eventually retiring from the US Army Reserve. During his military service, he received a MS in coastal engineering from The George Washington University. Beginning in 1980, he was a Federal civilian employee, first at the Corps of Engineers' Coastal Engineering Research Center (CERC) then at NOAA's National Data Buoy Center (NDBC), until his retirement from Federal service.

**Brig. Gen. D.L. Johnson (USAF Ret.), NOAA Assistant Administrator for Weather Services**

David L. Johnson serves as the Assistant Administrator for the National Weather Service under the National Oceanic and Atmospheric Administration (NOAA). Prior to joining NOAA, he served as the U.S. Air Force Director of Weather, responsible for developing doctrine, policy, requirements and operational organizations to support Air Force and Army operations worldwide. Brigadier General Johnson organized, trained and equipped forces for the war in Afghanistan and the war in Iraq, and managed a steady flow of accurate and focused environmental information to battlefield commanders. He was also a key advisor in

the development of the National Polar-orbiting Environmental Operational Satellite System (NPOESS). During his 30-year career with the Air Force, General Johnson logged over 3,800 flying hours including 78 combat sorties.

**Paul L. Kelly, Senior Vice President, Rowan Companies, Inc.**

Paul L. Kelly is a Senior Vice President of Rowan Companies, Inc., a major provider of international and domestic offshore contract drilling and helicopter services. He also serves on the Board of the National Ocean Industries Association. Mr. Kelly represented the oil service/supply industry on the U.S. Secretary of the Interior's Outer Continental Shelf Policy Committee during the past four administrations, serving as chairman of the Committee from 1994-1996. In 1998, he served on the H. John Heinz III Center for Science, Economics, and the Environment Steering Group, which wrote the report, "Our Ocean Future, Themes and Issues Concerning the Nation's Stake in the Oceans Developed for Discussion During 1998 Year of the Ocean."

**Dr. James J. Kendall, Chief Scientist, Minerals Management Service**

Jim Kendall coordinates the Environmental Studies Program (ESP) of the U.S. Department of the Interior's Minerals Management Service (MMS) and serves as the Bureau's Chief Scientist. The MMS ESP is tasked with providing the environmental and socioeconomic information necessary for MMS to make informed decisions concerning offshore oil and gas and marine minerals activities. Prior to joining the MMS Headquarters Office, Dr. Kendall served as the ESP Studies Chief for the MMS Gulf of Mexico OCS Regional Office in New Orleans, Louisiana. He has conducted marine research in the Gulf of Mexico, Caribbean, and Red Sea.

**Dr. Jane Lubchenco, Distinguished Professor of Zoology, Oregon State University**

Jane Lubchenco is an environmental scientist and marine ecologist who is actively engaged in teaching, research, synthesis and communication of scientific knowledge. She grew up in Colorado, received her Ph.D. and taught at Harvard University, and then 26 years ago moved to Oregon State University. She served on the Pew Oceans Commission and is a former President of AAAS, and a member of the National Academy of Sciences. Dr. Lubchenco's research interests include coastal marine ecosystems, biodiversity, climate change, and the state of the oceans. She has received numerous awards, including a MacArthur Fellowship, a Pew Fellowship, eight honorary degrees, the 2002 Heinz Award for the Environment, and the Nierenberg Prize for Science in the Public Interest.

**Dr. Steve Lyons, Tropical Program Manager, The Weather Channel**

Steve Lyons has been an expert in Tropical and Marine Meteorology for The Weather Channel since 1998. He has participated in more than 50 national and international conferences and provided World Meteorological Organization training courses in marine meteorology, tropical meteorology and ocean wave forecasting. Prior to joining The Weather Channel, Mr. Lyons managed the Tropical Analysis and Forecast Branch of the Tropical Prediction Center, National Hurricane Center. He has also been a Research Scientist for the U.S. Navy, the Geophysical Fluid Dynamics Laboratory at Princeton University, and the University of California at Los Angeles. In addition, he has been a Professor of Meteorology at Texas A&M University and at the University of Hawaii.

**Captain David MacFarland, PORTS Program Manager, NOAA National Ocean Service**

Dave MacFarland is the manager of NOAA's Physical Oceanographic Real-Time System (PORTS), a real-time ocean observing system designed to make marine transportation in ports both more safe and efficient. Prior to becoming the PORTS Manager, he served 33 years in NOAA's Commissioned Corps the last 5 years as Director of NOAA's Office of Coast Survey responsible for the nautical charting and hydrographic surveying of our national waters in support of safe navigation. As the United States Hydrographer he was tasked by the Department of State to lead several national delegations to address topics related to safety of navigation.

**Dr. Kumar Mahadevan, President, Mote Marine Laboratory**

Kumar Mahadevan is President and CEO of Mote Marine Laboratory, an independent nonprofit marine research and education organization that includes a public aquarium. He manages a staff of 230 and 1,500 volunteers. He serves on the Board of Directors for the JASON Foundation for Education and the Florida Ocean Alliance, and is a member of the Explorers Club. He is a Benthic Ecologist by training, with specific research interests in the investigation of man-induced ecological disturbances. Dr. Mahadevan's studies have addressed a diverse array of topics, such as the effects of deep-water munitions dumps in the North Atlantic abyssal plain, the effect of power generation facilities in Southwest Florida waters, the effects of oil refinery effluents, and physiological studies of arctic (Point Barrow) benthic fauna.

**Dr. Larry Mayer, Director, Center for Coastal and Ocean Mapping, University of New Hampshire**

Larry Mayer became founding Director of the Center for Coastal and Ocean Mapping at the University of New Hampshire, as well as Co-Director of the NOAA/UNH Joint Hydrographic Center, in 2000. His research concerns sonar imaging, remote characterization of the seafloor, and advanced applications of 3-D visualization to ocean mapping problems. Dr. Mayer has participated in more than 40 cruises (spending over 50 months at sea) during the last 30 years and has been chief or co-chief scientist of numerous expeditions, including two legs of the Ocean Drilling Program. He also served on the President's Panel on Ocean Exploration and recently chaired the National Academy of Sciences Committee, National Needs for Coastal Mapping and Charting.

**Glenn T. Prickett, Executive Director, The Center for Environmental Leadership in Business, Conservation International**

Glenn T. Prickett is Executive Director of The Center for Environmental Leadership in Business (CELB) and a Senior Vice President of Conservation International (CI). CELB, a division of Conservation International, engages the private sector worldwide in creating solutions to global environmental problems. Prior to joining CI, Mr. Prickett served as Chief Environmental Advisor at the U.S. Agency for International Development and Senior Associate with the International Program of the Natural Resources Defense Council.

**Dr. Jeffrey M. Reutter, Director, Ohio Sea Grant College Program and Stone Laboratory Ohio State University**

Jeffrey M. Reutter is an aquatic biologist and limnologist. He has directed four programs at Ohio State University since 1987: the F.T. Stone Laboratory (oldest freshwater biological field station in the country); the Ohio Sea Grant College Program; the Center for Lake Erie Area Research (CLEAR); and the Great Lakes Aquatic Ecosystem Research Consortium (GLAERC). Dr. Reutter has authored more than 100 technical reports and journal articles and his expertise includes the Lake Erie ecosystem, aquatic invasive species, coastal economic development, and artificial reefs. He is President of the National Association of Marine Laboratories (NAML), Past US Chair of the Council of Great Lakes Research Managers for the International Joint Commission (IJC), and a member of many regional and national committees.

**Jeffrey S. Rosen, Senior Consultant, Perot Systems Government Services**

Jeffrey S. Rosen is a Senior Technical Consultant for the Environmental Information Services Group for Perot Systems Government Services. He has nearly 30 years experience in conducting environmental research, focused on processing data into useful information to support effective environmental management. Mr. Rosen has led teams in the development of information systems and the analysis and interpretation of the resulting data for many NOAA organizations, including the National Marine Sanctuary Program, the Stellwagen Bank National Marine Sanctuary, the Coastal Services Center, the national Status and Trends

Program and the National Marine Fisheries Service. He is currently active in the Mid Atlantic Integrated Assessment Program and the EPA's Information Collection Rule (Drinking Water).

**Dr. Andrew Rosenberg, Professor, Institute for the Study of Earth, Oceans, and Space University of New Hampshire**

Andrew Rosenberg is a Professor in the Institute for the Study of Earth, Oceans, and Space at the University of New Hampshire where prior to April 2004, he was Dean of the College of Life Sciences and Agriculture. Before assuming the dean's position in June 2000, he was the Deputy Director of the National Marine Fisheries Service (NMFS) in the National Oceanic and Atmospheric Administration. He was also the Northeast Regional Administrator for NMFS for four years. Dr. Rosenberg has served as the U.S. representative to international organizations including the Food and Agriculture Organization of the United Nations and the Northwest Atlantic Fisheries Organization. With his expertise in marine biology and living marine resource conservation, he has earned recognition from such diverse organizations as the U.S. Coast Guard and the World Wildlife Fund.

**Roger T. Rufe, Jr. President and CEO, The Ocean Conservancy**

Roger T. Rufe, Jr. joined the The Ocean Conservancy after a 34-year career in the United States Coast Guard. While in the Coast Guard, he served as captain of five ships, as Chief of Congressional Affairs, and as a U.S. delegate to the Marine Environment Protection Committee of the International Maritime Organization in London. Mr. Rufe served on the Pew Oceans Commission and still serves on the Executive Committee of the World Conservation Union's Species Survival Commission.

**Dr. Paul Sandifer, Senior Scientist, NOAA National Centers for Coastal Ocean Science**

Paul Sandifer embarked upon a new career as Senior Scientist for the NOAA National Centers for Coastal Ocean Science (NCCOS) after completing a 31-year career with the South Carolina Department of Natural Resources. He spent nearly six of those years serving as the agency's director. In July of 2001, he was appointed by President George W. Bush to the 16-member U.S. Commission on Ocean Policy, which just last month released its preliminary report detailing the need for updating our ocean management. Dr. Sandifer is also author or co-author of more than 120 scientific and technical publications in aquaculture, coastal ecology, and marine biology.

**Michael H. Shapiro, Deputy Assistant Administrator, Office of Water U.S. Environmental Protection Agency**

Michael Shapiro joined the Office of Water as the Deputy Assistant Administrator in November 2002. Prior to that, he was the Principal Deputy Assistant Administrator for the Office of Solid Waste and Emergency Response (OSWER). He has been in that position since February 1997, with a brief nine months as Acting Assistant Administrator during the transition between Administrations. Before that Mr. Shapiro was the Director of the Office of Solid Waste, where he had served since November 1993. Mr. Shapiro has a B.S. in Mechanical Engineering from Lehigh and a Ph.D. in Environmental Engineering from Harvard. He has also taught in the public policy program at the John F. Kennedy School of Government.

**Dr. Richard Spinrad, NOAA Assistant Administrator Ocean Service**

Rick Spinrad oversees a diverse portfolio, including nautical charting, marine sanctuaries, and coastal zone management activities. Prior to his appointment to NOAA, he served as Technical Director to the Oceanographer of the Navy, advising the U.S. Navy on operational oceanographic research and operations. Dr. Spinrad first joined the Office of Naval Research (ONR) in 1987 and held a variety of posts, including Director of ONR's Ocean Biology, Optics and Chemistry Division, and Director of the Ocean, Atmosphere and Space Modeling and Prediction Division. He also served as the first Director of the National Oceanographic Partnership Program Office before becoming Executive Director of Research and Education for the Consortium for Oceanographic Research and Education.

**Christophe A. G. Tulou, President, Center for SeaChange**

Christophe A. G. Tulou established the Center for SeaChange in September 2003, following his tenure as Executive Director of the Pew Oceans Commission. Prior to joining the Commission, he was president of Christophe Tulou Associates, an environmental, natural resource and ocean policy firm in Washington, DC. From 1993 to 1998, Mr. Tulou served as then-Delaware Governor Tom Carper's Cabinet Secretary for the Department of Natural Resources and Environmental Control. He also served over a decade in Congress as a Sea Grant Fellow, legislative director, and subcommittee staff director. During that time, he authored legislation on coastal development, ocean dumping of wastes, marine mammal health and stranding, hazardous substance reporting, and low-level radioactive waste management.

**Rear Admiral Richard D. West, President and CEO  
Consortium for Oceanographic Research and Education**

Dick West is President of the Consortium for Oceanographic Research and Education [CORE]. CORE is a non-profit, Washington, DC-based organization that represents 77 of this country's leading academic institutions, aquaria, non-profit research institutes and Federal research laboratories with the common goal of promoting and enhancing the visibility and effectiveness of ocean research and education. Prior to his position at CORE, Admiral West served as Oceanographer and Navigator of the Navy. During his 37 year career in the US Navy, Admiral West served with the riverine forces in Vietnam, on several ships, Commanding three, Commanding Officer of the Surface Warfare Officers School and several tours in research and development including three in the Pentagon.

**Patten D. White, CEO, Maine Lobstermen's Association**

Pat White is a commercial lobstermen from York, Maine. He is CEO of the Maine Lobstermen's Association and serves on the Atlantic States Marine Fisheries Commission. Mr. White has been a long-time champion of broad participation in fisheries management decisions at the local level and an advocate of the ecosystem approach to marine policy decisions. He has served as a member of both the New England Fisheries Management Council and as a member of the Pew Oceans Commission.

