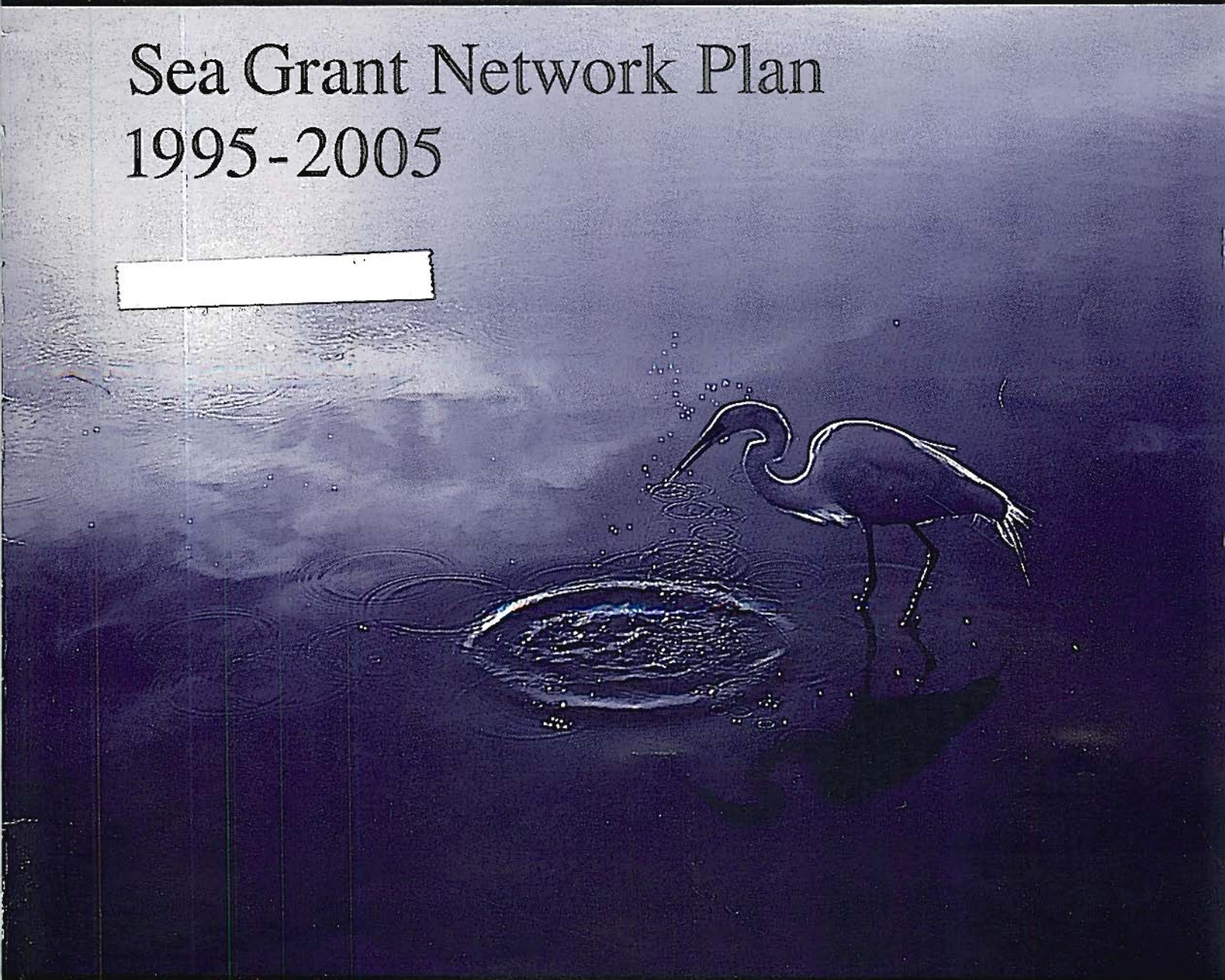
Coastal and Marine Resources for a Sustainable Economy and Environment

Sea Grant Network Plan 1995-2005



Sea Grant
National Sea Grant College Program

National Oceanic and Atmospheric Administration
U.S. Department of Commerce

Sea Grant Network Plan 1995 – 2005

Executive Summary

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Preface

This document, an abbreviated version of the *Sea Grant Network Plan*, is designed to provide a concise summary of the key issues and opportunities identified in the longer plan. The longer version, developed in conjunction with strategic planning efforts of the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA), identifies priorities and charts the Sea Grant Network's direction for the decade 1995 – 2005. It describes what Sea Grant is, where it fits among the nation's coastal and Great Lakes programs, and how it contributes to NOAA's mission. Most importantly, it identifies the issues and opportunities that will require Sea Grant attention into the 21st century.

Sea Grant's legislative charge is to "increase the understanding, assessment, development, utilization, and conservation of the nation's ocean and coastal resources by providing assistance to promote a strong education base, responsive research and training activities, and broad and prompt dissemination of knowledge and techniques." [PL94–461, Sec. 202(b)]. Decisions must be made about what realistically can be done to promote and advance these objectives.

The longer version of the network plan provides a more detailed framework for making these decisions. It was compiled after almost 20 months of drafting, deliberation and revision that began in March 1994. Throughout these months, drafts were written and reviewed by Sea Grant directors, members of the National Sea Grant Review Panel, National Sea Grant Office staff, and executives from NOAA line organizations, including specialists from the Office of Oceanic and Atmospheric Research (in which Sea Grant resides).

In August 1994, a team comprised of Sea Grant directors and National Sea Grant Office staff produced a draft that was widely circulated to individual Sea Grant programs, review panel members, and NOAA senior management. Comments on this version were incorporated in a draft circulated to Sea Grant programs and provided the basis for additional deliberations during Sea Grant Week '95, held in May.

This shorter version concludes the first stage in Sea Grant's strategic planning efforts. Based on the framework described here, the Sea Grant community will sharpen its focus by developing more detailed implementation plans, link these to measures that assess progress, and seek the resources required to pursue these plans. The longer version of the plan is available on the World Wide Web and is accessible through the National Sea Grant Office home page (http:/ /www.mdsg.umd.edu/NSGO/Plan).

Ronald C. Baird
Director

Introduction

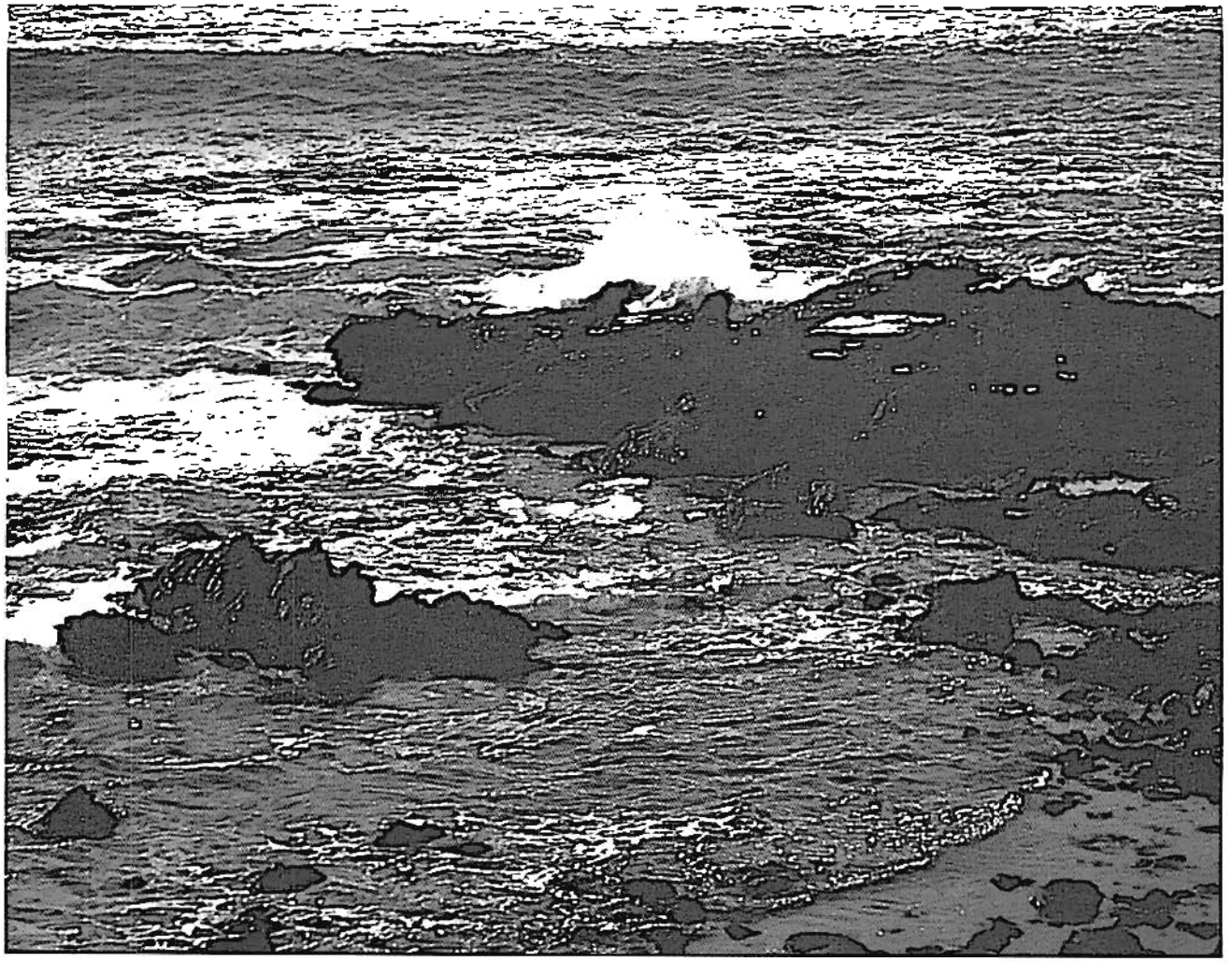
The National Sea Grant College Program

Congress established the National Sea Grant College Program in 1966 to hasten the development, use, and conservation of the nation's marine and Great Lakes resources. In the findings section of the *National Sea Grant College and Program Act of 1966*, Congress declared that:

- *"marine resources...constitute a far-reaching and largely untapped asset of immense potential significance to the United States;*
- *it is in the national interest of the United States to develop the skilled manpower, including scientists, engineers and technicians, and the facilities and equipment necessary for the exploitation of these resources;*
- *the gainful use of marine resources can substantially benefit the United States, and ultimately the people of the world, by providing greater economic opportunities, including expanded employment and commerce, the enjoyment and use of our marine resources, new sources of food and new means for the development of marine resources; and*
- *federal support toward establishment, development, and operation of programs by Sea Grant colleges and federal support of other Sea Grant programs designed to achieve the gainful use of marine resources, offer the best means of promoting programs toward the goals set forth [above]."*

The legislation called for a network of Sea Grant colleges that would conduct education, training, and research in all fields of marine study, and directed that grants and contracts would go to "suitable public and private institutions of higher education, institutes, laboratories, and public or private agencies, which are engaged in, or concerned with, activities in the various fields related to the development of marine resources."
[PL 89–688 Sec. 204(c)]

The founders' vision has been amply realized. After 30 years of federal support (never more than $53.3 million in any one year), 29 Sea Grant programs have been established in coastal and Great Lakes states and in Puerto Rico. These programs are the heart of a nationwide network of some 300 participating institutions that each year draw on the talents of over 3,000 scientists, engineers, educators, students, and outreach specialists. This network has provided a powerful national capability in marine resource research and outreach which did not exist prior to 1966 when Sea Grant was established.



Following are some notable Sea Grant achievements:

- *Led the development of hybrid striped bass aquaculture, which has grown from a university demonstration project to a $6 million fish farming industry in just six years. U.S. hybrid striped bass production is expected to exceed $50 million in five years.*

- *Using selective breeding techniques, developed new strains of salmon that grow three times faster than wild stocks. The eggs of these fast-growing salmon are being exported to aquaculturists in Chile, Europe and Japan, creating a U.S. industry now worth more than $5 million a year.*

- *Discovered that synthetic mimics of oyster molecules can be used to manufacture products such as detergent additives and biodegradable chemicals that reduce crystal growth in pipes, heat exchangers, and boilers. This work has already resulted in several patents and the formation of two multi-million dollar corporations in Bedford Park, Illinois, and Pendleton, South Carolina.*

- *Organized the first systematic effort in the U.S. to discover and develop new drugs from marine organisms. This biotechnology thrust has resulted in the discovery of more than 1,000 compounds — including at least 50 with significant potential for treating inflammatory diseases like arthritis and asthma — and the awarding of 14 patents through mid-1995.*

- *Conducted research on nutrient run-offs from agriculture into bays that has led four states to adopt "Best Management Practices." These new land practices have resulted in a 25 percent reduction of nitrogen compounds entering some bays, with a subsequent improvement in water quality.*

- *Developed methods for assessing the integrity and remaining useful life of marine structures. Regulatory agencies use these methods to evaluate the safety of offshore drilling and production platforms, which provide one-third of domestic gas and petroleum.*

- *Improved marine safety and lifesaving practices, from survival training for the fishing industry to major advances in the revival of coldwater, near-drowning victims. Sea Grant marine safety training helped prevent the loss of more than 90 lives in 1994 alone.*

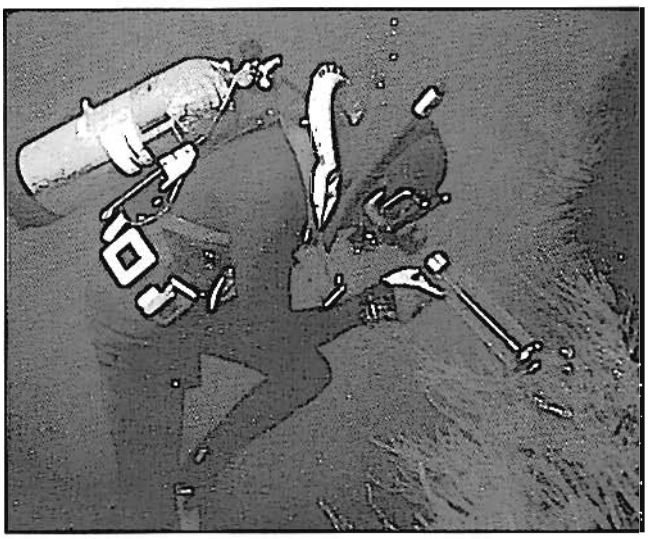
- *Supported almost 10,000 undergraduate and graduate students in a wide range of disciplines, including oceanography, marine biology, ocean law, marine policy and economics, pharmacology, and engineering.*

- *Developed standardized monitoring programs and increased knowledge of basic zebra mussel biology to help mitigate the spread of this non-native species.*

Sea Grant in the National Oceanic and Atmospheric Administration

Sea Grant plays a unique and important role in advancing the nation's interest in marine resources. Together with the Office of Naval Research (ONR) and the National Science Foundation (NSF), Sea Grant provides the only sustained federal contact and source of funds for universities with marine research capabilities. Moreover, Sea Grant provides the major source of research support for marine-related subjects outside biological, physical and chemical oceanography, and marine geology and geophysics. These include, for example, coastal and ocean engineering, fisheries science, and marine-related social sciences and law. Where NSF and ONR have remained steadfast in their support of basic oceanographic research, Sea Grant has supported scientific research to address marine and coastal resource issues of more immediate public concern. To ensure that programs respond to local as well as national concerns, the law requires that one-third of the program funds come from state or local governments, industry or other sources. This has provided outstanding leverage to limited federal funds.

Sea Grant is also the only NOAA marine program with sustained, legislatively mandated responsibility for linking NOAA with university researchers and educators. The Marine Advisory Service (MAS) provides a key link between NOAA programs and residents in coastal and Great Lakes states and in Puerto Rico. Many Sea Grant-supported research projects, pursued in collaboration with NOAA specialists associated with the Office of Ocean and Coastal Resource Management, the Coastal Ocean Program, the National Marine Fisheries Service and the



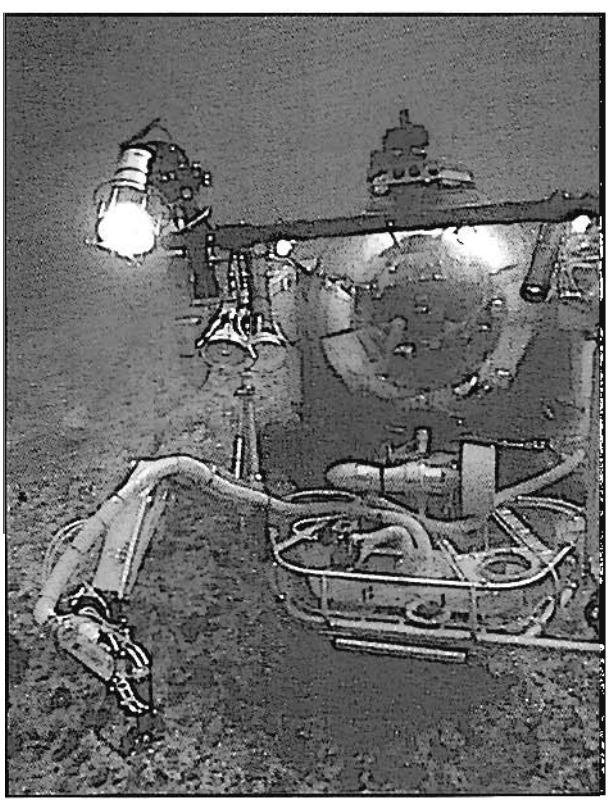
National Weather Service, contribute to a wide range of NOAA responsibilities. These include fisheries and coastal management, aquaculture development, coastal water quality investigations, habitat protection and restoration, marine sanctuaries and estuarine reserves management, and protection of life and property from natural hazards. Sea Grant is strengthened to the extent that it draws on the extensive technological and scientific resources available in NOAA. These include its forecasting and remote sensing capabilities; sophisticated environmental and resource information data bases; and access to NOAA ships, laboratories, and computing capabilities.

The Planning Environment

The strategic planning framework for Sea Grant assumes the persistence of the following trends over the next decade: demographic shifts; increased pressures on the coastal and marine environment; changing public values and expectations regarding resource conservation and use; globalization of the economy; technological innovation; and severe constraints on public expenditures.

Demographic Change – Projections indicate that between 1960 and 2010, coastal population will increase from 80 to more than 127 million people, or by nearly 60 percent nationwide. The demands these increased numbers place on the coastal environment and its resources are formidable, and conflicts over its use and access are inevitable.

Environmental Pressures – Increased population, intensified development, and competing uses will continue to challenge the coastal environment. The cumulative effect is to disrupt the natural processes of coastal ecosystems and to threaten the ecological, aesthetic, and economic values that attract people to the coast.

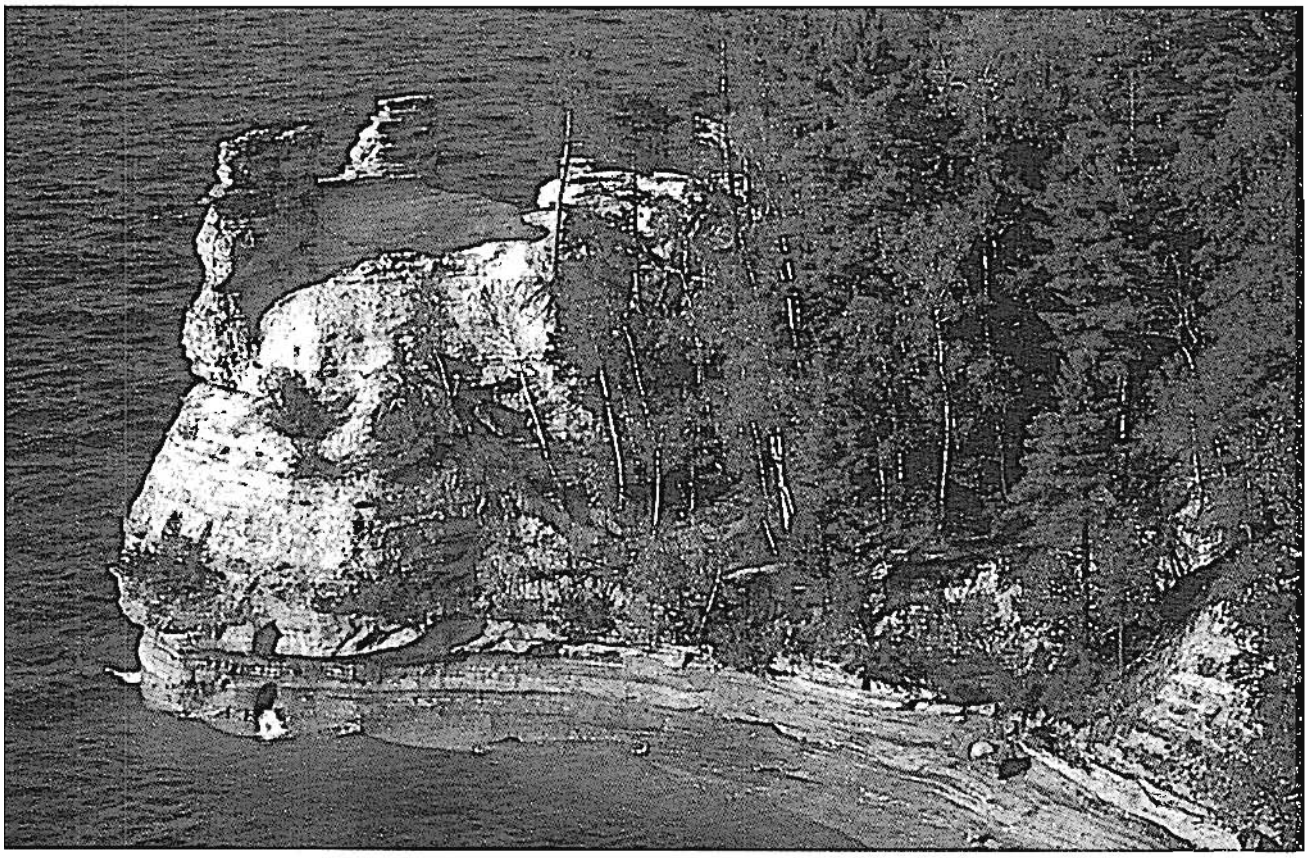


Changing Public Values and Expectations – There continues to be widespread public support for environmental protection, moderated by a belief that it is possible to use natural resources and, at the same time, minimize environmental destruction and preserve resources for future generations. These attitudes become translated into support for environmental education, expectations for a balanced approach toward resource use and conservation, and an expanded public access to coastal resources.

Globalization of the Economy – United States support for the North American Free Trade Agreement and the General Agreement on Tariffs and Trades in 1994 affirmed the move to global free trade and the increasingly global nature of the economy. The ability to compete in this expanded arena will depend significantly on the development of intellectual capital, a climate that promotes entrepreneurial innovation and institutional flexibility to meet emerging challenges and opportunities.

Technological Innovation – Technological innovations will continue to shape emerging economic and social relationships. These technologies will provide new tools for inquiry, product development, and information management.

Continued Pressures on the Federal Budget – Political support for ocean and coastal programs will be severely limited by fiscal and political conditions. The limited prospects for major capital investments (laboratories, vessels, remote sensing systems) and for increased funding for ocean programs will require collaborative approaches to ensure that resources are directed toward the most pressing problems.



Sea Grant Vision 1995–2005

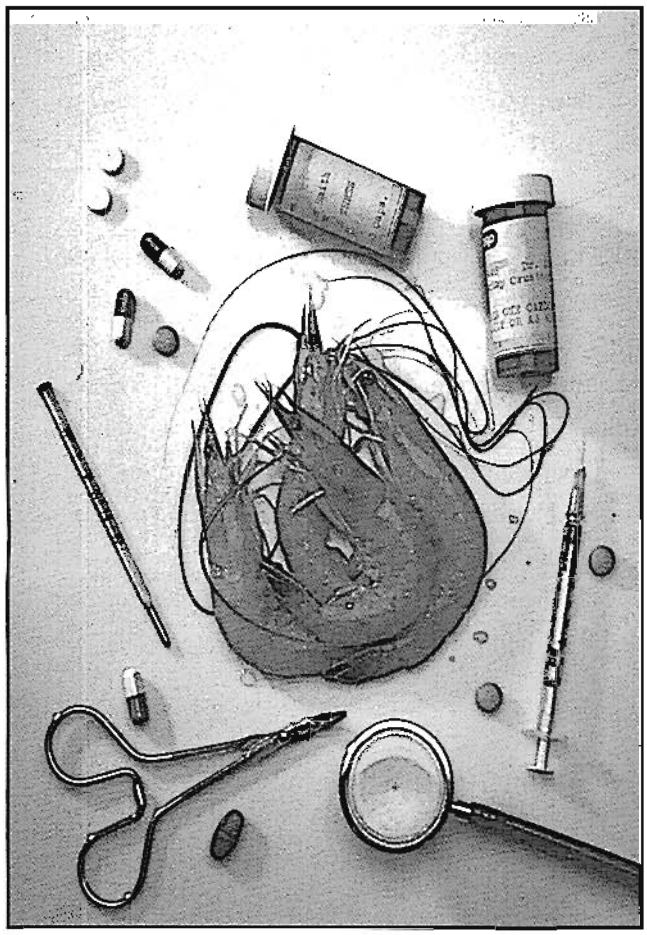
The broad trends described in "The Planning Environment" section provide the context for development of this plan. They are not inclusive. Issues perceived only dimly in 1995 may well emerge as major concerns. The variety of issues that invite Sea Grant attention far exceeds available resources. The intent, however, has been to respond to those conditions likely to persist and to identify those areas where Sea Grant can have its greatest impact. These areas are: Economic Leadership; Coastal Ecosystem Health and Public Safety; and Education and Human Resources. Emphasis between and among these topics will necessarily change throughout the decade, depending on budgets, scientific and technological breakthroughs, new problems and opportunities, and the capabilities of the Sea Grant Network. Nonetheless, by maintaining the course charted here we expect that:

- *The United States will be preeminent in increasing knowledge in the marine sciences, with Sea Grant continuing to be the catalyst for understanding coastal, marine, and Great Lakes systems;*
- *United States economic leadership will be enhanced in marine industries and products with aquaculture, marine biotechnology, and environmental technology most prominent among these;*
- *Scientifically-sound, cost-effective, sustainable use and conservation of coastal, marine and Great Lakes resources and environments will be in place, due in part to Sea Grant;*
- *The United States will be preeminent in marine affairs with Sea Grant establishing a cadre of technicians and professionals skilled in marine sciences, law, policy, and trades, as well as keeping citizens of all ages informed about the marine environment and its resources;*
- *Loss of life and coastal property will be measurably reduced through Sea Grant research, education, and outreach partnerships with other NOAA programs and government agencies.*

Economic Leadership

VISION. The Sea Grant Network's investment in the nation's future will stimulate a stream of scientific knowledge and new technology that will strengthen U.S. leadership in ocean and marine-related industries and enhance the social and economic well-being of coastal communities. Advanced technologies will be applied, including biotechnology, to develop products and processes for medical, industrial, and environmental applications. The economic contribution of the seafood production industries will be expanded. Collaborative efforts with business firms, industries, and community leaders will be undertaken to advance coastal and marine-related economies and to protect marine resources and environmental assets. To accomplish these goals, the network will focus its research, education, and outreach efforts in three main areas: advanced technology for commercial products and processes, seafood production, and coastal economic development.

CHALLENGES. In the decade ahead, environmental marine technologies and marine bioindustries have the potential to provide a major portion of economic development. Even though advances in biotechnology will be an essential component of this development, the economic and public health benefits of substances derived from marine organisms are still largely unexplored. Currently, the seafood industry is hampered in responding to the rising demand for quality seafood. Before this demand can be met, problems associated with declining fish stocks, deteriorating ecosystems, aquaculture development, and seafood processing will have to be addressed. Due to declining natural resources and increasingly mobile populations, dynamic changes are taking place in most of the nation's coastal communities. Many of these small to medium-sized communities lack the necessary resources and expertise to develop alternative economic opportunities, provide adequate community services, and manage population growth or decline. The essential infrastructure that supports human habitation, recreation and commerce on the nation's coast and industrial activities offshore includes shipyards, harbor structures, bridges, and offshore platforms. Many of these structures are aging and need to be brought up to modern standards of safety and performance.



KEY ACTION AREAS – To advance technology for commercial products and processes, the Sea Grant Network will focus on:

- ***Commercial Biotechnology*** – *Use marine biotechnology to benefit such industries as the pharmaceutical, chemical, and seafood industries. Develop fundamental knowledge concerned with the natural products and processes of marine organisms to provide models for new commercial products and new approaches to industrial processing and bioprocessing.*

- ***Environmental Technology*** – *Develop technologies that enhance environmental monitoring and assessment, minimize waste streams from aquaculture farms and seafood processing plants, and remediate contaminants in coastal and Great Lakes environments. Develop these technologies for commercialization by the private sector.*

KEY ACTION AREAS – To aid the seafood production industry, the Sea Grant Network will focus on:

- ***Commercial Fisheries*** – *Develop better ecosystem models so that resource managers can improve fishery forecasts. Seek new techniques and solutions for allocating fish more equitably. Assist fisheries managers, industry, and coastal communities in understanding the social, economic, and legal impacts of new management strategies. Minimize by-catch through efforts such as developing conservation gear. Use aquaculture to enhance wild stocks of key aquatic species.*

- ***Sustainable Aquaculture*** – *Assist government and industry in developing approaches to aquaculture policy, regulation, and financing. Develop growout system technology and increase the fundamental knowledge of animal husbandry in such areas as reproduction, hatchery technology, growth, nutrition, and disease diagnosis and control. Enhance aquaculture through biotechnology by developing understanding at the molecular and organism levels.*

- ***Seafood Technology*** – *Continue to work with processors to develop techniques that will decrease costs, ensure high-quality and safe products, and improve waste management. Expand the market for seafood by developing new products and byproducts.*

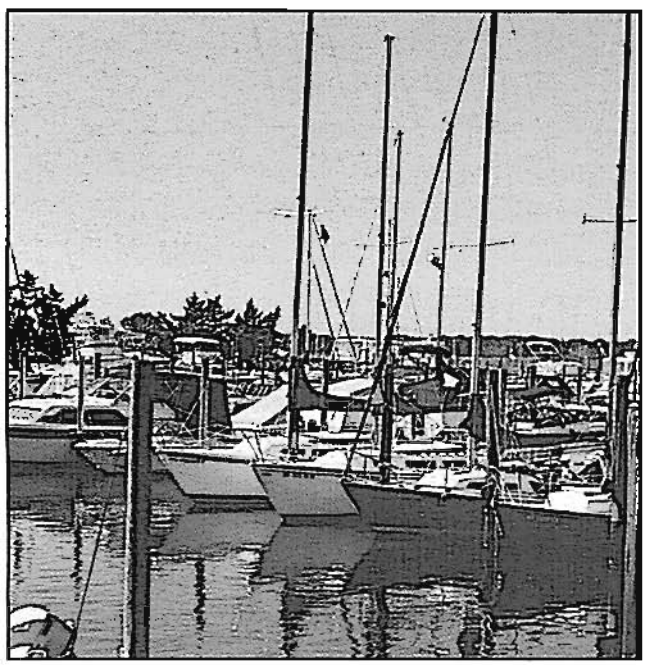
KEY ACTION AREAS – To assist coastal economic development, the Sea Grant Network will focus on:

- ***Coastal Business Development*** – *Concentrate research and outreach development efforts to support business development and retention in three key marine industries: fishing, coastal recreation, and marine trades.*

- ***Coastal Community Development*** – *Help implement coastal economic development programs for communities experiencing coastal revitalization, defense restructuring, retirement booms, and waterfront redevelopment. Develop technology for ports and harbors that will improve planning and operations.*

- ***Revitalizing Marine Infrastructure*** – *Develop safe and effective underwater inspection and survey mechanisms. Mount a comprehensive and long-term research effort to meet the technological challenges posed by the aging and obsolescence of marine structures.*

BENEFITS. Scientific knowledge achieves its fullest measure of value when it is applied by entrepreneurs in commercial enterprise and when it results in securing the benefits from marine resources for the people. The Sea Grant Network's strategies for economic leadership will help contribute to a robust and growing economy, sustainable coastal communities, a viable and modern marine infrastructure, wholesome seafood products, and a stream of goods and services based on the development and application of advanced technologies.



Coastal Ecosystem Health and Public Safety

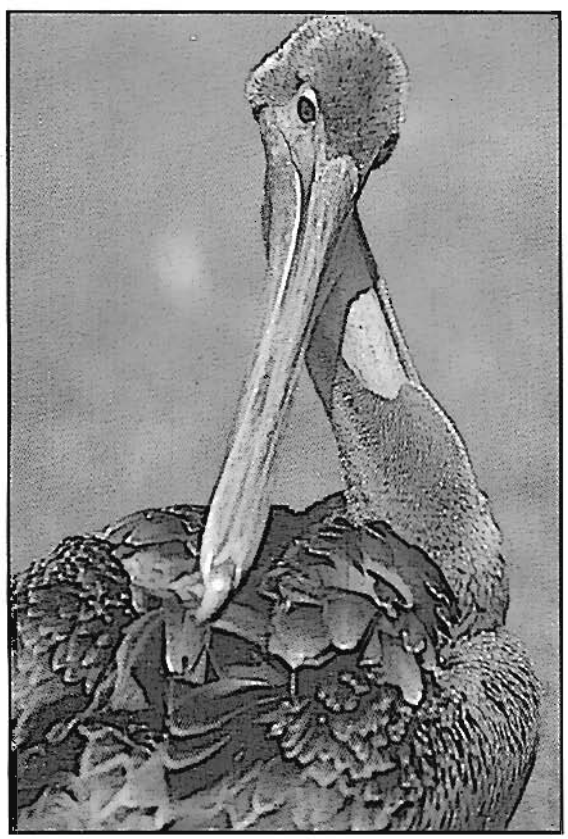
VISION. By 2005, the Sea Grant Network will have implemented policies and programs to protect and enhance both the health of coastal ecosystems and the safety of its inhabitants and users. More specifically, this vision includes: healthier coastal and Great Lakes ecosystems through greatly improved water quality; more high quality habitats for living marine resources; the complete integration of the physical and biological sciences with economics and the social sciences in the development of resource management policies; and increased capabilities to deal with coastal and natural hazards in order to protect life and property. To accomplish these goals, the Sea Grant Network will focus its research, education, and outreach efforts in two main areas: coastal ecosystem health and public safety.

CHALLENGES. In the last five decades, the population of the U.S. has doubled. Accompanying this growth has been a dramatic shift in population from inland rural areas to coastal urban areas. This shift often results in unplanned development activity that causes major declines in the health of the nation's coastal ecosystems. They become stressed by a multitude of factors including habitat loss or modification, loss of biodiversity, nutrient and toxic inputs, and diversion of fresh water. Currently, the inability to establish cause and effect relationships among coastal ecosystem impacts and the individual stressors prevents managers from reliably predicting the outcome of their actions. Therefore, understanding of ecosystem structure and function must be developed to the point that the interactive and cumulative effects of multiple stressors can be accounted for and mitigation strategies developed.

In addition, the population shift has increased the cost and complexity of dealing with hazards associated with coastal disasters. The nation needs to have a coordinated means whereby its coastal residents can obtain information designed to reduce loss of life and property.

KEY ACTION AREAS – To protect and enhance coastal ecosystem health, the Sea Grant Network will focus on:

- ***Coastal Ecosystems*** – *Concentrate research efforts on toxics, biological contaminants, nutrients, sedimentation, biotoxins/harmful algal blooms, and chemical and oil spills to gain a better understanding of how to protect and enhance the health of coastal ecosystems. Provide information to resource managers and regulators on ecosystem structure and function, and on the effects of declines in water quality on these systems. Develop and implement nonpoint source pollution control programs in cooperation with federal, state, and local governments.*



- ***Coastal and Great Lakes Habitats*** – *Provide information to resource managers and regulators about the impacts of habitat alteration and loss on ecosystem and fishery productivity. Support efforts to restore habitat that has been lost or degraded so that its original functional value can be recovered. Develop programs, in cooperation with federal, state and local governments, to control aquatic nuisance species and to prevent their introduction into coastal and Great Lakes waters. Through biotechnology, develop and transfer to users new technology for the creation and restoration of coastal and Great Lakes habitats.*

- ***Sustainable Development*** – *Promote sustainable development by providing policy-makers, regulators, and resource managers with new capabilities to assess the links between environmental policy and the physical, biological, economic, and social sciences. Provide accurate, unbiased information on the potential economic and social impacts of current and proposed plans, policies, and regulations. Develop new approaches for evaluating the effectiveness of policies intended to prevent, manage, and ameliorate environmental problems in the coastal zone.*

KEY ACTION AREAS – To ensure public safety, the Sea Grant Network will focus on:

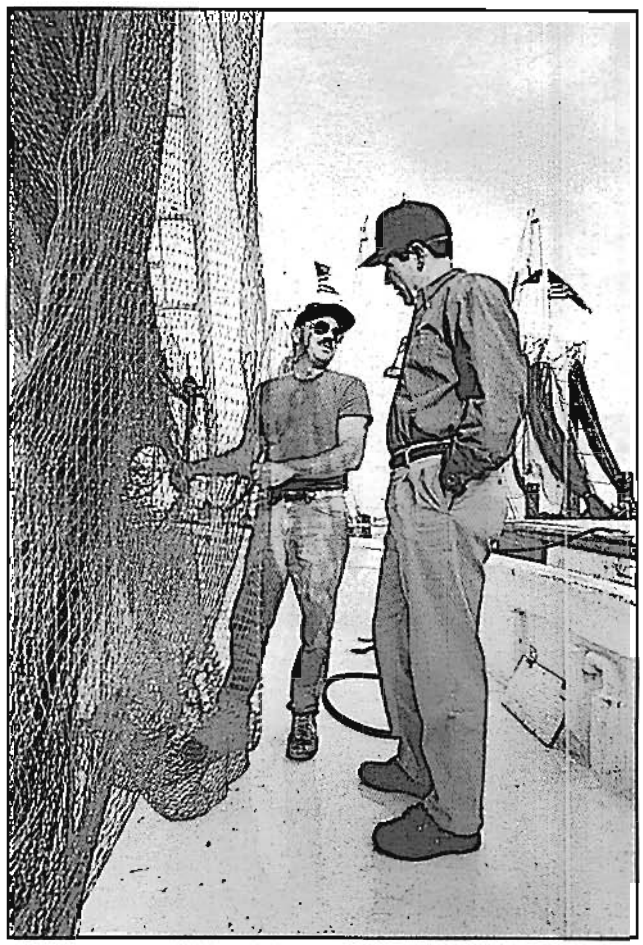
- ***Coastal Hazards*** – *Conduct coastal hazards research addressing: severe storms, earthquakes and tsunamis, coastal planning and building construction, and shoreline processes and erosion. Provide outreach through coastal hazard specialists and education by establishing information clearinghouses.*

- ***Safety at Sea*** – *Provide the scientific basis for design and testing of fishing vessels to maximize their inherent stability under extreme conditions. Design and test new equipment to increase safety at sea. Provide survival and safety training and materials. Through research, education and outreach, improve the safety of recreational, scientific and commercial divers.*

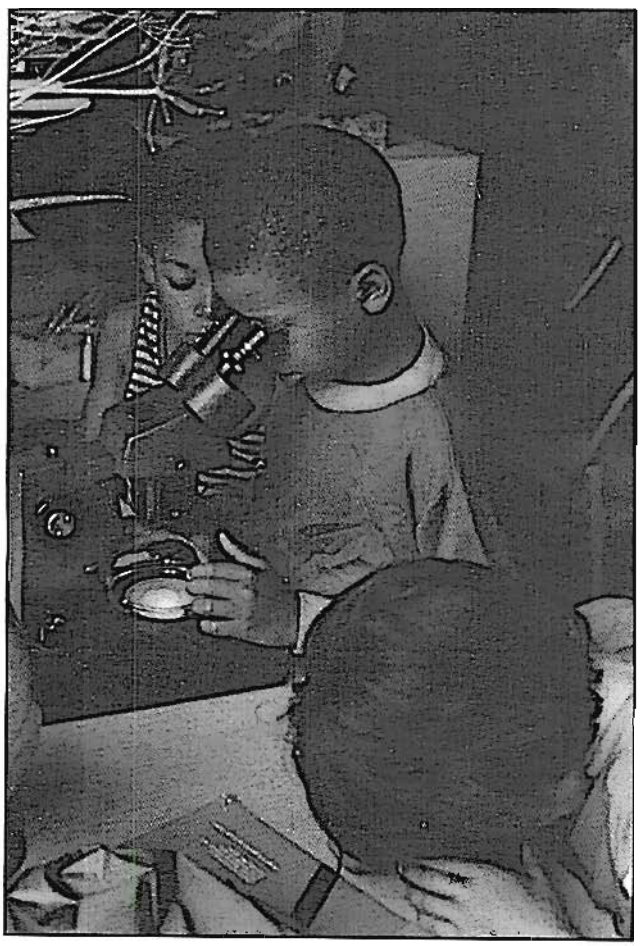
BENEFITS. Policy-makers and resource managers will be provided the information, technology, and techniques needed for formulating environmental policy. The protection and restoration of coastal and Great Lakes habitats will contribute to both the development of healthy coastal ecosystems and the efforts to rebuild the nation's fisheries. Improvements in water quality and habitat quantity and quality will provide broad benefits to the American public in terms of recreation, public health, and rebuilding populations of living marine resources. Improved vessel stability, better equipment, and increased safety of fishermen will not only save lives but also reduce the cost of fishing and increase economic returns for the industry. Improved diving and treatment procedures will reduce the loss of human lives and the socioeconomic costs associated with such losses.

Education and Human Resources

VISION. During the next decade, the Sea Grant Network will help position the U.S. to be more competitive in the global economy. It will do this by providing national leadership to develop well-prepared professionals who understand the changing nature of science and research in marine and coastal problems. Such individuals can, therefore, make wise decisions concerning resource management or make contributions as they pursue careers in academia, industry, and government. Sea Grant will also be a leader in providing marine/aquatic environmental information, science, and technology to the general public as well as to those in the precollege education system. Through its education, outreach, and communications capabilities, Sea Grant will bring the latest scientific and technical advances from the academic sector to the public realm. To accomplish these goals, Sea Grant will draw upon its partnership of people, universities, government and businesses to ensure a technically trained work force and a scientifically and environmentally informed citizenry in the 21st century.



CHALLENGES. Education, involvement and, ultimately, stewardship need to be accelerated in all coastal environments or the nation will lose its economic base of natural resources. To successfully compete in the world marketplace, the U.S. needs a workforce capable of world class research to develop new products. It also needs scientifically trained policy-makers to address the increasing number of coastal conflicts caused by the growth in coastal population. In addition, fishermen, seafood processors, and small businesses, which are the pillar of the U.S. coastal economy, need to be provided training opportunities. Presently, women, minorities and those with disabilities are underrepresented in the field of marine science and policy but, as the 21st century approaches, social pluralism and cultural diversity will become increasingly important considerations for resource managers and information providers.



KEY ACTION AREAS – To provide a technically trained workforce, the Sea Grant Network will focus on:

- ***Scientists and Engineers*** – *Continue to provide fellowships and research assistantships to highly qualified students. Initiate an Industrial Fellowship Program in which qualified graduate students will conduct research within a corporate setting under both academic and industrial supervision. Fund undergraduate and graduate assistantships for the best students in marine sciences and work to increase entry and advancement of minorities and women in the workforce.*

- ***Resource Managers*** – *Increase the number of decision-makers through postgraduate education in natural resource management. Develop programs for local decision-makers that use advanced technologies to teach integrated ecosystem management techniques. Develop outreach programs to address merging coastal resource issues such as habitat restoration and water quality.*

- ***Technical Training*** – *Target human resource development in the emerging industrial and service sectors related to marine industry. Provide workers postsecondary training to obtain skills to be job-ready in a changing work environment. Provide training, retraining and job-to-work programs for marine industries such as boat building, marine electronics, aquaculture, recreation and tourism.*

KEY ACTION AREAS – To assure an environmentally and scientifically informed citizenry, the Sea Grant Network will focus on:

- ***Precollege Education*** – *Design and implement K-12 programs that provide marine and coastal information and curricula. Teach the teacher through training and direct outreach to classrooms. Directly contact youth through school programs, summer camps and field trips. Increase the rate of information transfer of marine research conducted by NOAA, the U.S. Navy, and other agencies. Increase the use of the "electronic highway" to acquire and analyze marine and coastal data.*

- ***Informal Education*** – *Increase public understanding of science through nonformal education avenues including public lectures, programs at museums and aquaria, and life-long learning experiences that target the needs of senior citizens. Respond to increasing demands for marine information by placing more emphasis on using the mass media—cable and network television, radio, and newspapers. Use emerging technologies in communications such as CD ROM and interactive video to more actively involve the learner.*

BENEFITS. With a technically trained workforce, public policy regarding coastal and ocean resources will be more effective. A more diverse workforce of scientists, technicians, and professionals highly skilled in marine science, marine issues, and marine trades will lead to greater scientific competitiveness and technology development nationally and internationally. The number of elementary and secondary students who choose marine-related careers will increase. The increased use of current information about the coastal environment and its resources in classrooms and by the public will result in a better informed citizenry. These citizens will be aware of coastal and marine issues, and be able to take action to solve problems and to assure sustainable development and environmental stewardship. ◆

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Editors: Victor Omelczenko, Lauriston King, Susan Borda (National Sea Grant Office) and Julie Zeidner (New York Sea Grant).

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