



RESEARCH



EDUCATION

Sea Grant
SCIENCE
SERVING
THE
21ST
CENTURY
30 YEARS OF PROGRESS

OUTREACH



SEA GRANT



1968-1998
*30th Anniversary of the
National Sea Grant College Program*

What is Sea Grant?

Sea Grant is a commitment, a partnership, a bridge, and a bond.

It's a commitment to solve coastal problems and develop marine resources. It's a partnership and a bridge between government, academia, industry, scientists, and private citizens to help Americans understand and sustainably use our precious Great Lakes and ocean waters for long-term economic growth. And it's a bond uniting 29 State Sea Grant programs, over 200 universities, and millions of people. In short, Sea Grant is an agent for scientific discovery, technology transfer, economic growth, and public education as they involve coastal, ocean, and Great Lakes resources.

Every day, Sea Grant scientists make progress on the important marine issues of our time. A network of extension professionals takes this information out of the laboratory and into the field, working to enhance a coastal business, a fishery, or residents' safety and quality of life. A dedicated corps of communication specialists builds public understanding of these issues for informed decision-making. And Sea Grant educators bring the discoveries into the nation's schools, using them to pioneer better ways of teaching, helping to create a new generation of scientifically literate Americans.

Through these research, education, and outreach activities, Sea Grant has helped position the United States as the world leader in marine research and the sustainable development of coastal resources.

30TH *National Sea Grant College Program* ANNIVERSARY

Long-term economic development, environmental stewardship, and responsible use of America's coastal, ocean, and Great Lakes resources is at the heart of Sea Grant's mission. Sea Grant's challenge is to guarantee optimal use of these resources, while ensuring that they provide sustainable, long-term benefits. With faculty from over 200 colleges and universities participating in the program, it is difficult to find an issue that Sea Grant cannot address. Sea Grant research, education, and outreach activities undertaken over the past 30 years encompass many diverse issues including the eight program areas highlighted to the right and explained in greater detail on the pages that follow. For information about other topics and research being conducted by Sea Grant, please contact the National Office, or the nearest state program, listed on the back of this publication.

- *Aquaculture*
- *Aquatic Nuisance Species*
- *Coastal Economic Development*
- *Coastal Habitat Enhancement*
- *Coastal Hazards*
- *Education*
- *Marine Biotechnology*
- *Seafood Technology*

Aquaculture

Many fisheries stocks around the world have begun to decline, even collapse, in recent years, yet demand for seafood continues to skyrocket due to a growing world population and an expanding appetite for seafood, particularly in wealthy nations. If Americans want to eat affordable seafood in the future, they must increasingly rely on farm-raised fish and shellfish.

To ensure healthy seafood supplies, Sea Grant has worked not only to improve wild stock management and coastal development, but also to encourage aquaculture that will not harm the environment.

Considerable investments in basic and applied science—genetics, reproduction, recirculation and filter systems, and rearing techniques—have contributed to a burgeoning U.S. aquaculture industry that could reduce the current trade deficit in seafood products. Sea Grant outreach and student training efforts have helped provide aquaculturists with the scientific and business skills required to compete in an international market.

- As a result of Sea Grant research and extension efforts, hybrid striped bass pond culture has expanded in just 10 years from a small demonstration project to an industry producing 10 million pounds of fish valued at \$25 million annually.
- Sea Grant investigators have developed a sterile oyster that can be grown year-round and now makes up one-third of the \$86 million U.S. oyster market.
- No mussel culture industry existed in the Northeast prior to 1980, and wild harvests were valued at about \$35,000. Today, following a five-year research and marketing effort by Sea Grant, landings of wild and farm-raised mussels in the region are valued at \$6 million.
- To minimize the risk of genetically engineered fish escaping into the environment, Sea Grant developed the first national environmental safety guidelines for aquatic biotechnology research and development, an award-winning effort recognized by the USDA.



- Working with watermen, researchers, students, and others, Sea Grant specialists have provided seed oysters and expertise to rebuild oyster bars in the Chesapeake Bay.
- Sea Grant research and outreach on Manila clams and blue mussels have resulted in new industries worth \$19 million annually.
- As a result of Sea Grant research and technology transfer, the small, local soft-shell crab industry has grown to a multi-million dollar investment extending from New Jersey to Texas.



Aquatic Nuisance Species

Beginning in 1850, an average of one new nonindigenous aquatic species has threatened an American ecosystem every 36 weeks. That number increased to one new species every 24 weeks in 1970, and has risen to one new species every 12 weeks since 1985, resulting in tremendous ecological and socio-economic damage in many regions of the nation.

From sponsoring research to conducting public education programs, Sea Grant has focused on finding solutions to these invasions. Sea Grant is the primary source of information on a range of aquatic nuisance species such as the zebra mussel, Eurasian ruffe, round goby, green crab, purple loosestrife, *Phragmites*, and others. The Sea Grant network houses technical collections and provides the public with easy access to on-line information.

Researchers, extension specialists, and educators continue to share their expertise at international research conferences, training workshops, and video conferences, many of which are sponsored by Sea Grant programs. A new three-year initiative will also bring research and outreach efforts to inland states.

- SGNIS, an on-line, interactive national information center developed by Sea Grant (<http://www.wansc.purdue.edu/sgnis/>), provides access to a comprehensive collection of research and educational materials related to zebra mussels and other aquatic nuisance species.



- To teach youth about the environmental threats posed by exotic species, Sea Grant has developed several "Exotic Aquatics" traveling trunks that have reached more than 11,000 educators and students in one year.
- Sea Grant programs have reduced the cost and adverse effects of clean-up efforts for large power plants in areas infested with zebra mussels by focusing efforts on times when zebra mussel larvae are most abundant, identifying effective and inexpensive treatments, and minimizing the frequency and duration of treatments.



Coastal Economic Development

Sea Grant enhances the coastal economy in many ways: identifying opportunities for business development and expansion along our coasts, minimizing economic losses caused by storms and natural disasters, developing new products for the seafood industry, and using high-tech science to develop new drugs from the sea.

Although not designed to be a "jobs program," Sea Grant fosters the creation of many jobs in the tourism industry, the commercial fishing industry, the charter fishing industry, the seafood processing and retail industries, the sport fishing industry, and the aquaculture industry, thereby enhancing the coastal economy and the quality of life for many Americans.



- From 1990-1995, Sea Grant was directly responsible for obtaining \$100 million in matching federal grants to develop 130 recreational and tourism facilities on the Gulf Coast.
- A wave-powered, reverse-osmosis pump created with Sea Grant support removes salt from seawater at significantly lower costs to public utilities than was possible with previous technology. The pump is used for food and chemical processing, mining activities, and by all branches of the U.S. military to provide drinking water in the field. Using this patented process, a Fortune 500 company is manufacturing and internationally marketing a line of motor-powered pumps.



- In the wake of timber-related industrial dislocations and salmon fishing closures, Sea Grant has helped small cities in the Pacific Northwest develop and implement revitalization plans for deteriorating waterfronts. More than \$1.5 million in state and federal grants helped one city with street improvements, building a public boat landing and plaza, and museum improvements. Riverfront revitalization also has attracted a new \$5 million private development and an historic tall ship moored at the public dock.
- Sea Grant's efforts to develop underwater preserves have significantly boosted the economy of a wide range of businesses in Great Lakes coastal communities. A recent study suggests that diving activity provided an economic stimulus of at least \$1.5 million over a two-year period for small towns near the preserves.



For additional examples, please refer to the "Coastal Habitat Enhancement" section.

Coastal Habitat Enhancement

To restore and enhance coastal habitats, Sea Grant investments in environmental stewardship have resulted in water quality improvements, restoration of wetland habitats, and better use of scientific data in policy decisions concerning coastal ecosystems.

Coastal habitat restoration has important ecological and economic implications including renewed opportunities for fishing, recreation and tourism, and commercial uses. Increased knowledge of coastal processes has led to better decision-making regarding the identification and use of critical coastal habitats.

- Sea Grant studies of sewage effluent plumes have led to revisions in pollution control, cleanup, and water treatment that will save Orange County, CA taxpayers \$50 million annually over a 30-year period. Lessons learned from these studies can be applied to other large sewage plants around the nation.



- Sea Grant has been instrumental in the development and construction of wetlands on all four coasts and in wetland loss mitigation strategies that have both created and restored valuable wetlands while allowing coastal development valued in excess of \$100 million.
- Sea Grant created a comprehensive database on Great Lakes contaminants and the scientific expertise necessary for developing the first complete model of a toxic industrial chemical in an aquatic ecosystem. The study has already saved the state of Wisconsin hundreds of millions of dollars in cleanup costs, and the model may ultimately save other states billions.
- Sea Grant constructed the largest freshwater artificial reefs in the world in the Great Lakes, attracting 20 to 60 times as many fish as the surrounding areas; the reefs pay for themselves 2.75 times per year.

Coastal Hazards

Before 1988, U.S. residents and businesses had never faced losses from a single catastrophe that exceeded \$1 billion. Since then, however, insurance companies have paid out more than \$1 billion for each of 15 natural disasters nationwide, including hurricanes, a typhoon, erosion, and flooding.

As a result, insurers in some coastal states have begun withdrawing coverage in high-risk areas. These states have had to create catastrophe funds paid for with taxpayer dollars to protect residents who could not buy policies on the private market. Where coverage is still available, consumers are bearing heavier costs through higher insurance premiums. Sea Grant's coastal hazards activities protect American lives and property, and allow insurers to make coverage available at reasonable rates.

But coastal storms are only one aspect of Sea Grant's efforts in public safety and well-being. Erosion studies, safer SCUBA diving protocols, and life-saving training for watermen (who run a high risk of hypothermia) help save lives and property.

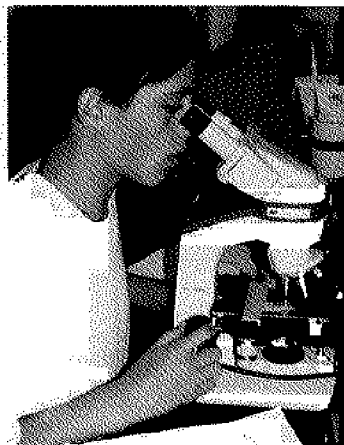
- Sea Grant promotes new construction techniques such as hurricane clips, cross-braced pile construction, and changes in roof and window design that have saved millions in repairs. Homes built in accordance with Sea Grant models can save an estimated \$220 annually in insurance premiums, or \$15,000 over the 70-year life span of the average home.
- Software developed by Sea Grant investigators allows builders to "plug in" specifications of their structure to assess the building's risk from coastal storm winds and water; the software also makes recommendations to mitigate identified risks. Structural engineers for the new 8,600-unit Sun City development near Hilton Head, SC credit the program with saving its homeowners millions in potential losses, as well as helping to protect lives in this retirement community.



- Assessments indicate that Sea Grant's research and outreach on cold water near-drowning has saved the lives of more than 1,500 people.
- Sea Grant scientists have developed sophisticated computer models to predict destructive wave conditions along the Southern California coastline during destructive El Niño cycles, and waves, currents, temperatures, and turbidity in the Great Lakes.
- Conservative estimates are that a Sea Grant publication identifying the locations of snags and obstructions in the Gulf saves commercial fishermen \$20 million a year in lost or damaged gear.
- By modifying a local beach renourishment design, Sea Grant specialists saved one urban Northeastern community \$720,000 and played a vital role in protecting more than \$10 million in public and private structures from erosion.
- Efforts to protect the Gulf Intercoastal Waterway—a national commercial artery supporting 150,000 jobs and generating \$4 billion a year in commerce—are nearing completion, thanks to a recent Sea Grant study. Without mitigation, a breach could have occurred, costing \$20 million per day in lost commerce.



Education



Education at all levels is a cornerstone of Sea Grant and includes graduate and undergraduate education, teacher training, K-12

curriculum development, marine policy fellowships in Washington, fellowships in cooperation with private industry, informal education for the general public, special training programs for industry, and much more.

Identifying outstanding graduate students and turning them into outstanding young scientists capable of solving the problems of tomorrow is one of Sea Grant's greatest accomplishments. This training is frequently done under the supervision of a nationally recognized scientist while working on a research project addressing a unique opportunity in the marine sciences, thereby making the training doubly beneficial.

The prestigious and very selective Dean John A. Knauss Marine Policy Fellowship program accelerates the careers of promising graduate students interested in marine policy issues by placing them in Washington's legislative or executive branch for a year. Not only do the students benefit, but their placement provides for the transfer of the most current scientific information to these offices.

- Sea Grant has supported 12,000 graduate research assistants while they worked on cutting-edge marine and Great Lakes science. These students have become more than a skilled workforce; they are a major factor in the nation's marine sector, with skills benefiting the environment and the economy.

- Since 1979, 341 students have received an insider's look at the national policy-making process by participating in the Knauss Policy Fellowship program in Washington, D.C. About one-third of these students stay within the D.C. area, working in government offices or in the halls of Congress. The remaining two-thirds work in industry and trade associations, in state government as managers, or in academia as teachers and university researchers.

- A Sea Grant-supported marine science program for teachers, Operation Pathfinder, has provided training to 278 teachers, who in turn trained an additional 45,000 educational professionals in 30 states and seven U.S. territories. Through this process, Operation Pathfinder can potentially provide marine and coastal science education to about 33 million students nationwide over a five-year period.

- A Sea Grant funded CD-ROM has become a model teaching tool that reaches virtually all grade levels. *The Sound* multimedia CD-ROM highlights the unique properties of Puget Sound, WA using text, video, games, and animation. Since its publication in May 1997, 5,000 copies have been distributed free to schools.

- *Marine Science Careers: A Sea Grant Guide to Ocean Opportunities* introduces students to a wide range of marine career fields and to people working in those fields. Intended for high school students and guidance counselors, 25,000 copies of the 40-page guide are in circulation, 5,000 of which were sent free to high schools in non-coastal states.

- Education and information programs on shoreline and community development have helped communities address issues of erosion and flooding, improved public access, and tourism expansion.



Marine Biotechnology

As a national network of research institutions, Sea Grant leads the nation's efforts in the emerging field of marine biotechnology, addressing critical medical, food, and environmental concerns.



Sea Grant-supported research has shown tremendous potential for using marine organisms to provide models for new pharmaceuticals, vaccines, household and industrial detergents, agricultural fertilizers, and genetically altered organisms for aquaculture and the seafood industry. Marine biotechnology is also providing new tools and approaches for understanding ecological relationships among organisms and fisheries information that will help improve marine resource management.

Sea Grant's research, while advancing science, is also training students for high technology careers and providing the foundation for commercial developments.

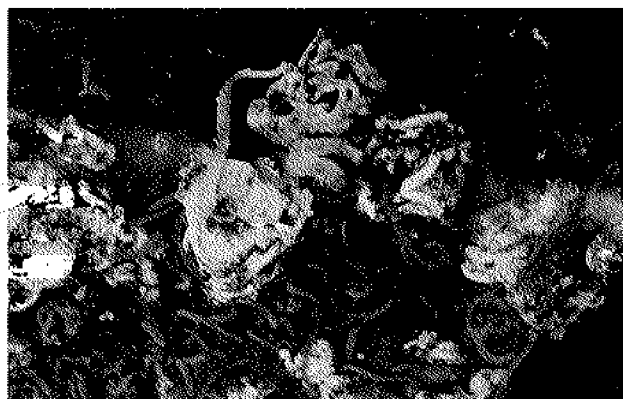


- Sea Grant organized the first systematic research effort in the United States to develop new drugs from marine organisms, resulting

in the discovery and description of more than 1,000 compounds that may be vitally important as many infectious organisms develop resistance to current drugs.

- Sea Grant-discovered compounds are being tested by both government agencies and commercial pharmaceutical companies as possible treatments for AIDS, inflammatory diseases such as arthritis, and prostate, lung and breast cancers.
- Using DNA sequences, researchers are developing quick-testing field probes to identify harmful algal blooms, a growing environmental problem in coastal waters worldwide. With accurate field-testing, managers can respond more effectively to determine and reduce health risks to both humans and animals.

- Biotechnology research is helping scientists and managers restore endangered fish stocks. Through DNA studies, scientists selectively breed for disease-resistant species of threatened fin and shellfish, or add an inheritable disease-resistant gene to a threatened species. Such techniques show promise in restoring commercially important species such as cod, sturgeon, abalone, clams, and oysters.



- Organisms found in the extreme temperature zones of underwater thermal vents—extremophiles—are the focal point of cutting-edge research that could improve the effectiveness of cold-water detergents, thereby saving the energy needed to heat water.
- Research into the role of poly-aspartic acid in oysters has led to the development of a more biodegradable, environmentally-friendly alternative to harmful chemicals found in detergents and personal hygiene products, as well as increasing fertilizer's ability to significantly enhance crop yields.

Seafood Technology

Sea Grant excels in building partnerships between public and private sectors, as evidenced by the program's development of new ways for Americans to reap the bounty of our waters sustainably. Sea Grant-sponsored research and technology transfer is helping the seafood industry by improving processing technology, products, and methods for assuring seafood safety.

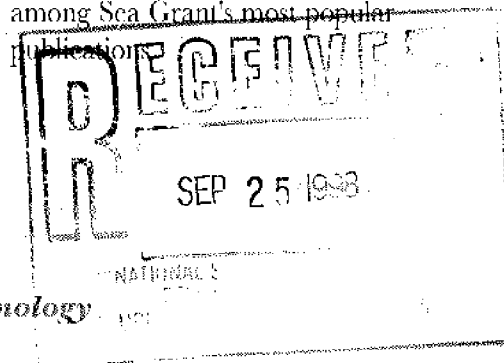
As wild fish stocks decline, Sea Grant is finding new ways to reduce waste and bycatch in fishing gear; developing new markets for under-used species; and ensuring the safety and quality of products through better storage, processing, and packaging techniques.



- Sea Grant's efforts to help the U.S. seafood industry implement new FDA-mandated processing procedures were cited by Vice President Al Gore's National Performance Review Board with its "Hammer Award" for "partnerships that make a significant contribution in improving the way federal agencies accomplish their responsibilities."
- New discoveries in biotechnology have played a pivotal role in finding new uses for bycatch species such as Pacific whiting and arrowtooth flounder, allowing the development of new multi-million dollar fisheries.
- Sea Grant researchers have used biotechnology to develop fast and highly specific techniques for detecting pathogens not only in shellfish, but also in meat and milk.
- In an effort to reduce illegal harvesting of egg-bearing lobsters, researchers have developed new technology that will identify such illegal catches and allow better enforcement of regulations designed to protect females and ensure a sustainable population of lobsters.



- Sea Grant research has led to the development of a new grading system for shrimp quality based on established freshness standards. The result will be a more consistent evaluation of both domestic and imported shrimp, ensuring a safe, stable supply of this popular seafood.
- Sea Grant technicians have educated thousands about seafood safety methods, both for handling fish as well as preparing it. Brochures on seafood safety are among Sea Grant's most popular publications.



The Origin of Sea Grant

The idea of a Sea Grant College Program was originally suggested by Athelstan Spilhaus at the 93rd meeting of the American Fisheries Society in 1963. Interest in the Sea Grant concept grew, much of it sparked by an editorial written by Spilhaus that appeared in a 1964 issue of *Science*:

"I have suggested the establishment of 'sea-grant colleges' in existing universities that wish to develop oceanic work . . . These would be modernized parallels of the great developments in agriculture and the mechanic arts which were occasioned by the Land-Grant Act of about a hundred years ago . . . Establishment of the land-grant colleges was one of the best investments this nation ever made. That same kind of imagination and foresight should be applied to exploitation of the sea."

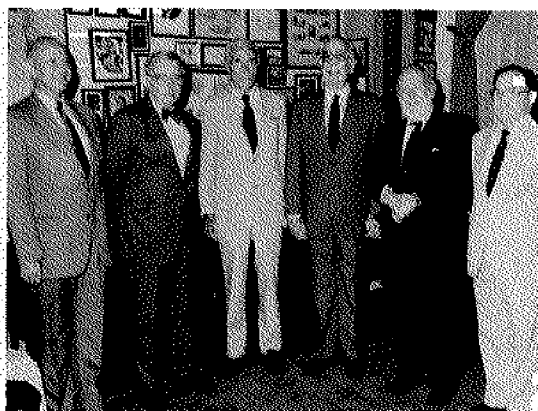
Thus, at a time when America was excited about science in general, especially the possibility of reaping sustained economic benefits from the vast resources of the seas, national enthusiasm for the Sea Grant College concept grew. In 1965, Sen. Claiborne Pell of Rhode Island introduced legislation to establish Sea Grant colleges on campuses nationwide as centers of excellence in marine and coastal studies. With the adoption in 1966 of the National Sea Grant College Act, Congress established an academic/industry/government partnership that would enhance the nation's education, economy, and environment into the 21st century.

1957 Sputnik I, Earth's first satellite, is launched by the Russians propelling science into the midst of international policy.

1958 U.S. universities confer 2,780 doctoral degrees in the sciences, yet only 13 are marine-related.

1963 Athelstan Spilhaus first publicly suggests the Sea Grant idea during the keynote address of the 93rd annual meeting of the American Fisheries Society.

1965 Senator Claiborne Pell, Rhode Island, introduces legislation to create Sea Grant Colleges by amending the National Science Foundation Act of 1950. Congressman Paul Rogers, Florida, introduces companion legislation in the House.



Four "Fathers of Sea Grant" and two National Directors: Robert Abel, John Knauss, Senator Pell, Congressman Rogers, Athelstan Spilhaus, and Ned Osterson.

1966 President Lyndon Johnson signs the bill, establishing the Sea Grant Program through The National Sea Grant College and Program Act of 1966.



1968

The work of Sea Grant begins as the first grants are awarded and the National Review Panel is established.

1970 Sea Grant becomes part of the National Oceanic and Atmospheric Administration.

1970 The National Sea Grant Depository is established as an information center dedicated to the collection, storage, documentation, and dissemination of Sea Grant literature.

1971 Four universities are the first to achieve Sea Grant College status: Oregon State University, University of Rhode Island, Texas A & M University, and University of Washington.

1972 University of Hawaii and University of Wisconsin achieve College status. University of Southern California becomes an Institutional Program.

1973 University of California achieves College status.

1975 State University of New York and Cornell University achieve College status.

1976 The National Sea Grant College and Program Act of 1966 is amended by the Sea Grant Improvement Act. The amendment strengthens the basic program of the original Act and codifies the National Sea Grant Review Panel.

1976 University of Delaware, State University System of Florida, Massachusetts Institute of Technology, and University of North Carolina achieve College status.

1978 Louisiana State University achieves College status.

1979 The Sea Grant Intern Program is initiated, allowing outstanding graduate students to spend one year in Washington, D.C., developing the skills needed for active leadership in both policy development and research in coastal and ocean sciences.

1980 University of Alaska, University of Georgia, and University of Maine/University of New Hampshire achieve College status.

1982 University of Maryland, University of Michigan/ Michigan State University, and Mississippi/Alabama Consortium achieve College status.

1984 Virginia Graduate Marine Science Consortium achieves College status.

1985 University of Minnesota achieves College status; Woods Hole Oceanographic Institution becomes an Institutional Program.

1986 South Carolina Consortium achieves College status.

1987 The Sea Grant Intern Program was renamed the Dean John A. Knauss Marine Policy Fellowship in honor of Dean Knauss, one of the founding fathers of Sea Grant.

1988 The Ohio State University and the University of Connecticut achieve College status.

1989 New Jersey Marine Science Consortium and University of Puerto Rico achieve College status.



Original "Founding Fathers" reunion: John Knauss, James Baker, Paul Rogers, Senator Pell, Robert Abel, and Ronald Baird.

1997 University of Illinois/Purdue University achieves College status.

1998 NOAA celebrates Sea Grant's 30th anniversary commemorating three decades of accomplishments in research, education, and outreach related to coastal, ocean, and Great Lakes resources. The year is proclaimed by the United Nations as the "International Year of the Ocean."



National Directors: Ronald Baird, Robert Abel, and Ned Ostenso.

This publication, issued March 1998, was jointly produced for the Sea Grant network by the Ohio Sea Grant College Program and the South Carolina Sea Grant Consortium which are supported by the States of Ohio and South Carolina, respectively, and by the U.S. Department of Commerce, NOAA National Sea Grant Office, under Grant Number NA46RG0482 to Ohio and Grant Number NA46RG0484 to South Carolina. The National Sea Grant College Program is a partnership of academia, government, and industry focusing on coastal, ocean, and Great Lakes resources. The program operates through a university-based network to meet environmental and economic needs by conducting research, education, and outreach. Publication OHSU-B-050: 3/98, reprinted 7/98.

Dedicated to the memory of Ned A. Ostenso (1930-1997), Director of the National Sea Grant College Program from 1977-1990.

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Managing Editors

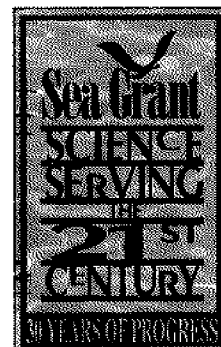
Nancy Blanton, Karen Ricker & Leigh Handal

Designers

Cindy Hayter, Dave Brenner & Linda Blackwell

Photos Provided by

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National Sea Grant College Program

*Building
Bridges
Between
Academia,
Government,
and the
Private Sector*



*Providing the
Science for
Management
Decisions*



*Focusing on
Environmental,
Economic,
and Education
Improvements*

