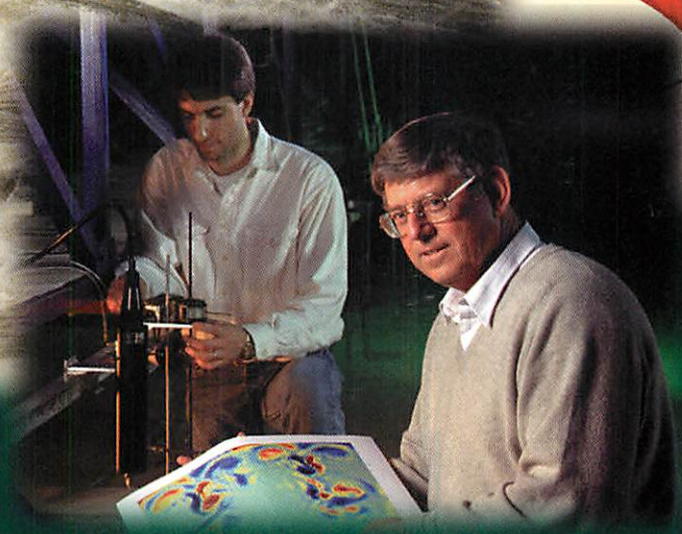
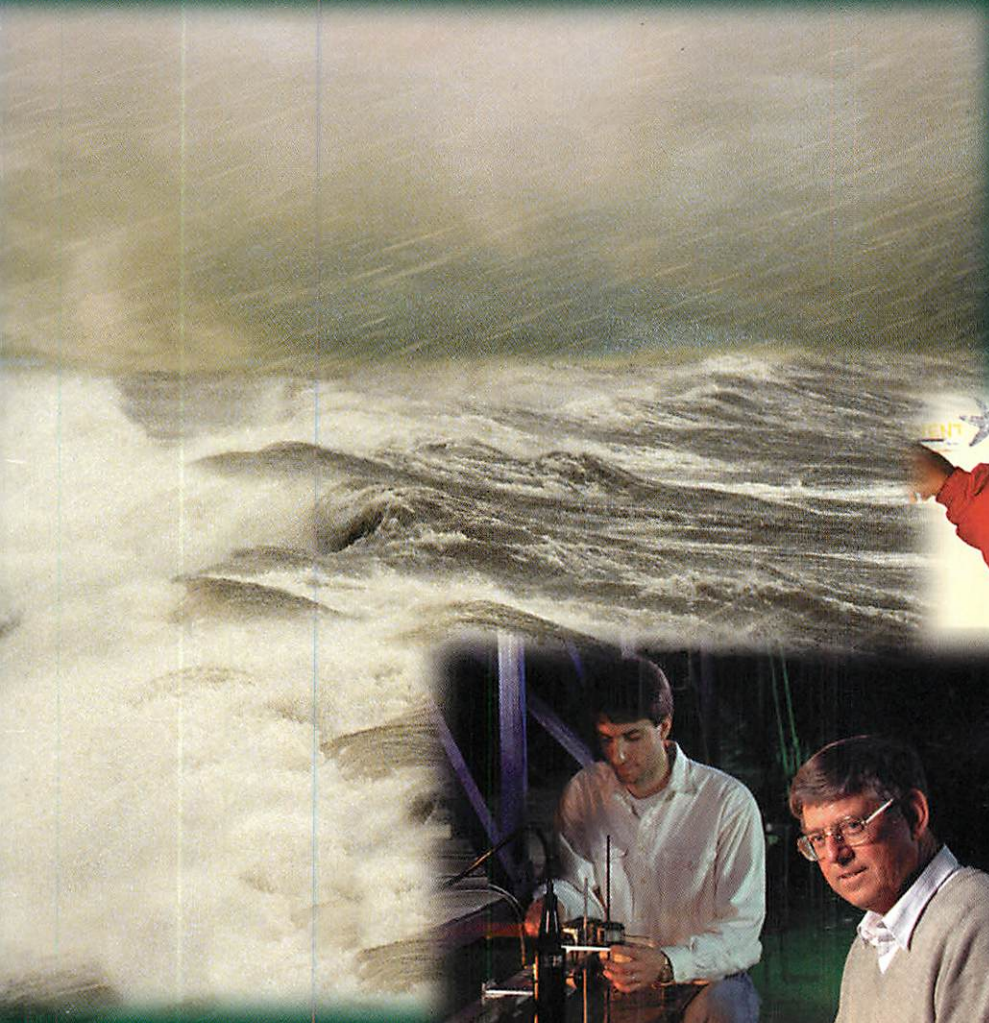


# National Sea Grant College Program Biennial Report 1998–1999







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U.S. Department of Commerce  
William M. Daley, Secretary

National Oceanic and Atmospheric Administration (NOAA)  
D. James Baker, Under Secretary

Office of Oceanic and Atmospheric Research (OAR)  
David L. Evans, Assistant Administrator

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In memory of Athelstan Spilhaus (1911-1998), the brilliant scientist, inventor, and dean at the University of Minnesota, whose vision of creating Sea Grant Colleges became a reality in 1966.



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## Director's Message

**T** *"The principal political challenge for society in the 21<sup>st</sup> century will be reconciling environmental protection with coastal economic development."*

*Ronald C. Baird, Director,*

*National Sea Grant*

*College Program*

## T O U R C O N S T I T U E N T S

Two events of historical significance took place this biennium that portend a bright future for the Sea Grant program as we enter the 21<sup>st</sup> century. The first was the designation of 1998 as the "Year of the Ocean." As part of that celebration, the President of the United States convened a major conference in Monterey, California, to help frame a national vision for the future of the world's oceans. The second was the celebration of the National Sea Grant College Program's 30<sup>th</sup> anniversary highlighted by two receptions on Capitol Hill where many dignitaries spoke on behalf of the program, including senior members of Congress, senior NOAA administrators, and several of Sea Grant's "founding fathers." The

take home messages from these events were that there is increasing recognition nationally of the importance of the ocean and coasts to this country's well-being and that Sea Grant has played a significant role in promoting the wise use of coastal and ocean resources.

The principal political challenge for society in the 21<sup>st</sup> century will be reconciling environmental protection with coastal economic development. Without engaging our incomparable research universities, we have little chance of making that reconciliation given the environmental issues on the very near horizon. Sea Grant is marvelously positioned for that engagement by reason of its university-based infrastructure and its exemplary performance.

That performance is due to the efforts of the many dedicated individuals throughout this organization who make good things happen and to the support of the many partners that comprise the Sea Grant Community:



*Ronald C. Baird*

legislators, state agencies, universities, industries, and many other stakeholders who provide resources and talent. Finally, we must include the citizens of this great nation who ultimately pay the bills and whom we serve. To all, our thanks for your trust, support, and confidence in Sea Grant.



**HIGHLIGHTS OF 1998 AND 1999 INCLUDE:**

■ Congressional appropriations for Sea Grant of \$56 million in FY 1998 and \$57.5 million in FY 1999.

■ Funds from all sources totaled \$99.2 million in 1998 and \$99.6 million in 1999. These amounts represent a leverage factor of approximately 74 percent on the direct federal appropriation for the National Sea Grant College Program.

■ Continued improvement in management efficiency:

—the cost of national administration is now less than 3 percent of the total funds managed during the biennium.

—through continued use of the Internet and computer technology, we added approximately \$12 million in nationally managed, peer reviewed, competitive programs to our portfolio with only minor increases in management costs.

■ Celebration of 30 years of Sea Grant achievement highlighted by several events on Capitol Hill. Featured speakers from the 105th Congress included Senator Ted Stevens of Alaska, Senator Judd Gregg of New Hampshire, Representative Don Young of Alaska, and Representative Frank Pallone of New Jersey.

■ Recognition by the Department of Commerce and NOAA of the exemplary performance of the National Sea Grant College Program. Over the past two years, three individuals in the National Sea Grant Office received awards, including: Leon Cammen, a 1999 NOAA Administrator's award; Shirley Fiske, a 1999 Legis Fellowship; and Victor Omelczenko, a 1999 Department of

Commerce Bronze Medal. In addition, the National Sea Grant College Program as a whole received a 1999 Department of Commerce Bronze Medal for its "distinguished record of scientific research, education, and public outreach focusing on coastal issues."

■ Successful implementation of the new performance evaluation protocol. High marks for performance were given by the National Sea Grant Review Panel and outside reviewers for the significant impacts of Sea Grant research and outreach activities on coastal America in all eight programs evaluated to date. This is testimony to the high return generated from the federal investment in Sea Grant.

■ Establishment of a National Marine Fisheries Service liaison billet in the National Sea Grant Office. In addition to the fisheries expertise provided, the liaison has greatly enhanced cooperative efforts between the two organizations, a major step forward in improving coordination with other NOAA operations.

■ The exemplary programmatic achievements by the Sea Grant network described later in this report are intended only to give you a flavor of the diversity, relevance, and high quality of our products/services during this biennium. We simply cannot do justice in one report to the many other positive impacts Sea Grant programs are having on coastal America.

In our last biennial report, I indicated that while many government programs are experiencing reduced scope and influence because of budgetary constraints, Sea Grant has chosen to position itself for growth by transforming the organization to be more efficient and responsive

to those we serve. This is in direct response to the growing environmental concerns in our coastal regions and the need to provide science-based information to users and decision-makers at many levels. Why and what we have done (and are doing) to transform our organization to better serve the national interest is the subject of this message to our stakeholders and constituents.

## ORGANIZATIONAL IMPERATIVES

There is little question that demand for services and products that allow us to better manage coastal resources will increase substantially in response to explosive coastal development and will be satisfied largely through the investment of public funds. That increased demand is convergent with Sea Grant's "core" competencies, and it is why we have chosen to position ourselves for growth in the 21<sup>st</sup> century.

Other emerging trends are creating imperatives for change in our organization in addition to product demand. Put simply, the next century will be characterized by rapid and profound change, explosive growth in knowledge creation and technology, and the unprecedented ability to rapidly and cheaply disseminate information. As environmental impacts continue to grow in scale and severity, the resolution of resource management issues will increasingly involve local and regional constituencies. While being mediated through large bureaucracies, Sea Grant with its 30-year culture has developed networks of multiple connections and relationships both locally and

nationally. The question then is how to transform this complex organization into one that incorporates the strengths of large agencies while having the speed, flexibility and creativity of a smaller organization. What we have done is to preserve Sea Grant's successful infrastructure while making changes in the way we operate so as to enhance the organization's ability to perform in a rapidly changing world.

### THE FOLLOWING IS A BRIEF SYNOPSIS OF THOSE CHANGES:

- Virtually all Sea Grant research is now peer reviewed and competitively awarded at both local, regional, and national levels. We want to invest in the best ideas and research capabilities.
- Sea Grant Colleges are now individually responsible for allocating resources to a portfolio of research, education, and outreach activities consistent with the needs of their state and region and with NOAA's mission. This empowers local management to more rapidly respond to emerging issues and opportunities.
- Individual Sea Grant programs must now have in place an advisory process whereby users help determine needs, priorities, and programmatic objectives.
- A performance-based evaluation system was introduced in FY 1998. Resources allocated to programs are determined in part by performance. Evaluation improves performance and drives constructive change.
- Sea Grant programs are developing a regional infrastructure to respond to emerging regional scale issues/problems, a growing need in coastal management.
- A new investment fund for nationally competitive research now enables Sea Grant to make relatively concentrated investments on specific



issues of national import. This allows us to bring forth the best ideas from our network as a whole.

■ Sea Grant has identified a number of theme areas critical to resource management for the next decade and beyond. These will help frame our strategic and operational objectives well into the next millennium.

We believe these changes represent organizational imperatives that will enable Sea Grant to perform successfully and competitively in a fast changing world where speed, innovation, and responsiveness are critical. Decision-making is now distributed, which not only increases responsiveness but also allows Sea Grant to tap the insights and creativity of a large network of universities. The whole organization has determined its own performance criteria.

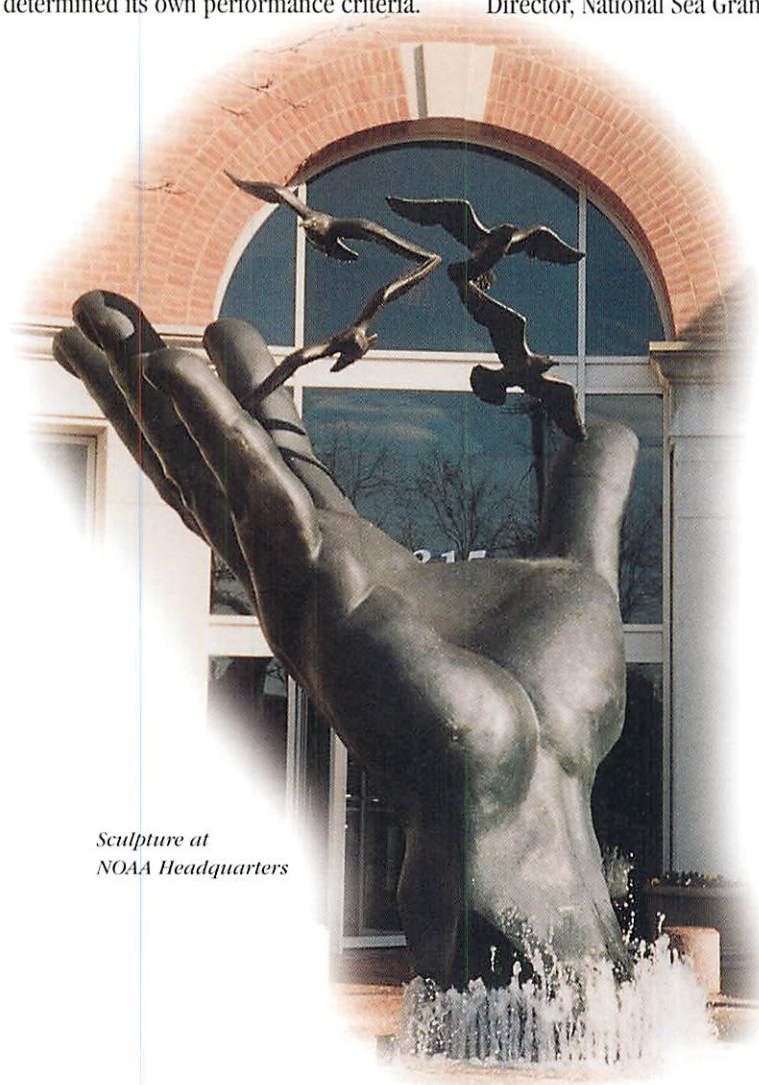
We now benefit from highly qualified, outside individuals judging performance in accordance with these criteria while developing better soft and hard metrics for evaluation. Everyone knows what the "big picture" goals are, and we have created a mechanism that drives constructive change. We believe Sea Grant is an organization in transition becoming more dynamic and responsive than ever before. Above all, it remains a great investment of taxpayer dollars.

Thanks again to our many friends, supporters, and stakeholders.



Ronald C. Baird

Director, National Sea Grant College Program



*Sculpture at  
NOAA Headquarters*



## Faces, Places, and Events During Fiscal Years 1998 and 1999

### October 1997

The University of Illinois and Purdue University are designated Sea Grant Colleges by the Department of Commerce.

**PHOTO A.** Purdue and University of Illinois receive certificates from DOC.

### February 1998

The Sea Grant Dean John A. Knauss Marine Policy Fellows Class of 1998 is welcomed to Washington by NOAA Administrator D. James Baker during the Year of the Ocean.

**PHOTO B.** Class of 1998.

### March 1998

Renewing the Sea Grant Program through 2003, the Sea Grant Reauthorization Act is approved by Congress and signed by President Clinton.

**PHOTO C.** The Capitol Building.

### March 1998

The annual reception is held for the alumni and the Class of 1998 Knauss Fellows.

**PHOTO D.** Former Senator Claiborne Pell, one of the founding fathers of Sea Grant, chats with National Sea Grant Director Ronald Baird.





### March 1998

Hosted by Senator Ted Stevens of Alaska and sponsored by the Sea Grant Association (SGA), a Capitol Hill reception kicks off the year-long celebration of Sea Grant's 30th anniversary of grantmaking.

**PHOTO E.** Senator Stevens makes opening remarks after being introduced by Alaska Sea Grant Director Ron Dearborn.

**PHOTO F.** Senator Judd Gregg receives award from New Hampshire Sea Grant Director Ann Bucklin.

**PHOTO G.** Representative Frank Pallone Jr. (r) receives award from New Jersey Sea Grant Director Mike Weinstein (l).

### June 1998

Sea Grant's 30th anniversary is highlighted at the annual NOAA fish fry.

**PHOTO H.** National Extension Leader Jim Murray (l) greets NOAA Administrator D. James Baker (r).

### August 1998

Sea Grant holds a symposium on "Essential Fish Habitat" at the American Fisheries Society (AFS) meeting in Hartford, Connecticut. The proceedings are edited by the first-ever AFS/Sea Grant Intern.

**PHOTO I.** Essential Fish Habitat Proceedings.





## Faces, Places, and Events During Fiscal Years 1998 and 1999

### November 1998

The United States Marine Safety Association (USMSA) presents its annual safety award to the Sea Grant network for continuing efforts on behalf of safety of life at sea.

**PHOTO J.** Receiving the award for the network are: Washington Sea Grant's Mike Spranger and Ginny Goblirsch and Alaska Sea Grant's Deborah Mercy. Greg Switlik (r), USMSA Board Officer and former Sea Grant Review Panel (SGRP) member, presented the award.

### February 1999

The Knauss Fellows Class of 1999, the largest class ever, is welcomed to Washington by NOAA Administrator D. James Baker.

**PHOTO K.** Class of 1999.

### March 1999

Hosted by Representative Don Young of Alaska and sponsored by SGA, a Capitol Hill reception concludes Sea Grant's year-long 30th anniversary celebration and celebrates the 20th anniversary of the Knauss Fellows Program.

**PHOTO L.** Representative Don Young holds plaque presented by Alaska Sea Grant Director Ron Dearborn (l) and by former SGRP Chair Jeffrey Stephan (r).

**PHOTO M.** Former Knauss Fellows, Craig Zamuda '83 and Christine Dawson '79 with their daughter.

**PHOTO N.** Commemorative 30th anniversary brochures are presented by Ronald Baird (l) to Ohio Sea Grant Director Jeffrey Reutter, Jeffrey Stephan, and SGA Executive Director Lee Stevens for their work on the anniversary committee.





## April 1999

For their tireless efforts to preserve and protect the nation's environment, four Sea Grant-nominated individuals are honored by NOAA as Environmental Heroes. Named for their work with the Youth for Environmental Service program were Hawaii Sea Grant's Bruce Miller and Sean Casey and State Representative Brian Schatz. Recognized for his role as advisor to New York Sea Grant was Walter "Skip" Hartman, SGRP member.

PHOTO O. The Earth

## June 1999 Sea Grant Week

The Sea Grant Week '99 conference, hosted in Portland by Oregon Sea Grant and sponsored by SGA, brings together over 200 people from universities, states, NOAA, and other federal agencies to plan for the future.

PHOTO P. Sea Grant Week logo





## Reducing the Costs of Coastal Hazards

**N** “NOAA’s university-based Sea Grant Program is uniquely positioned to help the government and universities of Honduras establish a national extension education program to improve citizen decision-making during and after the reconstruction process.”  
*President William Clinton’s remarks after Hurricane Mitch*

### TROUBLE IN PARADISE

The nation’s coastlines are under attack. The enemy, however, is not a foreign invader, but natural hazards such as hurricanes, which take lives, damage property, and disrupt ecosystems as a result of high winds, storm surge, flooding and shoreline erosion. And



sometimes the enemy is us. We contribute to coastal erosion by building too close to the shoreline or by making uneducated decisions about engineering solutions designed to protect the coasts.

Although the advent of radar and reconnaissance planes has decreased the number of deaths in the U.S. from large storms such as hurricanes, coastal hazards continue to take a severe economic toll on both local and national economies. Economic losses from disasters are closely tied to population growth and investment in high risk areas. As the U.S. coastal population increases by 3,600 people a day, resulting in a projected total increase of 27 million people between now and 2015, the nation will likely witness a tremendous rise in the costs of damages from coastal hazards.

Since most coastal hazards cannot be prevented, the nation must focus on reducing their impacts, thereby reducing the costs to taxpayers. Money spent today on preventative measures can significantly reduce the cost of post-disaster cleanup tomorrow. University-based state Sea Grant programs are battling on the front lines to prevent and reduce the risks arising from hurricanes and coastal erosion by conducting problem-oriented, applied research along with outreach and education.

### BLOWING AWAY

The U.S. has entered into a period of Atlantic hurricane activity more intense than any since the 1960s. The 1998 Atlantic hurricane season brought 14 tropical cyclones, including three major hurricanes. These storms inflicted \$7.3 billion in damages and 23

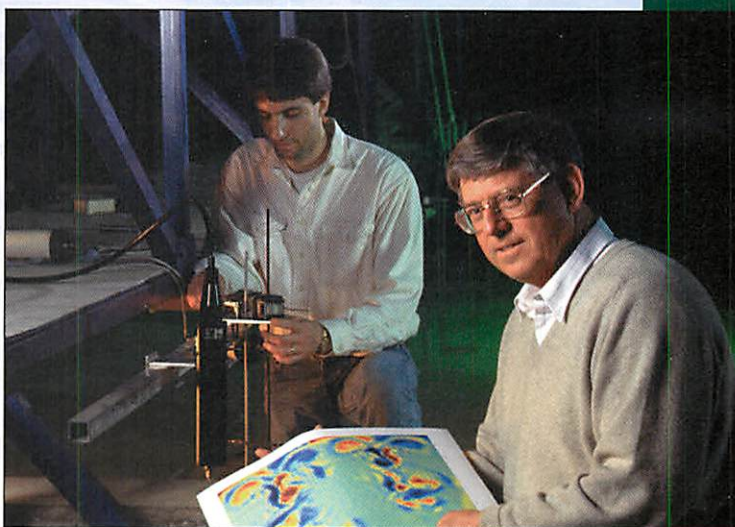


fatalities in the U.S. alone. The economic and human toll from the 1999 hurricane season has not yet been tallied. But with five major hurricanes occurring that year, the costs to the U.S. will continue to rise.

Winds accompanying hurricanes are a major threat to both life and property. Sea Grant researchers have developed inexpensive methods homeowners can use to retrofit their houses to withstand intense winds. For example, they found that roofing material secured properly with screws withstood up to five times more wind pressure than materials held in place by nails only. Or that by simply applying adhesives to the connection between plywood roofing and roof trusses, a roof's capacity to withstand hurricane wind pressures is improved by a factor of four or five.

By studying the winds of past hurricanes, Sea Grant researchers are developing a user-friendly computer application to predict the geographic extent, the wind speed, and the expected damage of future hurricanes as they approach landfall. Managers will be able to use this application to speed up disaster relief by strategically locating staging areas to store and distribute emergency supplies. By studying winds during an actual hurricane, Sea Grant scientists hope to collect information that will prove helpful in retrofitting homes so they are less vulnerable to wind damage. To collect the information, the researchers, along with state agency officials, have mounted sensors in 10 single-family homes that will measure wind pressure and speed when a hurricane hits.

In addition to looking at what happens to individual buildings during a hurricane, Sea Grant scientists are working with state and federal agencies to develop a comprehensive data bank on 1996's Hurricane Fran, which is considered a 100-year storm-surge event. This extensive database will provide a wide opportunity for analysis. For example, researchers will



DELAWARE SEA GRANT

*Assessing Coastline Changes*

be able to determine whether beach nourishment efforts were successful by comparing damage in those areas to damage outside the nourishment zone.

## SLIDING AWAY

Erosion poses many problems to coastal communities. Valuable property is being lost to erosion in all 30 states bordering an ocean or a Great Lake. Average coastline recession rates of 25 feet per year are not uncommon on some barrier islands in the Southeast, and rates of 50 feet per year have occurred along the Great Lakes. The driving forces behind this erosion are wind, waves, longshore currents, and human activity.



To protect erosion-prone buildings built near the ocean, contractors are using a new piling standard developed through Sea Grant research. This new standard requires that pilings extend at least five feet below mean sea



*Inspecting Property Damage*

level, instead of the old standard of eight feet below ground level. Hundreds of homeowners whose houses were built to these new standards are grateful to Sea Grant because their houses are still

standing and have had minimal damage after being put to the test by several hurricanes.

Sea Grant is a leader in developing coastal tools to predict shoreline changes. In collaboration with the U.S. Geological Survey, Sea Grant has created the first photomosaic maps in the nation. These maps will be used to chart the coastal erosion process on the Hawaiian Island of Oahu. In the past 50 years, coastal erosion has claimed almost one-quarter of the island's beaches, threatening its \$10 billion a year tourism industry that supports almost a third of all island jobs. By comparing digitally enhanced aerial photographs of Hawaii taken from 1949 to 1997, the researchers will be able to determine not only where erosion hazard areas exist now but also where they are likely to exist in the future, property by property, 60 years into the future.

Another unique coastal tool developed by Sea Grant is the refraction/diffraction model, which can be used to show how waves behave near harbors, inlets, and islands. Currently being used by engineering firms and govern-

ment agencies in the U.S. and abroad, this model can determine, for example, what changes in wave height might occur if a new channel were dredged near a harbor. The model thus helps users to test structures or strategies before they are implemented.

In a project that will provide valuable risk assessment tools for urban areas, a team of Sea Grant researchers from both coasts is collaborating to assess public and private sector efforts, including those of the insurance industry, to reduce the impacts of projected rising sea level over the next 50 years. Team members are combining data about storm surges, erosion, and shoreline recession into local resource assessment and impact models. This study is particularly relevant to California where much urban coastal land has been developed and where infrastructure is constructed to the shoreline's edge, but other parts of the nation experiencing the same population growth trends should also find it valuable.

Although Great Lakes beaches are not affected by the daily fluctuations of water levels that occur in ocean tidal zones, they are very susceptible to damage when storm waves, which historically have reached heights greater than 27 feet, strike the shoreline. Sea Grant researches have found evidence that Great Lakes weather patterns, and hence their water levels, wave energies and coastal damage, are linked to oceanic disturbances in both the eastern Pacific and western Atlantic oceans.

In addition to damage caused by storm waves, many coastal erosion problems in the Great Lakes are caused by human activity. Deterioration of a century-old, man-made breakwater in Grand Marais Harbor in



Michigan's Upper Peninsula has led to extensive shoaling in some areas and erosion in others. Sea Grant researchers are using historical photos, aerial photographs, and underwater videos of the harbor in conjunction with computer modeling techniques to provide solutions for revitalizing the harbor and to predict the effectiveness of those solutions. This information will be used by both local officials and residents in making decisions about restoring the harbor.

## REDUCING IMPACTS

Sea Grant researchers and outreach specialists work closely with coastal communities to educate and raise the awareness of residents and business owners about coastal hazards and actions that can be taken to reduce or eliminate their impacts. They can be found in their communities working with developers to improve the hurricane resistance of new construction, providing the public with information on coastal development regulations, working with businesses to help them recover more quickly from disasters and to educate them about hazard mitigation benefits,

or showing boat owners and marina operators how to reduce the risk of damage from hurricanes. In the wake of a hurricane, Sea Grant researchers and extension agents can be found assisting in efforts to assess the storm's environmental effects on such things as water quality, fisheries and ecosystems, and aquaculture.

In a national outreach effort, Sea Grant, along with NOAA's Coastal Services Center, has created the HazNet Web site at <http://www.haznet.org>. This site puts coastal hazard information at the fingertips of coastal managers and the public. It provides information about natural hazards and the current planning efforts and research of Sea Grant programs, NOAA, FEMA, and state and local community sources. Visitors to HazNet can find a wealth of information from advice on installing storm shutters and roof systems to data on major hurricanes. They can also get a list of contacts in coastal states who are involved in hazard efforts, as well as a bulletin board and discussion group. The site, which has been online for over a year, provides one-stop shopping for information on hurricanes, tornadoes, floods, coastal erosion, earthquakes, tsunamis, and volcanoes.

## OUTREACH GOES INTERNATIONAL

On the national front, President William Clinton has tapped Sea Grant's expertise in natural hazard mitigation and recovery to help the coastal communities of Honduras and Nicaragua rebuild after being devastated by Hurricane Mitch in the spring of 1999. With a history of research on Caribbean-related coastal hazards and of outreach to Spanish-speaking communities, Puerto Rico Sea Grant is uniquely positioned to help in this rebuilding effort. Therefore, it is coordinating a major project to assess and address the educational and technical support that Honduras and Nicaragua need in order to rebuild. The strengths of the entire Sea Grant Extension network will be used to help both nations rebuild so as to minimize the impact of future disasters. This project will also provide the foundation for developing extension/technology transfer programs in both countries.





## Taking the Pathway to Excitement

**T***he Operation Pathfinder experience can be summed up by the ancient Chinese proverb, 'Tell me, I forget. Show me, I remember.*

*Involve me, I understand.' "*

*Elaine K. Holcombe,  
sixth grade science teacher*

### THE PATHWAY

If teachers had to write the age-old, first-day-of-school English assignment, "How I spent my summer vacation," 176 teachers from around the nation would have quite an interesting story to tell. Those teachers all participated in last summer's regional sessions of Sea Grant's COAST: Operation Pathfinder. This exciting, national science education effort targets K-12 teachers and places a special emphasis on attracting teachers of minorities. The program's goals are not only to increase teachers' awareness and understanding of oceanography and coastal processes but also to improve their teaching techniques.

To accomplish these goals, teachers participating in this fully-supported 14-day

course for undergraduate or graduate credit receive a dynamic mix of marine science field work and hands-on science activities. In addition, they are exposed to a diverse group of guest presenters—formal and informal educators, Navy and Coast Guard personnel, scientists and social scientists. These presenters "bridge the gap" between the laboratory and the classroom, and make science fun, interactive and relevant to the everyday lives of the teachers and, thus, to their students.

The COAST program also emphasizes the use of technology and multi-disciplinary approaches to teaching; for example, teachers can learn how to develop Web pages for their own classrooms or how to combine science and literature lessons. Upon completing the course, participants are required to develop at least one inservice teacher training workshop or staff development program within their school or school district; infuse the course concepts and activities into their existing curricula; and submit a journal article, present a paper or demonstrate an activity at a state, regional, or national education conference.



VIRGINIA SEA GRANT

*Working on a Map Activity*



## THE EXCITEMENT

Hosted by university-based state Sea Grant programs, Pathfinder institutes are offered in six regions of the United States: the Great Lakes, Northeast, Mid-Atlantic, Gulf and South Atlantic, Pacific, and Pacific Island Network.

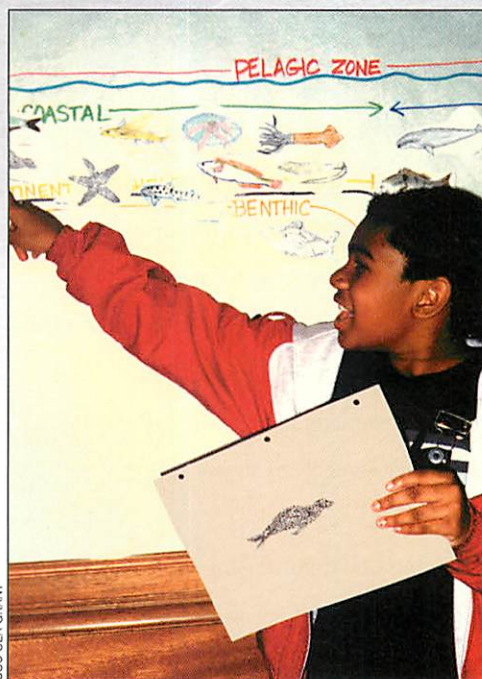
Regardless of the site, all Pathfinder teachers study six major topics:

- oceanographic physical processes,
- deep ocean discoveries and technologies,
- marine and aquatic resources,
- marine and aquatic habitats,
- marine and aquatic pollution, and
- plate tectonics.

To complement these major topics, teachers are provided an array of curricular materials including the *Oceanography and Coastal Processes Resource Guide*, which contains 81 activities that were developed and field-tested by precollege teachers. This publication is currently in its second printing and is also available on CD ROM. Both the second edition and the CD ROM are aligned with the National Science Standards, and the publication is also available on the COAST Web site at [http://www.coast-nopp.org/resource\\_guide](http://www.coast-nopp.org/resource_guide).

No matter the location, most teachers find the ample opportunities for field trips to be the most exciting part of the Pathfinder experience. For example, "Pathfinders" in the Great Lakes region braved wind, rain and the white caps of Lake Superior to reach Madeline Island. While there, they hiked on the island's beach and collected, for their classrooms, rocks that each told a story of the geological processes that shaped and continue to shape the Earth.

Halfway through the hike, the teachers found themselves surrounded by one of the island's coastal wetlands. To capture the essence of this spot for their students, the teachers collected plant samples and took photographs. After wading into one of the island's bays, the Pathfinders anchored meter sticks in the sediment, and watched amazed as the water level rose in only a matter of minutes. They all agreed that this was the highlight of their field trip—witnessing a Lake Superior seiche.



USC SEA GRANT

*Making Science Fun*

Pathfinder teachers in the Northeast region did a hydrologic transect from the Great Bay to the Isles of Shoals, taking water samples with a Van Dorn bottle and recording temperature, salinity, and dissolved oxygen at six locations on the way to their overnight stay at the Shoals Marine Laboratory, located on Appledore Island about six miles off the New Hampshire coast. Using the island like a "living laboratory" to study its rocky shore environment, the teachers collected plankton to inspect in the Shoals

## TEACHER TRAINING MULTIPLIES

During the past eight years, more than 700 teachers from the U.S., Puerto Rico, and Pacific affiliates have received Operation Pathfinder training. However, this number multiplies many times over through the required inservice training that affected an additional 14,000 teachers. Over a five-year teaching period, these nearly 15,000 teachers have the potential of reaching over 5.5 million K-12 students concerning the relevance of the world's oceans and coastlines and man's impact on these environments.



laboratory, and studied the island's gulls, cormorants, black-crowned night herons, and other birds. It was a very busy 24-hour stay on the island, one that everyone agreed was not nearly long enough.

The dynamic nature of North Carolina's Outer Banks was explored by Pathfinders in the Mid-Atlantic region during a flyover in small planes leaving from Manteo airport. Inlet migration, overwash, back marshes and development were easily seen at 500 feet. The next day, with a geologist, the teachers "ground-truthed" the same barrier island system by stopping at inlets, walking on overwash fans, and predicting which oceanfront cottages would fall into the sea on the next storm tide. The capstone to this field experience was watching the relocation of Cape Hatteras Lighthouse, slowly being moved 2,900 feet from its precarious perch next to the sea, and understanding the intricacies of retreating from shoreline erosion.

In the Gulf Coast region, Pathfinders took hiking and canoeing expeditions to experience wetlands firsthand and to collect and identify plants to press and take back to their classrooms. They also trawled for sea life and beachcombed for shells on and near the Chandeleur Islands during an 18-hour cruise aboard the 97-foot *Tommy Munro*. During this adventure, they gathered great collections of shells and

preserved marine life such as squid, crabs, mackerel, croaker, and flounder. In addition to the collections assembled for use in their classrooms, the teachers also had an opportunity to measure water-quality parameters such as salinity, pH, turbidity, temperature, and levels of dissolved oxygen.

The Pacific region field trips took the Pathfinders to a variety of locations where they were introduced to North Pacific ecosystems. On one popular field trip, teachers explored the rich variety of seashore life on local rocky shores. The characteristic assemblage of organisms and biological interactions among species were explored with Hatfield Marine Science Center scientists. Other activities involved coring for tsunami sands in local salt marshes, studying the geology of local coastal formations, and cruising an estuary to trawl for bottom dwelling organisms.

In the Pacific Island Network region, teachers from Micronesia and American Samoa participated in a reef survey of sea cucumbers. This exciting field experience integrated the ecology and biology of the reef inhabitants into a purposeful science activity that included preparation of equipment and reef information, the actual reef survey, and post-activities of analyzing the data and drawing conclusions. After arriving on the beautiful reef flat, teachers broke into transect teams to cover the 100m transect. Teachers explored



*Lighthouse Teaches About Erosion*



more of the reef flat and discovered other inhabitants. Following themes of conservation and respect for the environment, reef animals collected for brief sharing and observations were released as close as possible to the natural habitats where they were found.

## S U P P O R T E R S

The Operation Pathfinder project began as a prototype implemented, with enthusiastic support from the Oceanographer of the Navy, during the summer of 1993. In 1994, additional support from the U.S. Department of the Navy (Office of Naval Research, Naval Oceanographic Office, the Naval Research Laboratory, and the Naval Meteorology and Oceanography Command) enabled the program to expand nationwide. At this time, other support came from national and state Sea Grant programs; NOAA partners including the National Environmental Satellite, Data and Information Service, the Office of Oceanic and Atmospheric Research, and the National Ocean Service (Office of Coastal Zone Management); and from the U.S. Department of Interior's Office of Insular Affairs.

Beginning in the summer of 1998, Sea Grant's Operation Pathfinder became part of a multi-agency effort. It joined the "Consortium for Oceanographic Activities for Students and Teachers" (COAST) program, a working collaborative designed to effectively deliver oceanographic and coastal processes education to preservice and inservice K-12 teachers. The

other COAST components—the Ocean Voyagers Program and STARBOARD (Stimulating Teachers About Resources for Broad Oceanographic Research Delivery)—include an emphasis on the use of World Wide Web resources, integrated curriculum development, teacher-at-sea programs, and teacher-student research partnerships using three-dimensional computer models and unclassified data from the Navy and NOAA. This expanded program was made



*Participating in Reef Survey*

possible by the National Ocean Partnership Program. It received funding from the Office of Naval Research in cooperation with the University of Southern Mississippi, St. Norbert College, Mississippi State University, the national and state Sea Grant programs, and the National Marine Educators Association.



## Making Seafood Safer for the Nation

**W** *“Without Sea Grant’s participation, the transition to comply with the new FDA seafood safety regulations would have been extremely difficult for the industry.”*

*Roger Tollefsen, President of the New York Seafood Council*

### THE CHALLENGE

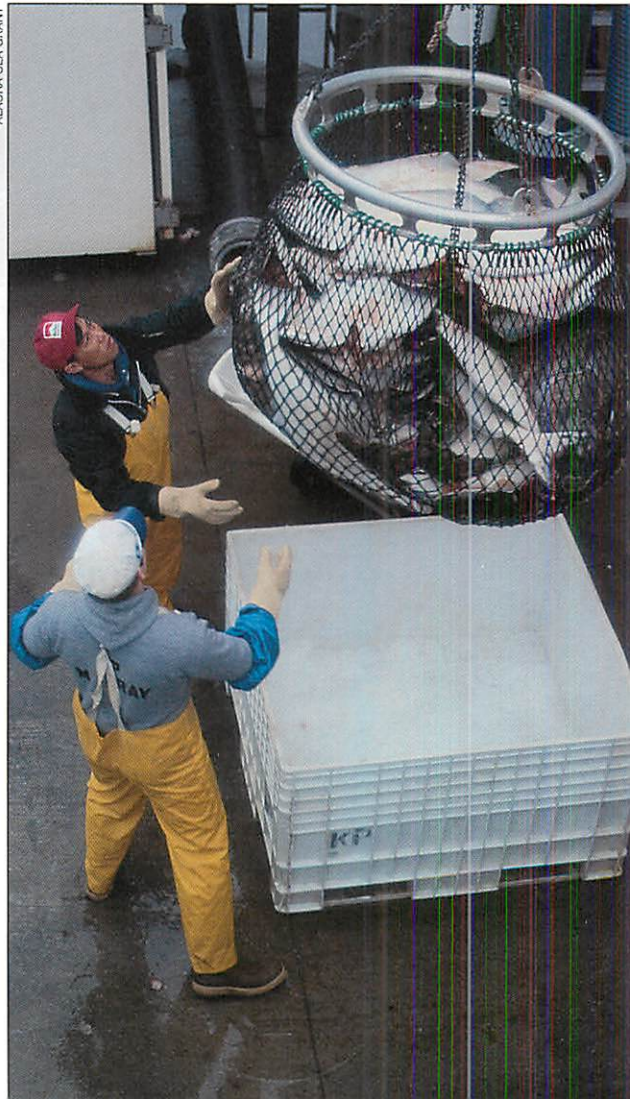
The challenge was enormous. In a short time, workers at more than 5,000 seafood processing plants nationwide would need training to meet pending U.S. Food and Drug Administration (FDA) regulations designed to assure the safety of the nation’s seafood. These mandatory regulations required that workers be trained in the proper handling of seafood and that processing plants have an approved plan to monitor key points in the processing procedures where seafood was vulnerable to contamination. In New York alone, for instance, the new regulations would affect over 600 seafood businesses that contribute more than \$1 billion to the economy of that state.

Further complicating matters, some processors would be required to develop customized procedures for each processing

method and for each species of fish and shellfish. Overall, nearly 300 commercial species of fish and fishery products are produced in the U.S. In addition, imported seafood had to meet the same stringent quality standards.

Called HACCP for “Hazard Analysis and Critical Control Point,” the new food inspection system represented a unified, straightforward commonsense approach to food safety that could reverse negative perceptions held by some consumers about seafood. Initially developed in the 1960s for the U.S. space program, the HACCP system uses methods designed to avoid or minimize potential risks before they occur rather than look for problems after it is too late to correct them.

ALASKA SEA GRANT



*Seafood Safety from Processing Plant to Table*



HACCP is essentially a self-inspection system designed to deal with the aspects of production that most readily lead to product deterioration. It involves analyzing hazards specific to a particular food product and determining where in a processing or handling operation the hazards should be controlled. The seafood processors then institute necessary controls and monitor them by maintaining careful records to demonstrate to regulatory authorities and, ultimately, to consumers that the HACCP program is in place and working. Now becoming the world standard for food safety, HACCP is required by the European Union and is widely used in Canada.

## MEETING THE CHALLENGE

The university-based Sea Grant Program was uniquely positioned to help address the educational challenge posed by the new FDA regulations. For more than three decades, Sea Grant-funded researchers had been conducting research on seafood safety. To take this information out of the laboratory and into the field, Sea Grant had a network of marine extension agents who worked daily with seafood processors at the local level. It also had a corps of communicators and educators skilled in bringing, in plain language, the results of Sea Grant research to industry and the public.

Anticipating the potential regulations, Sea Grant spearheaded the formation of a partner-



SUZANNE PAISLEY

*Handling Seafood Properly*

ship known as the "Seafood HACCP Alliance." The partners included the Sea Grant network of universities, the FDA, the Association of Food and Drug Officials, and the Interstate Shellfish Sanitation Conference. Other partners in the alliance were NOAA's National Marine Fisheries Service (NMFS); the U.S. Department of Agriculture's Cooperative State Research, Education and Extension Service; the National Fisheries Institute; the National Food Processors Association; and state agencies that deal with health, food safety, and commerce.

The alliance, a unique success story of intergovernmental agency partnership and collaboration with industry and academia, was formed to meet the needs of education and training called for by the FDA regulations. Its goal was to insure the safety and quality of seafood consumed in the U.S. by developing a unified HACCP education, training, certification and technical assistance program for the nation's thousands of seafood inspectors, workers and importers.

At the core of the training effort was a 200-plus page training manual with complementary



visual training materials. Written with FDA guidance and containing contributions from Sea Grant researchers, this manual was edited, designed, printed, and distributed by Sea Grant. It was structured to train a dual audience of processing workers as well as inspectors, mindful of regional differences and existing educational networks.

The manual explaining the HACCP concept is easy to understand. It has been revised and reprinted three times and translated into six languages. To date, more than 7,000 copies of the guide have been sold in the U.S. and abroad.

In cooperation with the FDA, Sea Grant also helped develop a three-day training program that was used widely by both the Sea Grant network and NMFS to train the trainers. Using the manual, a cadre of 590 trainers conducted over 350 HACCP courses, yielding 11,000 graduates—90 percent domestic and 10 percent international with 75 percent representing commercial interests and 17 percent regulatory interests. The alliance's efforts influenced more than 5,000 seafood processing firms in the U.S. and 5,900 importers and their international suppliers.

For processors who needed help drafting their individual HACCP plans, Sea Grant specialists around the country wrote a series of generic plans to serve as models. To speed the circulation of these models and to make it possible to update and refine them quickly, they

were mounted on the Sea Grant-developed alliance Web site at <http://seafood.ucdavis.edu/haccp/ha.htm>. Dubbed "HACCP-central" by *Seafood Leader* magazine, the Web site also contains a compendium of fish and fishery product processes, hazards, and controls compiled by Sea Grant.

Sea Grant programs from coast to coast served as informal information centers for state processors who needed to know about the new regulations or where to go for training. In addition, with the help of Sea



*Maintaining Careful Records*

Grant, seafood safety-related questions needing further attention were identified and distributed to agencies supporting ocean and coastal research.

Training the seafood industry in just two short years was a big undertaking. It was truly a national project with impacts in every state in the nation plus every U.S. territory. Twenty nations exporting to the U.S. also received HACCP alliance training. All 29 Sea Grant programs were members of the alliance with

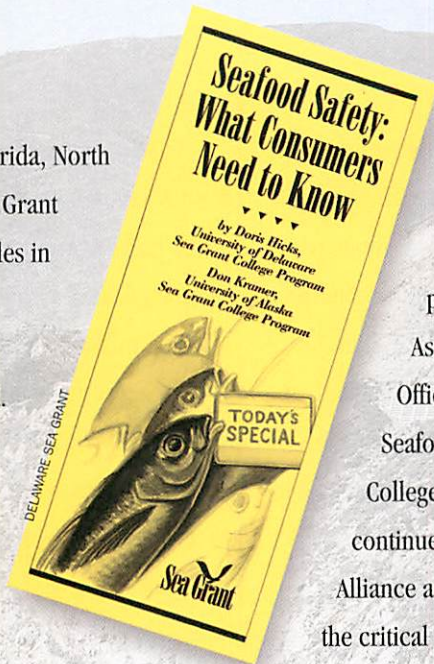


the Alaska, California, Florida, North Carolina and Virginia Sea Grant Programs playing lead roles in their particular regions.

Support for the new regulations is widespread. Managers of seafood processing plants have reported that the HACCP system has returned profits in the form of increased efficiency. In addition, a recent survey of 144 commercial firms located across eight states found that all respondents felt the alliance training course provided them with a basic understanding of HACCP principles and 98 percent indicated that, by the end of the course, they understood what actions they needed to take in order to comply. Eighty-three percent indicated they would not have been able to develop a HACCP plan to comply with the FDA regulations without the training course. Furthermore, the FDA has estimated that the new regulations will prevent 20,000 to 60,000 seafood-related illnesses a year, which could cost consumers as much as \$115 million annually.

## A NEW CHALLENGE

From its initial concept, the Seafood HACCP Alliance was formed to develop training programs that would become self-sustaining, and this goal has been largely achieved. The goal of HACCP adoption by industry has also been accomplished. However, during recent FDA and state regulatory inspections, it was discovered that many firms need further



training in sanitation operating procedures.

With funding for the project ending in July 1999, the Association of Food and Drug Officials, the FDA Office of Seafood, and the National Sea Grant College Program teamed up to continue support of the Seafood HACCP Alliance and its important work through the critical transition to the year 2000.

With this support, a new training program on "Sanitation Control Procedures" will be launched to address industry deficiencies in properly monitoring sanitation. Information about this training program, a one-day course offered with a certificate of completion, will be posted on the Web in the spring of 2000. In addition to helping guide the seafood HACCP implementation efforts, Sea Grant will also continue to enhance seafood safety through innovative research projects.



## ALLIANCE WINS HAMMER AWARD

Using its ability to pull together existing resources and programs and to coordinate efforts, the National Sea Grant Network was able, for less than \$85,000 a year, to provide the necessary training to help implement a revolutionary inspection process for the entire U.S. seafood industry and for seafood importers. In recognition of its innovative approach and success in working with industry, the alliance received Vice President Albert Gore's National Performance Review Hammer Award. This award is presented to "partnerships that make a significant contribution in improving the way federal agencies accomplish their responsibilities."



## Financial Report

In FY 1998, the annual operating budget for the National Sea Grant College Program was \$99.2 million.\* Approximately 56 percent of these funds came from federal appropriations of \$56 million. Matching funds from state partners accounted for about 31 percent of the total. Pass-through funds coming from NOAA and other agencies and prior year deobligations from FY 1997 accounted for the remaining 13 percent of the total.

In FY 1999, the annual operating budget for the National Sea Grant College Program was \$99.6 million. Approximately 58 percent of these funds came from federal appropriations of \$57.5 million. Matching funds from state partners accounted for about 33 percent of the total. Pass-through funds coming from NOAA and other agencies and carryover funds from FY 1998 accounted for approximately 9 percent of the total.

\* Funds from other state and federal sources are managed by individual Sea Grant programs independent of those managed by the National Sea Grant Office that are shown here.

### Sea Grant FY 1998 & FY 1999 Financial Report

(In thousands)

Fiscal Year	1998	1999
Appropriation*	\$56,000	\$57,500
Rescission**	0	(211)
Prior year carryover	0	761
Prior year deobligations	428	212
<b>Available Funding</b>	<b>\$56,428</b>	<b>\$58,262</b>
Sea Grant Core Programs	42,307	42,914
National Competitions		
Oyster Research	2,621	2,471
Marine Biotechnology Research	2,461	1,981
Nonindigenous Species Program	1,110	2,375
Coastal Technology	1,216	1,896
Sea Grant National Outreach	515	560
Sea Grant/NOAA Research Partnerships	540	545
Harmful Algal Bloom Research***	0	563
<b>Total</b>	<b>8,463</b>	<b>10,391</b>
Other Network Activities		
Rapid Response Fund	246	231
Network Communications	400	427
SBIR Grants	644	751
Knauss Fellowship Program	360	360
Miscellaneous Programs	533	123
<b>Total</b>	<b>2,183</b>	<b>1,892</b>
Total Grants Awarded	52,953	55,197
NSGO Program Management Costs****	2,714	2,964
Accounting Error/Rent Shortfall*****	0	76
<b>Total Expenditures</b>	<b>\$55,667</b>	<b>\$58,237</b>
Carryover	761	25

\* Pass-through funds, which are received from NOAA components and other federal agencies, are not included in these figures. These funds, which were managed by Sea Grant programs, amounted to an additional \$12,075,865 in FY 1998 and \$8,319,299 in FY 1999.

\*\* Steel, oil and gas rescission, enacted late in FY 1999 by Congress and signed by the President, required government-wide reduction in outlays.

\*\*\* Funds carried over from savings in prior year's program management costs.

\*\*\*\* The NSGO administrative costs increased substantially as a result of an increase in administrative overhead from NOAA. Carryover funds were used to cover the administrative funding shortfall.

\*\*\*\*\* An end-of-year accounting error occurred that was below the threshold for adjustment. In addition, NOAA charged the Sea Grant program a proportionate share of the NOAA-wide rent shortfall.



## Financial Report Explanatory Notes

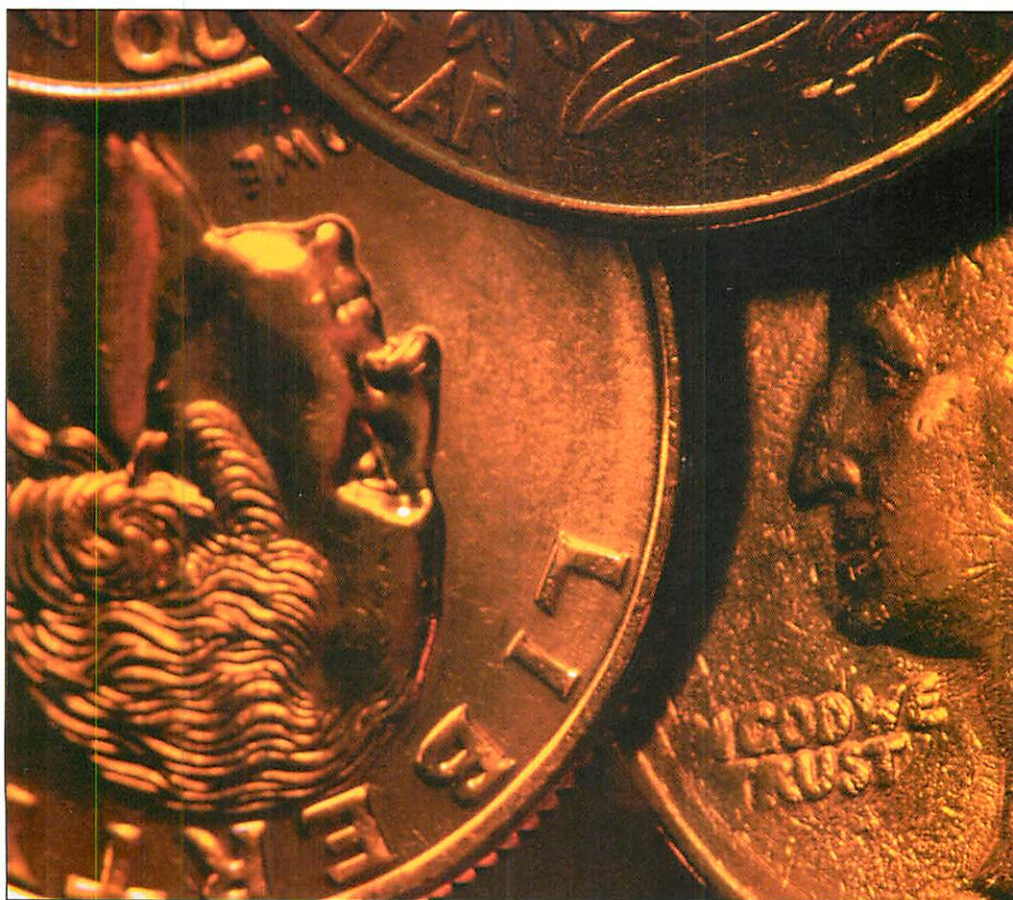
### SEA GRANT CORE PROGRAM

■ Sea Grant invested \$85.2 million during FYs 1998 and 1999 in the core program, which is composed of 29 Sea Grant colleges and institutions. Each of these 29 individual programs is responsible for developing an integrated approach to solving marine and coastal problems through merit-reviewed research, education, and outreach activities. The core programs draw upon the academic talent not only in their institutions but also through a wider network that has grown to encompass over 200 participating universities and other marine organizations throughout the nation. Federal oversight of the program is conducted by NOAA's National Sea Grant Office.

### NATIONAL COMPETITIONS

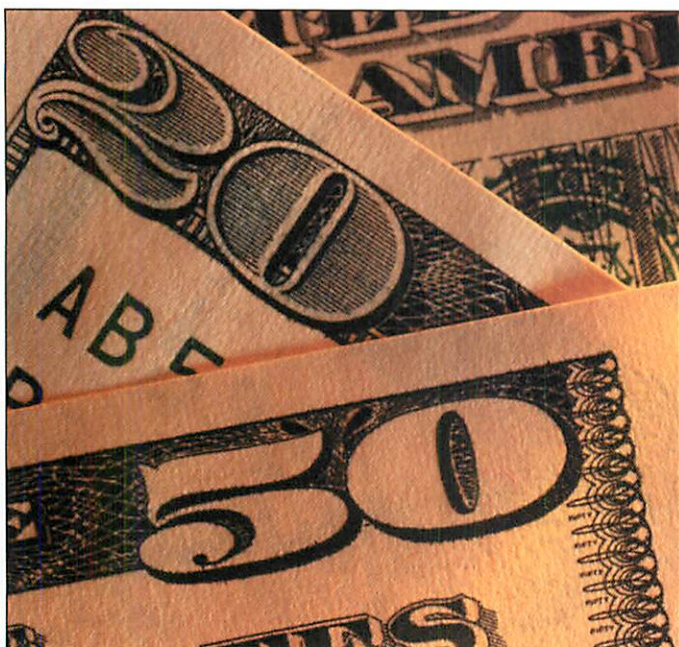
■ Sea Grant made grant awards of \$5.1 million in FYs 1998 and 1999 for Oyster Research. The goal of this program is to develop a better understanding of oyster diseases while enhancing development of effective bioremediation technologies. A total of \$1,950,000 was devoted specifically to research addressing human pathogens in Gulf Coast oysters.

■ Sea Grant's marine biotechnology program totaled \$4.4 million in FYs 1998 and 1999. The following areas were emphasized: environmental remediation, marine natural products, seafood and aquacultural pathogens, and biotechnology to enhance aquaculture.





■ Sea Grant awarded \$3.5 million in FYs 1998 and 1999 in research and outreach grants through national competitions to address the problem of nonindigenous species invasions of marine and Great Lakes coastal ecosystems.



The goals of this program are to prevent new introductions, control the spread of established species, and provide information to mitigate the damage from established populations.

■ Sea Grant made awards of \$3.1 million in coastal technology development grants during the two reporting years. The program's objectives are technology development/transfer and enhancement of interactions between academia and industry. Expenditures were made in FY 1998 to support prior year commitments on grants to the National Coastal Resources Research and Development Institute (\$1 million). The remainder supported awards in aquaculture technology (\$728,000), industrial graduate fellowships (\$673,000) and other coastal-related technologies.

■ Sea Grant invested approximately \$1.1 million in FYs 1998 and 1999 on competitive grants to support innovative outreach programs. Awards were made to develop nationally coordinated efforts in enhancing retail seafood quality and safety, catch and release techniques in fisheries, hazard mitigation, habitat restoration, environmental economics, and marine sciences career information.

■ Sea Grant invested approximately \$1.1 million over two years in the Sea Grant/NOAA Partnership Program, which supported research between individual Sea Grant academic researchers and NOAA's National Marine Fisheries Service, National Ocean Service, and Office of Oceanic and Atmospheric Research. Awards were made in such areas as stock analyses, coastline mapping, and hydrothermal vent microbes. This highly successful program generated almost \$3 million in additional matching state and federal support.

■ Sea Grant invested \$563,000 in FY 1999 to support the Ecology and Oceanography of Harmful Algal Blooms (ECOHAB) federal interagency program, particularly on studies to determine the economic impacts of harmful algal blooms and to develop methods to mitigate their impacts on aquaculture. Awards were made through local Sea Grant programs.

## OTHER NETWORK ACTIVITIES

■ In FY 1998, Sea Grant created a rapid response fund to allow programs to respond to unforeseen opportunities and natural disasters. Approximately \$250,000 was budgeted in each year for such events. Because of this fund,



individual Sea Grant programs were able to respond rapidly to events such as El Niño, Hurricane Mitch, *Pfiesteria* algal blooms, and severe coastal flooding.

■ Sea Grant invested \$827,000 during FYs 1998 and 1999 to support Network Communications projects such as the *Sea Grant Abstracts* quarterly, the National Sea Grant Depository, the National Media Relations Center, and network publications.

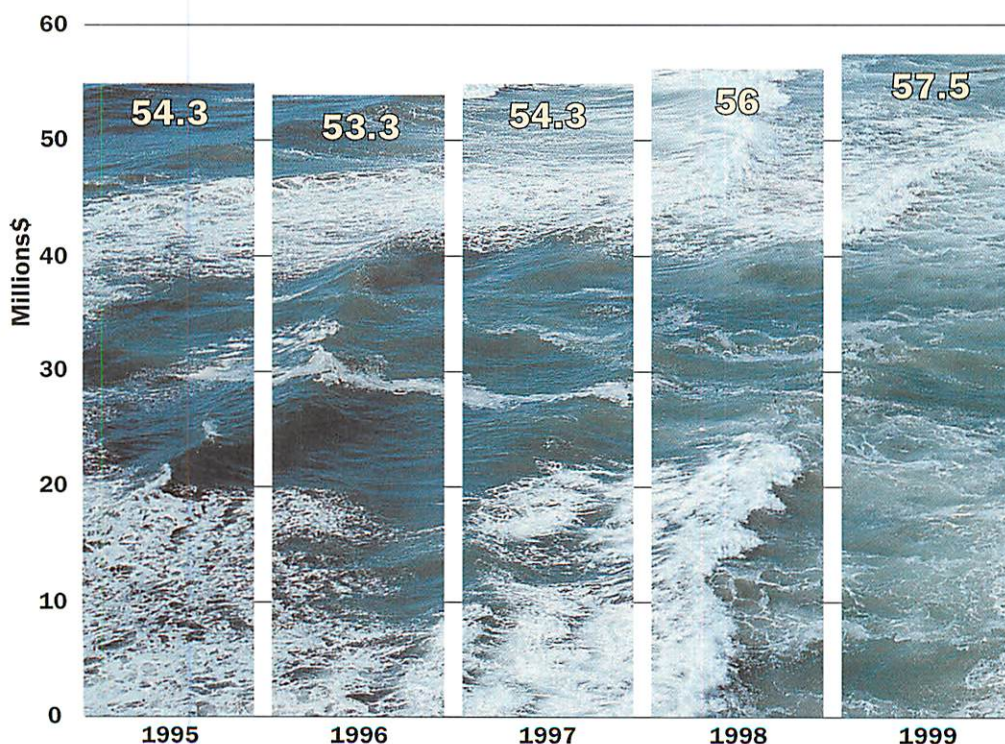
■ Sea Grant invested \$1.4 million during FYs 1998 and 1999 in NOAA's Small Business Innovation Research (SBIR) Program. This Congressionally mandated program provides funding for research projects to assist small businesses in developing commercial products. Principal investments were made in areas such as algal bloom sensor technology, aquaculture filter systems, autonomous underwater vehicle mapping systems, pompano rearing technology,

and shrimp feed development.

■ Sea Grant invested \$720,000 in FYs 1998 and 1999 to support the Knauss Fellowship Program, established to provide an opportunity for graduate students to work in government agencies and Congress on national policy decisions affecting ocean and Great Lakes resources.

■ Sea Grant made investments in several miscellaneous programs accounting for grants totaling \$656,000. Principal elements of these investments include support to enhance marine science education of Minority Serving Institutions located in Sea Grant states (\$250,000) and prior commitments to the HACCP Seafood Alliance Program (\$100,000). The remainder went primarily to grants to universities not served by Sea Grant programs and to an ongoing teacher training effort, the very successful Operation Pathfinder Program.

**Sea Grant Appropriations  
FYs 1995 - 1999**





## SEA GRANT FUNDING BY STRATEGIC PLAN

The following charts show the level of effort within the Sea Grant network during FYs 1998 and 1999 according to the *Sea Grant Network Plan*. This plan was developed in conjunction with the strategic planning efforts of the Department of Commerce's National Oceanic and Atmospheric Administration. The plan, which identifies priorities and charts the Sea Grant network's direction for the decade 1995-2005, focuses on three broad portfolios: Economic Leadership; Coastal Ecosystem Health and Public Safety; and Education and

Human Resources. Following are the key action areas identified within these portfolios:

### ECONOMIC LEADERSHIP:

commercial biotechnology; environmental technology; commercial fisheries; sustainable aquaculture; seafood technology; coastal business development; coastal community development; and revitalizing marine infrastructure.

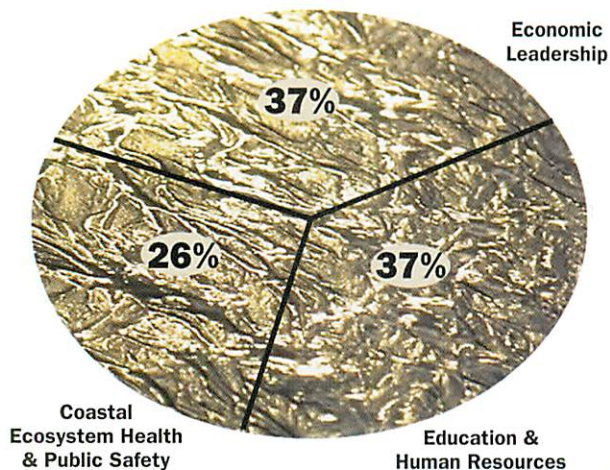
### COASTAL ECOSYSTEM HEALTH AND PUBLIC SAFETY:

coastal ecosystems; coastal and Great Lakes habitats; sustainable development; coastal hazards; and safety at sea.

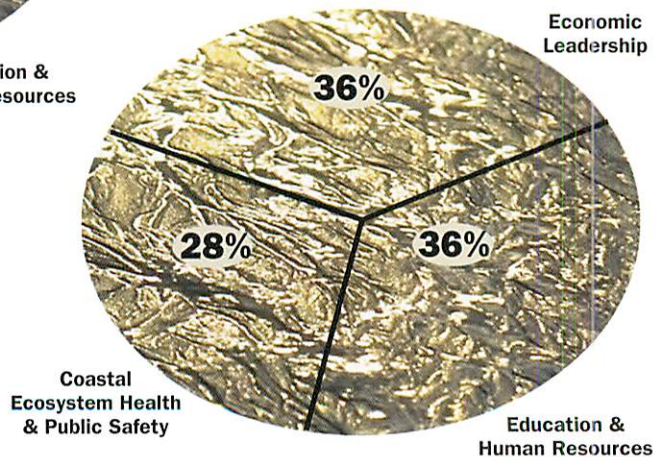
### EDUCATION AND HUMAN RESOURCES:

education of scientists, engineers, and resource managers; technical training; precollege education; and informal education (outreach).

**Total FY 1998  
Grant Funding \$95.8M  
Federal, Match & Pass-Through  
by Sea Grant Strategic Plan Category**



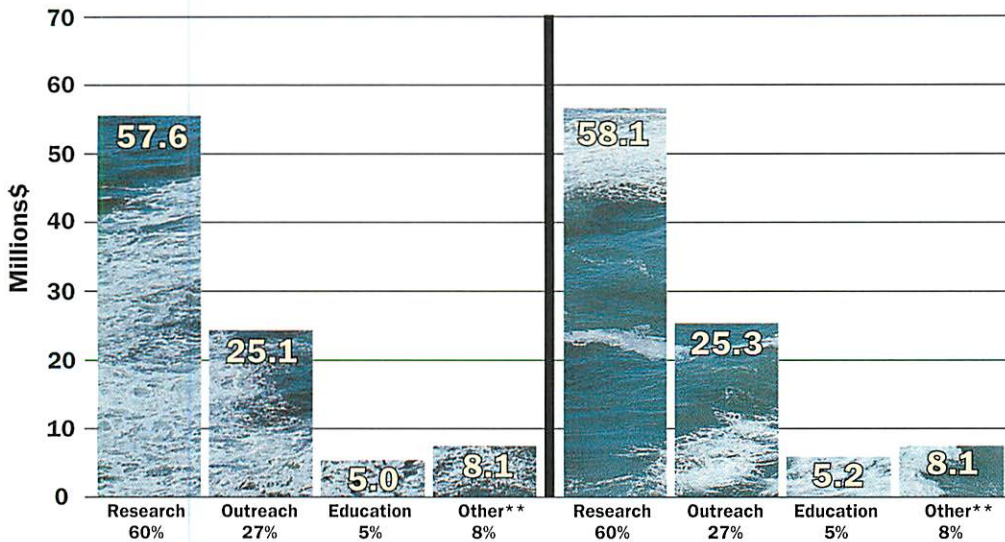
**Total FY 1999  
Grant Funding \$96.7M  
Federal, Match & Pass-Through  
by Sea Grant Strategic Plan Category**





**Grant Award Categories\***  
FY 1998 - \$95.8M Total

**Grant Award Categories\***  
FY 1999 - \$96.7M Total



\*Does not include NOAA administration expenditures.

\*\*Includes program development and administration expenditures at local Sea Grant programs.

## SEA GRANT FUNDING FOR RESEARCH, EDUCATION, AND OUTREACH

The charts above show Sea Grant's level of investment during FYs 1998 and 1999 in the broad areas of research, education, and outreach. In addition, other costs including program administration and development are shown. A few explanatory notes:

■ **Research** in Sea Grant supports over 500 projects per year across the full spectrum of the marine sciences—from aquaculture, biotechnology, coastal processes, and estuarine studies to fisheries, habitat restoration, ocean engineering, seafood technology, and water quality. Also included here are the regional and program development funds that seed research efforts and provide support for graduate research assistants.

■ **Education** in Sea Grant includes efforts such as development of precollege curricula, training of K-12 teachers in the marine sciences, fellowship opportunities for policy study in Washington, D.C., and for research with industry, and support for graduate research assistants (except for those cases where such assistants are included in specific research project budgets as above).

■ **Outreach** in Sea Grant includes both the extension service and the communications activities of the individual Sea Grant programs. These activities facilitate the rapid transfer of scientific information in forms that can be readily understood by coastal clients and other users.

■ **Program Administration** in Sea Grant relies significantly on local university-based management who help shape and manage programs that draw upon the strengths of academic institutions to address critical coastal and Great Lakes issues.



## Funding Summary

Funding Summary by Program/State			
1998			
	Federal*	Matching	Total
Alaska	1,407,081	884,819	2,291,900
California	4,499,075	2,369,958	6,869,033
Connecticut	838,600	494,166	1,332,766
Delaware	1,241,568	1,020,127	2,261,695
Florida	2,101,530	1,082,749	3,184,279
Georgia	1,302,865	779,581	2,082,446
Hawaii	2,027,284	1,261,580	3,288,864
Illinois/Indiana	948,525	684,117	1,632,642
Louisiana	2,584,779	1,747,424	4,332,203
Maine/New Hampshire	2,054,146	1,103,018	3,157,164
Maryland	2,083,832	1,131,633	3,215,465
MIT	1,915,615	1,164,545	3,080,160
Michigan	1,218,789	707,936	1,926,725
Minnesota	960,137	498,040	1,458,177
Mississippi/Alabama	1,218,765	763,282	1,982,047
New Jersey	988,258	799,460	1,787,718
New York	2,435,305	1,379,976	3,815,281
North Carolina	1,671,661	960,743	2,632,404
Ohio	1,145,563	668,926	1,814,489
Oregon	2,558,532	1,657,785	4,216,317
Puerto Rico	873,000	770,325	1,643,325
Rhode Island	1,990,149	995,076	2,985,225
South Carolina	1,759,519	1,186,334	2,945,853
Texas	1,748,186	955,832	2,704,018
Univ. of S. Calif.	752,000	413,053	1,165,053
Virginia	1,876,710	957,462	2,834,172
Washington	2,835,314	1,556,264	4,391,578
Wisconsin	2,340,483	1,400,000	3,740,483
Woods Hole	1,264,188	777,739	2,041,927
Independent/Other**	2,311,640	562,340	2,873,980
<b>Grand Total:</b>	<b>52,953,099</b>	<b>30,734,290</b>	<b>83,687,389</b>

\*Sea Grant appropriated funds only; pass-through funding not included.

\*\*Funds used to support the National Coastal Resources Research & Development Institute, Small Business Innovative Research Program, and grants to university investigators in non-coastal states.



## Funding Summary by Program/State

1999

	Federal*	Matching	Total
Alaska	1,404,013	707,184	2,111,197
California	5,089,254	2,711,888	7,801,142
Connecticut	1,050,065	465,680	1,515,745
Delaware	1,420,131	1,642,293	3,062,424
Florida	2,694,164	1,527,239	4,221,403
Georgia	1,148,285	629,505	1,777,790
Hawaii	2,239,533	1,385,135	3,624,668
Illinois/Indiana	1,281,916	778,370	2,060,286
Louisiana	2,121,234	1,499,439	3,620,673
Maine/New Hampshire	1,907,352	1,239,413	3,146,765
Maryland	1,824,756	1,129,579	2,954,335
MIT	2,060,582	1,298,711	3,359,293
Michigan	1,473,655	843,512	2,317,167
Minnesota	1,151,512	616,603	1,768,115
Mississippi/Alabama	1,482,042	887,316	2,369,358
New Jersey	1,245,872	878,399	2,124,271
New York	3,106,164	1,542,336	4,648,500
North Carolina	2,018,179	1,110,257	3,128,436
Ohio	1,215,852	720,852	1,936,704
Oregon	2,338,353	1,807,176	4,145,529
Puerto Rico	958,090	866,802	1,824,892
Rhode Island	2,264,305	1,134,990	3,399,295
South Carolina	1,601,510	867,411	2,468,921
Texas	2,040,028	1,050,608	3,090,636
Univ. of S. Calif.	746,000	504,096	1,250,096
Virginia	1,936,740	1,030,688	2,967,428
Washington	2,851,327	1,535,086	4,386,413
Wisconsin	1,936,286	1,628,632	3,564,918
Woods Hole	1,244,444	714,472	1,958,916
Independent/Other**	1,345,246	349,669	1,694,915
<b>Grand Total:</b>	<b>55,196,890</b>	<b>33,103,341</b>	<b>88,300,231</b>

\*Sea Grant appropriated funds only; pass-through funding not included.

\*\*Funds used to support the Small Business Innovative Research Program and grants to university investigators in non-coastal states.



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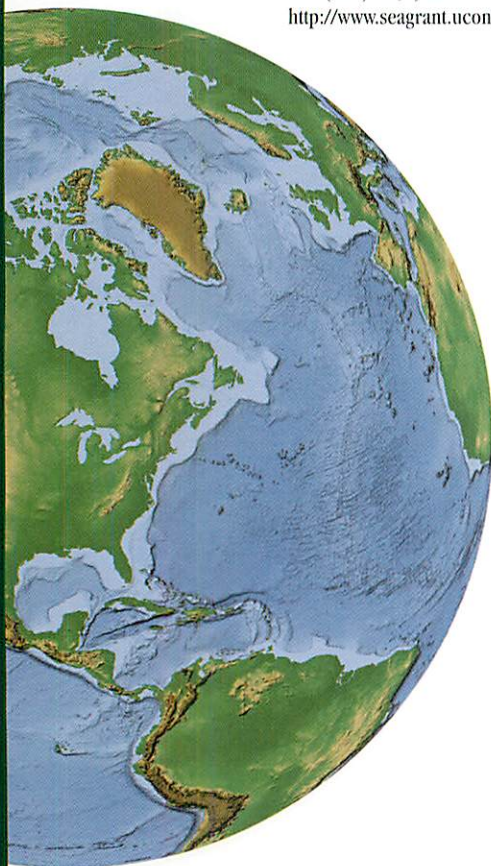
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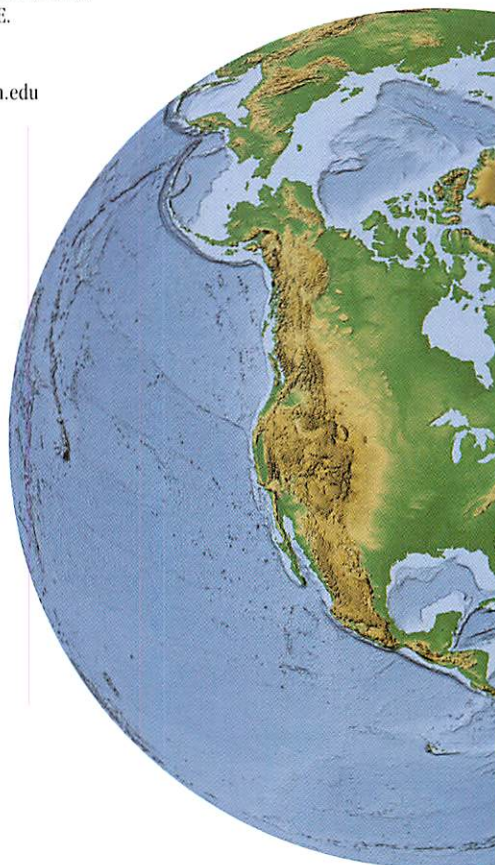
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\*Sea Grant College (total 27)  
 (ME-NH=1, IL-IN=1)  
 +Institutional Program (2)





## Regional Web Sites and Other Resources



**LOCATION MAP WITH REGIONAL  
AND LOCAL PROGRAM HOT LINKS**  
[http://www.nsgo.seagrant.org/  
NationalSeaGrant.html](http://www.nsgo.seagrant.org/NationalSeaGrant.html)

**NATIONAL SEA GRANT  
DEPOSITORY**  
<http://nsgd.gso.uri.edu/>

**NATIONAL SEA GRANT NEWS  
MEDIA CENTER**  
<http://www.seagrantnews.org>

**NORTHEAST REGION**  
<http://web.mit.edu/seagrant/northeast/>

**MID-ATLANTIC REGION**  
<http://www.mid-atlantic.seagrant.org>

**SOUTHEAST REGION**  
[http://gnv.ifas.ufl.edu/~seaweb/  
homepage/seagul.htm](http://gnv.ifas.ufl.edu/~seaweb/homepage/seagul.htm)  
(Southeast regional home page also  
includes Gulf region)

**GULF REGION**  
[http://gnv.ifas.ufl.edu/~seaweb/  
homepage/seagul.htm](http://gnv.ifas.ufl.edu/~seaweb/homepage/seagul.htm)  
(Gulf regional home page also includes  
Southeast region)

**GREAT LAKES REGION**  
[http://www.seagrant.wisc.edu/  
greatlakes/glnetwork/](http://www.seagrant.wisc.edu/greatlakes/glnetwork/)

**PACIFIC REGION**  
[http://www.wsg.washington.edu/  
regional/region.html](http://www.wsg.washington.edu/regional/region.html)

**PENNSYLVANIA SEA GRANT**  
[http://www.pserie.psu.edu/seagrant/  
seagindex.htm](http://www.pserie.psu.edu/seagrant/seagindex.htm)

**OTHER SEA GRANT RESOURCES**  
AquaNIC (Aquaculture Network  
Information Center)  
<http://aquanic.org>

BRIDGE (Teacher Resource Center)  
<http://www.marine-ed.org/>

HazNet (Coastal Hazards)  
<http://www.haznet.org>

MarinaNet (A Network Marine Trades  
Project)  
<http://seagrant.orst.edu/crt/>

Marine Science Careers  
<http://www.marinecareers.net>

Mississippi-Alabama Sea Grant Legal  
Program  
<http://www.olemiss.edu/pubs/waterlog/>

Sea Grant Nonindigenous Species Site  
(SGNIS)  
<http://www.ansc.purdue.edu/sgnis/>

Northeast Network Aquatic Exotic News  
[http://www.ucc.uconn.edu/~wwwsgo/  
aen.html](http://www.ucc.uconn.edu/~wwwsgo/aen.html)

*Pfiesteria piscicida* Information Site  
[http://www.mdsg.umd.edu/fish-health/  
pfiesteria](http://www.mdsg.umd.edu/fish-health/pfiesteria)



