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INTRODUCTION

Mr. Chairman and members of the Committee, I am pleased to appear before you to discuss the Preliminary Report of the U.S. Commission on Ocean Policy, which was released to the public on Tuesday, April 20. We believe this report offers a blueprint for a coordinated, comprehensive national ocean policy for the 21st century. It includes nearly 200 action-oriented recommendations that present workable solutions for a broad range of ocean- and coastal-related issues.

As you know, the last comprehensive review of U.S. ocean policy took place more than 35 years ago when the Commission on Marine Science, Engineering and Resources—known as the Stratton Commission—issued its report, *Our Nation and the Sea*. Since then, considerable progress has been made, but many challenges remain and new issues have emerged. The value of the oceans to our nation has only grown in 35 years, and the time to act is now.

The simple fact is that the oceans affect and sustain all life on Earth. They drive and moderate weather and climate, provide us with food, oxygen, transportation corridors, recreational opportunities, energy resources and other natural products, and serve as a national security buffer. In our travels around the country, we heard and saw first-hand how communities care about the ocean and coasts, and how they worry about their future.

THE VALUE OF THE OCEANS AND COASTS

America's oceans and coasts provide ecological and aesthetic benefits with tremendous value to our national economy. In 2000, the ocean economy contributed more than $117 billion to American prosperity and supported well over two million jobs. More than $1 trillion, or one-tenth of the nation's annual GDP, is generated within the relatively narrow strip of land immediately adjacent to the coast. Considering the economies of all coastal watershed counties, that contribution swells to over $4.5 trillion, fully half of the nation's GDP. The contribution to employment is equally impressive, with 16 million jobs in the nearshore zone and 60 million in coastal watershed counties.

The country also remains highly dependent on marine transportation. More than thirteen million jobs are connected to the trade transported through the nation's network of ports and inland waterways. Annually, the nation's ports handle more than $700 billion in goods. The cruise industry and its passengers account for another $11 billion in spending.

Offshore oil and gas operations have expanded into deeper waters with new and improved technologies. The offshore oil and gas industry's annual production is valued at $25–$40 billion, and its yearly bonus bid and royalty payments contribute approximately $5 billion to the U.S. Treasury.

The commercial fishing industry's total annual value exceeds $28 billion, with the recreational saltwater fishing industry valued at around $20 billion, and the annual U.S. retail trade in ornamental fish worth another $3 billion. Nationwide, retail expenditures on recreational boating exceeded $30 billion in 2002.

In the last three decades, more than 37 million people and 19 million homes have been added to coastal areas. Every year, hundreds of millions of Americans and international visitors flock to the coasts to enjoy the oceans, spending billions of dollars and directly supporting more than a million and a half jobs. In fact, tourism and recreation is one of the fastest-growing business sectors—enriching economies and supporting jobs in communities virtually everywhere along the coasts of the continental United States, southeast Alaska, Hawaii, and our island territories and commonwealths.

These concrete, quantifiable contributions to the national economy are just one measure of the oceans' value. We also love the oceans for their beauty and majesty, and for their intrinsic power to relax, rejuvenate, and inspire. Unfortunately, we are starting to love our oceans to death.

TROUBLE IN PARADISE

Development comes with costs, and we are only now discovering the full extent of those costs. Pollution, depletion of fish and other living marine resources, habitat destruction and degradation, and the introduction of invasive non-native species are just some of the ways people harm the oceans, with serious consequences for the entire planet.

In 2001, 23 percent of the nation's estuarine areas were not suitable for swimming, fishing, or supporting marine species. In 2002, about 12,000 beach closings and swimming advisories were issued across the nation, most due to the presence of bacteria associated with fecal contamination. Marine toxins afflict more than 90,000 people annually across the globe and are responsible for an

estimated 62 percent of all seafood-related illnesses. Such events are on the rise, costing millions of dollars a year in decreased tourism revenues and increased health care costs.

Experts estimate that 25 to 30 percent of the world's major fish stocks are overexploited, and many U.S. fisheries are experiencing similar difficulties. Since the Pilgrims first arrived at Plymouth Rock, over half of our fresh and saltwater wetlands—more than 110 million acres—have been lost.

Our failure to properly manage the human activities that affect oceans and coasts is compromising their ecological integrity and diminishing our ability to fully realize their potential. Congress recognized this situation when it passed the Oceans Act of 2000 calling for a Commission on Ocean Policy to establish findings and develop recommendations for a coordinated and comprehensive national ocean policy. Pursuant to that Act, the President appointed 16 Commission members, including individuals nominated by the leadership in the United States Senate and the House of Representatives. These individuals were drawn from diverse backgrounds with knowledge in ocean and coastal activities.

Because of the vast scope of topics the Commission was required to address, it sought input from individuals across the country. The Commission members traveled around the United States obtaining valuable information from diverse marine-related interests. They heard testimony on ocean and coastal issues during nine regional meetings and experienced regional concerns first-hand during seventeen site visits. The regional meetings also highlighted relevant success stories and regional models with potential national applicability.

Four additional public meetings were held in Washington, D.C., after completion of the regional meetings, to publicly present and discuss many of the policy options under consideration for the Commission's recommendations. In all, the Commission heard from some 445 witnesses, including over 275 invited presentations and an additional 170 comments from the public, resulting in nearly 1,900 pages of testimony (included as Appendices to the report).

The message we heard was clear: the oceans and coasts are in trouble and major changes are urgently needed. While new scientific understanding shows that natural systems are complex and interconnected, our decisionmaking and management approaches have not been updated to reflect that complexity and interconnectedness. Responsibilities remain dispersed among a confusing array of agencies at the Federal, State, and local levels. Better approaches and tools are also needed to gather data to understand the complex marine environment. Perhaps most important, people must understand the role the oceans have on their lives and livelihoods and the impacts they themselves have on the oceans.

As the result of significant thought and deliberation and the consideration of a wide range of potential solutions, the Commission prepared its preliminary report containing bold and broad-reaching recommendations for reform—reform that needs to start now, while it is still possible to reverse distressing declines, seize exciting opportunities, and sustain the oceans and their valuable assets for future generations.

VISION AND STRATEGY FOR THE 21ST CENTURY

Any strategy for change must begin with a clear picture of the desired endpoint. In the desirable future we wish to create, the oceans and coasts would be clean, safe, and sustainably managed.

They would contribute significantly to the economy, supporting multiple beneficial uses such as food production, development of energy and mineral resources, recreation, transportation of goods and people, and the discovery of novel medicines and other products, while preserving a high level of biodiversity and a full range of natural habitats. The coasts would be attractive places to live, work and play, with clean water and beaches, easy public access, sustainable economies, safe bustling harbors and ports, adequate roads and services, and special protection for sensitive habitats. Beach closings, toxic algal blooms, proliferation of invasive species, and vanishing native species would be rare. Better land use planning and improved predictions of severe weather and other natural hazards would save lives and money.

The management of our oceans and coasts would also look different: it would follow ecosystem boundaries, considering interactions among all elements of the system, rather than addressing isolated areas or problems. In the face of scientific uncertainty, managers would balance competing considerations and proceed with caution. Ocean governance would be effective, participatory, and well coordinated among government agencies, the private sector, and the public.

Managers and politicians would recognize the critical importance of good data and science, providing strong support for physical, biological, social, and economic research. The nation would invest in the tools and technologies needed to conduct this research: ample, well-equipped surface and underwater research vessels; reliable, sustained satellites; state-of-the-art computing facilities; and innovative sensors that withstand harsh ocean conditions. A widespread network of observing and monitoring stations would provide data for research, planning, marine operations, timely forecasts, and periodic assessments. Scientific findings and observations would be translated into practical information, maps, and products used by decisionmakers and the public.

Better education would be a cornerstone of ocean policy, with the United States once again joining the top ranks in math, science, and technology achievement. An ample, well-trained, and motivated workforce would be available to study the oceans, set wise policies, apply technological advances, engineer new solutions, and teach the public about the value and beauty of the oceans and coasts throughout their lives. As a result of this lifelong education, people would understand the links among the land, sea, air, and human activities and would be better stewards of the nation's resources.

Finally, the United States would be a leader and full partner globally, sharing its science, engineering, technology, and policy expertise, particularly with developing countries, to facilitate the achievement of sustainable ocean management on a global level.

The Commission believes this vision is practical and attainable. To achieve it, national ocean policy should be guided by a set of overarching principles including the following:

Sustainability: Ocean policy should be designed to meet the needs of the present generation without compromising the ability of future generations to meet their needs.
Stewardship: The principle of stewardship applies both to the government and to every citizen. The U.S. government holds ocean and coastal resources in the public trust—a special responsibility that necessitates balancing different uses of those resources for the continued benefit of all Americans. Just as important, every member of the public should recognize the value of the oceans and coasts, supporting appropriate policies and acting responsibly while minimizing negative environmental impacts.

Ocean–Land–Atmosphere Connections: Ocean policies should be based on the recognition that the oceans, land, and atmosphere are inextricably intertwined and that actions that affect one Earth system component are likely to affect another.
Ecosystem-based Management: U.S. ocean and coastal resources should be managed to reflect the relationships among all ecosystem components, including humans and nonhuman species and the environments in which they live. Applying this principle will require defining relevant geographic management areas based on ecosystem, rather than political, boundaries.
Multiple Use Management: The many potentially beneficial uses of ocean and coastal resources should be acknowledged and managed in a way that balances competing uses while preserving and protecting the overall integrity of the ocean and coastal environments.
Preservation of Marine Biodiversity: Downward trends in marine biodiversity should be reversed where they exist, with a desired end of maintaining or recovering natural levels of biological diversity and ecosystem services.
Best Available Science and Information: Ocean policy decisions should be based on the best available understanding of the natural, social, and economic processes that affect ocean and coastal environments. Decisionmakers should be able to obtain and understand quality science and information in a way that facilitates successful management of ocean and coastal resources.
Adaptive Management: Ocean management programs should be designed to meet clear goals and provide new information to continually improve the scientific basis for future management. Periodic reevaluation of the goals and effectiveness of management measures, and incorporation of new information in implementing future management, are essential.
Understandable Laws and Clear Decisions: Laws governing uses of ocean and coastal resources should be clear, coordinated, and accessible to the nation's citizens to facilitate compliance. Policy decisions and the reasoning behind them should also be clear and available to all interested parties.
Participatory Governance: Governance of ocean uses should ensure widespread participation by all citizens on issues that affect them.
Timeliness: Ocean governance systems should operate with as much efficiency and predictability as possible.
Accountability: Decisionmakers and members of the public should be accountable for the actions they take that affect ocean and coastal resources.
International Responsibility: The United States should act cooperatively with other nations in developing and implementing international ocean policy, reflecting the deep connections between U.S. interests and the global ocean.

Ecosystem-based Management
Ecosystem-based management emerged as an overarching theme of the Commission's work. To move toward more ecosystem-based approaches, managers must consider the relationships among all ecosystem components, including human and nonhuman species and the environments in which they live. Management areas should be defined based on ecosystem, rather than political, boundaries. A balanced precautionary approach should be adopted that weighs the level of scientific uncertainty and the potential risk of damage before proceeding.

In moving toward an ecosystem-based approach, the U.S. Commission on Ocean Policy considers the following actions absolutely critical. First, a new national ocean policy framework must be established to improve Federal leadership and coordination and enhance opportunities for State, territorial, tribal, and local entities to improve responses at the regional level. Second, decisions about ocean and coastal resources need to be based on the most current, credible, unbiased scientific

data. And third, improved education about the oceans is needed to give the general public a sense of stewardship and prepare a new generation of leaders to address ocean issues.

IMPROVING GOVERNANCE

Many different entities at the Federal, regional, State, territorial, tribal and local levels participate in the management of the nation's oceans and coasts. At the Federal level, eleven of the fifteen existing cabinet-level departments and four independent agencies play important roles in the development of ocean and coastal policy. All of these Federal agencies also interact in various ways with State, territorial, tribal, and local entities.

A lack of communication and coordination among the various agency programs at the national level, and among Federal, State and local stakeholders at the regional level, continues to inhibit effective action. A new National Ocean Policy Framework is needed to provide high-level attention and coordinated implementation of an integrated national ocean policy.

National Coordination and Leadership

A first step in enhancing management, and a central part of the new National Ocean Policy Framework, is improved coordination among the many Federal programs. A number of attempts have been made to coordinate on particular topics, such as coral reefs or marine transportation, or within a broad category, such as ocean science and technology. Within the Executive Office of the President, three entities have specific responsibilities relevant to oceans: the Office of Science and Technology Policy that addresses government-wide science and technology issues and includes an ocean subcommittee; the Council on Environmental Quality (CEQ) that oversees broad Federal environmental efforts and implementation of the National Environmental Policy Act; and the National Security Council's Policy Coordinating Committee that addresses international issues and also includes a subcommittee on international ocean issues.

While all these coordinating bodies are helpful in their designated areas of interest, they do not constitute a high-level interagency mechanism able to deal with all of the interconnected ocean and coastal challenges facing the nation, including not only science and technology, the environment, and international matters, but the many other economic, social, and technical issues that affect the ocean.

The value of the ocean to American society also cries out for greater visibility and leaderships. Only the Executive Office of the President can transcend traditional conflicts among departments and agencies, make recommendations for broad Federal agency reorganization, and provide guidance on funding priorities, making it the appropriate venue for coordinating an integrated national ocean policy.

National Ocean Council

Congress should establish a National Ocean Council within the Executive Office of the President to provide high-level level attention to ocean and coastal issues, develop and guide the implementation of appropriate national policies, and coordinate the many Federal departments and agencies with ocean and coastal responsibilities. The National Ocean Council, or NOC, should be composed of cabinet secretaries of departments and directors of independent agencies with relevant ocean- and coastal-related responsibilities and should carry out a variety of functions including the following:

- developing broad principles and national goals for ocean and coastal governance;
- making recommendations to the President on national ocean policy;
- coordinating and integrating activities of ocean-related Federal agencies;
- identifying statutory and regulatory redundancies or omissions and developing strategies to resolve conflicts, fill gaps, and address new and emerging ocean issues;
- developing and supporting partnerships between government agencies and nongovernmental organizations, the private sector, academia, and the public.

Presidential Council of Advisors on Ocean Policy

A Presidential Council of Advisors on Ocean Policy, co-chaired by the chair of the National Ocean Council and a non-Federal member, should advise the President on ocean and coastal policy matters and serve as a formal structure for input from non-Federal individuals and organizations. It should be composed of a representative selection of individuals appointed by the President, including governors of coastal states, other appropriate State, territorial, tribal and local government representatives, and individuals from the private sector, research and education communities, nongovernmental organizations, watershed organizations and other non-Federal bodies with ocean interests. The members should be knowledgeable about and experienced in ocean and coastal issues.

Need for Presidential Action—the Assistant to the President

Although Congress should establish the National Ocean Council and the Presidential Council of Advisors on Ocean Policy in law to ensure their long-term future, the Commission is cognizant of the complex and often lengthy nature of the legislative process. While awaiting congressional action, the President should immediately establish these entities through Executive Order, and should appoint an Assistant to the President to chair the Council. As chair of the NOC and co-chair of the Presidential Council of Advisors on Ocean Policy, the Assistant to the President should lead the coordination of Federal agency actions related to oceans and coasts, make recommendations for Federal agency reorganization as needed to improve ocean and coastal management, resolve interagency policy disputes, and promote regional approaches. The Assistant to the President should also advise OMB and the agencies on appropriate funding levels for important ocean- and coastal-related activities, and prepare a biennial report as mandated by section 5 of the Oceans Act of 2000.

Office of Ocean Policy

Because the National Ocean Council will be responsible for planning and coordination rather than operational duties, the support of a small staff and committees will be required to carry out its functions. An Office of Ocean Policy should support the Assistant to the President, the National Ocean Council, and the Presidential Council of Advisors on Ocean Policy. The Office of Ocean Policy should be composed of a small staff that reports to the Assistant to the President, managed by an executive director responsible for day-to-day activities. Strong links should be maintained among the National Ocean Council, its committees and staff, other parts of the Executive Office of the President, and ocean-related advisory councils and commissions.

Committee on Ocean Science, Education, Technology, and Operations

A committee under the National Ocean Council will be needed to assume the functions of the current National Ocean Research Leadership Council (NORLC), a congressionally-established government coordination and leadership organization for oceanographic research programs on the national level. By placing the NORLC under the NOC and broadening its responsibilities to include operational programs and educational activities in addition to research, it will become more visible

and more effective. In recognition of its broader mandate, the NORLC should be redesignated as the Committee on Ocean Science, Education, Technology, and Operations (COSETO). Strong connections between the Office of Science and Technology Policy and the NOC (through COSETO) will be essential. To eliminate overlapping functions, the National Science and Technology Council's Joint Subcommittee on Oceans, should be subsumed into COSETO.

Committee on Ocean Resource Management

The National Ocean Council will need a second committee, to coordinate Federal resource management policy, including the many existing, single-issue coordination efforts such as the Coral Reef Task Force, the Interagency Committee on the Marine Transportation System, the National Dredging Team, Coastal America, and many others. The NOC Committee on Ocean Resource Management (CORM) would perform high-level, cross-cutting oversight of these issue-specific efforts to ensure consideration of cumulative impacts, minimize conflicting mandates, and implement an ecosystem-based management approach. Because of the Council on Environmental Quality's role in environmental issues, this office should also maintain strong connections with the National Ocean Council and its CORM.

A Regional Approach

In addition to improved coordination at the national level, an important component of the new National Ocean Policy Framework is the promotion of regional approaches that allow decisionmakers to address issues across jurisdictional lines. The nation's ocean and coastal resources are affected by human activities that span cities, counties, States, and sometimes nations. Federal, State, territorial, tribal, and local governments need the ability to respond to ocean and coastal issues in a coordinated fashion within regions defined by the boundaries of ecosystems rather than somewhat arbitrary government jurisdictions. The voluntary establishment of regional ocean councils, improved coordination of Federal agency efforts at the regional level, and dissemination of regionally significant research and information would enhance regional coordination and improve responses to regional issues.

Creating Regional Ocean Councils

There are many examples where concern for the health of a particular ecosystem (such as the Chesapeake Bay, Pacific Northwest, Gulf of Mexico, or Mississippi River Basin) has motivated a wide range of participants to create new structures for addressing regional concerns. There is a growing awareness that existing regional approaches can be strengthened and similar approaches can benefit the health and productivity of all the nation's ocean and coastal regions.

Regional ocean councils can serve as mechanisms for a wide range of participants to join forces to address issues of regional concern, realize regional opportunities, identify regional goals, and promote a sense of stewardship for a specific area among all levels of government, private interests, and the public. It will be up to the participants—including representatives from all levels of government, the private sector, nongovernmental organizations, and academia—to determine how the council will operate in each region. Possible council functions might include:

- designating ad hoc subcommittees to examine specific issues of regional concern;
- mediating and resolving disputes among different interests in the region;
- monitoring and evaluating the state of the region and the effectiveness of management efforts;
- building public awareness about regional ocean and coastal issues;

- facilitating government approvals or permitting processes that involve several Federal, State, and local government agencies within the region; and
- helping to link activities located in upstream, coastal, and offshore areas within an ecosystem-based management context.

Regional ocean councils should be created by interested parties at the State and local level, rather than mandated by the Federal Government. However, to stimulate the process, the National Ocean Council should develop flexible guidelines for the voluntary creation of regional ocean councils. Initial efforts should be encouraged in regions where readiness and support for a regional approach is already strong. The first councils can then serve as pilot projects, allowing those involved to learn what works in the region, building support to implement a regional ocean council, and paving the way for councils in other regions. Once established, regional ocean councils will most likely evolve, as participants identify the structure and functions that best suit their needs. Whether a council has decisionmaking authority will be up to the regional participants. National involvement may be necessary to implement more formal decisionmaking mechanisms such as legislation, interagency agreements, and interstate compacts.

Regional ocean councils should encompass an area from the inland extent of coastal watersheds to the offshore boundary of the nation's EEZ. The boundaries of the Regional Fishery Management Councils (RFMCs) may be considered as a starting point, although these regions may not always be suitable. For example, more than one regional ocean council will probably be necessary within California where there is only one RFMC. A regional ocean council for the Great Lakes region is also desirable.

Improving Regional Coordination of Federal Agencies

While the process of planning, establishing, and testing regional ocean councils is underway, Federal agencies should be directed to immediately improve their own regional coordination and provide stronger institutional, technical, and financial support for regional issues. Currently, the actions of Federal agencies often overlap, conflict, or are inconsistent with one another at the regional and State levels. Although several Federal agencies already divide their operations into regions, the boundaries of these regions differ from one agency to the next, the functions of regional offices vary widely, and it is common for the regional office of one agency to operate in isolation from the regional offices of other agencies. Improved regional coordination should be a first step, followed in time by Federal reorganization around common regional boundaries.

Enhancing Regional Research and Information

Decisionmakers at all levels need the best available science, information, tools, and technology on which to base ocean and coastal management decisions. However, research and data collection targeted at regional concerns is severely limited. Furthermore, the data that do exist are rarely translated into products that are useful to managers. Regional ocean information programs should be established to set priorities for research, data collection, information products, and outreach activities in support of improved regional management. Where and when they are established, regional ocean councils will be the logical bodies to administer these programs.

Improved Governance of Offshore Waters

Converging economic, technological, legal, and demographic factors make Federal waters an increasingly attractive place for enterprises seeking to tap the ocean's resources. The challenge for

policymakers will be to realize the ocean's potential while minimizing conflicts among users, safeguarding human and marine health, and fulfilling the Federal Government's obligation to manage public resources for the maximum long-term benefit of the entire nation. While institutional frameworks exist for managing some ocean uses, increasingly unacceptable gaps remain.

The array of agencies involved, and their frequent lack of coordination, can create roadblocks to public participation, discourage private investment, cause harmful delays, and generate unnecessary costs. This is particularly true for new ocean uses that are subject to scattered or ill defined Federal agency authorities and an uncertain decisionmaking process. Without an understandable, streamlined, and broadly accepted method for reviewing proposed activities, ad hoc management approaches will continue, perpetuating uncertainty and raising questions about the comprehensiveness and legitimacy of decisions.

To start, each existing or foreseeable activity in Federal waters should be overseen by one lead Federal agency, designated by Congress to coordinate among all the agencies with applicable authorities while ensuring full consideration of the public interest. Pending such designations, the NOC should assign agencies to coordinate research, assessment, and monitoring of new offshore activities.

But better management of individual activities is only a first step. To move toward an ecosystem-based management approach, the Federal Government should develop a broad understanding of offshore areas and their resources, prioritize all potential uses, and ensure that activities within a given area are compatible. As the pressure for offshore uses grows, and before serious conflicts arise, coordination should be improved among the management programs for different offshore activities. The National Ocean Council should review each single-purpose program that regulates some offshore activity with the goal of determining how all such programs may be better coordinated.

Ultimately, the nation needs a coordinated offshore management regime that encompasses traditional and emerging uses, and is flexible enough to incorporate uses not yet foreseen. The new regime will need to make decisions and resolve disputes through an open process accepted by all parties. Congress, working with the NOC and regional ocean councils, should establish such an offshore management regime and establish principles for offshore use, including the need to:

- integrate single-purpose programs within the broader offshore regime;
- create a planning process for new and emerging activities; and
- ensure a reasonable return to the public in exchange for allowing private interests to profit from public resources.

Establishing a coordinated offshore management regime will take time, and it will not be easy. No regime for governing ocean activities will eliminate all conflicts, given the complexity of the problems and the diverse perspectives of competing interests. However, the National Ocean Council, Presidential Council of Advisors on Ocean Policy, regional ocean councils, and other components of the National Ocean Policy Framework provide a promising basis for more coordinated, participatory management of ocean activities.

Marine Protected Areas
In contemplating the coordinated, ecosystem-based management of both nearshore and offshore areas, marine protected areas can be a valuable tool. Marine protected areas can be created for many different reasons, including conserving living marine resources and habitat, protecting endangered or threatened species, maintaining biological diversity, and preserving historically or culturally important submerged archeological resources. These areas have also been recognized for their scientific, recreational, and educational values.

The creation of new MPAs can be a controversial process: supported by those who see their benefits, while vigorously opposed by others who dislike the limitations MPAs impose on ocean uses. Thus, it is important to engage local and regional stakeholders in the design and implementation of marine protected areas to build support and ensure compliance with any restrictions. Because marine protected areas also have national implications, such as possible impacts on freedom of navigation, Federal involvement and oversight will still be needed.

With its multiple use, ecosystem-based perspective, the National Ocean Council should oversee the development of a flexible process—which is adaptive and based on best available science—to design and implement marine protected areas. Regional ocean councils, or other appropriate entities, can provide a forum for applying the process developed by the NOC, with broad stakeholder participation.

Strengthening and Streamlining the Federal Agency Structure
Although improved coordination is a vital aspect of the new National Ocean Policy Framework, changes to the Federal agency structure itself will also be needed. The proliferation of Federal agencies with some element of responsibility for ocean and coastal activities immediately suggests that some consolidation is possible. Combining similar ocean and coastal functions and programs could improve government performance, reduce unnecessary overlaps, facilitate local, State, and regional interactions with the Federal Government, and begin to move the nation toward a more ecosystem-based management approach.

However, the complex Legislative and Executive Branch process for making such changes compels a cautious, methodical, multi-phased approach for improving the Federal structure.

Strengthening NOAA—Phase I
NOAA's mission is to understand and predict changes in the Earth's environment and to conserve and manage ocean and coastal resources to meet the nation's economic, social, and environmental needs. Since its creation, NOAA has made significant strides in many areas, despite programmatic and functional overlaps and frequent disagreements and disconnects among its five line offices. Although the organization has evolved over time, including the recent creation of a sixth line office to improve integration on specific issues, these changes take time and results can be hard to quantify.

There is widespread agreement that NOAA needs to manage its current activities more effectively. Moreover, if the recommendations in the Commission's preliminary report are implemented, NOAA will be required to handle a number of new responsibilities. A stronger, more effective, science-based and service-oriented ocean agency—one that contributes to better management of oceans and coasts through an ecosystem-based approach—is needed.

NOAA's three primary functions can be summarized as follows:

1) *Assessment, prediction, and operations* for ocean, coastal, and atmospheric environments, including mapping and charting, satellite-based and in situ data collection, implementation of the Integrated Ocean Observing System, data information systems, and weather services and products.
2) *Marine resource and area management*, including fisheries, ocean and coastal areas, vulnerable species and habitats, and protection from pollution and invasive species.
3) *Scientific research and education*, including a focus on applied research, the availability of scientifically valid data, and promotion of educational activities.

One of the critical objectives for a strengthened NOAA is improved performance within these categories and smoother interactions among them. For example, resource management decisions should be based on the best available science, research itself should be planned to support the agency's management missions, and research in different areas—sea, land, and air—should be connected and coordinated. Changes of this nature will likely require adjustments to the internal operation of the agency, including possible additional changes to the current line office structure.

These changes can be promoted by codifying the establishment and functions of the National Oceanic and Atmospheric Administration through passage of an organic act for the agency. The act should ensure that NOAA's structure is consistent with the principles of ecosystem-based management and with its primary functions: assessment, prediction, and operations; management; and research and education. NOAA will require budget support commensurate with its important, varied, and growing responsibilities.

Reviewing NOAA's Budget

NOAA's placement within the Department of Commerce has an unusual history and continues to be questioned by many observers. If nothing else, this affiliation has distinct budgetary implications. As part of DOC, NOAA's budget is reviewed within the Office of Management and Budget's General Government Programs, along with other DOC programs with fundamentally different characteristics and missions. NOAA's OMB review also fails to consider its ocean and atmospheric programs in context with other Federal resource management and science programs. To support the move toward a more ecosystem-based management approach, NOAA's budget should be reviewed within OMB's Natural Resources Programs, along with the budgets of more similar departments and agencies.

Consolidating Ocean and Coastal Programs—Phase II

As I have said, many agencies across the Federal Government—in addition to NOAA—administer ocean- and coastal-related programs. Although I have focused on NOAA as the primary ocean agency, the other agencies should also be strengthened in similar ways.

However, even solid performance within each agency will not eliminate the many similar or overlapping activities. In some cases, programmatic overlap can provide useful checks and balances as agencies bring different perspectives and experiences to the table. In other cases, the number of separate agencies addressing a similar issue is not helpful. Such fragmentation diffuses responsibility, introduces unnecessary overlap, raises administrative costs, inhibits communication, and interferes with the development of a comprehensive management regime that addresses issues within an ecosystem-based context.

The Commission's preliminary report presents specific recommendations on program consolidation in areas such as nonpoint source pollution, area-based ocean and coastal resource management, vessel pollution, invasive species, marine mammals, aquaculture, and satellite-based Earth observing. Using these recommendations as a starting point, the Assistant to the President, with advice from the National Ocean Council and the Presidential Council of Advisors on Ocean Policy, should review Federal ocean, coastal and atmospheric programs, and recommend further opportunities for consolidation.

Programs not suitable for consolidation—such as security-related programs that cannot be transferred without harm to the overall enterprise—should continue to be coordinated through the National Ocean Council and the regional ocean councils. However, in most cases, judicious consolidation of ocean- and coastal-related functions will improve policy integration and program effectiveness.

Presidential Reorganization Authority

The recommended program consolidation will not be easy within the current legislative process. The creation and reorganization of agencies is often contentious, lengthy, and uncertain, involving multiple committees in both houses of Congress. Recognizing this shortcoming, Congress has several times in the past chosen to give the President limited reorganization authority. Renewing this authority by allowing the President to propose agency reorganization, with an expedited and limited congressional review and approval process, would provide an excellent mechanism to achieve reorganization of Federal ocean- and coastal-related agencies in a timely fashion.

Managing all Natural Resources in an Ecosystem-based Management Context—Phase III

Strengthening the performance of ocean, coastal, and atmospheric programs through coordination and consolidation are important steps in moving toward an ecosystem-based management approach. By immediately establishing the National Ocean Council and strengthening NOAA, followed by the consolidation of suitable ocean and coastal programs and functions, the nation will be poised to take a further step in strengthening the Federal Government structure.

Based on a growing understanding of ecosystems, including recognition of the inextricable links among the sea, land, air, and all living things, a more fundamental reorganization of Federal resource agencies will eventually be needed. Consolidation of all natural resource functions, including those involving oceans and coasts, would enable the Federal Government to move toward true ecosystem-based management. This could be implemented through the establishment of a Department of Natural Resources or some other structural unification that brings together all of the nation's natural resource programs.

SCIENCE-BASED DECISIONS: ADVANCING OUR UNDERSTANDING OF THE OCEANS

Ecosystem-based management provides many potential benefits, but also imposes new responsibilities on managers. The need to collect good information and to improve understanding is perhaps foremost among these new responsibilities. Despite considerable progress over the last century, the oceans remain one of the least explored and most poorly understood environments on the planet.

Greater knowledge can enable policymakers and managers to make wise, science-based decisions at the national, regional, State, and local levels. However, existing research and monitoring programs, which tend to be agency-specific and single issue oriented, will need to be reorganized to support ecosystem-based management. The current mismatch between the size and complexity of marine ecosystems and the fragmented research and monitoring programs for coastal and ocean ecosystems must be resolved.

The nation also lacks effective mechanisms for incorporating scientific information into decisionmaking in a timely manner. As knowledge improves, it must be translated into useful terms and actively incorporated into policy through an adaptive process. To make the translation effective, local, State, regional, and national managers need avenues to communicate their information needs and priorities to the research community.

In addition to these practical needs, ocean science and technology will continue to be an integral part of the overall U.S. basic research enterprise and future discoveries will undoubtedly contribute greatly to society. Fundamental knowledge about the oceans is essential to understanding the Earth's environment and how it changes over time, assessing and predicting the status of marine resources, finding beneficial new uses of ocean resources, and protecting national security.

Federal Leadership in Ocean Science and Technology

Our Commission defines ocean science and technology broadly to include: exploration of new ocean environments; basic and applied research to increase understanding of the biology, chemistry, physics, and geology of the oceans and coasts, their interactions with terrestrial, hydrologic, and atmospheric systems, and the interactions between ocean and coastal regions and humans; and the development of new methodologies and instruments.

Today, 15 Federal agencies support or conduct diverse activities in ocean science, technology, assessment, and management. The heads of these agencies direct the National Oceanographic Partnership Program (NOPP), which coordinates national oceanographic research and education. NOPP has provided a useful venue for agencies to support a small number of ocean science and technology projects, but it has not realized its full potential as an overarching mechanism for coordination among Federal agencies and State, local, academic, and private entities.

Under the proposed National Ocean Policy Framework, the National Ocean Council's Committee on Ocean Science, Education, Technology, and Operations (COSETO) will assume leadership of NOPP to implement a broad national strategy for ocean research, education, observation, exploration, and marine operations. NOPP's existing offices and committees will be incorporated within this structure. Ocean.US, the lead office for planning the Integrated Ocean Observing System (IOOS), and the Federal Oceanographic Facilities Committee which provides advice on oceanographic facilities, will both report to COSETO.

Creating a National Strategy for Ocean Science and Technology

The United States needs a national strategy for ocean and coastal research, exploration, and marine operations that can help meet the ocean resource management challenges of the 21st century and ensure that useful products result from Federal investments in ocean research. Much more needs to be known about how marine ecosystems function on varying spatial scales, how human activities affect marine ecosystems and how, in turn, these changes affect human health. Coordinated and enhanced research activities and marine operations are needed to:

- understand biological, physical, and chemical processes and interactions
- maintain overall ecosystem health and biological diversity
- observe, monitor, assess, and predict environmental events and long-term trends
- explore the ocean depths for new resources
- map ocean and coastal areas for safe navigation and resource management

Furthermore, the ocean and coastal environment is rife with conflicts among competing users and between groups of people applying different sets of values to the same issues. To resolve these conflicts, information is needed not only about the natural environment but also about relevant social, cultural, and economic factors.

Better coordination and increased support of ocean science and technology activities nationwide will help the United States to address numerous management challenges, and will position the nation to quickly tackle new issues as they emerge.

Advancing Ocean and Coastal Research

The United States has a wealth of ocean research expertise spread across a network of government and industry laboratories and world-class universities, colleges, and marine centers. With strong Federal support, these institutions made the United States the world leader in oceanography during the 20th century. However, a leader cannot stand still. Ocean and coastal management issues continue to grow in number and complexity, new fields of study have emerged, new interdisciplinary approaches are being tried, and there is a growing need to understand the ocean on a global and regional scale. All this has created a corresponding demand for high-quality scientific information. And while the need for increased information continues to grow, the Federal investment in ocean research has stagnated in recent decades.

The current annual Federal investment in marine science is well below the level necessary to address adequately the nation's needs for coastal and ocean information. Unless funding increases sharply, the gap between requirements and resources will continue to grow and the United States will lose its position as the world's leader in ocean research.

Congress should double the Federal ocean and coastal research budget over the next five years, from the 2004 level of approximately $650 million to $1.3 billion per year. As part of this increase, the National Ocean Council or Congress should:

- fund the research component of the regional ocean information programs to provide practical, management-oriented information at regional, State, and local levels;
- create a national program for social science and economic research to examine the human dimensions and economic value of the nation's oceans and coasts, with funding of at least $8-10 million a year;
- establish a joint Oceans and Human Health Initiative funded at $28 million a year;
- significantly increase the budget of the National Sea Grant College Program.

To ensure that increased investments are used wisely and that important research activities continue, Federal agencies will need to create long-term strategic plans. A mechanism is required to coordinate federally-funded ocean research, support long-term projects, and create partnerships

throughout all agencies and sectors. Transparent and comprehensive research plans would achieve these goals and ensure that research results can be translated into operational products in a timely manner. The National Ocean Council should develop a national ocean research strategy that reflects a long-term vision, promotes advances in basic and applied ocean science and technology, and guides relevant agencies in developing ten-year science plans and budgets.

Ocean Exploration

About 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. Advances in deep-sea technologies have also made it easier to locate shipwrecks and historical artifacts lost in the ocean depths, such as the stunning discovery of the *RMS Titanic* in 1985. The continued exploration of marine archaeological sites will help us to better understand human history and our global cultural heritage.

Very little is known about the ocean depths due primarily to the lack of a long-term, large-scale national commitment to ocean exploration. In 2000, recommendations from the President's Panel on Ocean Exploration led to the establishment of the Office of Exploration within NOAA, at a modest funding level of $4 million in fiscal year 2001, and $14 million in each of fiscal years 2002 and 2003. This program is helping NOAA to fulfill its applied science, environmental assessment, and technology development responsibilities; although the program's small budget and agency-specific focus limit its effectiveness.

NOAA and NSF, by virtue of their missions and mandates, are well positioned to lead a global U.S. ocean exploration effort. NOAA currently runs the Office of Ocean Exploration, but NSF's focus on basic research provides an excellent complement to NOAA's more applied mission. Working together, the two agencies have the capacity to systematically explore and conduct research in previously unexamined ocean environments. To succeed, coordination, joint funding, and interactions with academia and industry will be essential. Congress should appropriate significant funding for an expanded national ocean exploration program and the National Oceanic and Atmospheric Administration and the National Science Foundation should be designated as the lead agencies. An expanded national ocean exploration program will require a budget of approximately $110 million annually, plus additional funds for required infrastructure.

Mapping, Charting, and Assessments

The need for routine mapping, monitoring, and assessment of U.S. waters has grown significantly in the past two decades. Accurate, up-to-date maps and charts of harbors, coastlines, and the open ocean are necessary for many activities, including shipping, military operations, and scientific research. In addition, expanded regulatory regimes rely heavily on routine assessments of living and nonliving marine resources and water quality. Modern sensor technologies, which can detect new variables in greater detail in the water column and seafloor, have improved our ability to follow changing ocean and terrestrial dynamics. But as these new technologies are implemented, they need to be calibrated against previous methods, as well as with each other, to provide useful environmental characterizations and ensure the consistency of long-term statistical data sets.

At least ten Federal agencies, almost all coastal states, and many local agencies, academic institutions, and private companies are involved in mapping, charting, and assessing living and nonliving resources in U.S. waters. However, different organizations use varying methods for

collecting and presenting these data, leading to disparate products that contain gaps in the information they present. Ideally, a variety of information (e.g., bathymetry, topography, bottom type, habitat, salinity, vulnerability) should be integrated into maps using Global Positioning System coordinates and a common geodetic reference frame. In addition, these maps should include living marine resources, energy resources, and environmental data when available, to create complete environmental characterizations necessary for developing and implementing science-based ecosystem-based management approaches.

Coordination of the many existing Federal mapping activities will increase efficiency and help ensure that all necessary surveys are conducted. Drawing upon the mapping and charting abilities found in the private sector and academia will also be necessary to achieve the best results at the lowest cost.

The National Ocean Council should coordinate Federal ocean and coastal resource assessment, mapping, and charting activities with the goal of creating standardized, easily accessible national maps that incorporate living and nonliving marine resource data along with bathymetry, topography, and other natural features.

Achieving a Sustained, Integrated Ocean Observing System

About 150 years ago, this nation set out to create a comprehensive weather forecasting and warning network and today most people cannot imagine living without constantly updated weather reports. Recognizing the enormous national benefits that have accrued from the weather observing network, it is time to invest in a similar observational and forecasting capability for the oceans. This system would gather information on physical, geological, chemical, and biological parameters for the oceans and coasts, conditions that affect—and are affected by—humans and their activities. The United States currently has the scientific and technological capacity to develop a sustained, national Integrated Ocean Observing System (IOOS) that will support and enhance the nation's efforts for:

- improving the health of our coasts and oceans;
- protecting human lives and livelihoods from marine hazards;
- supporting national defense and homeland security efforts;
- measuring, explaining, and predicting environmental changes;
- providing for the sustainable use, protection, and enjoyment of ocean resources;

The National Ocean Council should make the development and implementation of a sustained, national Integrated Ocean Observing System a central focus of its leadership and coordination role. The United States simply cannot provide the economic, environmental, and security benefits listed above, achieve new levels of understanding and predictive capability, or generate the information needed by a wide range of users, without implementing the IOOS.

The IOOS is based on two components: 1) open ocean observations conducted in cooperation with the international Global Ocean Observing System (GOOS) and 2) a national network of coastal observations conducted at the regional level. The coastal component will include the U.S. exclusive economic zone, the Great Lakes, and coastal and estuarine areas.

A strong national governance structure is required to establish policy and provide oversight for all components of the IOOS and to ensure strong integration among the regional, national, and global

levels. Interagency coordination and consensus through the National Ocean Council and Ocean.US will be essential. While regional systems will retain a level of autonomy, achievement of the IOOS with nationwide benefits will require the regional systems to follow some national guidelines and standards. In addition, developers of the IOOS must ensure that the global component is not minimized and that the connectivity with the GOOS, including U.S. funding and leadership, remains strong and viable.

Formalizing Ocean.US

Ocean.US has made significant progress as the lead organization for the design and implementation of the national IOOS. However, a fundamental problem current exists in that Ocean.US has a number of responsibilities without any real authority or control over budgets. Its ephemeral existence under the Memorandum of Agreement which created it, its dependence on personnel detailed from the member agencies, and its lack of a dedicated budget severely detract from its stature within the ocean community and its ability to carry out its responsibilities. Congress should formally establish Ocean.US under the National Ocean Council structure so that it may effectively advise the NOC and achieve its coordination and planning mandates. The office requires consistent funding and dedicated full-time staff with the expertise and skills needed to ensure professional credibility. In addition, outside experts on rotational appointments could help Ocean.US better meet its responsibilities.

Coordinating Regional Observing Systems

Ocean.US envisions the creation of a nationwide network of regional ocean observing systems that will form the backbone of coastal observations for the IOOS. Although Ocean.US has proposed the creation of Regional Associations, coordinated through a national federation, as the governing bodies of the regional systems, this concept is unnecessarily narrow. To fully address the needs of coastal managers, ocean observations need to be integrated into other information gathering activities such as regionally-focused research, outreach and education, and regional ecosystem assessments. Thus, the proposed regional ocean information programs provide a more comprehensive mechanism for developing and implementing regional ocean observing systems, in coordination with their broader responsibilities. Regular meetings among all the regional ocean information programs and Ocean.US will be important for providing regional and local input into developing requirements of the national IOOS.

Reaching Out to the User Community

The IOOS must meet the needs of a broad suite of users, including the general public. To get the most out of the IOOS, resource managers at Federal, State, regional, territorial, tribal, and local levels will need to supply input about their information needs and operational requirements and provide guidance on what output would be most useful. Other users, including educators, ocean and coastal industries, fishermen, and coastal citizens, must also have a visible avenue for providing input. Ocean.US and the regional ocean information programs will need to devote significant time and thought to proactively approaching users and promoting public awareness of the enormous potential of the IOOS.

Planning Space-based Observations

An integral part of the national IOOS are the space-borne sensors that provide comprehensive, real-time, widespread coverage of ocean conditions and features. However, implementing sustained observations from space requires intense planning with long lead times. Given the cost, the time frame for constructing and launching satellites, and the inability to modify satellites once in orbit,

five- to ten-year plans are required to ensure that satellite observations will be available on a continuous basis and employ the most useful and modern sensors. Ocean.US and NOAA must work with NASA to ensure that ongoing satellite operations are fully integrated into the national IOOS.

Both NOAA and NASA currently operate civilian, space-based, Earth observing programs that measure terrestrial, atmospheric, and oceanic variables. NOAA's primary mission in this area is to provide sustained, operational observations for monitoring and predicting environmental conditions and long-term changes, with a focus on weather and climate. In contrast, NASA's mission is to advance research efforts and sensor development. A NASA project can last from a few days to a few years, and NASA has repeatedly asserted that it is not in the business of providing data continuity. In many instances, the lifetime of a NASA satellite, and its continued ability to collect and transmit data, outlasts its funding, resulting in premature termination at odds with the pressing demands for data in the operational context. Thus NASA's efforts have not, and will not, result in the sustained capabilities needed for the national IOOS.

Congress should transfer the operation of NASA's Earth environmental observing satellites, along with associated resources, to NOAA to achieve continuous data collection. NOAA and NASA should work together to plan future missions and then ensure the smooth transition of each Earth environmental observing satellite after its launch. By consolidating Earth, and particularly ocean, observing satellite missions in NOAA, more seamless, long-term planning will be possible, resulting in a smooth concept-to-operations data collection process.

Information Product Development

To justify large Federal investments in the IOOS, the system must result in tangible benefits for a broad and diverse user community, including the general public, scientists, resource managers, emergency responders, policymakers, private industry, educators, and officials responsible for homeland security. National Weather Service and commercial meteorological products have applications ranging from scientific research to human safety, transportation, agriculture, and simple daily forecasts. Similarly, IOOS products should be wide-ranging and based on the needs of regional and local organizations and communities, as well as national needs. The regional ocean information programs should help produce information products of benefit to regional, State, and local managers and organizations. These regional programs will also provide important feedback to national forecasters and modelers about ways to make national IOOS products more useful.

Funding the IOOS

To fulfill its potential, the IOOS will require stable funding over the long haul. The lack of long-term funding for existing regional ocean observing systems has contributed to their isolation and piecemeal implementation. But consistent funding will help ensure that the American public receives the greatest return for its investment in the form of useful information, reliable forecasts, and timely warnings. The estimated start-up costs for the implementation of the national IOOS over the first five years is close to $2 billion.

Continuous improvements to IOOS observation and prediction capabilities will also require sustained investments in technology development. Considering the costs of sensor development, telecommunications, computer systems, and improvements in modeling and prediction capabilities, annual costs for operating, maintaining, and upgrading the national IOOS are estimated to be $650–$750 million a year.

Whole Earth Observations

The IOOS cannot exist as a stand-alone system, developed without considering associated observations. Rather, it should be integrated with other environmental observing systems to link weather, climate, terrestrial, biological, watershed, and ocean observations into a unified Earth Observing System. The National Ocean Council should oversee coordination of the IOOS with other existing and planned terrestrial, watershed, atmospheric, and biological observation and information collection systems, with the ultimate goal of developing a national Earth Observing System. Such a system would improve understanding of environmental changes, processes, and interactions, making ecosystem-based management possible.

Enhancing Ocean Infrastructure and Technology Development

A robust infrastructure with cutting-edge technology forms the backbone of modern ocean science. It supports scientific discovery and facilitates application of those discoveries to the management of ocean resources. The nation has long relied on technological innovation, including satellites, early-warning systems, broadband telecommunications, and pollution control devices to advance economic prosperity, protect life and property, and conserve natural resources. Ocean research, exploration, mapping, and assessment activities will continue to rely on modern facilities and new technologies to acquire data in the open ocean, along the coasts, in polar regions, on the seafloor, and even from space.

The three major components of the nation's scientific infrastructure for oceans and coasts are:

- *Facilities*—land-based laboratories and ocean platforms, including ships, airplanes, satellites, and submersibles, where research and observations are conducted;
- *Hardware*—research equipment, instrumentation, sensors, and information technology systems used in the facilities; and
- *Technical Support*—the expert human resources needed to operate and maintain the facilities and hardware as well as participating in data collection, assimilation, analysis, modeling, and dissemination.

The number and types of assets included in the national ocean science infrastructure are extensive and cover a wide range of Federal, State, academic, institutional, and private-sector entities.

Together, they represent a substantial public and private investment that has made possible great strides in modern oceanography over the last 50 years. But a recent assessment of these assets revealed that significant components of the U.S. ocean infrastructure are aged or obsolete and that, in some cases, current capacity is insufficient to meet the needs of the ocean science and operational community. The National Ocean Council's Committee on Ocean Science, Education, Technology, and Operations should develop a national ocean and coastal infrastructure and technology strategy to achieve and maintain an appropriate mix of federally-supported, modern ocean facilities that meet the nation's needs for quality resource management, science, and assessment.

Funding Needed Assets

There are currently several critically needed components of the ocean science and technology infrastructure, including:

- Surface vessels, such as new University National Oceanographic Laboratory System vessels and fishery research ships
- Undersea vehicles, including an array of manned, remotely operated, and autonomous submersibles
- Aircraft, both manned and unmanned
- Modern laboratories and instrumentation
- Dedicated ocean exploration platforms
- Telecommunications technology
- Environmental and biological sensors

Congress should establish a modernization fund to support these critical ocean infrastructure and technology needs. Such a fund would be used to build or upgrade facilities and acquire related instrumentation and equipment. It would also provide a mechanism to coordinate similar equipment purchases across agencies, where feasible, creating significant economies of scale. Current and future spending priorities for the fund should be based on the National Ocean Council's ocean and coastal infrastructure and technology strategy.

Transferring Technology

The development of needed ocean technologies—whether identified by the national strategy or through interagency communication—requires directed funding and coordination. Federal agency programs will benefit by having a centralized office responsible for accelerating the transition of technological advances made by Federal and academic laboratories into routine operations.

NOAA should create, and Congress should fund, an Office of Technology to expedite the transition of experimental technologies into operational applications. This office should work closely with academic institutions, the regional ocean information programs, the National Science Foundation, the U.S. Navy, the National Aeronautics and Space Administration, and other relevant agencies to achieve this mission.

Modernizing Ocean Data and Information Products

Ocean and coastal data are essential for understanding marine processes and resources. They are the foundation for the science-based information on which resource managers depend. But storing and processing large amounts of data, and converting them into information products useful to a broad community of end users, remains a huge challenge.

There are two major challenges facing data managers today: the exponentially growing volume of data, which continually strains data ingestion, storage, and assimilation capabilities; and the need for timely access to these data by the user community in a variety of useful formats. Meeting these challenges will require a concerted effort to integrate and modernize the current data management system. The ultimate goal of improved ocean data management should be to effectively store, access, integrate, and utilize a wide and disparate range of data needed to better understand the environment and to translate and deliver scientific results and information products in a timely way.

Interagency Coordination

An interagency group, dedicated to ocean data and information planning, is needed to enhance coordination, effectively use existing resources for joint projects, schedule future software and hardware acquisitions and upgrades, and oversee strategic funding.

Congress should amend the National Oceanographic Partnership Act to create and fund Ocean.IT as the lead Federal interagency planning organization for ocean and coastal data and information management. Ocean.IT should consist of representatives from all Federal agencies involved in ocean data and information management, be supported by a small office, and report to the National Ocean Council's Committee on Ocean Science, Education, Technology, and Operations.

Ocean.IT should coordinate the development of a viable, long-term data management strategy which includes:

- The implementation of an interagency plan to improve access to data at the national data centers, Distributed Active Archive Centers, and other discipline-based centers. This plan will need to be appropriately integrated with other national and international data management plans, including those for the Integrated Ocean Observing System and Global Ocean Observing System.
- Opportunities to partner with the private sector to enhance environmental data and information management capabilities.

This organization should not have an operational role, but instead should be responsible solely for interagency planning and coordination, similar to the role of Ocean.US for the IOOS.

Informational Product Development

Compared to a few decades ago, an impressive array of data and information products for forecasting ocean and coastal conditions is now available from a wide range of sources. A mechanism is now needed to bring these data together, including the enormous amounts of information that will be generated by the national IOOS, and use these data to generate and disseminate products beneficial to large and diverse audiences.

The National Oceanic and Atmospheric Administration and the U.S. Navy should establish a joint ocean and coastal information management and communications program to generate information products relevant to national, regional, State, and local needs on an operational basis. This program should build on the Navy's model for operational oceanography and take advantage of the strengths of both agencies to reduce duplication and more effectively meet the nation's information needs. This partnership will also allow for the prompt incorporation of classified military data into informational products without publicly releasing the raw data. A NOAA-Navy joint program would rapidly advance U.S. coastal and ocean analyses and forecasting capabilities using all available physical, biological, chemical, and socioeconomic data.

Interactions between private companies and the NOAA-Navy national ocean and coastal information management and communications program could lead to the production of a wide range of general and tailored forecast and warning products. An interface between national forecasters at the NOAA–Navy program and the regional ocean information programs would also help identify ocean and coastal informational products of particular value at the regional and local levels.

PROMOTING LIFELONG OCEAN EDUCATION

Education has provided the skilled and knowledgeable workforce that made America a world leader in technology, productivity, prosperity, and security. However, the emergence of rampant illiteracy about science, mathematics, and the environment now threaten the future of America, its people, and the oceans on which we rely.

Testing results suggest that, after getting off to a good start in elementary school, by the time U.S. students graduate from high school their achievement in math and science falls well below the international average. Ocean-related topics offer an effective tool to keep students interested in science, increase their awareness of the natural world, and boost their academic achievement in many areas. In addition, the links between the marine environment and human experience make the oceans a powerful vehicle for teaching history, culture, economics, and other social sciences. Yet teachers receive little guidance on how they might use exciting ocean subjects to engage students, while adhering to the national and State science and other education standards that prescribe their curricula.

In addition, a 1999 study indicated that just 32 percent of the nation's adults grasp simple environmental concepts, and even fewer understand more complex issues, such as ecosystem decline, loss of biodiversity, or watershed degradation. It is not generally understood that nonpoint source pollution threatens the health of our coastal waters, or that mercury in fish comes from human activities via the atmosphere. Few people understand the tangible value of the ocean to the nation or that their own actions can have an impact on that resource. From excess applications of fertilizers, pesticides, and herbicides on lawns, to the trash washed off city streets into rivers and coastal waters, ordinary activities contribute significantly to the degradation of the marine environment. Without an acknowledgement of the impacts associated with ordinary behavior and a willingness to take the necessary action—which may incur additional costs—achieving a collective commitment to more responsible lifestyles and new policies will be difficult.

Excellent lifelong education in marine affairs and sciences is essential to raising public awareness of the close connection between the oceans and humans, including our history and culture. This awareness will result in better public understanding of the connections among the ocean, land, and atmosphere, the potential benefits and costs inherent in resource use, and the roles of government and citizens as ocean stewards.

Ocean Stewardship

To successfully address complex ocean- and coastal-related issues, balance the use and conservation of marine resources, and realize future benefits from the ocean, an interested, engaged public will be needed. The public should be armed not only with the knowledge and skills needed to make informed choices, but also with a sense of excitement about the marine environment. Individuals should understand the importance of the ocean to their lives and should realize how individual actions affect the marine environment. Public understanding of human impacts on the marine environment should be balanced with recognition of the benefits to be derived from well-managed ocean resources. Because of the connection among the ocean, the atmosphere, and the land, inland communities need to be just as informed as seaside communities.

Science Literacy

Ocean-related education has the potential to stem the tide of science illiteracy threatening to undermine the nation's health, safety, and security. Children have a natural curiosity about the world around them and this allure could be parlayed into higher achievement in other subjects as well. The influence of the ocean on nearly every aspect of daily life, and the central role it plays in the development of the nation, make ocean-based studies ideal for enhancing student performance in areas such as geography, history, economics, policy, and law. Strengthening science literacy, therefore, encompasses not only natural sciences, but a full suite of social sciences.

Future Ocean Leaders

The nation needs a diverse, knowledgeable, and adequately prepared workforce to enhance understanding of the marine environment and make decisions regarding complex ocean- and coastal-related issues. The education of the 21st century ocean-related workforce will require not only a strong understanding of oceanography and other disciplines, but an ability to integrate science concepts, engineering methods, and sociopolitical considerations. Resolving complex ocean issues related to economic stability, environmental health, and national security will require a workforce with diverse skills and backgrounds. Developing and maintaining such a workforce will rely, in turn, on programs of higher education that prepare future ocean professionals at a variety of levels and in a variety of marine-related fields.

Coordinating Ocean Education

Although not all ocean-related Federal agencies have a specific education mission, most have made efforts to reach out to students, teachers, and the public to inform them about ocean issues, sometimes by adding ocean-related components to larger science and environmental education efforts. And while it is valuable for ocean-related information to be included as part of broader environmental and science education efforts, it is also important to support educational efforts that focus specifically on oceans, coasts, and the human relationship with them.

Federal programs can provide many opportunities for ocean-related education, but ultimately education is a State responsibility, and control is exerted primarily at the local level. Therefore, the interaction between education administrators at the State, district, and individual school levels and Federal agencies will be fundamental to the success of any effort to use ocean-based examples to enhance student achievement. Aquariums, zoos, and other informal education centers also provide the public with opportunities to learn about the marine environment and should be integral components of a national effort to increase ocean-related education.

Despite the existence of many positive efforts, ocean education remains a patchwork of independently conceived and implemented programs and activities. These efforts cannot provide the nationwide momentum and visibility needed to promote sustained ocean education for students, teachers, and the general public. Within the Federal Government, there is little discussion of ocean education, even among those agencies with the greatest responsibility for ocean issues. Different programs and funding mechanisms are not coordinated and resources are seldom leveraged. Even within individual agencies, offices that have education components often do not collaborate or communicate.

To strengthen ocean education and coordinate Federal education efforts, the National Ocean Council should establish a national ocean education office (Ocean.ED) under its Committee on Ocean Science, Education, Technology, and Operations. This office should coordinate and integrate

Federal agency programs and leverage resources; serve as a central, visible point of contact for K–12, university-level, and informal education partners; and work with all parties to develop coherent, comprehensive planning for ocean education efforts.

To fulfill its coordination activities, Congress should provide dedicated funding for Ocean.ED operations and program implementation. However, this national effort is not meant to replace other successful programs and activities, but rather provide a mechanism for communication, coordination, and joining of forces.

Developing Ocean Curricula

The value of ocean-based learning must be recognized within local school districts to create a demand for ocean-related education products. Federal, regional, State, and local education professionals need to advocate for the inclusion of ocean-based examples in State and local education requirements and testing. Collaborative efforts will be needed to develop research-based, ocean-related curricular materials that are aligned with State and national educational standards and meet the needs of teachers. Ocean.ED, working with State and local education authorities and the research community, should coordinate the development and adoption of ocean-related materials and examples that meet existing education standards.

Teaching the Teachers

Higher expectations for our youth mean higher expectations for teachers as well. Students cannot achieve without instruction by capable teachers who are knowledgeable in the topics being presented. Thus, improving the quality of science and math education must begin with improving preparation of undergraduates studying to be teachers (referred to as pre-service teachers) and professional development for certified teachers in the classroom (referred to as in-service teachers).

The ocean research community is brimming with potential for engaging K–12 educators in the excitement and satisfaction of the scientific enterprise, and the nation's research infrastructure provides significant opportunities for formal preparation, hands-on involvement, and teacher certification. Although several public and private sector programs can provide teachers with research experience in ocean-related topics, access to these programs is quite limited, very few have long-term, stable funding, and the different efforts are poorly coordinated. Ocean.ED, working with academic institutions and local school districts, should help establish stronger and more effective relationships between the research and education communities to expand professional development opportunities for teachers and teacher educators.

Bringing Oceans Education to All Students

Through field and laboratory experiments, oceans offer a natural avenue for students to gain first-hand exposure to science while developing an awareness of the importance of the ocean. Not all students are near, or able to travel to, the shore, but new ocean research technologies represent a tremendous and virtually untapped avenue to overcome this limitation, allowing students anywhere to be involved in real oceanographic investigations. The same remote-access technologies that make advanced ocean research possible can also help students and teachers participate in collecting, analyzing, and distributing ocean data. Enabling students to interact with practicing scientists, even if they are thousands of miles away, can help create a lifelong affinity for learning.

Social, economic, and cultural factors can also play an influential role in inhibiting a student's access to education opportunities, especially science-based opportunities. These factors are

unusually strong among minority students and other groups that have been traditionally underrepresented and underserved in scientific fields, including marine sciences. Repairing this broken link will depend on exposing minority students to ocean-related studies early in their education, continuing that exposure throughout their school years, and demonstrating the possibilities and rewards of a career in ocean-related fields.

Federal agencies and academic institutions should find ways to provide all students with opportunities to participate in ocean research and exploration, virtually or in person, including summer programs, field trips, remote participation in ocean expeditions, and, most important, after-school activities. Mentoring, especially near-peer guidance, is critical and should be a component of any student-oriented program. Ocean.ED should promote partnerships among school districts, institutions of higher learning, aquariums, science centers, museums, and private laboratories to develop more opportunities for students to explore the marine environment, both through virtual means and hands-on field, laboratory, and at-sea experiences. Ocean.ED should also ensure that ocean-based educational programs and materials acknowledge cultural differences and other aspects of human diversity, resulting in programs that expose students and teachers from all cultures and backgrounds to ocean issues.

Drawing Students into the Field of Ocean Science and Management

The ocean community must compete with countless other professions in attracting the talent it needs. Success lies, in part, in promoting marine-related career opportunities among undergraduate students from a broad range of disciplines. First-hand experiences in marine fields can be influential in demonstrating the possibilities and rewards of an ocean-related career.

Intellectually stimulating and financially attractive options for pursuing graduate studies in an ocean-related field must follow, so a student's developing interest in ocean studies is not overshadowed by other professions that actively pursue, encourage, and support their future leaders. Ocean sciences have another potentially important role to play at the undergraduate level. Marine science courses can be attractive options for non-science majors who need to fulfill science requirements for graduation, presenting an excellent opportunity to raise general ocean awareness.

The National Oceanic and Atmospheric Administration, National Science Foundation, and Office of Naval Research should support colleges and universities in promoting introductory marine science courses to expose students, including non-science majors, to these subjects.

Training Ocean Professionals

Because ocean science is fundamentally interdisciplinary, well-trained ocean professionals can find excellent careers in many areas including engineering, economics, education, law, management, policy, science, and technology. Individuals considering or pursuing graduate studies in a marine field should be aware of these options, and exploration of nontraditional marine areas should be encouraged. Equally important, professionals educated and trained in other fields should be made aware of the exciting opportunities available to them in marine-related fields.

Ocean.ED should guide and promote the development of the nation's ocean-related workforce by:

- promoting student support, diversified educational opportunities, and investment in innovative approaches to graduate education that prepare students for a broad range of careers in academia, government, and industry;

- encouraging graduate departments of ocean sciences and engineering to experiment with new or redesigned programs that emphasize cross-disciplinary courses of study.

Complementing the need to create an adequate workforce is the need to sustain and enhance that workforce through professional development and continuing education opportunities. Learning does not stop once the formal education process is complete; ocean professionals in all fields must be provided the means and liberty to continually build upon their knowledge and skills throughout their careers.

Informing the Public

Public information needs are as varied as our population is diverse. Some individuals will benefit from detailed information on how specific issues directly affect their jobs or business. Others may need information presented in a language and media tailored to their culture and community. Still others seek advice on how to alter their own activities to support responsible ocean stewardship. This information is as critical for those who live in the heartland as for those who live near the shore.

Informal education requires outreach programs, in partnership with local communities, to make contact with individuals where they live and work, regarding issues that affect how they live and work, in a style that speaks to them. Information supplied to the public should be timely and accurate. It should also be supported by a system that allows for follow-up and the acquisition of additional information or guidance. Ocean.ED, working with other appropriate entities, should enhance existing and establish new mechanisms for developing and delivering relevant, accessible information and outreach programs to enhance community education.

Regional Outreach—Connecting the Research and Education Communities

Collaboration between the research and education communities must be improved if ocean-based information, including ocean data and new discoveries, is to be transformed into exciting and accessible materials to stimulate student achievement and enhance public awareness. Some efforts do exist to make these connections, most notably through the Centers for Ocean Sciences Education Excellence (COSEE) and National Sea Grant College Program.

COSEE

The COSEE network, supported primarily through NSF, includes regional centers and a central coordinating office that work to integrate oceanographic data and information into high-quality curricular materials, to provide ocean scientists with opportunities to learn more about educational needs and requirements, to provide K–12 teachers with the knowledge and skills they need to effectively incorporate ocean-related information into their lessons, and to deliver ocean-related information to the public. Though recognized as a model for enhancing education and bringing accessible ocean-related information to the public, COSEE currently has only seven regional centers, each serving a limited number of schools in its area. The program does not have the level of committed, long-term support required to fully realize it's potential.

While COSEE is currently a National Science Foundation program, placing it within the National Ocean Council (NOC) structure would capitalize on the tremendous potential to enhance and expand the program. The NOC and the NSF should relocate COSEE within the larger NOC structure as a program to be organized, overseen, and funded through Ocean.ED. In addition, the

number of COSEE regional offices should be tripled to 21 with each center receiving at least $1.5 million a year for an initial five-year period.

National Sea Grant College Program
The National Sea Grant College Program was created by Congress in 1966 as a partnership between the nation's universities and NOAA. Sea Grant programs sponsor research, education, outreach, and technology transfer through a network of Sea Grant Colleges and research institutions.

Sea Grant has forged connections between the research and education communities since its inception. Its programs provide K–12 teacher preparation and professional development programs consistent with State education standards, offer hands-on educational experiences for students, and develop research-based curricular and communications materials for students and the public. The Sea Grant network relies on longstanding local partnerships, with many connections to populations that have been traditionally underrepresented and underserved by the ocean community.

Despite its successes, however, Sea Grant is currently an underutilized resource. The existing Sea Grant network requires increased funding to expand its roles and responsibilities, particularly in education and outreach. In particular, Sea Grant extension and communications programs, familiar to many resource managers and others in coastal communities, should become the primary mechanisms for delivering and interpreting information products developed through the regional ocean information programs

Specific Federal Responsibilities
Each Federal agency with ocean-related responsibilities—most notably NOAA, NSF, and Office of Naval Research—has a responsibility to help ensure a vibrant ocean-related workforce. These agencies need to develop interrelated and crosscutting educational opportunities at the undergraduate, graduate, and postdoctoral levels.

National Oceanic and Atmospheric Administration
NOAA should be particularly concerned with creating a pipeline of students in areas it identifies to be of critical importance to the agency. Opportunities should include both research experiences, especially exposure to mission-oriented research, and experiences beyond the research arena. Student exposure can begin as early as the junior or senior level in high school, continuing through postdoctoral education. A range of programs will help identify and recruit the best and brightest to careers in marine-related fields and ensure a continuing source of essential human capital. At the graduate and postdoctoral levels, NOAA should support fellowships and traineeships that emphasize interdisciplinary approaches and real-world experiences beyond the university setting.

NOAA should establish a national ocean education and training program, patterned after the National Institutes of Health model, within its Office of Education and Sustainable Development to provide diverse, innovative ocean-related education opportunities at the undergraduate, graduate, and postdoctoral levels.

In addition, NOAA should establish competitive "Distinguished Professorships in Marine Studies" within Sea Grant Colleges or other leading institutions of higher education with a demonstrated commitment to marine programs. Disciplines of interest to NOAA for such professorships could include fisheries science, climate research, atmospheric studies, and marine resource economics,

policy, aquaculture, genomics, education, and ecosystem studies. The intent would be to create a cadre of distinguished NOAA endowed chairs at universities around the nation.

National Science Foundation
At the undergraduate level, NSF's Research Experience for Undergraduates program could be expanded to include more marine-related experiences. At the graduate and postdoctoral levels, opportunities could include fellowships that encourage cross-disciplinary research, interdisciplinary traineeships, and master's degree fellowships. Programs such as NSF's Integrative Graduate Education and Research Training program, Centers for Learning and Teaching, and Graduate Teaching Fellows in K–12 Education should be supported and enhanced both within NSF and adopted by other Federal ocean agencies. The National Science Foundation's Directorates of Geosciences, Biological Sciences, and Education and Human Resources should develop cooperative programs to provide diverse educational opportunities at the undergraduate, graduate, and postdoctoral levels in a range of ocean-related fields.

Office of Naval Research
The success of the Navy depends on a well-developed understanding of the environment in which it operates. Understanding the ocean environment—including the atmosphere above it, the seafloor beneath it, and the coastlines that encircle it—will always be a core naval requirement. Thus the Navy should play a central role in ensuring support for the education of future generations of ocean professionals. The Office of Naval Research should reinvigorate its support of graduate education in ocean sciences and engineering. This could be partly accomplished by increasing the number of ocean-related awards made under ONR's National Defense Science and Engineering Graduate Fellowship Program.

SPECIFIC MANAGEMENT CHALLENGES

Although the areas I discussed—improved governance through a new National Ocean Policy Framework, the incorporation of scientific information in decisionmaking, and broad public education—represent the overarching areas that this nation must address using the guiding principles I mentioned earlier, the U.S. Commission on Ocean Policy did not stop there in its deliberations and recommendations. The Commission also addressed a wide range of specific ocean management challenges – challenges that will continue to be addressed individually, but which now must also become part of more ecosystem based management approach, applying the guiding principles throughout the management process. These individual ocean and coastal management challenges include: Linking the management of coasts and watersheds; Protecting life and property from natural hazards; Restoring and conserving habitat; Better managing sediments and shorelines; Supporting marine commerce and transportation; Reducing water pollution from all sources, including from vessels and through the introduction of marine debris; Preventing the introduction of invasive species; Sustainably managing our fisheries; Protecting marine mammals and other marine species; Conserving corals and corals reefs; Enabling the environmentally-sound development of marine aquaculture; Understanding and safeguarding Oceans and Human Health; and, developing offshore energy resources and marine minerals.

IMPROVING MANAGEMENT OF COASTS AND WATERSHEDS

Let me begin by addressing some of the issues in our coastal areas. While coastal counties (located entirely or partially within coastal watersheds) comprise only 17 percent of the land area in the

contiguous United States, they are home to more than 53 percent of the total U.S. population. Coastal population trends indicate average increases of 3,600 people a day moving to coastal counties, reaching a total population of 165 million by 2015. These figures do not include the 180 million people who visit the coast every year.

Population growth and tourism bring many benefits to coastal communities, including new jobs and businesses and enhanced educational opportunities. The popularity of ocean and coastal areas increases pressures on these environments, creating a number of challenges for managers and decisionmakers. Increased development puts more people and property at risk from coastal hazards, reduces and fragments fish and wildlife habitat, alters sedimentation rates and flows, and contributes to coastal water pollution.
The pattern of coastal growth—often in scattered and unplanned clusters of homes and businesses—is also significant. Urban sprawl increases the need for infrastructure such as roads, bridges, and sewers, degrading the coastal environment while making fragile or hazard-prone areas ever more accessible to development. Because of the connections between coastal and upland areas, development and sprawl that occur deep within the nation's watersheds also affect coastal resources.

To reap economic benefits and mitigate pressures associated with growing coastal development, State and local governments needs more Federal support to enhance their capacity to plan for and guide growth, and to employ watershed management approaches.

A complex combination of individuals and institutions at all levels of government make decisions that cumulatively affect the nation's ocean and coastal areas. These institutional processes determine where to build infrastructure, encourage commerce, extract natural resources, dispose of wastes, and protect or restore environmental attributes.

Although most coastal management activities take place at State and local levels, coastal decisionmaking is also influenced by Federal actions, including funding decisions and standard setting. Of the many Federal programs that provide guidance and support for State and local decisionmaking, some address the management of activities and resources within designated geographic areas, while others address the management of specific resources, such as fisheries or marine mammals.

The Coastal Zone Management Act (CZMA) is the Federal Government's principal tool for fostering comprehensive coastal management. The CZMA created the Coastal Zone Management Program CZM Program, a unique partnership between the Federal and coastal state governments, whose goal is to balance the conservation of the coastal environment with the responsible development of economic and cultural interests. The tools, assistance, and resources provided by the CZMA have enabled States and territories to increase their management capacity and improve decisionmaking to enhance the condition of their coastal areas.

However, the CZM Program can be strengthened in a number of ways, including by developing strong, specific, measurable goals and performance standards that reflect a growing understanding of the ocean and coastal environments and the need to manage growth in regions under pressure from coastal development. A large portion of Federal funding should be linked to program performance with additional incentives offered to States that perform exceptionally well. In addition, a fallback mechanism is needed to ensure that national goals are realized when a State

does not adequately participate or perform. Finally, the landside boundaries of State coastal management programs should also be reconsidered. At a minimum, each State should set the inland extent of its coastal zone based on the boundaries of coastal watersheds.

In addition to the CZM Program, other Federal area-based coastal programs include NOAA's National Estuarine Research Reserve System and National Marine Sanctuaries Program; EPA's National Estuary Program; and Fish and Wildlife Service's Coastal Program and Coastal Barrier Resources System. These programs have made significant progress in managing coastal resources in particular locations, working with communities and decisionmakers in those areas, and fostering improved coordination between different levels of government. However, because these programs generally operate in isolation from one another, they cannot ensure effective management of all ocean and coastal resources or achievement of broad national goals. As NOAA is strengthened through the multi-phased approach described earlier, consolidation of area-based coastal resource management programs will result in more effective, unified strategies for managing these areas, an improved understanding of the ocean and coastal environment, and a basis for moving toward an ecosystem-based management approach.

Federal programs related to transportation, flood insurance, disaster relief, wetlands permitting, dredging, beach nourishment, shoreline protection, and taxation also exert a profound influence on the coast. While these laws and policies address specific issues, and have each provided societal benefits, in many cases Federal activities under their purview have inadvertently led to degradation of coastal environments. For this reason, policies should be re-evaluated to ensure consistency with national, regional, and State goals aimed at achieving economically and environmentally sustainable development.

Linking Coastal and Watershed Management

For well over a decade there has been a growing interest in watershed management. This approach addresses water quality and quantity issues by acknowledging the hydrologic connections between upstream and downstream areas and considering the cumulative impacts of all activities that take place throughout a watershed. Watersheds are optimal organizing units for dealing with the management of water and closely related resources. The benefits of a watershed focus have also been recognized at the state, regional, national, and international levels through successful efforts such as the Chesapeake Bay Program, the Delaware River Basin Commission, and the bi-national Great Lakes Commission. At the Federal level, EPA has supported efforts to address a variety of problems at the watershed level.

Many watershed groups are formed at the local level by community members concerned about water quality or the health of fish and wildlife populations. Often, these groups work to improve watershed health through partnerships among citizens, industry, interest groups, and government. However, the environmental and political characteristics of the nation's watersheds vary tremendously, and watershed management initiatives can differ widely in size and scope. As interest in watershed management continues to grow, so does the need for a framework to guide such initiatives and evaluate their effectiveness.

The Federal Government can play an important role by helping to develop this framework and by providing assistance to States and communities for watershed initiatives. Congress should amend the Coastal Zone Management Act, the Clean Water Act, and other Federal laws where appropriate,

to provide better financial, technical, and institutional support for watershed initiatives and better integration of these initiatives into coastal management.

Assessing the Growing Cost of Natural Hazards

The nation has experienced enormous and growing losses from natural hazards. Conservative estimates, including only direct costs such as those for structural replacement and repair, put the nationwide losses from all natural hazards at more than $50 billion a year, though some experts believe this figure represents only half or less of the true costs. More accurate figures for national losses due to natural hazards are unavailable because the United States does not consistently collect and compile such data, let alone focus on specific losses in coastal areas. Additionally, there are no estimates of the costs associated with destruction of natural environments.

Many Federal agencies have explicit operational responsibilities related to hazards management, while numerous others provide technical information or deliver disaster assistance. The nation's lead agencies for disaster response, recovery, mitigation, and planning are the Federal Emergency Management Agency (FEMA) and the U.S. Army Corps of Engineers (USACE). These agencies implement programs that specifically target the reduction of risks from natural hazards. NOAA and USFWS also have a significant influence on natural hazards management.

Opportunities for improving Federal natural hazards management, include: Amending Federal infrastructure policies that encourage inappropriate development; Augmenting hazards information collection and dissemination; Improving the National Flood Insurance Program (NFIP); and Undertaking effective and universal hazards mitigation planning.

Conserving and Restoring Coastal Habitat

The diverse habitats that comprise the ocean and coastal environment provide tangible benefits such as buffering coastal communities against the effects of storms, filtering pollutants from runoff, and providing a basis for booming recreation and tourism industries. These habitats also provide spawning grounds, nurseries, shelter, and food for marine life, including a disproportionate number of rare and endangered species.

As more people come to the coast to live, work, and visit, coastal habitats face increasing pressures. Most human activities in coastal areas provide distinct societal benefits, such as dredging rivers and harbors to facilitate navigation, converting forests and wetlands for agriculture and development, and building dams for flood control and hydropower. But these activities can also degrade coastal habitats and compromise their ability to adapt to environmental changes.

Conserving valuable ocean and coastal areas protects significant habitat and other natural resources. Millions of coastal acres have been designated for conservation by various levels of government, and the tools for implementing conservation programs are found in a multitude of statutes. A number of Federal programs aim to preserve the natural attributes of specific areas while providing varying levels of access to the public for educational, recreational, and commercial purposes. In addition, nonregulatory conservation techniques—including fee simple land acquisition, the purchase or donation of easements, tax incentives and disincentives, and tradable development rights—play a special role in enabling willing landowners to limit future development on their land for conservation purposes. Land acquisition and easements are often implemented through partnerships among governments, nongovernmental organizations such as land trusts, and the

private sector. Funding and support for continued conservation of coastal and estuarine lands is important to ensure the ability to maintain critical habitats and the benefits they provide.

Conservation is cost-effective, avoiding the much larger expense and scientific uncertainties associated with attempting to restore habitats that have been degraded or lost. Even so, once critical habitat has been lost, or the functioning of those areas diminished, restoration is often needed. Habitat restoration efforts are proliferating in response to heightened public awareness of and concern for the health of the nation's oceans and coasts.

Restoration efforts, particularly large-scale projects, are challenging in a number of ways. First, the success of these efforts requires an understanding about how to recreate natural systems and restore historical ecosystem functions, a field still in its infancy. Second, these efforts cross political boundaries and affect a broad range of human activities, requiring support and intense coordination among a wide range of governmental and nongovernmental stakeholders. While some restoration projects have been successful, continued progress will depend on sustained funding, government leadership and coordination, scientific research, and stakeholder support.

In addition to the large-scale, regional restoration efforts, there are numerous small-scale efforts that collectively make significant contributions. These activities often demonstrate the power of public–private partnerships, bringing together community members, government agencies, and businesses to solve common problems. However, as long as each project continues to be planned and implemented in isolation, its overall impact will be constrained.

Currently the many entities that administer conservation and restoration activities operate largely independently of one another, with no framework for assessing overall benefits in an ecosystem-based context. The multitude of disjointed programs prohibits a comprehensive assessment of the progress of conservation and restoration efforts and makes it difficult to ensure the most effective use of limited resources. An overarching national strategy that sets goals and priorities can also enhance the effectiveness of individual efforts and provide a basis for coordinating measures and evaluating progress of both habitat conservation and restoration activities.

Managing Sediment and Shorelines

Sediment in Great Lakes, coastal, and ocean waters is composed of inorganic and organic particles created through erosion, decomposition of plants and animals, and human activities. Sediment may be carried by wind or water from upland areas down to coastal areas, or may originate in the marine environment. Once sediment arrives at the ocean, it is transported by wind, waves, and currents in dynamic processes that constantly build up and wear away cliffs, beaches, sandbars, inlets, and other natural features.

From a human perspective, sediment has a dual nature—desirable in some locations and unwanted in others. Sediment can be used to create or restore beaches and to renew wetlands and other coastal habitats. Such activities are referred to as beneficial uses. Undesirable sediment can cloud water and degrade wildlife habitat, form barriers to navigation, and contaminate the food chain for marine plants, animals and humans.

The dual nature of sediment as both a threat and a resource to humans and the environment makes its management particularly challenging. To complicate matters further, the natural processes that create, move, and deposit sediment operate on regional scales, while management tends to focus on

discrete locations—a single beach, wetland, or port. In addition, the policies that affect sediment location, transport, and quality fall under the jurisdiction of diverse programs within multiple agencies at all levels of government. This complex governance approach makes it difficult to manage sediment at the appropriate scale and in consonance, rather than in conflict, with natural processes.

Coastal stakeholders have increasingly recognized the need to develop more proactive and preventive strategies. However, their absence from broad watershed planning efforts—where decisions about land use and water management could reduce excess and contaminated sediments at their source—makes such change difficult to realize. The nation needs both a better understanding of the interactions between human activities and sediment flows, and a better mechanism for involving all potentially affected parties.

Moving toward an ecosystem-based management approach is a critical step. Participation by Federal, State, and local entities in watershed management efforts, along with key stakeholders such as coastal planners and port managers, is one way to diminish upland sources of excess and contaminated sediment that harm the marine environment. Ecosystem considerations should be included in the process for permitting any activity that alters sediment flows.

Dredged materials have long been used to create new land for commercial, residential, and infrastructure developments, as well as to bolster beaches and barrier islands to protect against storm and erosion hazards and enhance tourism and recreation. Since the 1970s, these beneficial uses of dredged materials have also included environmental enhancement, such as restoration of wetlands, creation of wildlife habitat, and improvement of fish habitat. Surprisingly, navigation-related dredged materials do not find their way into beneficial use projects as often as perhaps they should. This is due in part to sediment contamination, but also to USACE policies that favor disposal in open waters or in upland dump sites. These policies may be unnecessarily foregoing opportunities to support economic growth or environmental protection and may have serious unintentional consequences for aquatic ecosystems. A more accurate system for selecting and ranking projects would be based on a comparative net economic and environmental return for the United States rather than a narrow cost-benefit analysis for a specific project.

Finally, the characterization, containment, removal, and treatment of contaminated sediment continue to be technically difficult and prohibitively expensive, and point to the importance of adopting an adaptive management approach to the problem. Scientifically sound methods for identifying contaminated sediment and developing innovative technologies to improve dredging and treatment of this material are critical steps toward improving the economic and ecological health of coastal areas. To be successful, these efforts will require new resources and effective regional planning.

Supporting Marine Commerce and Transportation

As the world's largest trading nation, the United States imports and exports more merchandise than any other country and has one of the most extensive marine transportation systems in the world. U.S. marine import-export trade is an essential and growing component of the national economy, accounting for nearly seven percent of the nation's gross domestic product. Domestically, coastal and inland marine trade amounts to roughly one billion tons of cargo, worth more than $220 billion a year. The marine transportation system itself is a highly complex public-private sector partnership consisting of an interconnected mix of waterways, ports and terminals, water-based and

land-based intermodal connections, vessels, vehicles, equipment, personnel, support service industries, and users.

For the nation's marine transportation system to meet current and future demands, ongoing maintenance, improvement, and expansion will be required. A key prerequisite for a robust system is better coordination, planning, decisionmaking and allocation of resources at the Federal level. In particular it will be essential to enhance the connections between this system and other modes of transportation, such as highways, railways, and airports. At the same time, in moving toward an ecosystem-based management approach, planning for the movement of cargo and passengers should be coordinated with the management of many other ocean and coastal uses and activities, and with efforts to protect the marine environment.

Within the Federal Government, responsibilities for marine commerce and transportation are spread among numerous agencies, primarily the U.S. Department of Transportation (DOT), U.S. Coast Guard, USACE, NOAA, U.S. Customs Service, and EPA. These agencies have many roles, including vessel traffic management, national security, marine safety, waterway maintenance, environmental protection, and customs. These responsibilities are poorly coordinated and do not mesh well with the structure and function of such system. Statutory, regulatory, and policy differences among Federal agencies with roles in marine transportation lead to fragmentation, competition, and in some cases, an inability to work collaboratively due to conflicting mandates. National leadership and support will be needed to achieve better integration within the Federal government, better links with the rest of the nation's transportation infrastructure, and coordination between marine transportation and other important ocean and coastal uses and activities. The logical agency to assume this responsibility, as it does for the highway, aviation, and railway systems, is DOT.

Even with one clearly mandated lead Federal agency, coordination will be needed among the Federal and non-Federal participants in the marine transportation system. Given the significance of domestic and international trade to the nation and the complexity of the components that make up the system the Interagency Committee for the Marine Transportation System (ICMTS) should be strengthened, codified and placed under the oversight of the National Ocean Council. And because marine transportation involves many actors outside the Federal Government, the Marine Transportation System National Advisory Council should be maintained to coordinate among non-Federal participants in the marine transportation system and a venue for providing input to the Federal Government on important national issues.

An important step in allowing the U.S. marine transportation system to grow, while minimizing increased congestion, delays, and costs to U.S. businesses and consumers, is to improve the movement of cargo into and out of ports. Existing intermodal connections are inadequate to meet the expected increase in foreign and domestic trade. The nation's transportation infrastructure is largely an agglomeration of competing transportation modes, each focusing on its own priorities. While this approach has produced an extensive infrastructure, a national strategy is needed to enhance the connections among these modes, including the nation's ports, and ensure greater overall effectiveness.

DOT, working with the ICMTS, should draft a new national freight transportation strategy to support continued growth of the nation's economy and international and domestic trade. Based on the new strategy, investments should be directed toward planning and implementation of intermodal

projects of national significance. In developing the national freight transportation strategy, DOT should emphasize strategic planning with States, regions, and the public sector as is already being carried out for the U.S. highway system.

Planning for the future of the U.S. marine transportation system requires accurate and timely information, including estimates of the volume of current and future cargo transportation, their origins and destinations, and the capacity of the various transportation modes. Such information is essential to understand the strengths and weaknesses of the current system and the challenges and opportunities for improving its effectiveness. DOT, working with other appropriate entities, should establish a national data collection, research, and analysis program to provide a comprehensive picture of freight flows in the United States and to enhance the performance of the nation's intermodal transportation system. DOT should periodically assess and prioritize the nation's future needs for ports and intermodal transportation capacity to meet expected growth in marine commerce.

Finally, natural disasters, labor disputes, terrorist attacks, ship collisions, spills of hazardous materials, and many other human and naturally caused events can disrupt the flow of marine cargo and passenger services, causing severe economic and social ramifications nationally and internationally. Diminished port capacity could also affect vital military operations. In developing a national freight transportation strategy, DOT should work closely with the U.S. Department of Homeland Security and the FEMA to incorporate port security and other emergency preparedness requirements. The strategy should focus on preventing threats to national security and port operations and on response and recovery practices that limit the impacts of such events, including an assessment of the availability of alternative port capacity.

COASTAL AND OCEAN WATER QUALITY

Coastal and ocean water quality is threatened by multiple sources of pollution, including point and nonpoint source pollution, atmospheric deposition of pollutants, vessel pollution, invasive species, and trash being washed into the ocean and onto beaches. Addressing these multiple pollutants will require development of an ecosystem-based and watershed management approach that includes a variety of management tools, coordination, and ongoing monitoring.

Addressing Coastal Water Pollution

Coastal waters are one of the nation's greatest assets, yet they are being bombarded with pollution from all directions. The heavy concentration of activity in coastal areas, combined with pollutants flowing from streams far inland and others carried through the air great distances from their source, are the primary causes of nutrient enrichment, hypoxia, toxic contamination, sedimentation, and other problems that plague coastal waters.

Any solution must be founded on an ecosystem-based and watershed management approach involving a broad range of agencies, programs, and individuals. The complex array of laws, agencies, and programs that address water pollution, and the number of parties involved, will require greatly enhanced coordination among Federal agencies, primarily EPA, NOAA, USDA, and USACE. Greater coordination is also needed between the Federal Government and managers at the State, territorial, tribal, and local levels, watershed groups, nongovernmental organizations, private stakeholders, and the academic and research communities. Solutions will also require a substantial financial investment and will take time.

Reducing Point Sources of Pollution
Over the last few decades, great strides have been made in controlling water pollution from point sources, although further improvements could be realized through increased funding, strengthened enforcement, and promotion of innovative approaches such as market-based incentives. The Commission also addresses several specific point sources of pollution, including wastewater treatment plants, sewer system overflows, septic systems, industrial facilities, and animal feeding operations.

Increasing the Focus on Nonpoint Sources of Pollution
While considerable progress has been made in reducing point sources of pollution, further progress toward improving coastal water quality will require significant reductions in nonpoint sources as well. This pollution occurs when rainfall and snowmelt carry pollutants over land, into streams and groundwater, and down to coastal waters. Ninety percent of impaired water bodies do not meet water quality standards at least in part because of nonpoint source pollution. The majority of the nonpoint source pollution entering rivers, estuaries, coastal waters, and ultimately the oceans is from agricultural and stormwater runoff.

To address nonpoint source pollution, the NOC should establish significant reduction of nonpoint source pollution in all impaired coastal watersheds as a national goal, and set measurable objectives to meet water quality standards. The nation has a number of opportunities to reduce the impacts of nonpoint sources of pollution on coastal waters. Because agricultural runoff contributes substantially to nonpoint source pollution, USDA should align its conservation programs and funding with other programs aimed at reducing nonpoint source pollution, such as those of EPA and NOAA. Other opportunities for the nation to reduce nonpoint source pollution include coordination of Federal nonpoint programs so they are mutually supportive, more targeted and aggressive use of state revolving loan funds, broader implementation of incentives and disincentives, and improved monitoring to assess compliance and overall progress. State and local governments also have important roles to play in land use planning and stormwater management decisions.

Watersheds are often the appropriate geographic unit for addressing water-related problems and collaborative watershed groups have had significant successes in addressing nonpoint source pollution. Therefore, the NOC and regional ocean councils should strengthen the ability of collaborative watershed groups to address problems associated with nonpoint source pollution by developing and implementing strategies to provide them with adequate technical, institutional, and financial support.

Addressing Atmospheric Sources of Pollution
Atmospheric deposition of pollutants can also harm water quality, aquatic resources, and human health. To address atmospheric deposition, EPA, States, and watershed groups should explore regional approaches for managing atmospheric deposition, particularly when it affects water bodies in states far from the source.

Creating a National Water Quality Monitoring Network
Pollution of the nation's coastal waters has led to beach closures, oxygen depletion, health impacts from toxic contamination, and many other problems. Despite these threats to coastal waters, there is no national network in place to monitor water quality changes and their causes, facilitate estimates

of their economic impact, and measure the success of management efforts. Increased monitoring is needed not only along the nation's coasts, but also inland where pollutants make their way downstream, ultimately impacting coastal waters. A national water quality monitoring network is essential to support the move toward an ecosystem-based management approach that considers human activities, their benefits, and their potential impacts within the context of the broader biological and physical environment. An essential step toward controlling pollution will be to strengthen and coordinate monitoring efforts to provide decision makers with necessary information.

A number of monitoring efforts are currently conducted by Federal agencies, State governments, research institutions and academia, nongovernmental organizations, and individual volunteers. Existing monitoring programs vary in many respects, including sampling design and intensity, parameters tested, analytical methodology, data management protocols, and funding. Even when the same properties are measured, different data management protocols may make the integration of that information difficult. Consequently, while a number of monitoring programs exist, they are not designed to support a comprehensive and coordinated national monitoring network.

Ensuring Comprehensive, Coordinated Coverage

The nation's coastal margin is the most densely populated and developed region of the nation, and its waters have been significantly degraded by pollution. Yet in recent years, due largely to lack of funding, monitoring has been extremely sparse along the coasts. Much remains unknown about the status of coastal waters, and increased monitoring will be required to make informed management decisions about this economically and ecologically valuable region. Yet the close connections between coastal and upstream waters dictate that any water quality monitoring network must be national in scope. NOAA, EPA, and USGS should lead the effort to develop a national water quality monitoring network that coordinates existing and planned monitoring efforts, including Federal, State, local, and private efforts. The network should include a federally-funded backbone of critical stations and measurements needed to assess long-term water quality trends and conditions.

Because of the inherent overlap between inland, coastal, and open-ocean monitoring and observing, the national water quality monitoring network should be closely linked with the Integrated Ocean Observing System (IOOS) and ultimately with a broad Earth observing system. NOAA should ensure that the water quality monitoring network includes adequate coverage in both coastal areas and the upland areas that affect them, and that the network is linked to the IOOS, to be incorporated eventually into a comprehensive Earth observing system.

Creating an Effective Monitoring Network and Making Data Accessible and Useful

In addition to coordinating existing monitoring efforts, an effective national water quality monitoring network should have specific goals and objectives, reflect user needs, and be helpful in assessing the effectiveness of management approaches. The overall system design should determine what and where to monitor, including definition of a set of core variables. Technical expertise will be needed to standardize procedures and establish quality control and data management protocols. The network should be periodically assessed and modified as necessary. Most important, the data collected through the national monitoring network should be useful to managers and stakeholders in evaluating management measures, determining best management practices, and making continual improvements in reaching ecosystem goals. This data should also be translated into timely and useful information products that are readily accessible to decision makers and the public. The

design and implementation of the national monitoring network will require not only Federal coordination, but also significant input from the States.

Limiting Vessel Pollution and Improving Vessel Safety

The benefits from vessel activities are significant – ships carry more than 95 percent of the nation's overseas cargo - but these operations also present safety, security and environmental risks that must be effectively addressed.

Success in addressing these concerns will depend on a broad domestic and international framework comprised of three key components. The first component is a strong voluntary commitment on the part of vessel owners and operators to build a workplace ethic that incorporates safety, security, and environmental protection as important and valued aspects of everyday vessel operations. Reliable means of measuring the success of these efforts, as reflected in crew and company performance, are essential and should include extensive use of third-party audits. The U.S. Coast Guard, through incentives and partnership programs, should encourage industry partners to develop stronger voluntary measures, particularly those that reward crew member contributions, as part of a continuing long-term effort that focuses on building a culture of safety, security, and environmental compliance.

The second key component is effective oversight and control by the primary vessel regulator, the vessel's flag state. Foreign flag vessels, subject primarily to the jurisdiction and control of other governments, carry more than 90 percent of international commercial freight entering and departing the United States and account for 95 percent of passenger ships and 75 percent of cargo ships operating in U.S. waters. Although many flag states take their responsibilities seriously, oversight and enforcement vary dramatically. Over the past decade, the International Maritime Organization has developed guidelines to improve flag state oversight and enforcement. However, implementation of these measures has met with mixed results. Mounting international security concerns have made effective flag state oversight and control more urgent today than ever before. The United States should work with other nations to accelerate efforts at the International Maritime Organization to enhance flag state oversight and enforcement. Initiatives should include expeditious promulgation of a code outlining flag state responsibilities, and development of a mandatory external audit regime to evaluate performance and identify areas where additional technical assistance can be used to best advantage.

The third key framework component is effective control over vessels visiting U.S. ports. The Coast Guard currently carries out a port state control program that allocates limited inspection resources to the highest-risk vessels, based on an assessment of the vessel owner, flag state, classification society, performance history, and vessel type. Performance-based vessel inspections, while the most effective means of verifying compliance, are resource intensive. These inspections have played a critical role in identifying and correcting potential problems, and in assessing the effectiveness of overall efforts to improve safety and environmental compliance. Concerns have been expressed in Congress and elsewhere about the adequacy of Coast Guard resources to meet new security demands while fulfilling other important responsibilities. Congress should provide the U.S. Coast Guard with the resources necessary to sustain and strengthen the performance-based inspection program for marine safety and environmental protection while also meeting new vessel security inspection and other maritime security requirements. In addition, the Coast Guard should work at the regional and international levels to increase effective coordination and vessel information sharing among concerned port states.

In addition to outlining a framework to address vessel safety, security and environmental concerns, our report also recommends more comprehensive approaches to address waste stream, oil and air pollution from commercial and recreational vessels. Recommendations include: establishing a uniform national regime to deal with cruise ship waste streams; ratifying and working to strengthen MARPOL Annex V1 air emission standards; developing comprehensive policy guidance and contingency plans for vessels seeking places of refuge in the United States; developing a long-term plan that identifies and addresses the greatest risks associated with marine oil transportation systems; and updating and accelerating efforts to reduce recreational vessel pollution. We also place particular emphasis on the use of market-based mechanisms and incentives to reduce pollution and encourage appropriate voluntary actions.

Preventing the Spread of Invasive Species

The introduction of non-native marine organisms into ports, coastal areas, and watersheds has damaged marine ecosystems around the world, costing millions of dollars in remediation, monitoring, and ecosystem damage. Invasive species policies are not keeping pace with the problem primarily because of inadequate funding, a lack of coordination among Federal agencies, redundant programs, and outdated technologies.

Making Prevention the First Line of Defense

The discharge of ballast water is considered a primary pathway for introduction of non-native aquatic species. Exchanging ballast water in the middle of the ocean to reduce the risk of transferring organisms from one ecosystem to another is the primary management tool currently available for ships to control the introduction of invasive species.

To better control the introduction of invasive species, the U.S. Coast Guard's national ballast water management program should: apply uniform, mandatory national standards; incorporate sound science in the development of a biologically meaningful and enforceable ballast water treatment standard; include a process for revising the standard to incorporate new technologies; ensure full consultation with EPA; and include an interagency review, through the NOC, of the policy for ships that declare they have no ballast on board.

While ballast water is considered a primary pathway, there are also other important ship-related sources of non-native aquatic species, including ships' hulls, anchors, navigational buoys, drilling platforms, and floating marine debris. Other pathways include intentional and unintentional human introductions of fish and shellfish, and illegally released organisms from the aquaculture, aquarium, horticulture, and pet industries. There is increasing concern that an expanding trade through the Internet and dealers of exotic pets is exacerbating the invasive species problem.

To address these pathways of introduction, the NOC, working with the Aquatic Nuisance Species Task Force and the National Invasive Species Council, should coordinate public education and outreach efforts on aquatic invasive species, with the aim of increasing public awareness about the importance of prevention.

Accelerating Detection and Response

Only the most draconian prevention strategy could hope to eliminate all introductions of non-native species and thus prevent the possibility of an invasion. Yet no effective mechanism is in place for rapidly responding to newly discovered aquatic invasions when they do occur. Therefore, the

National Invasive Species Council and the Aquatic Nuisance Species Task Force, working with other appropriate entities, should establish a national plan for early detection of invasive species and a system for prompt notification and rapid response.

Improving the Control of Invasive Species

As biological invasions continue, there is a pressing need to improve the control of invasive species by reducing the overlaps and redundancies caused by the involvement of so many agencies with insufficient interagency coordination. The NOC should review and streamline the current proliferation of Federal and regional programs for managing marine invasive species, and coordinate Federal, regional and State efforts.

The study of marine biological invasions is a relatively new research area and little is understood about how or why certain species become invasive, what pathways of introduction are most important, and whether certain factors make an ecosystem more susceptible to invasions. To better understand marine biological invasions, the NOC should coordinate the development and implementation of an interagency plan for research and monitoring to understand and prevent aquatic species invasions.

Reducing Marine Debris

The trash and other waste that drifts around the global ocean and washes up on the nation's shores poses a serious threat to fishery resources, wildlife, and habitat, as well as human health and safety. Approximately 80 percent of debris is washed off the land, blown by winds, or intentionally dumped from shore, while 20 percent comes from vessels and offshore platforms.

NOAA currently addresses marine debris as a part of several other efforts, but there is a need to coordinate, strengthen, and increase the visibility of the marine debris efforts within NOAA by creating a centralized marine debris program within the agency. This program should be coordinated with EPA's marine debris activities, as well as with the significant efforts conducted by private citizens, state, local, and nongovernmental organizations.

Interagency Coordination

Although strengthening NOAA's work on marine debris through establishment of an office within the agency is an important step, an interagency committee under the NOC is needed to unite all appropriate Federal agencies around the issue. Such a committee could support existing marine debris efforts by agencies and nongovernmental organizations, and should expand and better coordinate national and international marine debris efforts, including: public outreach and education; partnerships with state and local governments, community groups, nongovernmental organizations, and industry; and monitoring, identification and research.

Eliminating Derelict Fishing Gear

Whether intentionally discarded or unintentionally lost during storms or fishing operations, derelict fishing gear poses serious threats, entrapping marine life, destroying coral reefs and other habitat, and even posing danger to humans. Although derelict fishing gear is a worldwide problem, currently no international treaties or plans of action address it. A strong need exists for the U.S. Department of State and NOAA, working with the United Nations Food and Agriculture Organization, to develop a plan of action to address derelict fishing gear, to be implemented on a regional, multi-national basis. In addition, within the United States, a public–private partnership program is needed to prevent, remove, and dispose of derelict fishing gear.

Ensuring Appropriate Port Reception Facilities

Under requirements for port reception facilities in Annex V of MARPOL, member nations must provide waste disposal facilities in their ports to receive waste from ships. Despite this requirement, many ports do not have adequate facilities. In addition, Annex V calls for the designation of Special Areas that receive a higher level of protection than is required in other ocean areas. Special Areas have been designated for many parts of the world, however, for a Special Area to receive extra protection, there must first be a demonstration of adequate port reception facilities. Some important Special Areas, such as the Wider Caribbean, are not yet eligible to receive extra protection because of inadequate port reception facilities. Therefore, the U.S. Department of State should increase efforts to ensure that all port reception facilities meet the criteria necessary to allow implementation of Special Areas protections.

ENHANCING THE USE AND PROTECTION OF OCEAN RESOURCES

The ocean's biological and mineral resources are of enormous value to the nation, not only for their direct economic output, but also for their incalculable aesthetic importance.

The commercial fishing industry's total value exceeds $28 billion annually, with the recreational saltwater fishing industry valued at around $20 billion. NOAA estimates that U.S. coral reefs cover approximately 7,600 square miles. In 2001, coral reefs in the Florida Keys alone supported $105 million in income and more than 8,000 jobs. Further, approximately one half of all federally managed commercial fish species depend on coral reefs for at least part of their life cycle. Currently, energy development in Federal waters accounts for more than 30 percent of domestic oil production and 25 percent of natural gas, with a total annual value of between $25 – $40 billion, and a contribution of about $5 billion in royalties to the U.S. Treasury.

In order to provide for sustainable use, management needs to be strengthened in a broader context that looks at impacts of management decisions on the ecosystem as a whole.

Fisheries Management

The last 30 years has seen the evolution of an industry from being largely unregulated but with seemingly boundless potential, to one that is highly regulated and struggling to regain its potential as we move toward a sustainable, ecosystem-based fisheries management regime.

In 1976, based in part on the recommendations of the Stratton Commission, Congress approved the Magnuson–Stevens Fishery Conservation and Management Act to manage and assert U.S. control over fishery resources within 200 nautical miles of the coast. Eight Regional Fishery Management Councils (RFMCs) were created to develop management plans for fisheries in Federal waters. The Act required regional plans to be consistent with broad national guidelines, but otherwise granted considerable flexibility to the RFMCs. The regional flexibility that had been seen as a great strength of the new law now showed its downside as some RFMCs set unsustainable harvest levels, leading to the collapse or near-collapse of several important fisheries.

In the over 30 years since the Stratton report, some fishery management bodies have revealed fundamental weaknesses in the system that led to overexploited stocks and ecosystem degradation in some regions. However, the management practices in some regions, particularly the North Pacific, protected fisheries from overexploitation and served as a model for many of the

Commission's fisheries recommendations. The Commission fishery recommendations can be grouped into six areas: strengthening the link between science and management, clarifying jurisdiction representation, expanding the use of dedicated access privileges, improving enforcement, and strengthening international management.

The link between fishery management decisions and peer-reviewed scientific info must be strengthened, including developing an expanded research program that is more responsive to managers' needs. To accomplish this, a number of management improvements are needed. RFMCs should be required to rely on the advice of their Scientific and Statistical Committees (SSCs), especially when setting harvest levels. RFMCs should not be allowed to approve measures less conservative than recommended by the SSC. SSC members should be nominated by the RFMCs and appointed by the NOAA Administrator. To ensure that SSC members are of the highest quality, their credentials and potential conflicts of interest should be reviewed by an external organization. To ensure sufficient external review of the scientific advice of the SSCs, NOAA should develop a standardized, independent peer-review process for implementation by all RFMCs. To ensure that needed conservation measures are implemented in a timely manner, default measures should be developed that would go into effect with a lack of action on the part of the RFMCs. Finally, to ensure that manager's have the information they require, NOAA's process for developing research plans should incorporate manager's priorities to the extent practicable. An expanded cooperative research program and increased emphasis on in-season recreational fishery data collection should be an important component of this effort.

Responsibilities and jurisdiction of the various Federal and interstate fishery management entities need to be clarified, and the representation on the Federal regional fishery management councils need to be broadened. To ensure that jurisdictional confusion does not lead to delaying conservation measures, Congress should assign a lead management authority among the various Federal and interstate management authorities, based primarily on proportion of catch occurring within each entities jurisdiction. To ensure that the RFMCs have appropriate representation, particularly as we move toward ecosystem-based management, the governors should be required to submit a broader slate of candidates to be appointed by the NOAA Administrator. To ensure that RFMCs members have the necessary knowledge to properly manage fisheries, members should be required to take a training course. Finally, to ensure that all interstate fishery commissions have the necessary means to manage the fisheries under their jurisdiction, Congress should grant authority similar to the Atlantic Coastal Fisheries Cooperative Management Act to the Gulf and Pacific States Commissions.

To reverse existing incentives that create an unsustainable "race for the fish," fishery managers should explore widespread adoption of dedicated access privileges to promote conservation and help reduce overcapitalization. Congress should amend the Magnuson–Stevens Fishery Conservation and Management Act to affirm that fishery managers are authorized to institute dedicated access privileges, subject to meeting national guidelines; and every Federal, interstate, and State fishery management entity should consider the potential benefits of adopting dedicated access programs. In addition, Congress should directly address overcapitalization by revising Federal programs that subsidize overcapitalization, as well as work with NOAA to develop programs that permanently address overcapitalization in fisheries.

Fishery enforcement must be improved through adoption of better technology, such as Vessel Monitoring Systems (VMS) and better cooperation among Federal agencies and States. Funding

should be increased for Joint Enforcement Agreements between NOAA's National Marine Fisheries Service and coastal states as the best method of restoring the enforcement presence of the Coast Guard diminished because of the increased need for maritime security following the 9/11 terrorist attacks. The expanded use of VMS is another cost effective way of increasing enforcement capabilities.

Fishery management needs to continue the move toward ecosystem-based management in order to improve management, reduce conflicts between socio-economic impacts and biological sustainability, and provide a proper forum to address difficult management issues. In particular, issues such as habitat damage and bycatch should be approached from an ecosystem basis and management plans should be designed to reduce impacts from these factors.

Because many of the stocks targeted by U.S. fishermen traverse international waters, it will be impossible to conserve some stocks without the aid of other countries. In addition, many endangered species such as sea turtles and whales travel the high seas. To promote international cooperation to conserve living marine resources, the Commission makes the following recommendations. The U.S. should work to encourage other countries to adopt and enforce existing international agreements to promote worldwide adoption of sustainable fisheries practices, in particular the Fish Stocks Agreement and the United Nations Food and Agriculture Organization's Compliance Agreement. The National Ocean Council should recommend effective methods to promote adoption of other important international conservation agreements, such as the Code of Conduct for responsible fisheries. In addition, the United States should continue to press for the inclusion of environmental objectives—particularly those specified in international environmental agreements—as legitimate elements of trade policy.

Marine Mammals and Endangered Species

Because of their intelligence, visibility and frequent interactions with humans, marine mammals hold a special place in the minds of most people and are afforded a higher level of protection than fish or other marine organisms. The American public has also consistently been supportive of efforts to prevent species from becoming endangered or extinct from human-caused activities. Because of the concern that the American public has shown for marine mammals and endangered species, specific legislation was enacted to provide them greater protection. The Marine Mammal Protection Act and the Endangered Species Act are landmark laws that have protected marine mammals and populations in danger of extinction since their passage. However, both Acts need to move toward a more ecosystem-based regime to improve protections for these populations.

The biggest threat to marine mammals worldwide today is their accidental capture or entanglement in fishing gear (known as "bycatch"), killing hundreds of thousands of animals a year. Commercial harvesting contributed to major declines in the populations of marine mammals but only a few nations still allow hunting for purposes other than subsistence. Hunters from those nations continue to kill hundreds of thousands of seals, whales, dolphins, and other marine mammals each year while legal subsistence hunting accounts for thousands more. Other potential causes of death and injury to marine mammals, such as ships strikes, pollution and toxic substances, and noise from ships and sonar, cause many fewer deaths than bycatch and hunting.

The threats to endangered marine species such as sea turtles and sea birds are myriad and not easily categorized. One factor that is common to declines in many species is the destruction or degradation

of their natural habitat. Thus the successful recovery of a species depends to a large degree on protection or restoration of this habitat.

One of the critical components to improving protections for protected species is expanding the knowledge base. We know very little about the basic biology for these species, particularly marine mammals. The lack of basic scientific information has perhaps contributed to the frequent mismatch between causes of impacts to marine mammal populations and the amount of management attention paid to them. For example, the top two impacts to marine mammals by orders of magnitude are bycatch and hunting, yet most recent attention is being paid to other causes. Under ecosystem-based management, the most critical impacts should be addressed first. However, our overwhelming lack of knowledge of marine mammal and endangered species makes it difficult to properly rank and address impacts to these species. As the foundation to improving management, the Commission recommends an expanded research, technology, and engineering program, coordinated through the National Ocean Council, to examine and mitigate the effects of human activities on marine mammals and endangered species. In particular, Congress should expand Federal funding for research into ocean acoustics and the potential impacts of noise on marine mammals. The U.S. should increase efforts to extend the benefits of the expanded research program to other countries.

Another important component to improving protections for protected species will be to clarify and coordinate Federal agency actions. The Commission recommends that jurisdiction for marine mammals be consolidated within NOAA, and that the NOC improve coordination between NOAA and the Fish and Wildlife Service with respect to the implementation of the Endangered Species Act, particularly for anadromous species or when land-based activities have significant impacts on marine species.

The MMPA, with limited exceptions, prohibits the hunting, killing, or harassment of marine mammals. One of the exceptions authorizes the issuance of permits for the unintentional and incidental taking of small numbers of marine mammals provided it has only a negligible impact on the species. This provision has been problematic because terms such as small numbers and negligible impact are not defined in the Act, resulting in a lack of clarity about when a permit is necessary and under what circumstances it should be granted. Congress should amend the Marine Mammal Protection Act to require the NOAA to more clearly specify categories of activities that are allowed without a permit, those that require a permit, and those that are prohibited. Specifically, Congress should amend the Marine Mammal Protection Act to revise the definition of harassment to cover only activities that meaningfully disrupt behaviors that are significant to the survival and reproduction of marine mammals.

As an adjunct to clarifying allowed and permitted activities, the permitting process itself should be streamlined. Specifically, programmatic permitting should be used where possible to simplify agency permitting.

Coral Communities

Tropical and deepwater coral communities are among the oldest and most diverse ecosystems, rivaling tropical rainforests in biodiversity and economic value. But, tropical coral reef health is rapidly declining, with pristine reefs being rare or nonexistent and possibly one-third of the world's reefs severely damaged. The existing management structure is inadequate and agencies and laws overseeing coral reef management have made little progress in actually protecting corals. Immediate action is needed to avoid irreversible harm.

In the short-term, the Coral Reef Task Force (CRTF) should be strengthened by placing it under the NOC, and adding the U.S. Department of Energy and the U.S. Army Corps of Engineers. The strengthened CRTF should begin immediate development of actions to reverse impacts of coastal pollution and fishing on coral communities. The EPA and USDA, at the minimum, should be charged with implementing the coastal pollution reduction plan and NOAA should be charged with implementing the plan for reversing impacts from fishing. In addition, the CRTF's area of responsibility should be expanded to include deepwater coral communities as well.

In the long-term, the Congress should enact a "Coral Protection and Management Act" that provides direct authority to protect and manage corals, and provides a framework for research and cooperation with international protections efforts. This legislation should include the following elements: support for mapping, monitoring, and research programs; support for new research and assessment activities to fill critical information gaps; liability provisions for damages to coral reefs similar to those in the Marine Protection, Research, and Sanctuaries Act; support for outreach activities to educate the public about coral conservation and reduce human impacts; and, support for U.S. involvement, particularly through the sharing of scientific and management expertise, in bilateral, regional, and international coral reef management programs.

As the world's largest importer of ornamental coral reef resources, the United States has a particular responsibility to help eliminate destructive harvesting practices and ensure the sustainable use of these resources. Many of these resources are harvested by methods that destroy reefs and overexploit ornamental species. A balance is needed between sustaining the legitimate trade in ornamental resources and sustaining the health and survival of the world's coral reef resources. The U.S. should develop domestic standards for the importation of coral species, to ensure that U.S. citizens do not indirectly promote unsustainable practices in coral harvesting countries.

Aquaculture

Marine aquaculture has the potential to supply part of the ever increasing domestic and worldwide demand for seafood. However, there are two major concerns that need to be addressed: environmental problems with existing aquaculture operations, particularly net-pen facilities, and a confusing, inconsistent array of State and Federal regulations that hinder private sector investment.

To oversee a comprehensive and environmentally sound management regime, Congress should amend the National Aquaculture Act to designate NOAA as the lead Federal agency for implementing a national policy for environmentally and economically sustainable marine aquaculture and create an Office of Sustainable Marine Aquaculture in NOAA.

This new NOAA office should develop a single, multi-agency Federal permit for the aquaculture industry and ensure aquaculture facilities meet State and national environmental standards to lessen impacts from escapement and disease and protect the sustainability and diversity of wild stocks.

Furthermore, the permitting and leasing system and implementing regulations should: reflect a balance between economic and environmental objectives consistent with national and regional goals; be coordinated with guidelines and regulations developed at the State level; include a system for the assessment and collection of a reasonable portion of the resource rent generated from marine aquaculture projects that use ocean resources held in public trust; require applicants to post a bond to ensure that any later performance problems will be remedied and that abandoned facilities will be

safely removed at no additional cost to the taxpayers; and, require the development, dissemination, and adoption by industry of best management practices that are adaptable to new research and technology advances.

Enhanced investments in research, demonstration projects, and technical assistance can help the industry address environmental issues, conduct risk assessments, develop technology, select species, and improve best management practices. It is also vital for developing fair and reasonable policies, regulations, and management measures. Most of the Federal research to support marine aquaculture has been carried out under the auspices of NOAA's National Sea Grant College Program, which funds primarily university-based research. Congress should increase funding for expanded marine aquaculture research, development, training, extension, and technology transfer programs in NOAA. The Office of Sustainable Marine Aquaculture should set priorities for the research and technology programs, in close collaboration with academic, business, and other stakeholders.

Because the U.S. market for seafood is one of the largest in the world, we can use our market power as a positive force for promoting sustainable, environmentally sound aquaculture practices not only in the U.S., but the world as well. The U.S. should work to ensure that all countries adhere to aquaculture standards such as are in the UN FAO Code of Conduct for Responsible Fisheries.

Oceans and Human Health

Beneficial and harmful links between human health and ocean health exist. While several important medical treatments are based on chemicals discovered in marine animals, increasingly common phenomena such as harmful algal blooms have demonstrated ability to negatively impact human health. The health of marine ecosystems is affected by human activities such as pollution, global warming, and fishing. But in addition, human health depends on thriving ocean ecosystems. A better understanding about the many ways marine organisms affect human health, both for good by providing drugs and bioproducts, and for bad by causing human ailments, is needed.

Congress should establish an oceans and human health initiative to create a competitive grant program and coordinate Federal activities. Existing programs at NOAA, NSF and the National Institute of Environmental Health Sciences should be coalesced in this initiative. This initiative should be expanded to include other pertinent agencies such as the EPA and FDA.

New knowledge and technologies are needed to detect and mitigate microbial pathogens. These methods must be quick and accurate so that information can be communicated to resource managers and the coastal community in a timely manner. As they are developed, technologies need to be integrated into biological and biochemical sensors that can continuously monitor high-risk sites. It is important that site-specific sensor data and satellite sensor data be incorporated into the IOOS. To accomplish this task, the National Oceanic and Atmospheric Administration, National Science Foundation, National Institute of Environmental Health Sciences, and other appropriate entities should support the development and implementation of improved methods for monitoring and identifying pathogens and chemical toxins in ocean waters and organisms.

Offshore Energy and Mineral Resources

Oil and gas development on the Outer Continental Shelf (OCS) provides over a quarter of our domestic oil and gas reserves, and contributes thousands of jobs and billions of dollars to our

economy. In addition to its responsibilities for living marine resources, the Federal Government also exercises jurisdiction over nonliving resources, energy and other minerals located in the waters and seabed of the more than 1.7 billion acres of OCS. Offshore oil and gas development has the most mature and broadest management structure of all such resources. Although controversial in many areas, the process for oil and gas leasing and production is well institutionalized, reasonably comprehensive, and could be a model for new ocean-based renewable energy projects as part of a coordinated offshore management regime.

MMS's Environmental Studies Program (ESP) is a major source of information about the impacts of OCS oil and gas activities on the human, marine, and coastal environments. Since 1986, annual funding for the program has decreased, in real dollars, from a high of $56 million to approximately $18 million in 2003. The erosion in ESP funding has occurred at a time when more and better information, not less, is needed. There continues to be a need to better understand the cumulative and long-term impacts of OCS oil and gas development, especially in the area of low levels of persistent organic and inorganic chemicals, and their cumulative or synergistic effects.

The U.S. Department of the Interior should reverse recent budgetary trends and increase funding for the Minerals Management Service's Environmental Studies Program. The development of technologies and exploratory activities moving into very deep waters requires an increase in the MMS environmental studies program to keep track of new and emerging environmental issues. In addition to this program, the development of the IOOS could provide better information that can improve management of offshore resources. Industry and Federal agency partnerships should allow use of industry facilities to be incorporated into the IOOS.

To make certain that the Federal-State partnership is strengthened and that critical marine ecosystems are protected, more investment of the resource rents generated from OCS energy leasing and production into the sustainability of ocean and coastal resources is necessary. Specifically, some portion of the revenues received by the Federal Government annually for the leasing and extraction of nonrenewable offshore resources need to be allocated to all coastal states for programs and efforts to enhance the conservation and sustainable development of renewable ocean and coastal resources. Congress should ensure that revenues received from leasing and extraction of oil and gas and other new offshore uses are used to promote sustainable development of renewable ocean and coastal resources through creation of a grant program to all coastal states, with a larger share going to OCS producing States.

Conventional oil and gas are not the only fossil-based fuel sources located beneath ocean floors. Methane hydrates are solid, ice-like structures composed of water and natural gas. They occur naturally in areas of the world where methane and water can combine at appropriate conditions of temperature and pressure, such as in thick sediments of deep ocean basins, at water depths greater than 500 meters. The estimated amount of natural gas in the gas hydrate accumulations of the world greatly exceeds the volume of all known conventional gas resources. Conservative estimates reveal the quantity is enough to supply all of the nation's energy needs for more than 2,000 years at current rates of use. However, there is still no known practical and safe way to develop the gas and it is clear that much more information is needed to determine if methane hydrates can become a commercially viable and environmentally acceptable source of energy. The National Ocean Council (NOC), working with the U.S. Department of Energy and other appropriate entities, should determine whether methane hydrates can contribute significantly to meeting the nation's long-term

energy needs. If such contribution looks promising, the NOC should determine how much the current investment in research and development efforts should be increased.

There is continued interest in offshore renewable technologies as a means of reducing U.S. reliance on potentially unstable supplies of foreign oil, diversifying the nation's energy mix, and providing more environmentally benign sources of energy. As long as Federal agencies are forced to bootstrap their authorities to address these activities, the nation runs the risk of unresolved conflicts, unnecessary delays, and uncertain procedures. What is urgently needed is a comprehensive offshore management regime, developed by the National Ocean Council, which is designed to review all offshore uses in a greater planning context. A coherent and predictable federal management process for offshore renewable resources that is able to weigh the benefits to the nation's energy future against the potential adverse effects on other ocean users, marine life, and the ocean's natural processes, should be fully integrated into the broader management regime. Congress, with input from the National Ocean Council, should enact legislation providing for the comprehensive management of offshore renewable energy development as part of a coordinated offshore management regime. Specifically, this legislation should: streamline the process for licensing, leasing, and permitting renewable energy facilities in U.S. waters; subsume existing statutes, such as the Ocean Thermal Energy Conversion Act, and should be based on the premise that the oceans are a public resource; and, ensure that the public receives a fair return from the use of that resource and development rights are allocated through an open, transparent process that takes into account State, local, and public concerns.

ADVANCING INTERNATIONAL OCEAN SCIENCE AND POLICY

The United States has traditionally been a leader in international ocean policymaking and has participated in the development of many international agreements that govern the world's ocean areas and resources. That leadership must be maintained and reinvigorated. The international ocean challenges of the 21st century will require improved collaboration among domestic and international policymakers to establish ambitious objectives and take the actions necessary to achieve them.

The United States can best advance its own ocean interests and positively contribute to the health of the world's oceans by first ensuring that U.S. domestic policies and actions embody exemplary standards of wise, sustainable ocean management. The new national ocean policy framework will be instrumental in setting this positive tone for the international ocean community. The Commission also recommends several specific actions to maintain and reinvigorate the leadership of U.S. in global ocean issues:

U.S. Accession to the United Nations Convention on the Law of the Sea

The United States should accede to the United Nations Convention on the Law of the Sea—the preeminent legal framework for addressing international ocean issues. Until that step is taken, the nation will not be able to fully participate in bodies established under the Convention that make decisions on issues of importance to all coastal and seafaring nations, or to assume its important leadership role and protect United States interests as the law of the sea evolves.

Enhanced Coordination Among U.S. Ocean-Related Federal Agencies

Within the U.S. Government, the U.S. Department of State is the lead agency for most ocean-related international negotiations. However, the role of more specialized agencies is extremely

important due to the science and resource focus of many multilateral ocean issues. Consistent involvement of a wide range of experts is essential both to establish international standards that reflect U.S. interests, and to ensure that subsequent actions by the United States and others are in accordance with those standards.

A new mechanism is needed to provide the optimum degree of coordination among U.S. agencies sharing responsibility and knowledge of international ocean issues. An interagency committee should be established under the auspices of the National Ocean Council to enhance coordination and collaboration among U.S. Government agencies, strengthening U.S performance at international negotiations and improving implementation of international ocean policy.

Successful national and international ocean policy depends on sound scientific information. It is essential, therefore, to ensure that U.S. policymakers benefit from timely advice and guidance from the U.S. marine scientific community. This, in turn, requires procedures that both give scientists the opportunity to provide input and policy makers the chance to carefully consider their recommendations. The State Department should increase its internal training and scientific support to ensure better integration of ocean-related scientific expertise in policy and program development and implementation. In addition, the Department should develop more effective mechanisms to facilitate input from other government agencies and the broader scientific community.

Building International Capacity in Ocean Science and Management

Implementation of international ocean policy and improved management of ocean and coastal resources worldwide are affected by the adequacy of the science and management capacity of every coastal nation. To maintain progress on a global scale, the United States and other capable nations must assist coastal nations of more limited means. To be most effective, assistance should be science-based and developed within the context of an ecosystem-based approach. The U.S. Department of State should offer strong support for U.S. scientists conducting research programs around the world. Existing international partnerships should be strengthened and new partnerships promoted to facilitate the conduct of international research**.**

Capacity-building efforts should be concentrated on issues that have been identified as particularly critical for the health of an ecosystem or marine species, and have the greatest potential for positive impacts. In most instances, effective capacity-building will require long-term efforts to change detrimental practices and build support for new, sustainable management approaches. These efforts will require a funding commitment sufficient to make the changes needed to preserve or rebuild healthy ecosystems. As part of its international leadership role, the United States should increase its efforts to enhance long-term ocean science and management capacity in other nations through funding, education and training, technical assistance, and sharing best practices, management techniques, and lessons learned.

IMPLEMENTING A NEW NATIONAL OCEAN POLICY

To implement the blueprint for a new national ocean policy outlined in our report, several key elements are required: the will to move forward, the actors to carry out the changes, and the resources to support sustainable management of our oceans and coasts. Congress and the President have already demonstrated political will by enacting the Oceans Act of 2000 and appointing the U.S. Commission on Ocean Policy. Our preliminary report specifies who should carry out each recommendation and discusses what the costs will be and how they can be covered.

Who Should Take Action
In our report, we make 198 specific recommendations to implement a more coordinated and comprehensive national ocean policy. One of our goals was to ensure that every recommendation was aimed at a clear responsible party who could take action and be held accountable over time. As you read the report, you will see the recommendations grouped according to subject area. However, to highlight the assignment of responsibility, we also present a summary of all 198 recommendations, organized by the primary actors, in Chapter 31.

In brief:

- We include 54 recommendations for Congress, 69 for Executive Branch leaders, and 125 for Federal Government agencies.

- Of the 69 recommendations for Executive Branch leaders, 8 recommendations are for the President, 45 for the new National Ocean Council, 13 for the offices under the NOC's Committee on Ocean Science, Education, Technology, and Operations, 2 for the Assistant to the President, and 1 for the Presidential Council of Advisors on Ocean Policy.

- Of the 125 recommendations aimed at Federal Government agencies, 44 are for NOAA, 20 for EPA, 10 for the U.S. Coast Guard, 9 for NSF, 9 for the Department of the Interior, 8 for the U.S. Navy, 8 for the Department of State, 6 for the Department of Transportation, 5 for NASA, 3 for the National Institute of Environmental Health Sciences, 2 for the U.S. Army Corps of Engineers, 2 for the Department of Agriculture, and 1 for the Department of Labor.

(Note that some recommendations include more than one actor. As a result, the breakdown by organization adds up to more than 198.)

Although we have avoided targeting States (and local, territorial, and tribal governments) as the primary actors in our recommendations, they have a critically important role to play in the new National Ocean Policy Framework—through establishment of regional ocean councils, and in areas such as coastal development, water quality, education, natural hazards planning, fishery management, habitat conservation, and much more. States should also participate in the design and implementation of regional ocean observing systems and their integration into the national IOOS, as well as other research and monitoring activities.

How Can the Needed Changes be Achieved: Costs and Revenues
The recommendations I've just alluded to outline a series of ambitious proposals for improving the use and protection of the nation's oceans and coasts. But meaningful change requires meaningful investments. In the case of the ocean, such investments are easy to justify.

As I explained earlier and as we discuss in more detail in the preliminary report, more than one trillion dollars, or one-tenth of the nation's annual gross domestic product, is generated each year within communities immediately adjacent to the coast. By including the economic contribution from all coastal watershed counties, that number jumps to around five trillion dollars, or fully one half of our nation's economy. Those contributions are threatened by continued degradation of ocean and coastal environments and resources.

Modest levels of new funding will reap substantial dividends by supporting new management strategies to sustain our ocean and coastal resources and maximize their long-term value.

Costs

From the start, this Commission pledged to be clear about the costs of its recommendations. In keeping with that goal, the final report will include a complete accounting of the startup, short-term, and continuing costs associated with each issue area, including an analysis of Federal, State, and local budget implications to the extent possible.

At this stage, I am able to provide a rough estimate of overall new Federal spending associated with the Commission's preliminary recommendations. The Commission continues to refine its calculations and the information on which they are based, and will have more detailed costs and revenue estimates in the final report to the Congress and the President.

The total estimated additional cost for initiatives outlined in our report will be approximately:

- $1.2 billion in the first year
- $2.4 billion in the second year
- $3.2 billion per year in ongoing costs thereafter

A few special investments are worth highlighting:

- Creation of the National Ocean Council and related elements, with first-year costs of $1 million and ongoing annual costs of $2 million.
- Expansion of ocean education programs, with first-year costs of $7 million, second year costs of $251 million, and ongoing annual costs of $246 million.
- Establishment of an integrated ocean observing system, with first-year costs of $290 million, second-year costs of $312 million, and ongoing annual costs of $652 million.
- Increased ocean science and exploration, with first-year costs of $230 million, second-year costs of $395 million, and ongoing annual costs of $760 million.
- Dedicated Federal support for needed State actions, with first-year costs of $500 million, second-year costs of $750 million, and ongoing annual costs of $1 billion.

In view of the value generated by the ocean and coastal economy, we believe these are very reasonable investments.

Revenue: Creation of an Ocean Policy Trust Fund

Mindful of intense budgetary pressures at both Federal and State levels—and sensitive to the hardship associated with unfunded Federal mandates—the Commission set out to identify appropriate sources of revenue to cover the cost of its recommendations. A logical, responsible funding strategy is outlined in the preliminary report and will be developed further in the final report.

The Commission proposes creation of an Ocean Policy Trust Fund composed of rents generated from permitted uses in Federal waters. The Fund would include Outer Continental Shelf oil and gas revenues that are not currently committed. It would support the additional responsibilities we suggest for Federal agencies and prevent the creation of unfunded mandates to states.

The critical nature of the nation's oceans assets and the challenges faced in managing them make it clear that the time has come to establish an Ocean Policy Trust Fund in the U.S. Treasury to assist Federal agencies and State governments in carrying out the comprehensive ocean policy recommended by this Commission.

The Fund would include Federal revenues from Outer Continental Shelf oil and gas development that are not currently committed to other funds. The Land and Water Conservation Fund, the National Historic Preservation Fund, and the OCS oil and gas revenues given to coastal states from the three mile area seaward of their submerged lands would not be affected. After those programs were funded, in accordance with law, the remaining OCS monies would be deposited into the Ocean Policy Trust Fund.

Additional funds may also become available based on new offshore activities. In several sections of the preliminary report we discuss revenues that may be generated from permitted uses of Federal waters. In general, when a resource is publicly-owned, its use by private profit-making entities should be contingent on a reasonable return to taxpayers. Creating a link between permitted activities in Federal waters and the cost of associated regulatory and management responsibilities is logical and well justified by precedents in Federal land management.

Approximately $5 billion is generated annually from OCS oil and gas revenues. Protecting the three programs noted above would remove about $1 billion. Thus, some $4 billion would remain available for the Ocean Policy Trust Fund each year under current projections. At this time it is not possible to specify the amount of revenue that might be produced by emerging uses in Federal waters, nor predict when they may begin to flow.

The report recommends that a portion of the revenues received from the use of offshore resources be granted to States for the conservation and sustainable development of renewable ocean and coastal resources. OCS oil and gas producing States should receive a larger portion of such revenues to address the impacts on their States from extraction activities in adjacent Federal offshore waters.

In the Commission's view, Trust Fund monies should be used exclusively to support improved ocean and coastal management consistent with the nation's new coordinated and comprehensive national ocean policy. Such funds would be used to supplement—not replace—existing appropriations for ocean and coastal programs, and to fund new or expanded duties.

CLOSING STATEMENT

What I have presented to you today is a broad overview of the Commission's preliminary report – the culmination of two and a half years of work by 16 dedicated commissioners, 26 world-class science advisors, and a tireless staff of experts. To create this report, the Commission heard testimony and collected other information that shaped our understanding of the most pressing issues facing our nation's oceans and coasts.

The Commission balanced environmental, technical, economic, and scientific factors in making its recommendations. These bold recommendations for reform call for immediate implementation, while it is still possible to reverse distressing declines, seize exciting opportunities, and sustain the

oceans and their valuable assets for future generations. Clearly, the Commission's recommendations will require some new investments. However, without major change, the tremendous potential of our oceans and coasts to American prosperity will continue to deteriorate.

It has taken more than 35 years for the nation to refocus its attention on these vital resources. Our report provides a blueprint for the 21st century to achieve a future where our oceans and coasts are clean, safe, and sustainably managed and continue to contribute significantly to the well being of all the nation's citizens. The time to act is now and everyone who cares about the oceans and coasts must play a part. Leadership from this Committee and others in Congress, and from the White House, will be essential and we look forward to working closely with all of you in the months and years to come.