Executive Summary

America is a nation intrinsically connected to and immensely reliant on the ocean. All citizens—whether they reside in the country's farmlands or mountains, in its cities or along the coast—affect and are affected by the sea. Our grocery stores and restaurants are stocked with seafood and our docks are bustling with seaborne cargo. Millions of visitors annually flock to the nation's shores, creating jobs and contributing substantially to the U.S. economy through one of the country's largest and most rapidly growing economic sectors: tourism and recreation.

The offshore ocean area under U.S. jurisdiction is larger than its total land mass, providing a vast expanse for commerce, trade, energy and mineral resources, and a buffer for security. Born of the sea are clouds that bring life-sustaining water to our fields and aquifers, and drifting microscopic plants that generate much of the oxygen we breathe. Energy from beneath the seabed helps fuel our economy and sustain our high quality of life. The oceans host great biological diversity with vast medical potential and are a frontier for exciting exploration and effective education. The importance of our oceans, coasts, and Great Lakes cannot be overstated; they are critical to the very existence and well-being of the nation and its people. Yet, as the 21st century dawns, it is clear that these invaluable and life-sustaining assets are vulnerable to the activities of humans.

Human ingenuity and ever-improving technologies have enabled us to exploit—and significantly alter—the ocean's bounty to meet society's escalating needs. Pollution runs off the land, degrading coastal waters and harming marine life. Many fish populations are declining and some of our ocean's most majestic creatures have nearly disappeared. Along our coasts, habitats that are essential to fish and wildlife and provide valuable services to humanity continue to suffer significant losses. Non-native species are being introduced, both intentionally and accidentally, into distant areas, often resulting in significant economic costs, risks to human health, and ecological consequences that we are only beginning to comprehend.

Yet all is not lost. This is a moment of unprecedented opportunity. Today, as never before, we recognize the links among the land, air, oceans, and human activities. We have access to advanced technology and timely information on a wide variety of scales. We recognize the detrimental impacts wrought by human influences. The time has come for us to alter our course and set sail for a new vision for America, one in which the oceans, coasts, and Great Lakes are healthy and productive, and our use of their resources is both profitable and sustainable.

It has been thirty-five years since this nation's management of the oceans, coasts, and Great Lakes was comprehensively reviewed. In that time, significant changes have occurred in how we use marine assets and in our understanding of the consequences of our actions. This report from the U.S. Commission on Ocean Policy provides a blueprint for change in the 21st century, with recommendations for creation of an effective national ocean policy that ensures sustainable use and protection of our oceans, coasts, and Great Lakes for today and far into the future.

The Value of the Oceans and Coasts

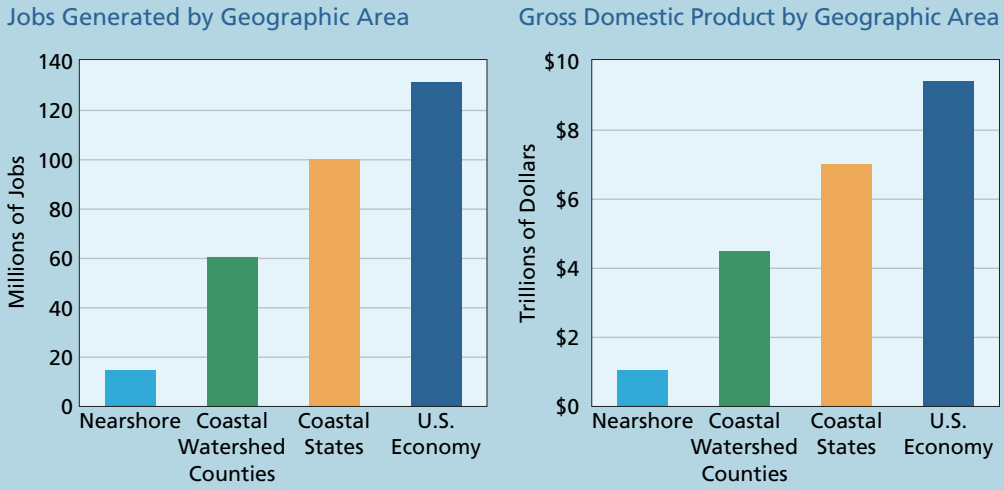
America's oceans, coasts, and Great Lakes provide tremendous value to our economy. Based on estimates in 2000, ocean-related activities directly contributed more than $117 billion to American prosperity and supported well over two million jobs. By including coastal activities, the numbers become even more impressive; more than $1 trillion, or one-tenth of the nation's annual gross domestic product, is generated within the relatively narrow strip of land immediately adjacent to the coast that we call the nearshore zone (Figure ES.1). When the economies throughout coastal watershed counties are considered, the contribution swells to over $4.5 trillion, fully half of the nation's gross domestic product, accounting for some 60 million jobs.

The United States uses the sea as a highway for transporting goods and people and as a source of energy and potentially lifesaving drugs. Annually, the nation's ports handle more than $700 billion in merchandise, while the cruise industry and its passengers account for another $12 billion in spending. More than thirteen million jobs are connected to maritime trade. With offshore oil and gas operations expanding into ever deeper waters, annual production is now valued at $25–$40 billion, and yearly bonus bid and royalty payments contribute approximately $5 billion to the U.S. Treasury. Ocean exploration has also led to a growing and potentially multi-billion dollar industry in marine-based bioproducts and pharmaceuticals.

Fisheries are another important source of economic revenue and jobs and provide a critical supply of healthy protein. They also constitute an important cultural heritage for fishing communities. 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.

Every year, hundreds of millions of people visit America's coasts to enjoy the oceans, spending billions of dollars and directly supporting millions of jobs. Nationwide, retail expenditures on recreational boating alone exceeded $30 billion in 2002. In fact, tourism and recreation is one of the nation's fastest-growing business sectors, enriching economies and supporting jobs in communities virtually everywhere along the shores of the United States and its territories. Over half of the U.S. population lives in coastal watersheds,

Figure ES.1 The Value of the Coasts



Coastal watershed counties, which account for less than a quarter of U.S. land area, are significant contributors to the U.S. economy. In 2000, they were home to nearly half of the nation's jobs and generated a similar proportion of the nation's gross domestic product.

Source: Living Near… and Making a Living from… the Nation's Coasts and Oceans, Appendix C.

and more than 37 million people and 19 million homes have been added to coastal areas during the last three decades, driving up real estate values and requiring ever greater support services.

These concrete, quantifiable contributions are just one measure of the value of the nation's oceans, coasts, and Great Lakes. There are many even more important attributes that cannot be given a price tag, such as global climate control, life support, cultural heritage, and the aesthetic value of the ocean with its intrinsic power to relax, rejuvenate, and inspire.

Trouble in Paradise

Unfortunately, our use and enjoyment of the ocean and its resources have come with costs, and we are only now discovering the full extent of the consequences of our actions. In 2001, 23 percent of the nation's estuarine areas were considered impaired for swimming, fishing, or supporting marine species. In 2003, there were more than 18,000 days of closings and advisories at ocean and Great Lakes beaches, most due to the presence of bacteria associated with fecal contamination. Across the globe, marine toxins afflict more than 90,000 people annually and are responsible for an estimated 62 percent of all seafood-related illnesses. Harmful algal blooms appear to be occurring more frequently in our coastal waters and non-native species are increasingly invading marine ecosystems. Experts estimate that 25 to 30 percent of the world's major fish stocks are overexploited, and many U.S. fisheries are experiencing serious 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.

Coastal waters are one of the nation's greatest assets, yet they are being bombarded with pollutants from a variety of sources. While progress has been made in reducing point sources of pollution, nonpoint source pollution has increased and is the primary cause of nutrient enrichment, hypoxia, harmful algal blooms, toxic contamination, and other problems that plague coastal waters. Nonpoint source pollution occurs when rainfall and snowmelt wash pollutants such as fertilizers, pesticides, bacteria, viruses, pet waste, sediments, oil, chemicals, and litter into our rivers and coastal waters. Other pollutants, such as mercury and some organic chemicals, can be carried vast distances through the atmosphere before settling into ocean waters.

Our failure to properly manage the human activities that affect the nation's oceans, coasts, and Great Lakes is compromising their ecological integrity, diminishing our ability to fully realize their potential, costing us jobs and revenue, threatening human health, and putting our future at risk.

The Work of the U.S. Commission on Ocean Policy

Congress clearly recognized both the promise of the oceans and the threats to them when it passed the Oceans Act of 2000, calling for establishment of 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 sixteen Commission members drawn from diverse backgrounds, including individuals nominated by the leadership in the United States Senate and House of Representatives.

The Commission held sixteen public meetings around the country and conducted eighteen regional site visits, receiving testimony, both oral and written, from hundreds of people. Overall, the Commission heard from some 447 witnesses, including over 275 invited presentations and an additional 172 comments from the public, resulting in nearly 1,900 pages of testimony.

The message from both experts and the public alike was clear: our oceans, coasts, and Great Lakes are in trouble and major changes are urgently needed in the way we manage them. The Commission learned about new scientific findings that demonstrate the complexity and interconnectedness of natural systems. It also confirmed that our management approaches have not been updated to reflect this complexity, with responsibilities remaining dispersed among a confusing array of agencies at the federal, state, and local levels. Managers, decision makers, and the public cried out for improved and timely access to reliable data and solid scientific information that have been translated into useful results and products. Another steady theme heard around the country was the plea for additional federal support, citing decades of underinvestment in the study, exploration, protection, and management of our oceans, coasts, and Great Lakes. Finally, the point was made that we must enhance ocean-related education so that all citizens recognize the role of the oceans, coasts, and Great Lakes in their own lives and the impacts they themselves have on these environments.

Following extensive consideration, and deliberation of a broad array of potential solutions, the Commission presented a preliminary report in early 2004. Comments were solicited from state and territorial governors, tribal leaders, and the public; the response was overwhelming. Thoughtful, constructive feedback was received from thirty-seven governors (including 33 of the 34 coastal state governors), five tribal leaders, and a multitude of other organizations and individuals—over one thousand pages in all. Commenters were nearly unanimous in praising the report, agreeing that our oceans are in trouble, and supporting the call for action to rectify the situation. Where governors and others offered corrections or suggestions for improvement, the Commission paid close attention and made changes as needed.

This final report lays out the Commission's conclusions and detailed 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.

A Vision and Strategy for the 21st Century and Beyond

The Commission began by envisioning a desirable future. In this future, the oceans, coasts, and Great Lakes are clean, safe, prospering, and sustainably managed. They contribute significantly to the economy, supporting multiple, beneficial uses such as food production, development of energy and mineral resources, recreation and tourism, transportation of goods and people, and the discovery of novel medicines, while preserving a high level of biodiversity and a wide range of critical natural habitats.

In this future, the coasts are attractive places to live, work, and play, with clean water and beaches, easy public access, sustainable and strong economies, safe bustling harbors and ports, adequate roads and services, and special protection for sensitive habitats and threatened species. Beach closings, toxic algal blooms, proliferation of invasive species, and vanishing native species are rare. Better land-use planning and improved predictions of severe weather and other natural hazards save lives and money.

In this future, the management of our impacts on the oceans, coasts, and Great Lakes has also changed. Management boundaries correspond with ecosystem regions, and policies consider interactions among all ecosystem components. In the face of scientific uncertainty, managers balance competing considerations and proceed with caution. Ocean governance is effective, participatory, and well coordinated among government agencies, the private sector, and the public.

The Commission envisions a time when the importance of reliable data and sound science is widely recognized and strong support is provided for physical, biological, social,

and economic research, as well as ocean exploration. The nation invests in the needed scientific tools and technologies, including ample, well-equipped surface and underwater research vessels, reliable, sustained satellites, state-of-the-art computing facilities, and innovative sensors that can withstand harsh ocean conditions. A widespread network of observing and monitoring stations provides a steady stream of data, and scientific findings are translated into practical information and products for decision makers, vessel operators, educators, and the public.

In this hoped-for future, better education is a cornerstone of national ocean policy, with the United States once again joining the top ranks in math, science, and technology achievement. An audacious program to explore unknown reaches of the ocean inspires and engages people of all ages. An ample, diverse, well-trained, and motivated workforce is available to study the oceans, set wise policies, develop and apply technological advances, and engineer new solutions. An effective team of educators works closely with scientists to learn and teach about the oceans—its value, beauty, and critical role on the planet. And, as a result of lifelong education, all citizens are better stewards of the nation's resources and marine environment.

Finally, the Commission's vision sees the United States as an exemplary leader and full partner globally, eagerly exchanging science, engineering, technology, and policy expertise with others, particularly those in developing countries, to facilitate the achievement of sustainable ocean management on an international level.

While progress has been made in a number of areas, the nation's existing system for managing our oceans, coasts, and Great Lakes is simply unable to effectively implement the appropriate guiding principles (see next page) and realize a positive long-term vision.

The Commission recommends moving toward an ecosystem-based management approach by focusing on three cross-cutting themes: (1) a new, coordinated national ocean policy framework to improve decision making; (2) cutting edge ocean data and science translated into high-quality information for managers; and (3) lifelong ocean-related education to create well-informed citizens with a strong stewardship ethic. These themes are woven throughout the report, appearing again and again in chapters dealing with a wide variety of ocean challenges.

A New National Ocean Policy Framework

To improve decision making, promote effective coordination, and move toward an ecosystem-based management approach, a new National Ocean Policy Framework is needed. While this framework is intended to produce strong, national leadership, it is also designed to support and enhance the critical roles of state, territorial, tribal, and local decision makers.

Improved National Coordination and Leadership

At the federal level, eleven of fifteen cabinet-level departments and four independent agencies play important roles in the development of ocean and coastal policy. These agencies interact with one another and with state, territorial, tribal, and local authorities in sometimes haphazard ways. Improved communication and coordination would greatly enhance the effectiveness of the nation's ocean policy.

Within the Executive Office of the President, three entities have some responsibilities relevant to oceans: the Office of Science and Technology Policy addresses government-wide science and technology issues and includes an ocean subcommittee; the Council on Environmental Quality (CEQ) oversees broad federal environmental efforts and implementation of the National Environmental Policy Act; and the National Security Council's

Guiding Principles

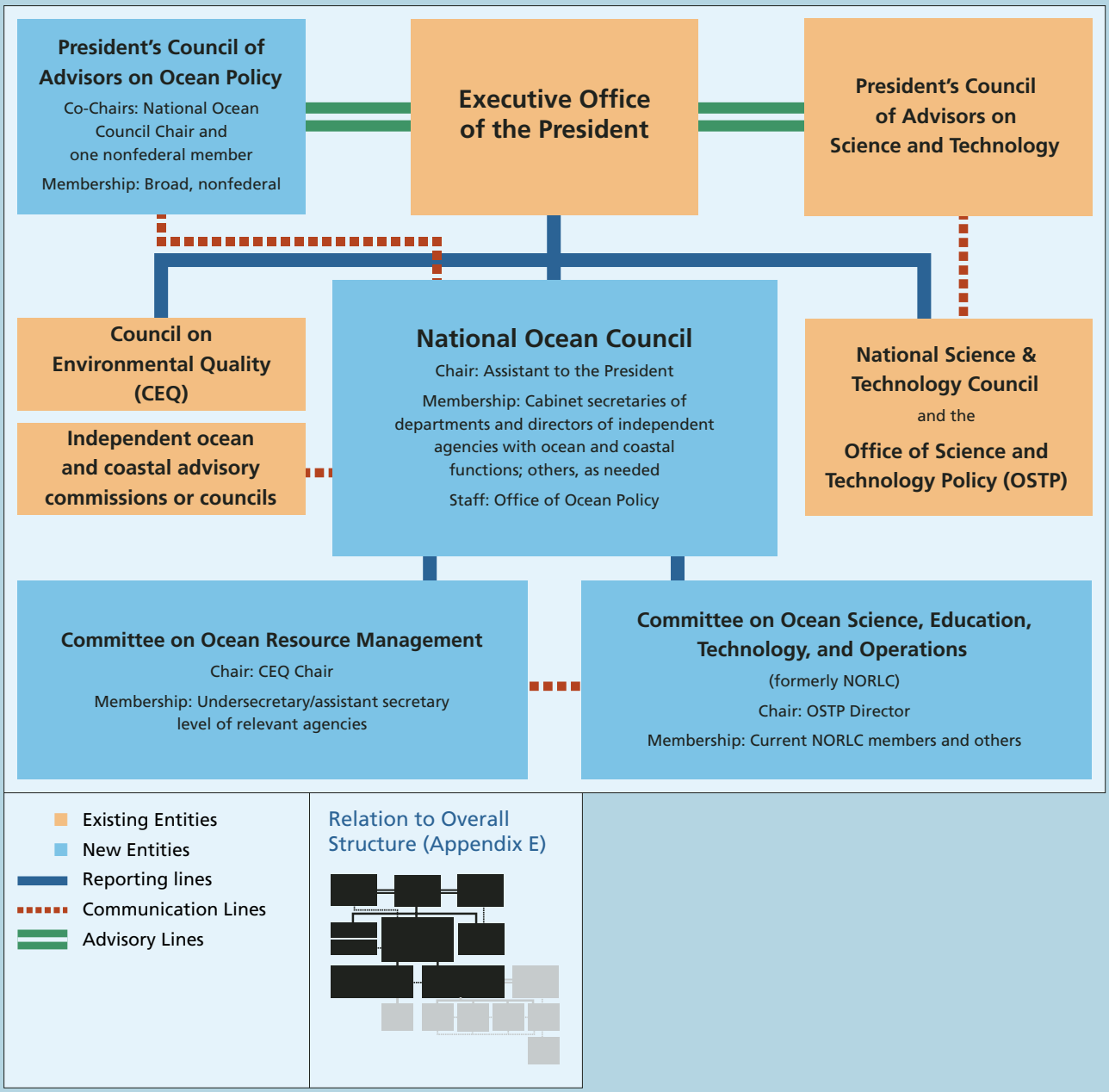
The Commission believes its vision for the future is both practical and attainable. To achieve it, however, an overarching set of principles should guide national ocean policy.

- **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. Decision makers 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:** Decision makers 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.

Global Environment Policy Coordinating Committee includes a subcommittee to deal with international ocean issues. But there is no multi-issue, interagency mechanism to guide, oversee, and coordinate all aspects of ocean and coastal science and policy.

As part of a new National Ocean Policy Framework, the Commission recommends that Congress establish a National Ocean Council (NOC) within the Executive Office of the President, chaired by an Assistant to the President and composed of cabinet secretaries of departments and administrators of independent agencies with relevant ocean- and coastal-related responsibilities (Figure ES.2). The NOC should provide high-level attention to ocean, coastal, and Great Lakes issues, develop and guide the implementation of

Figure ES.2 Proposed Structure for Coordination of Federal Ocean Activities



Shown here are the institutional components that should be established in the Executive Office of the President (EOP) to improve federal leadership and coordination of the nation's oceans and coasts. This diagram also illustrates the organizational relationship between these new components and existing units in the EOP.

appropriate national policies, and coordinate the many federal departments and agencies with ocean and coastal responsibilities. 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. A Committee on Ocean Science, Education, Technology, and Operations and a Committee on Ocean Resource Management should be created under the NOC to support its coordination and planning functions.

A President's Council of Advisors on Ocean Policy, consisting of representatives from state, territorial, tribal, and local governments and academic, public interest, and private sector organizations, should also be established to ensure a formal structure for nonfederal input to the NOC and the President on ocean and coastal policy matters.

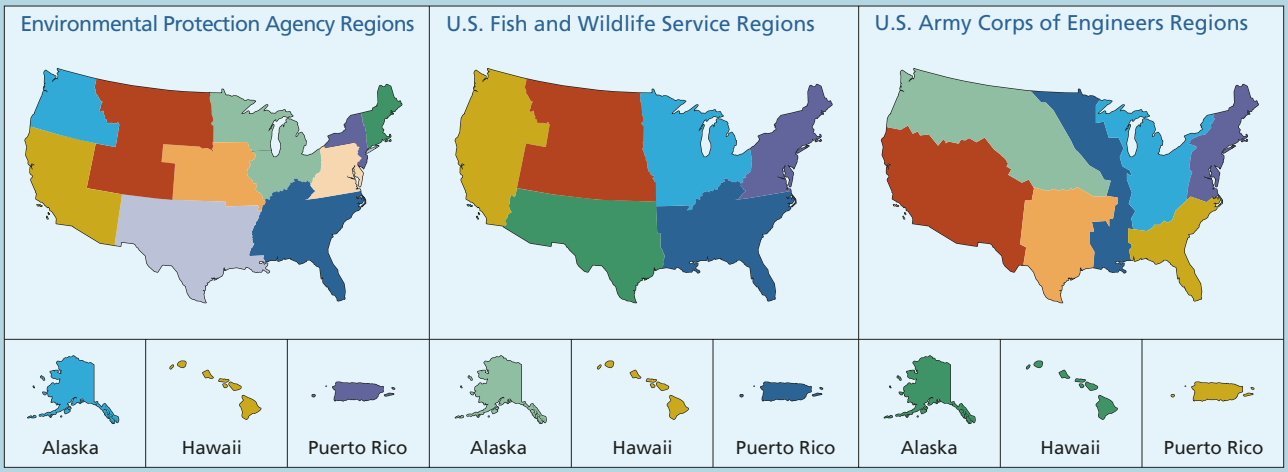
A small Office of Ocean Policy should provide staff support to all the bodies discussed above. Pending congressional action, the Commission recommends that the President put this structure in place through an executive order.

An Enhanced Regional Approach

Ensuring full state, territorial, tribal, and local participation in ocean policy development and implementation is a critical element of the new National Ocean Policy Framework. Many of the nation's most pressing ocean and coastal issues are local or regional in nature and their resolution requires the active involvement of state and local policy makers, as well as a wide range of stakeholders.

One of the priority tasks for the new National Ocean Council should be to develop and promote a flexible, voluntary process that groups of states could use to establish regional ocean councils. These regional ocean councils would then serve as focal points for discussion, cooperation, and coordination. They would improve the nation's ability to respond to issues that cross jurisdictional boundaries and would help policy makers address the large-scale connections and conflicts among watershed, coastal, and offshore uses. To complement and support this effort, the President should direct all federal agencies with ocean-related functions to immediately improve their regional coordination, moving over time to adopt a common regional structure (Figure ES.3).

Figure ES.3 Alignment of Federal Regions Is Essential for Communication



Shown above are the existing regional management areas for three federal agencies. Because these areas do not coincide, it is difficult for the agencies to coordinate and communicate about issues of common concern at the regional level. Furthermore, this lack of coordination impedes their ability to effectively interact with regional, state, territorial, tribal, and local entities on a regional basis.

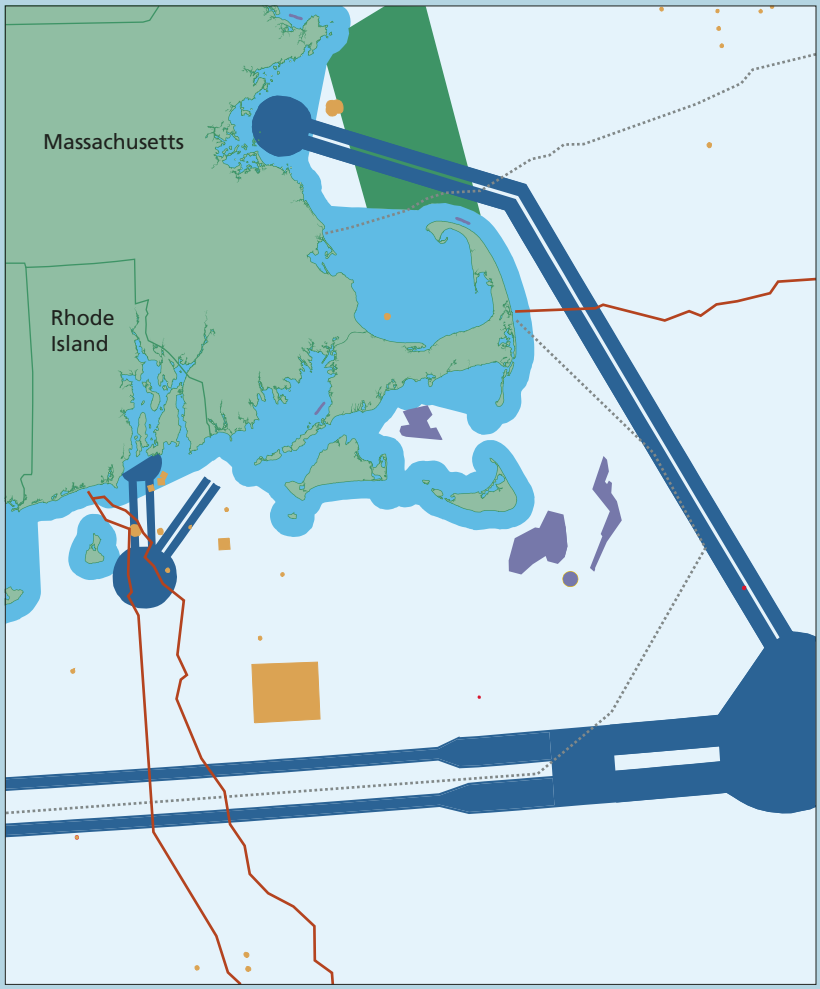
One pervasive problem for state and local managers is lack of sufficient, reliable information on which to base decisions. The Commission recommends that governors within a region identify an appropriate organization to create a regional ocean information program. Such programs will identify user-driven regional priorities for research, data, and science-based information products and help meet those needs by enhancing existing resources and promoting education, training, and outreach in support of improved ocean and coastal management.

Coordinated Governance of Offshore Waters

The nation's vast offshore ocean areas are becoming an increasingly appealing place to pursue economic activities (Figure ES.4). Well-established institutional frameworks exist for longstanding ocean uses, such as fishing and energy extraction; however, authorities governing new activities, such as the placement of wind farms or aquaculture facilities, need to be clarified. A comprehensive offshore management regime is needed that enables us to realize the ocean's potential while safeguarding human and ecosystem health, minimizing conflicts among users, and fulfilling the government's obligation to manage the sea in a way that maximizes long-term benefits for all the nation's citizens.

The National Ocean Council, supported by congressional action where necessary, should ensure that each current or foreseeable activity in federal waters is administered by a lead federal agency. Well-developed laws or authorities that cover existing programs would not be supplanted, but the lead agency would be expected to continue and enhance coordination among all other involved federal partners. For emerging ocean activities whose management is ill defined, dispersed, or essentially non-existent, the National Ocean Council and Congress, working with affected stakeholders, should ensure that the lead agency provides strong coordination, while working toward a more comprehensive governance structure.

Figure ES.4 Coordination Is Essential in Busy Offshore Waters



- Wind farm proposals
- Shipping lanes, fairways, and precautionary areas
- Hazardous areas—dumping areas; toxic wastes; unexploded ordnance, torpedos, depth charges, etc.
- State Waters (3 nautical miles)
- National Marine Sanctuary
- Telecommunications cables—active
- Telecommunications cables—inactive

Like many offshore areas of the nation, the waters off a small portion of the New England coast are home to a number of existing and proposed activities. In addition to the uses shown above, many offshore areas also contain dredging projects, marine protected areas, fishery closures, recreational activities, artificial reefs, and in certain coastal regions, oil and gas development. User conflicts can and do arise when incompatible activities take place in the same area. A comprehensive offshore management regime is needed for the balanced coordination of all offshore uses.

Source: Minerals Management Service, Washington, DC.

Based on an improved understanding of offshore areas and their resources, the federal government should work with appropriate state and local authorities to ensure that the many different activities within a given area are compatible, in keeping with an ecosystem-based management approach. As the pressure for offshore uses grows, and before serious conflicts arise, it is critical that the National Ocean Council review the complete array of single-purpose offshore programs with the goal of achieving coordination among them.

Ultimately, a streamlined program for each activity should be combined with a comprehensive offshore management regime that considers all uses, addresses the cumulative impacts of multiple activities, and coordinates the many authorities with interests in offshore waters. The National Ocean Council, President's Council of Advisors on Ocean Policy, federal agencies, regional ocean councils, and states will all have roles to play in realizing more coordinated, participatory management of offshore ocean activities.

In considering the coordination of ocean activities, marine protected areas provide one valuable tool for achieving more ecosystem-based management of both nearshore and offshore areas. Such areas can be created for many different reasons including: enhancement of living marine resources; protection of habitats, endangered species, and marine biological diversity; or preservation of historically or culturally important submerged archeological resources. Marine protected areas may also provide scientific, recreational, and educational benefits. The level of protection and types of activities allowed can vary greatly depending on the goals of the protected area.

With its multiple use, ecosystem-based perspective, the National Ocean Council should oversee the development of a flexible process—one that is adaptive and based on the best available science—to design, implement, and assess marine protected areas. Regional ocean councils, or other appropriate entities, can provide a forum for engaging all stakeholders in this process.

A Strengthened Federal Agency Structure

Improved coordination through a National Ocean Council is necessary, but not sufficient to bring about the depth of change needed. Some restructuring of existing federal agencies will be needed to make government less redundant, more flexible, more responsive to the needs of states and stakeholders, and better suited to an ecosystem-based management approach. Because of the significant hurdles involved, a phased approach is suggested.

The National Oceanic and Atmospheric Administration (NOAA) is the nation's primary ocean agency. Although it has made significant progress in many areas, there is widespread agreement that the agency could manage its activities more effectively. In addition, many of the recommendations in this report call for NOAA to handle additional responsibilities. A stronger, more effective, science-based and service-oriented ocean agency is needed—one that works with others to achieve better management of oceans and coasts through an ecosystem-based approach.

As an initial step in a phased approach, Congress should pass an organic act that codifies the existence of NOAA. This will strengthen the agency and help ensure that its structure is consistent with three primary functions: management; assessment, prediction, and operations; and research and education. To support the move toward a more ecosystem-based management approach within and among federal agencies, the Office of Management and Budget (OMB) should review NOAA's budget within its natural resource programs directorate, rather than the general government programs directorate. This change would make it easier to reconcile NOAA's budget with those of the other major resource-oriented departments and agencies, all of which are reviewed as natural resource programs at OMB.

As a second step in the phased approach, all federal agencies with ocean-related responsibilities should be reviewed and strengthened and overlapping programs should be considered for consolidation. Programmatic overlaps can be positive, providing useful

checks and balances as agencies bring different perspectives and experiences to the table. However, they can also diffuse responsibility, introduce unnecessary redundancy, raise administrative costs, and interfere with the development of a comprehensive management regime. The Commission recommends that program consolidation be pursued in areas such as area-based ocean and coastal resource management, invasive species, marine mammals, aquaculture, and satellite-based Earth observing. The Assistant to the President, with advice from the National Ocean Council and the President's Council of Advisors on Ocean Policy, should review other federal ocean, coastal, and atmospheric programs, and recommend additional opportunities for consolidation.

Ultimately, our growing understanding of ecosystems and the inextricable links among the sea, land, air, and all living things, points to the need for more fundamental reorganization of the federal government. Consolidation of *all* natural resource functions, including those involving oceans and coasts, would enable federal agencies to move toward true ecosystem-based management.

Sound Science and Information for Wise Decisions

An effective national ocean policy should be based on unbiased, credible, and up-to-date scientific information. Unfortunately, the oceans remain one of the least explored and most poorly understood environments on the planet, despite some tantalizing discoveries over the last century.

Sustained investments will be required to: support research and exploration; provide an adequate infrastructure for data collection, science, and management; and translate new scientific findings into useful and timely information products for managers, educators, and the public. This is especially true as we move toward an ecosystem-based management approach that imposes new responsibilities on managers and requires improved understanding of physical, biological, social, and economic forces.

Investing in Science and Exploration

Over the past two decades, with our oceans, coasts, and Great Lakes under siege, federal investment in ocean research has stagnated while other fields have grown. As a result, ocean science funding has fallen from 7 percent of the total federal research budget twenty-five years ago to just 3.5 percent today. This lagging support in the United States, combined with growing foreign capability, has lessened the nation's pre-eminence in ocean research, exploration, and technology development. Chronic under-investment has also left much of our ocean-related infrastructure in woefully poor condition.

The current annual federal investment in marine science is well below the level necessary to adequately meet the nation's needs for coastal and ocean information. The Commission urges Congress to double the federal ocean and coastal research budget over the next five years, including a national program of social science and economic research to examine the human dimensions and economic value of the nation's marine resources. In addition, a dedicated ocean exploration program should be launched to unlock the mysteries of the deep by discovering new ecosystems, natural resources, and archaeological treasures.

A renewed U.S. commitment to ocean science and technology will require not only substantially increased funding, but also improved strategic planning, closer interagency coordination, robust technology and infrastructure, and 21st century data management systems. The Commission recommends: creation of a national strategy for ocean research that will guide individual agencies' ten-year science plans; enhancement and maintenance of the nation's ocean and coastal infrastructure; and development of new technologies, with more rapid transition of experimental technologies into operational applications.

Launching a New Era of Data Collection

The Integrated Ocean Observing System

About 150 years ago, this nation set out to create a comprehensive weather forecasting and warning network. Today it is hard to imagine living without constantly updated and increasingly accurate weather reports. Now it is time to fully incorporate the oceans in this observational and forecasting capability. A sustained, national Integrated Ocean Observing System (IOOS) will provide invaluable economic, societal, and environmental benefits, including improved warnings of coastal and health hazards, more efficient use of living and nonliving resources, safer marine operations, and a better understanding of climate change. Our information needs are growing and the challenges we face along our coasts and in our oceans are escalating. The nation needs to substantially advance its ability to observe, monitor, and forecast ocean and coastal conditions, and contribute to global Earth observing capabilities (Figure ES.5).

Figure ES.5 Many Different Platforms Collect Data as Part of the IOOS

This picture is an artist's rendering of the various water-, air-, and space-components of ocean observing systems. The data collected by each of these different sensors are transmitted via seafloor fiber optic cables and satellites to a central location on land.

Source: HARRIS Corporation Maritime Communications, Melbourne, FL.

The Commission recommends that the Federal government, through the National Ocean Council, make the development and implementation of the IOOS a high priority, to be organized through a formalized Ocean.US office. The United States simply cannot achieve the levels of understanding and predictive capability needed, or generate the information required by a wide range of users, without the IOOS. While implementation of the IOOS will require significant, sustained funding, estimates suggest that an operational IOOS will save the United States billions of dollars annually through enhanced weather forecasts, improved resource management, and safer, more efficient marine operations.

The IOOS must meet the needs of a broad suite of users, from scientists to the general public. To maximize its benefits, resource managers at federal, regional, state, and local levels will need to explain their information needs and provide guidance on the most useful outputs and products. The regional observing systems, overseen by Regional Associations, will provide a visible avenue for all users to provide input to the national IOOS.

The National Monitoring Network

Despite the growing threats to ocean, coastal, and Great Lakes waters, there is no national monitoring network in place to assess their status, track changes over time, help identify causes and impacts, or determine the success of management efforts. Increased monitoring is needed not only along the nation's coasts, but also inland where pollutants often originate, traveling downstream and ultimately affecting coastal waters. A national monitoring network is essential to support the move toward an ecosystem-based management approach that considers the impacts of human activities within the context of the broader biological and physical environment. NOAA, EPA, and USGS should lead an effort to develop a national monitoring network that coordinates and expands existing efforts by federal, state, local, and private entities.

Because of the inherent overlap between inland, coastal, and open-ocean waters, NOAA should ensure that the national monitoring network includes adequate coverage in both coastal areas and the upland reaches that affect them, and that it is closely linked with the IOOS. User communities should participate fully in developing the network, and the data collected should be made available in useful formats to managers and stakeholders so they can make continual progress toward ecosystem-based management goals. The design and implementation of the national monitoring network will require not only federal coordination, but also significant input from states and regional entities.

Turning Data into Useful Information

The data generated from increased research, enhanced monitoring networks, and new observing systems will be essential in improving our management of ocean and coastal resources. However, two major challenges face today's data managers: the sheer volume of incoming data, which strains storage and assimilation capabilities, and the demand for timely access to the data in a variety of formats by user communities. Meeting these challenges will require a concerted effort to modernize the current data management system and will require greatly improved interagency planning and coordination. The Commission recommends the creation of several new programs and partnerships to achieve these goals.

First, Congress should amend the National Oceanographic Partnership Act to establish Ocean.IT, a new federal interagency mechanism to oversee ocean and coastal data management. This interagency group will enhance coordination, harmonize future software and hardware acquisitions and upgrades, and oversee strategic planning and funding. Building partnerships with the private sector and academia should also be a major goal of Ocean.IT.

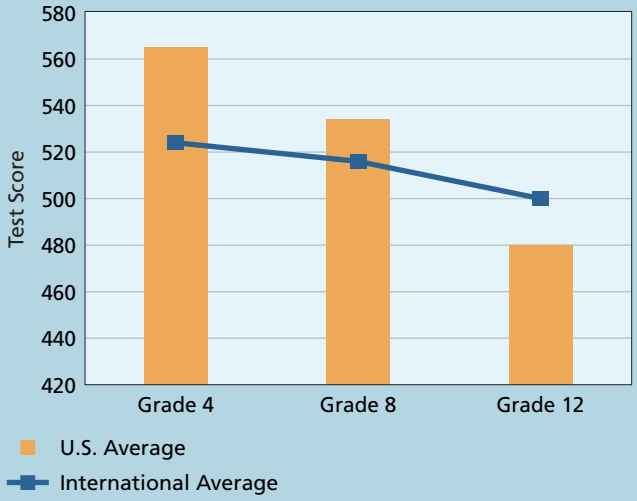
Second, NOAA and the U.S. Navy should establish an ocean and coastal information management and communications partnership to generate information products relevant to national, regional, state, and local operational needs. Building upon the Navy's model for operational oceanography, this partnership would rapidly advance U.S. coastal and ocean analyses and forecasting capabilities by drawing on the distinct, yet complementary capabilities of each organization and using all available physical, biological, chemical, and socioeconomic data.

The Commission recommends the creation of two additional programs that will aid in the creation and dissemination of information: multi-stakeholder regional ocean information programs to develop and disseminate useful information products on a regional basis; and accelerated coastal and ocean mapping and charting, coordinated through the Federal Geographic Data Committee.

Education: A Foundation for the Future

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 (Figure ES.6). More specifically, a 1999 study revealed 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 widely understood that nonpoint source pollution threatens the health of coastal waters, or that mercury in fish comes from human activities via the atmosphere. From excess application 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, but without an informed and educated citizenry, it will be difficult to achieve a collective commitment to stewardship, sustained investment, and more effective policies.

Figure ES.6 U.S. Students Fall Behind in Science



U.S. students in fourth grade score above the international average in science achievement, according to the Trends in International Mathematics and Science Study. However, as students approach their final year in secondary school, the performance in U.S. schools drops well below the international average.

Source: Calsyn, C., P. Gonzales, and M. Frase. *Highlights from TIMSS [Trends in International Mathematics and Science Study].* Washington, DC: National Center for Education Statistics, 1999.

A new national ocean policy should include a strong commitment to education to reverse scientific and environmental illiteracy, create a strong, diverse workforce, produce informed decision makers, and develop a national stewardship ethic for the oceans, coasts, and Great Lakes. The Commission recommends that all ocean-related agencies take responsibility for promoting education and outreach as an integral part of their missions. Ocean education at all levels, both formal and informal, should be enhanced with targeted projects and continual assessments and improvement.

A national ocean education office, Ocean.ED, should be created under the National Ocean Council to promote nationwide improvements in ocean education. As an interagency office, Ocean.ED should develop a coordinated national strategy and work in partnership with state and local governments and with K–12, university level, and informal educators. The National Science Foundation Centers for Ocean Science Education Excellence provide one outstanding model that should be expanded. Other recommendations include increased funding for training and fellowships, targeted efforts to increase participation by under-represented groups, and closer interaction between scientists and educators. All ocean-related agencies must explore innovative ways to engage people of all ages in learning and stewardship, using the excitement of ocean science and exploration as a catalyst.

Specific Management Challenges

Building on the foundation of improved governance, new scientific information, and enhanced education, the Commission's report covers the full breadth of topics included in its charge from Congress. As a result, it includes over 200 recommendations that span the gamut of ocean and coastal issues, ranging from upstream areas to the depths of the sea, from practical problem solving to broad guidance for ocean policy.

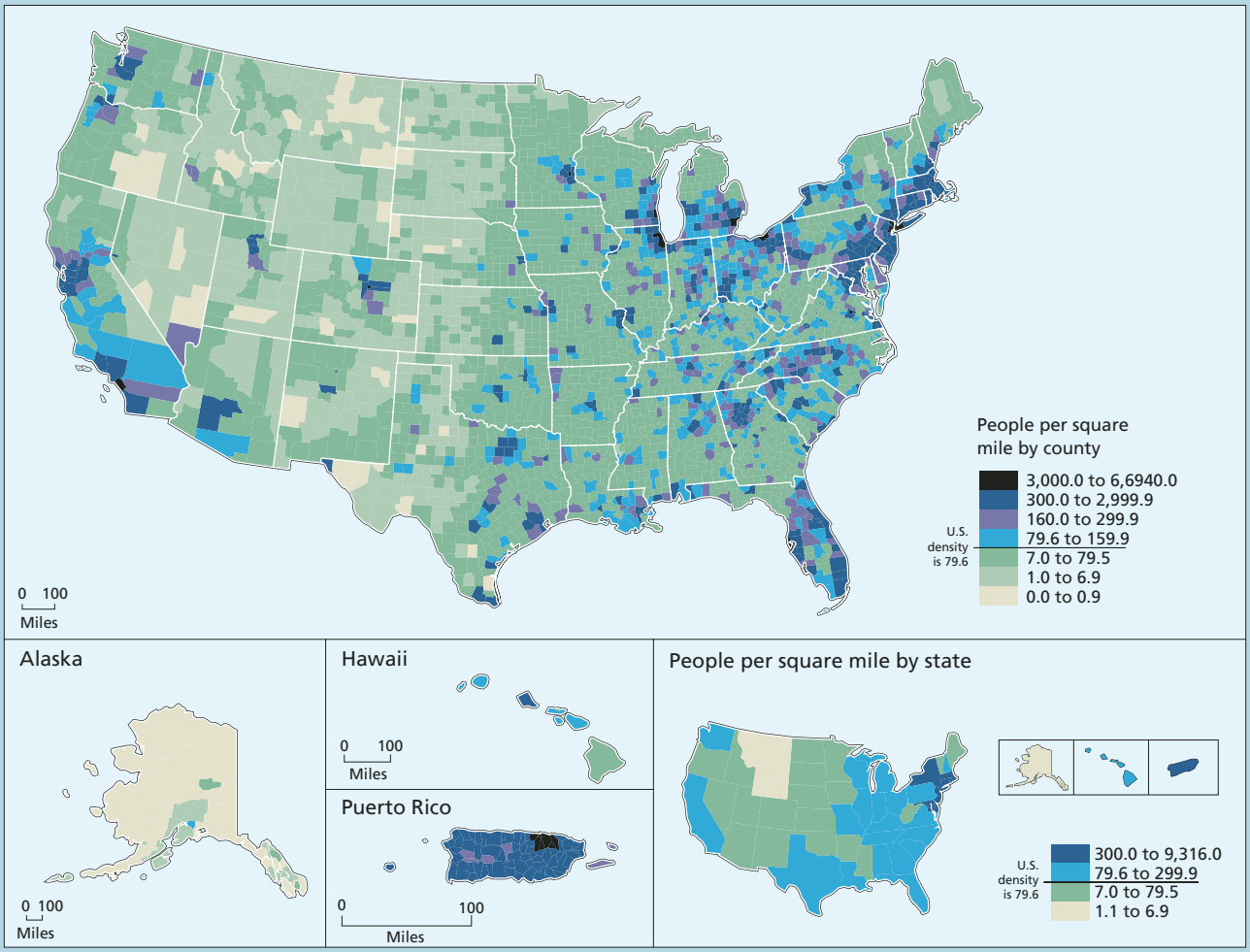
Several important issues pose particular challenges and are highlighted in the following sections. The full report addresses these topics and a number of others in much greater depth.

Managing Coasts and Their Watersheds

While coastal watershed counties comprise less than 25 percent of the land area in the United States, they are home to more than 52 percent of the total U.S. population. On average, some 3,600 people a day are moving to coastal counties, suggesting that by 2015 coastal populations will reach a total of 165 million. With another 180 million people visiting the coast each year, the pressure on our oceans, coasts, and Great Lakes will become ever more intense and the need for effective management greater (Figure ES.7).

Population growth and tourism bring many benefits to coastal communities and the nation, including new jobs, businesses, and enhanced educational opportunities. The great popularity of these areas, however, also puts more people and property at risk from

Figure ES.7 Population Density Peaks Near the Shore



As shown by 2000 U.S. Census figures, population density is generally highest in coastal areas, including counties surrounding the Great Lakes. Population growth and increasing population density in coastal counties reflect the attraction of the coast but also result in increased environmental impacts on coastal ecosystems.

Source: U.S. Census Bureau. "Census 2000." <www.census.gov> (Accessed March 2004).

coastal hazards, reduces and fragments fish and wildlife habitat, alters sediment and water flows, and contributes to coastal water pollution. Fortunately, we are gaining a much-improved understanding of human influences on coastal ecosystems, whether they originate locally, regionally, or in watersheds hundreds of miles upstream.

Without question, management of the nation's coastal zone has made great strides, but further improvements are urgently needed, with an emphasis on ecosystem-based, watershed approaches that consider environmental, economic, and social concerns. The Commission recommends that federal area-based coastal programs be consolidated and federal laws be modified to improve coastal resource protection and sustainable use. Congress should reauthorize and boost support for the Coastal Zone Management Act, strengthening the management capabilities of coastal states and enabling them to incorporate a watershed focus. The Coastal Zone Management Act, Clean Water Act, and other federal laws should be amended to provide financial, technical, and institutional support for watershed initiatives.

At the highest level, the National Ocean Council should develop national goals and direct changes to better link coastal and watershed management and minimize impacts asso-

ciated with coastal population and housing growth. The President's Council of Advisors on Ocean Policy can serve as a forum through which nonfederal entities have an opportunity to provide critically needed input to help guide this change. Regional ocean councils can also provide a mechanism for coordinating coastal and watershed management.

Guarding People and Property against Natural Hazards

Conservative estimates of damages from natural hazards, looking only at direct costs such as those for structural replacement and repair, put nationwide losses at more than $50 billion a year. Some experts believe this figure represents only half or less of the true costs. More accurate figures are unavailable because the United States does not consistently collect and compile such data, let alone focus specifically on losses in coastal areas or costs associated with damage to natural environments.

Many federal agencies have explicit operational responsibilities related to hazards management, while others provide technical information or deliver disaster assistance. The nation's lead agencies for natural hazards planning, response, recovery, and mitigation 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 and management of risks from natural hazards.

Opportunities for improving Federal natural hazards management include: modifying federal infrastructure policies that encourage inappropriate development in hazard-prone areas; augmenting hazards information collection, analysis, and dissemination; refining the National Flood Insurance Program (NFIP); and undertaking effective and universal state and local hazards mitigation planning.

Conserving and Restoring Coastal Habitat

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

As more people come to the coast to live, work, and visit, coastal habitats are increasingly stressed and damaged. Over the past several decades the nation has lost millions of acres of wetlands, seen the destruction of seagrass and kelp beds, and faced a loss of significant mangrove forests. Cost-effective conservation and restoration programs should be expanded according to a national strategy that sets goals and priorities, enhances the effectiveness and coordination of individual efforts, and periodically evaluates progress. Many habitat conservation and restoration projects have been successful, but continued progress will depend on sustained funding, improved government leadership and coordination, enhanced scientific research and monitoring, better education and outreach, and solid stakeholder support.

Managing Sediment and Shorelines

From a human perspective, sediment has a dual nature—desirable in some locations and unwanted in others—making its management particularly challenging. The natural flow of sediment over land and through waterways is important for sustaining coastal habitats and maintaining beaches. Too little sediment can lead to declining habitats, diminishing wetlands and eroding beaches. However, excess or contaminated sediment can block shipping channels, destroy habitats, poison the food chain, and endanger lives. Navigational dredging, infrastructure projects, farming, forestry, urban development, industrial opera-

tions, and many other necessary and beneficial human activities can interfere with natural sediment processes, adversely affecting the interests of other stakeholders and the environment.

The nation must overcome several challenges to improve its management of sediment. The natural processes that create, move, and deposit sediment operate on regional scales, while today's management regime generally addresses discrete locations—a single beach, wetland, or port—and rarely addresses broader upstream or coastal activities that affect sediment processes. To complicate matters further, the policies that control sediment dredging, transport, and quality fall under the jurisdiction of an assortment of programs within multiple agencies at all levels of government. Finally, our understanding of natural sediment processes, and how human activities affect sediment movement, is still limited.

A national sediment management strategy is needed that balances ecological and economic needs according to an ecosystem-based management approach. Such a strategy should consider sediment on a multi-project, regional, watershed basis, and should involve all relevant parties. Participation in watershed management efforts by federal, state, and local entities, along with key stakeholders such as coastal planners and port managers, is an important step in diminishing upland sources of excess or contaminated sediment. Scientifically sound methods for characterizing contaminated sediment, combined with innovative technologies for dredging, treatment, and disposal of this material, will also be critical.

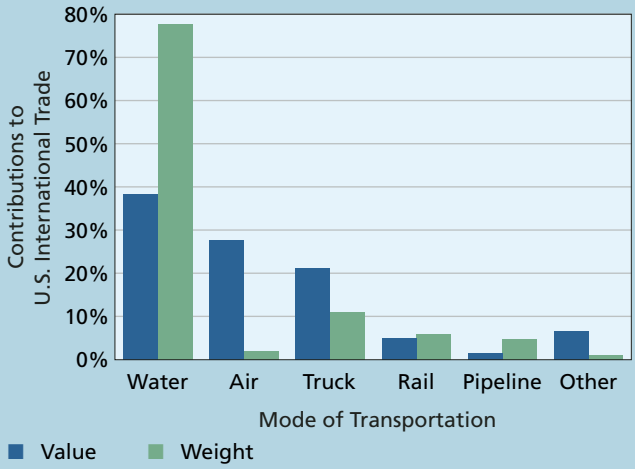
Supporting Marine Commerce and Transportation

Global trade is an essential and growing component of the nation's economy, accounting for nearly 7 percent of the gross domestic product. The vast majority of our import-export goods pass through the nation's extensive marine transportation system (Figure ES.8). To meet current demands and prepare for expected growth in the future, this system will require maintenance, improvement, and significant expansion.

A first step in the process will be better coordination, planning, and allocation of resources at the federal level. As part of a national move toward an ecosystem-based management approach, the efficient, safe, and secure movement of cargo and passengers should be well coordinated with other ocean and coastal uses and activities, and with efforts to protect the marine environment.

Specific recommendations include giving the Department of Transportation (DOT) lead responsibility within the federal government for oversight of the marine transportation system, including regular assessments of its status and future needs. DOT should develop an integrated national freight transportation strategy that strengthens the links between ports and other modes of transportation to support continued growth of international and domestic trade. In developing a national freight transportation strategy, DOT should work closely with the U.S. Department of Homeland Security and FEMA to incorporate port security and other emergency preparedness requirements.

Figure ES.8 Ports are the Primary Gateway for International Trade



In 2001, U.S. ports were major gateways for international trade. Waterborne commerce accounted for 78 percent of total U.S. international trade by weight (1,643 million tons) and 38 percent by value ($718 billion).

Source: U.S. Department of Transportation, Bureau of Transportation. "U.S. International Trade and Freight Transportation Trends 2003." <www.bts.gov/publications/us_international_trade_and_freight_transportation_trends/2003/> (Accessed May 2004).

To ensure good coordination, the Interagency Committee for the Marine Transportation System should be strengthened, codified, and placed under the oversight of the National Ocean Council. Because marine transportation is primarily a nonfederal activity, the Marine Transportation System National Advisory Council should also be maintained to provide a venue for outside input to the federal government on relevant issues.

Addressing Coastal Water Pollution

Coastal and ocean water quality is threatened by multiple sources of pollution, including point, nonpoint, and atmospheric sources, vessels, invasive species, and trash being washed onto beaches and into the ocean. Addressing these many sources requires development of an ecosystem-based and watershed management approach that draws on a variety of management tools. Because water contamination problems are complex and pervasive, their solution will require substantial investments of federal resources and greatly enhanced coordination both among federal agencies (primarily EPA, NOAA, USDA, and USACE) and between the federal government and managers at state, territorial, tribal, and local levels, in addition to watershed groups, nongovernmental organizations, private stakeholders, and the academic and research communities.

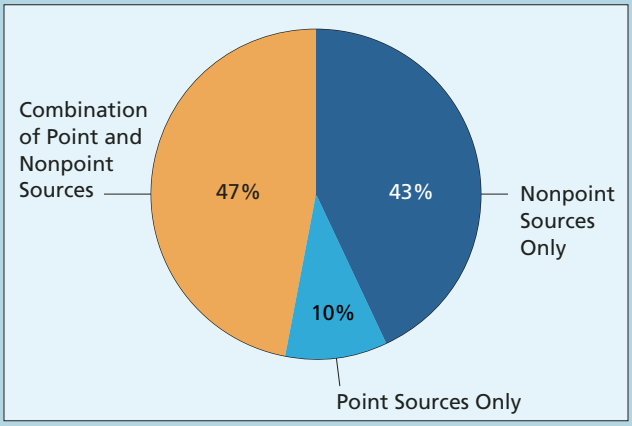
Over the last few decades, great strides have been made in reducing water pollution from point sources, although further improvements can be realized through increased funding, strengthened enforcement, and promotion of innovative approaches, such as market-based incentives. Persistently troublesome point sources of pollution, including wastewater treatment plants, sewer system overflows, septic systems, industrial facilities, and animal feeding operations, must continue to be addressed.

But the widespread and growing problem of nonpoint source pollution (Figure ES.9) has not seen similar success. Significant reduction of such pollution in all impaired coastal watersheds should be established as a national goal with measurable objectives set to meet water quality standards. Federal nonpoint source pollution programs should be better coordinated so they are mutually supportive. Because agricultural runoff contributes substantially to such pollution, USDA should align its conservation programs, technical assistance, and funding with EPA and NOAA programs for reducing nonpoint source pollution. State and local governments can also play central roles through better land-use planning and stormwater management.

Pollution reduction efforts should include the aggressive use of state revolving loan funds, implementation of incentives to reward good practices, and improved monitoring to assess compliance and overall progress. Congress should also amend the Clean Water Act to authorize federal financial disincentives to discourage activities that degrade water quality and to provide federal authority to act if a state chronically fails to make progress in controlling nonpoint sources.

Given the natural functioning of hydrologic systems, watersheds are often the appropriate geographic unit within which to address water-related problems. Collaborative watershed groups have had particular success in addressing nonpoint source pollution. The federal government should strengthen collaborative watershed groups by providing them with adequate technical, institutional, and financial support.

Figure ES.9 Controlling Nonpoint Source Pollution Is Key to Cleaner Waters



Nonpoint source pollution is a factor in 90 percent of all incidents where water quality is determined to be below the standards set for specific activities, such as recreation, water supply, aquatic life, or agriculture.

Source: U.S. Environmental Protection Agency. *Clean Water Act Section 303(d) Lists: Overview of TMDL Program.* Washington, DC, 1998.

Because contaminants can travel long distances through the atmosphere and be deposited far from their origin, EPA and states should also develop and implement regional and national strategies for controlling this source of water pollution, building upon efforts such as the EPA Air-Water Interface Work Plan. In addition, the United States should participate in a vigorous international research program on the sources and impacts of atmospheric deposition and play a leadership role in negotiating international solutions.

Limiting Vessel Pollution and Improving Vessel Safety

Ships carry more than 95 percent of the nation's overseas cargo, but their operations also present safety, security, and environmental risks. To minimize these risks, the Commission recommends that the U.S. Coast Guard work with industry partners and enhance incentive programs to encourage voluntary commitments from vessel owners and operators to build a workplace ethic that values safety, security, and environmental protection as central components of everyday vessel operations. These voluntary measures should be complemented by effective oversight and monitoring, whether conducted by the Coast Guard or third-party audit firms, and backed up by consistent enforcement efforts, including performance-based vessel inspections.

The United States should also work with other nations, through 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 flag state performance and identify areas where additional technical assistance is needed.

Control over vessels entering U.S. ports should be improved by ensuring that the Coast Guard has sufficient resources to sustain and strengthen its performance-based inspection program for marine safety and environmental protection, while also meeting its enhanced security responsibilities. 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.

A number of other important vessel-related priorities are discussed in the report, including the need for a uniform national regime to deal with cruise ship waste streams and reduction of recreational vessel pollution.

Preventing the Spread of Invasive Species

The introduction of non-native organisms into ports, coastal areas, and watersheds is causing harm to marine ecosystems around the world resulting in millions of dollars in costs for monitoring, control, and remediation. The most effective weapon against invasive species is prevention. To control the introduction of invasive species through ships' ballast water, a major pathway, the U.S. Coast Guard's national ballast water management program should: incorporate sound science in the development of biologically meaningful, mandatory, and enforceable ballast water treatment standards; develop new treatment technologies, revising the standards as needed to incorporate these technologies; and allow for full consultation with EPA.

To address introduction pathways other than ballast water, such as ships' hulls, anchors, navigational buoys, drilling platforms, fishing activities, the aquarium trade, aquaculture, and floating marine debris, the Departments of Agriculture, Commerce, the Interior, and Homeland Security should more actively monitor and prevent the importation of potentially invasive aquatic species. Because prevention will never be entirely effective, the Commission also recommends the development of a national plan for early detection of invasive species and a system for prompt notification and rapid response.

The National Ocean Council, working with the Aquatic Nuisance Species Task Force and the National Invasive Species Council, should review and streamline the current pro-

liferation of federal and state programs for managing invasive species and should coordinate education and outreach efforts to increase public awareness about the importance of prevention. In the long run, a rigorous program of research, technology development, and monitoring will be needed to understand and effectively prevent aquatic species invasions.

Reducing Marine Debris

Marine debris refers to the enormous amount of trash, abandoned fishing gear, and other waste that can be found drifting around the global ocean and washing up along its coastlines, posing serious threats to wildlife, habitats, and human health and safety. Approximately 80 percent of this debris originates on land, either washed along in runoff, blown by winds, or intentionally dumped from shore, while 20 percent comes from offshore platforms and vessels, including fishing boats.

The Commission recommends that NOAA, as the nation's primary ocean and coastal management agency, reestablish its defunct marine debris program to build on and complement EPA's modest program. NOAA and EPA should expand their marine debris efforts, taking advantage of each agency's strengths by pursuing: public outreach and education; partnerships with local governments, community groups, and industry; and strengthened research and monitoring efforts.

An interagency committee under the National Ocean Council should coordinate federal marine debris programs and take maximum advantage of the significant efforts conducted by private citizens, state and local governments, and nongovernmental organizations.

The United States should also remain active on the international level. An immediate priority is the development of an international plan of action to address derelict fishing gear on the high seas.

Achieving Sustainable Fisheries

Over the last thirty years, the fishing industry has evolved from being largely unmanaged, with seemingly boundless opportunities, to one that is highly regulated and struggling to remain viable in some places. While the current regime has many positive features, such as an emphasis on local participation, the pairing of science and management, and regional flexibility, it has also allowed overexploitation of many fish stocks, degradation of habitats, and negative impacts on many ecosystems and fishing communities.

The Commission's recommendations to improve fishery management can be grouped into six areas: re-emphasizing the role of science in the management process; strengthening the Regional Fishery Management Council (RFMC) system and clarifying jurisdictions; expanding the use of dedicated access privileges; improving enforcement; adopting an ecosystem-based management approach; and strengthening international management.

To strengthen the link between strong science and sustainable fishery management, RFMCs should be required to rely on the peer-reviewed advice of their Scientific and Statistical Committees (SSCs), particularly in setting harvest levels. In particular, an RFMC should not be allowed to approve any measure that exceeds the allowable biological catch recommended by its SSC. Because of their importance in the process, SSC members should be nominated by the RFMCs but appointed by the Administrator of NOAA, and their credentials and potential conflicts of interest should be vetted by an external organization. An expanded research program is needed that involves fishermen where possible and is responsive to managers' requirements.

Several recommendations are made concerning the composition, responsibilities, and jurisdiction of the various federal and interstate fishery management entities. In particular, membership on the RFMCs needs to be diversified and new members should receive consistent training in the often arcane vocabulary and policies involved in U.S. fishery management.

To reverse existing incentives that create an unsustainable "race for the fish," fishery managers should explore the 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 RFMCs are authorized to institute dedicated access privileges, subject to meeting national guidelines, and every federal, interstate, and state fishery management body should consider the potential benefits of adopting such programs. In addition, Congress should address overcapitalization directly by revising federal programs that subsidize this practice, as well as working with NOAA to develop programs that permanently reduce overcapitalization in fisheries.

Fishery enforcement should be continually strengthened through the adoption of better technologies, such as Vessel Monitoring Systems, better cooperation among federal and state agencies, and enhanced support for the infrastructure, personnel, and programs that make enforcement possible.

Consistent with one of the major themes of this report, fishery management needs to move toward a more ecosystem-based approach to improve its effectiveness and reduce conflicts between socioeconomic forces and biological sustainability. An ecosystem-based management approach will be particularly helpful in protecting essential fish habitat and reducing the impacts of bycatch.

Finally, the U.S. should work with other countries on worldwide adoption and enforcement of international agreements that promote sustainable fishery practices, in particular the United Nations Fish Stocks Agreement and the U.N. Food and Agriculture Organization's Compliance Agreement and Code of Conduct for Responsible Fisheries. The United States should also continue to press for the inclusion of environmental objectives—particularly those specified in international environmental agreements—as legitimate elements of trade policy.

Protecting Marine Mammals and Endangered Marine Species

The Marine Mammal Protection Act and the Endangered Species Act are landmark laws that have protected marine mammals, sea turtles, seabirds, and other populations at risk since their passage. However, both Acts need to be updated to support the move toward a more ecosystem-based approach.

As in so many other areas of ocean policy, immediate clarification and coordination of federal agency policies is needed. The Commission recommends that Congress consolidate the jurisdiction for marine mammals within NOAA, and that the National Ocean Council improve coordination between NOAA and the U.S. Fish and Wildlife Service in implementation of the Endangered Species Act, particularly for anadromous species or where land-based activities have significant impacts on marine species. Congress should also amend the Marine Mammal Protection Act to require NOAA to specify categories of activities that are allowed without a permit, those that require a permit, and those that are strictly prohibited. The permitting process itself should be streamlined by using programmatic permitting where possible. The definition of *harassment* in the Marine Mammal Protection Act should also be revised to cover only activities that meaningfully disrupt behaviors that are significant to the survival and reproduction of marine mammals.

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—including fishing, pollution, and climate change—on marine mammals, seabirds, sea turtles and all other marine endangered species. In addition, Congress should expand federal funding for research into ocean acoustics and the potential impacts of noise on marine mammals and other species.

Preserving Coral Reefs and Other Coral Communities

Coral communities are among the oldest and most diverse ecosystems on the planet, rivaling tropical rainforests in biodiversity and potential economic value. Unfortunately, like the rainforests, the world's coral reefs are increasingly showing signs of serious decline, with pristine reefs becoming rare and up to one-third of the world's reefs severely damaged according to some estimates.

A strengthened Coral Reef Task Force, under the oversight of the National Ocean Council, should promote immediate actions to reverse the impacts on tropical coral communities from pollution (with EPA and USDA in the lead) and from fishing (with NOAA in the lead). NOAA should be assigned as the lead agency for assessing and protecting the nation's relatively unexplored cold water coral communities, including dedicated research on their distribution and abundance and strategies to reduce major threats to their survival.

Congress should enact a Coral Protection and Management Act that provides direct authorities to protect and manage corals, and creates a framework for research and for cooperation with international efforts. This legislation should include: mapping, monitoring, and research programs to fill critical information gaps; liability provisions for damages to coral reefs, similar to those in the National Marine Sanctuaries Act; outreach activities to educate the public about coral conservation and reduce human impacts; and mechanisms for U.S. involvement in bilateral, regional, and international coral reef programs, particularly through the sharing of scientific, technical, and management expertise.

In many places, harvesting methods continue to damage reefs and overexploit ornamental species. 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 reef resources. The nation should develop standards for the importation of coral species to balance legitimate trade with protection of the world's coral reefs and to ensure that U.S. citizens do not unknowingly promote unsustainable practices.

Setting a Course for Sustainable Marine Aquaculture

Marine aquaculture has the potential to supply a significant part of the ever increasing domestic and global demand for seafood. However, two major concerns must be addressed: environmental problems associated with some aquaculture operations, particularly net-pen facilities, and a confusing, inconsistent array of state and federal regulations that hinder private sector investment.

The Commission recommends that Congress amend the National Aquaculture Act to designate NOAA as the lead federal agency for implementing a national policy on environmentally and economically sustainable marine aquaculture. Through a new Office of Sustainable Marine Aquaculture, NOAA should develop a single, multi-agency federal permitting process for the industry that ensures that aquaculture facilities meet all applicable environmental standards and protects the sustainability and diversity of wild stocks.

Additional investments in research, demonstration projects, and technical assistance can help the industry address environmental issues, conduct risk assessments, develop improved technology, select appropriate species, and create best management practices.

Connecting the Oceans and Human Health

Over the last several decades, scientific studies have demonstrated that the health of humans and the oceans are inextricably linked. Human inputs such as point and nonpoint source pollution adversely affect the health of coastal ecosystems, resulting in conditions which in turn affect human health.

Sewage effluent and stormwater discharges can contaminate water and marine organisms, leading to outbreaks of viral and bacterial diseases with serious medical consequences, and curtailing beach and ocean recreation. Chemicals like polychlorinated biphenyls (PCBs) and toxic metals like mercury enter the oceans from rivers and from atmospheric deposition. Once there, they accumulate in finfish and shellfish, posing potentially serious long-term health threats to consumers. Excessive nutrient inputs from nonpoint source pollution can lead to harmful algal blooms that are toxic to fish and humans and can result in oxygen-depleted "dead zones" that kill marine organisms and decimate recreational and commercial fishing. Global climate change may also result in the spread of human diseases such as cholera and malaria via the marine environment.

On a brighter note, a growing number of important medical treatments and biotechnologies are now based on chemicals that originate from marine organisms. Marine bioproducts with anti-inflammatory and cancer fighting properties are just a few examples of the promising medical advances found in the oceans. A more focused program of exploration and bioprospecting holds great promise for similar discoveries in the future.

Despite these threats and opportunities, our knowledge of the links between the oceans and human health is in its infancy and remains inadequate to make the science-based decisions that are needed. To expand this knowledge base, Congress should establish a major initiative on the oceans and human health. Existing programs at NOAA, NSF, and the National Institute of Environmental Health Sciences should be coordinated under this initiative, with additional input from EPA and FDA.

Managing Offshore Energy and Other Mineral Resources

Oil and gas development on the outer Continental Shelf (OCS) supplies over a quarter of the nation's domestic oil and gas reserves, and contributes thousands of jobs and billions of dollars to the economy. Although controversial in many locations, the process for oil and gas leasing and production is well developed, reasonably comprehensive, and could serve as a model for implementing offshore renewable energy projects within the context of a coordinated offshore management regime.

To maintain a strong link between ocean uses and ocean management, the Commission recommends dedicating federal revenues from OCS energy leasing and production to ensuring the sustainability of ocean and coastal resources. A portion of these funds should be given to coastal states, with larger shares going to OCS producing states to help address the environmental and economic consequences of energy production.

In addition to oil and gas, other offshore energy sources are being explored. The National Ocean Council (NOC), working with the U.S. Department of Energy and others, should determine whether methane hydrates can contribute significantly to meeting the nation's long-term energy needs and, if so, what level of investment in research and development is warranted. Renewable energy sources should also be considered as part of a coordinated offshore management regime. Congress, with input from the NOC, should enact legislation to streamline the licensing of renewable energy facilities in U.S. waters, relying on an open, transparent process that accounts for state, local, and public concerns. The legislation should include the principle that the ocean is a public resource and that the U.S. Treasury should receive a fair return from its use.

Advancing International Ocean Science and Policy

The United States has historically been a world leader in international ocean policy, participating actively in the development of international agreements that govern the planet's ocean areas and resources. That leadership must now be reaffirmed and reinvigorated by acceding to the United Nations Convention on the Law of the Sea, enhancing the partici-

pation of all ocean-related federal agencies in international discussions and negotiations, and taking a leading role in building international capacity in ocean science and management, particularly in developing countries.

The United States can advance its own interests and 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 community. Many additional recommendations for action at the international level are presented throughout the report in the context of specific ocean and coastal management issues, such as international fisheries, global transportation of air pollutants, trade in corals and other living marine resources, the worldwide spread of marine debris, and many others.

Implementing a New National Ocean Policy

There are over 200 recommendations in the Commission's report, each one calling on specific responsible parties to spearhead its implementation and be accountable for its progress. A large number of recommendations are directed at Congress, the leadership of the executive branch, and federal agencies, as shown in Chapter 31.

Although the Commission has generally targeted few recommendations specifically at state or local governments, it recognizes that a significant enhancement of the ocean and coastal partnership between the federal government and nonfederal governmental and nongovernmental stakeholders is one of the foundations of the new national ocean policy. These entities will have critically important roles to play in the 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. Strong state participation is also needed in the design and implementation of regional ocean observing systems and their integration into the national IOOS, as well as in other research and monitoring activities.

A Worthwhile Investment

Implementation of the recommendations in this report will lead to tangible, measurable improvements in U.S. ocean policy and in the health of our oceans, coasts, and Great Lakes. However, significant change cannot be achieved without adequate investments—of time, money, and political will. A summary of costs is presented in Chapter 30, and a detailed breakdown of the cost of each recommendation is provided in Appendix G. The Commission estimates the total additional cost for initiatives outlined in this report at approximately $1.5 billion in the first year and $3.9 billion per year after full implementation. The payoff from these investments will be substantial for the United States and its citizens, benefiting our economy, health, environment, quality of life, and security.

Long Term Support: The Ocean Policy Trust Fund

As noted previously, almost $5 trillion dollars, or one half of the nation's annual gross domestic product, is generated each year within coastal watershed counties. That enormous economic contribution is now being threatened by the degradation of our oceans, coasts, and Great Lakes. Modest levels of additional funding will reap significant dividends by supporting management strategies that restore and sustain our ocean and coastal resources and maximize their long-term value.

Despite pressing needs, the Commission is mindful of the intense budgetary constraints that exist at both federal and state levels—and is sensitive to the hardships associated with unfunded mandates, whether imposed on state governments or federal agencies. To cover

Critical Actions Recommended by the U.S. Commission on Ocean Policy

The following key recommendations provide the foundation for a comprehensive national ocean policy that will lead to significant improvements in ocean and coastal management.

Improved Governance

- Establish a National Ocean Council in the Executive Office of the President, chaired by an Assistant to the President.
- Create a non-federal President's Council of Advisors on Ocean Policy.
- Improve the federal agency structure by strengthening NOAA and consolidating federal agency programs according to a phased approach.
- Develop a flexible, voluntary process for creating regional ocean councils, facilitated and supported by the National Ocean Council.
- Create a coordinated management regime for activities in federal offshore waters.

Sound Science for Wise Decisions

- Double the nation's investment in ocean research, launch a new area of ocean exploration, and create the advanced technologies and modern infrastructure needed to support them.
- Implement the national Integrated Ocean Observing System and a national monitoring network.

Education—A Foundation for the Future

- Improve ocean-related education through coordinated and effective formal and informal efforts.

Specific Management Challenges

- Strengthen coastal and watershed management and the links between them.
- Set measurable goals for reducing water pollution, particularly from nonpoint sources, and strengthen incentives, technical assistance, enforcement, and other management tools to achieve those goals.
- Reform fisheries management by separating assessment and allocation, improving the Regional Fishery Management Council system, and exploring the use of dedicated access privileges.
- Accede to the United Nations Convention on the Law of the Sea to remain fully engaged on the international level.

Implementation

- Establish an Ocean Policy Trust Fund, based on unallocated revenues from offshore oil and gas development and new offshore activities, that is dedicated to supporting improved ocean and coastal management at federal and state levels.

the cost of its recommendations, the Commission believes it is important to identify appropriate, dedicated sources of revenue. In this regard, the nexus between federal offshore activities and the management responsibilities they engender is obvious. Thus, the Commission proposes the creation of an Ocean Policy Trust Fund in the U.S. Treasury, composed of revenues generated from permitted activities in federal waters.

The Trust Fund would start out with OCS oil and gas revenues that are not already committed to the Land and Water Conservation Fund, the National Historic Preservation Fund, or to certain coastal states based on oil and gas production in the three nautical mile area seaward of their submerged lands. After those existing programs are funded in accordance with law, the remaining OCS monies would be deposited into the Trust Fund. New offshore activities, such as renewable energy, aquaculture, or bioprospecting, may

also produce revenues in time, and these should be added to the Fund. Establishment of, and distributions from, the Ocean Policy Trust Fund should be kept separate from any decisions about whether a particular offshore activity should be authorized and permitted.

Approximately $5 billion is generated annually from OCS oil and gas revenues. Protecting the three programs noted above would remove about $1 billion from that total. Thus, some $4 billion would remain available for the Ocean Policy Trust Fund each year under current projections. It is not possible to estimate the level of revenue that might accompany emerging activities in federal waters, nor to predict when this income could begin to flow, but the amounts may be significant in years to come.

Trust Fund monies should be used to support the additional research, education, and management responsibilities recommended for federal and state agencies and other appropriate coastal authorities, consistent with a 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.

Call to Action

This report reflects the input of hundreds of Americans from across the nation, testimony from many of the world's leading experts, and months of deliberation. The recommendations contained within can set the course toward a future in which our oceans, coasts, and Great Lakes are healthy, enjoyed, and treasured by all people, and America's marine resources are restored and sustained for generations to come.

The opportunity is here and the time to act is now. A new national ocean policy can be implemented that balances ocean use with sustainability, is based on sound science and supported by excellent education, and is overseen by a coordinated system of governance with strong leadership at national and regional levels. It will take great political will, significant fiscal investment, and strong public support, but in the long run all of America will benefit from these changes.