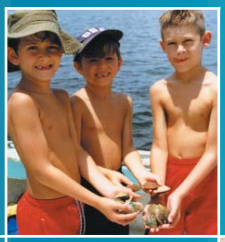
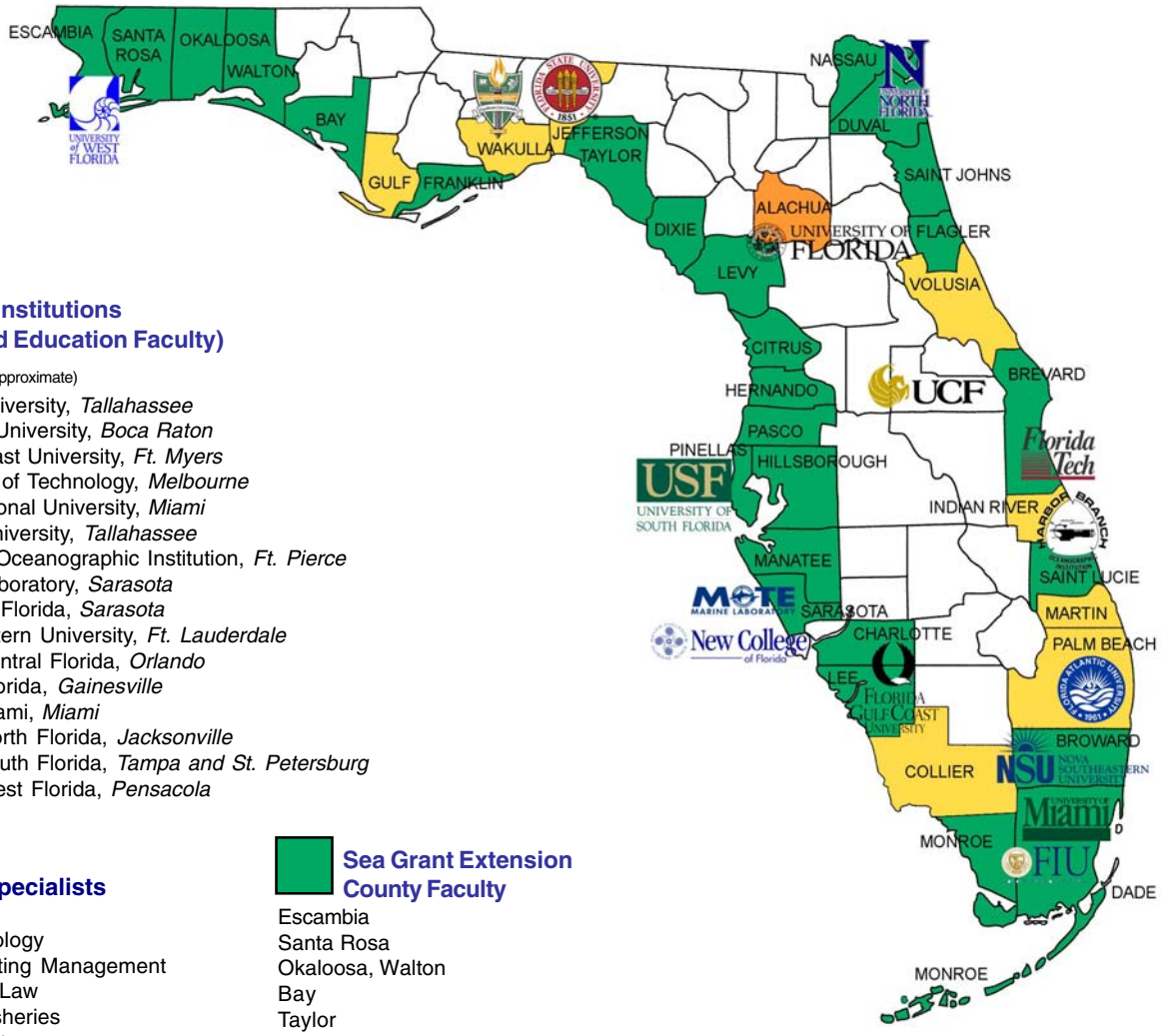
Sea Grant
Florida

Florida Sea Grant College Program Strategic Plan 2006 through 2009



Florida Sea Grant is a statewide program based at the University of Florida that partners NOAA Oceanic and Atmospheric Research with Florida universities, marine research organizations, businesses, governments and citizens.

Florida Sea Grant College Program
Academic Community of Marine Research, Education and Extension



Participating Institutions (Research and Education Faculty)

(Locations shown are approximate)

Florida A&M University, *Tallahassee*
Florida Atlantic University, *Boca Raton*
Florida Gulf Coast University, *Ft. Myers*
Florida Institute of Technology, *Melbourne*
Florida International University, *Miami*
Florida State University, *Tallahassee*
Harbor Branch Oceanographic Institution, *Ft. Pierce*
Mote Marine Laboratory, *Sarasota*
New College of Florida, *Sarasota*
Nova Southeastern University, *Ft. Lauderdale*
University of Central Florida, *Orlando*
University of Florida, *Gainesville*
University of Miami, *Miami*
University of North Florida, *Jacksonville*
University of South Florida, *Tampa and St. Petersburg*
University of West Florida, *Pensacola*

State Specialists

Economics
Seafood Technology
Waterways/Boating Management
Marine/Coastal Law
Recreational Fisheries
Fisheries Habitat
Coastal Planning
Estuaries

Management

Research
Extension
Education
Communication

Sea Grant Extension County Faculty

Escambia
Santa Rosa
Okaloosa, Walton
Bay
Taylor
Franklin
Dixie, Levy
Citrus, Hernando, Levy, Pasco, Pinellas
Hillsborough, Manatee, Sarasota
Charlotte
Lee
Monroe
Miami-Dade
Broward
St. Lucie
Brevard
Nassau, Duval, St. Johns, Flagler

Counties in need of Sea Grant Extension County Faculty

Gulf
Wakulla
Jefferson
Collier
Palm Beach
Martin
Indian River
Volusia

Cover Photos:
Boys with scallops, courtesy Mary Craven, Citrus County Tourist Development Council. Doctorfish, courtesy Luiz Rocha. Underwater dive scenics, Florida Sea Grant. All remaining photos courtesy UF/IFAS.

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Florida Sea Grant College Program
Strategic Plan
2006 through 2009

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Introduction

The Florida Sea Grant College Program (FSG) is committed to enhancing the practical use and conservation of coastal and marine resources for a sustainable economy and environment in a state with a coastline that stretches for 1,350 statute miles. The beginning year of this strategic plan, 2006, represents the 36th year for Sea Grant in Florida. The program operates through a statewide research, education and extension partnership of state and federal agencies, businesses and citizens. All eleven public universities, three private universities and two private nonprofit research laboratories constitute this virtual college without walls. Florida Sea Grant is one of 32 Sea Grant programs nationwide that together form the National Sea Grant College Program as authorized by federal legislation. It is the only university-based, statewide coastal research, education, extension/outreach and communications program in Florida.

Mission

Florida Sea Grant's mission is to enhance the practical use and conservation of coastal and marine resources to create a sustainable economy and environment. In a few words, it is "Science Serving Florida's Coast."

Setting

For Florida's 17 million residents and about 78 million annual visitors, the coast and its resources are a major attraction and an important part of their environment. Nowhere else in the United States are so many people so close to such an extensive and economically valuable coastline. Florida's population in the "coastal corridor," the 35 counties that touch the coastline, represents almost 80 percent of the state's residents. By 2025, the state's population is predicted to reach 23.2 million, meaning an additional 5.0 million people will live in the coastal counties – a growth rate roughly equivalent to adding one new city of Tampa each year.

A visit to Florida's shore reveals incomparable natural beauty. It also reveals a set of resources for which intense competition exists. Sport and commercial fisheries, recreational beach activities, boating, marinas, unique ecologies, productive wetlands, scenic views, urban and rural development, heavy and intense industrial use and the amenity-based economic and social lives of our coastal communities have all combined to place Florida's development and management in a fragile balance.

Working together, all Floridians must find a socially acceptable way to satisfy the demand for these resources while protecting their ecological integrities. Florida Sea Grant is poised to assist in solving problems that are created by this setting and to create opportunities to do so through its university base.

Partners

Agency Partners

Florida Sea Grant is located in a state with a wealth of complementary local, state and federal agencies that constitute potential partners in programs. In fact, most of them have partnered with Florida Sea Grant in recent years. Many county and city governments have marine/coastal/environmental departments with which Florida Sea Grant marine agents cooperate. Counties also partner in providing funding for the statewide Sea Grant Extension Program. Regional organizations also exist; two notable ones are the West Coast Inland Navigation District and the Florida Inland Navigation District. Cooperation is also sought with national and regional agencies not located in Florida (e.g., NOAA's Coastal Services Center and the Atlantic States and Gulf States marine fisheries commissions) Other state and federal agencies with planned and likely collaborations are:

Florida Department of
  Agriculture and Consumer Services
    Shellfish Management
    Seafood Marketing
Florida Department of Community Affairs
    Waterfronts Florida
Florida Department of Environmental Protection
    Beaches and Coastal Systems
    Coastal Management Program
    Clean Marina Program
    Environmental Education Program
Florida Fish and
  Wildlife Conservation Commission
    Marine Fisheries Management
    Fish and Wildlife Research Institute
    Habitat and Species Conservation Program
    Boating and Waterways
U.S. Army Corps of Engineers
U.S. Department of Agriculture
    Risk Management Agency
    Cooperative State Research, Education and
      Extension Service
U.S. Environmental Protection Agency
    National Estuary Program
      Tampa Bay
      Charlotte Harbor
      Indian River Lagoon
U.S. Federal Fisheries Management Councils
    Gulf of Mexico
    South Atlantic (located in South Carolina)
U.S. Food and Drug Administration
U.S. National Oceanic and
  Atmospheric Administration
    National Marine Fisheries Service
      Southeast Fisheries Science Center
      Panama City Laboratory
      Southeast Regional Office
    Atlantic Oceanographic and
      Meteorological Laboratory
    Florida Keys National Marine Sanctuary
    National Estuarine Research Reserves
      Apalachicola Bay
      Rookery Bay
      Guana Tolomato Matanzas

Industry, Non-governmental and Other Partners

Florida Sea Grant also benefits greatly from partnerships that exist with groups that are not governmental agencies. These partners may be individual companies, associations representing a particular industry sector, non-governmental organizations and other groups ranging from local to international interests that provide funding or other resources to a Florida Sea Grant activity. Individual companies are not listed but are included implicitly through industry associations. The following list of partners is a sampling of the many organizations that have participated in a Florida Sea Grant research, extension or communications activity during the last few years; many more could actually be included. The partners cut across all nine Sea Grant goal areas, are organized by geographic setting and are representative of the 61 organizations that partnered with Florida Sea Grant from 2000-04.

Local and State

Apalachicola Oyster Dealers Association
Aylesworth Foundation for the Advancement of
    Marine Science
BioFlorida
Coastal Conservation Association of Florida
Florida Wildlife Conservation Society
Florida Audubon Society
Florida Aquaculture Association
Florida Aquarium
Florida Bar Association
Florida Lifeguard Association
Florida Marine Science Educators Association
Florida Medical Association
Florida Museum of Natural History
Florida Shore and Beach Preservation
    Association
Marine Industries Association of Florida
Old Salt Fishing Club
Organized Fishermen of Florida
Southeastern Fisheries Association
The Nature Conservancy - Florida

Regional

Atlantic States Marine Fisheries Commission
Centers for Ocean Science Education Excellence
Gulf and South Atlantic Fisheries Development
    Foundation
Gulf States Marine Fisheries Commission
Interstate Shellfish Sanitation Conference

National and International

Association of Food and Drug Officials
Gulf and Caribbean Fisheries Institute
National Fisheries Institute
National Marine Manufacturers Association
National Shrimp Processors Association
United Nations Food and Agricultural Organization

Institutional Framework

The National Sea Grant College Program was created in 1966 by federal legislation. This partnership involving the nation's best universities and a wide array of state and federal agencies, businesses and citizens is centrally linked to the U.S. Department of Commerce, National Oceanic and Atmospheric Administration. Florida Sea Grant is one of the 32 Sea Grant programs, all based within the academic structures of their state. In Florida, the program is a statewide university-based research, education and extension program, and was designated a Sea Grant College by the U.S. Department of Commerce in 1976.

Florida Sea Grant is a State of Florida Center within the state's Board of Education. State of Florida centers must 1) achieve a statewide mission, 2) have a working relationship with two or more universities and 3) be successful in leveraging external funding support. Each center operates from a host campus (for Sea Grant, the University of Florida [UF]). The management team and all support staff are housed in one office complex at UF. Research activities and general contact with the 16 universities and laboratories participating in Sea Grant are conducted through the Campus Coordinators, appointed by the presidents of their institutions. Extension and communications programs are conducted in cooperation with UF's Institute of Food and Agricultural Sciences (UF/IFAS) extension and communications network. (See Florida Sea Grant's Academic Community of Marine Research, Education and Extension on the inside front cover of this publication.)

The University of Florida is the state's largest and most comprehensive university. It is a major research institution, a member of the American Association of Universities and one of the two federally designated Land Grant universities in Florida. Thus the University of Florida builds on its Land Grant traditions and embraces and embodies the Sea Grant concept and program. The University of Florida is statewide and reaches into all 67 counties of the state with an extension office, with additional research and education centers or health science clinics in many counties. Florida Sea Grant builds on this network in the 35 coastal counties and expands it beyond the state's borders to even international arenas.

This structure gives Florida Sea Grant strong state and local foundations and ensures its ability to seek additional resources at the national, state and university levels. The use of existing management infrastructure enhances Sea Grant's cost effectiveness. Florida Sea Grant allows for and encourages collaboration across its individual projects and programs. Faculty can develop "intellectual" initiatives on issues, such as marine biotechnology, where interests, not geographic location or campus boundary is the common bond. This collaborative work is highly valued.

Strengths, Weaknesses, Opportunities and Threats

"SWOT" is an acronym which represents Strengths, Weaknesses, Opportunities and Threats. SWOT represents a useful tool for any organization to use in strategic planning in order to build on its strengths, reverse it weaknesses, maximize its opportunities and overcome its threats. Strengths and weaknesses are normally internal considerations; opportunities and threats are considerations with more external influence.

Strengths

1. Florida Sea Grant is a science-based statewide network embedded in the best research universities in the state. It is hosted by the state's original Land Grant university which allows its extension and communications programs to function in a proven, recognized and expected way.
2. Florida Sea Grant offers an integrated program of research, outreach and technical assistance that allows it to link the high-quality science-based information it develops with local management structures to provide real solutions to real problems.
3. Florida Sea Grant can identify issues as they emerge at the local level and bring the best scientific minds to bear on these problems.

4. Florida Sea Grant has a comprehensive network of partners and extensive experience interpreting research and scientific information to a broad public.
5. Because Sea Grant is non-regulatory and focuses on understanding the science of coastal resources, it serves as an "honest broker" among a wide range of constituencies; Sea Grant is "resolution" driven, not "regulatory" driven.
6. The stability of Florida Sea Grant over the past three decades has enabled it to make long-term commitments to coastal problems and programs and to develop a highly skilled workforce.
7. Florida Sea Grant is interdisciplinary and can bring many different kinds of expertise to bear on specific problems.
8. Florida Sea Grant is tied to a national network, providing it access to science-based material in over 250 universities nationwide.
9. Florida Sea Grant is a statewide leader in providing educational opportunities for marine-oriented graduate students.

Weaknesses

1. Relatively level federal budgets over the past two decades have decreased the buying power of federal Sea Grant dollars; 2003 buying power of core federal funds was 34 percent below the peak year of 1980 and core plus national initiative federal funds were 17 percent below the peak year.
2. Florida Sea Grant's budget now comes from eight different sources making stable program planning difficult in some cases.
3. It is difficult to achieve budget priorities for state appropriations since the program is embedded in many different universities and departments, making the Sea Grant investment in each university relatively small in contrast to their total budgets.
4. Florida Sea Grant must rely on the good will of universities to participate in and support the program.
5. The overall budget is too small to make a major impact in many of the priority goal areas and the limited budget does not allow tackling some of the critical needs of the state and region.
6. The budget is too small to allow for a substantive immediate response capability and longer term commitments beyond the constraints of a two-year project funding cycle.
7. Both lack of funding and recent federal legislative changes cause more competition among Sea Grant programs for limited federal funds; both discourage cooperation across Sea Grant programs.

Opportunities

1. The strong recommendation by the 2004 report of the U.S. Commission on Ocean Policy that the National Sea Grant College Program should be enhanced through higher federal appropriations lays the groundwork for an expansion of existing programs and creation of new programs in critical need areas.
2. Florida Sea Grant can cause agency, industry and the public to view Sea Grant as Florida's primary statewide university-based research, education and extension program in support of coastal resource use, management and conservation.
3. Florida Sea Grant assumes a strong leadership role in helping Florida address such critical issues as protecting water quality and coastal habitat, responding to coastal hazards, ensuring seafood safety and developing coastal economies and communities.
4. Florida Sea Grant provides a strong federal-state-local network that integrates research, education and extension to generate practical solutions to real problems and strengthen Florida's capacity to deal with coastal problems.

5. Florida Sea Grant is prepared to receive and invest additional resources over the next four years to adequately respond to major coastal challenges and opportunities and to communicate science-based information for resource managers, policy makers and citizens.
6. Florida Sea Grant sits in a unique and valued geographic setting that encourages international cooperation, particularly with Latin America and the Caribbean.

Threats

1. The recognized success of Florida Sea Grant programs will lead to increased demands by a broader constituency that will dilute available resources.
2. Relatively level federal Sea Grant budgets and rapidly increasing extramural budgets by other universities will make Sea Grant less respected and of lower priority within the state.
3. Sea Grant will be unable to maintain its proven and valued multi-task approach rather than evolving into another single source for research funds.
4. Increased public engagement and outreach in marine and coastal topical areas by Florida universities and agencies yields positive education impacts, but could make partners more competitive for funds and reduce Florida Sea Grant's ability to carry out an effective extension and education program.

Regional, National and International Collaborations

This strategic plan addresses goals that are important not only in Florida, but nationally and internationally. About 80 percent of Florida Sea Grant's work occurs within Florida, 15 percent in the rest of the U.S. and 5 percent internationally. These percentages are based on evaluating actual research, education, extension and communications activities conducted under the 2002-05 strategic planning process. The work in each area is expected to maintain about the same levels of effort for 2006-09. Florida Sea Grant places a priority on regional, national and international work when Florida industries and the Florida coastal environment are impacted by activities outside state boundaries and when the work can have an impact on other regions that will ultimately benefit Floridians.

Each of Florida Sea Grant's goal areas requires a different focus in geographic coverage. For example, much of the seafood safety and quality work is national and international in nature due to the complexities and international structure of the seafood industry, while water quality and habitat work is based mostly in Florida. The following chart provides an estimate of the geographic location of the principal audiences for each goal area for 2006-09.

Goal/Region	Local	Regional	National	International
1. Biotechnology	√	√	√	√
2. Fisheries	√	√		
3. Aquaculture	√	√		
4. Seafood Safety	√	√	√	√
5. Waterfront Communities	√	√	√	
6. Ecosystem Health	√			
7. Coastal Hazards	√	√		
8. Graduate Education	√		√	
9. Marine Education	√			

Planning

Approach

The development of this strategic plan began in May, 2004, but built upon the structure and process began with Florida Sea Grant's first five-year plan in 1996. In the current cycle, a meeting was held with the Florida Sea Grant statewide extension faculty, who were asked to take the leadership in developing various sections of the plan along with Florida Sea Grant management. This meeting and subsequent ones were used to review the 2002-05 strategic plan and its priorities. A request was also sent to the campus coordinators to solicit research faculty volunteers who were interested in participating in or commenting on the priorities for 2006-09. About 30 research faculty representing 10 participating institutions volunteered.

Each leader was asked to involve the research faculty and the appropriate agency personnel and industry stakeholders in the development of each section of the plan. Florida Sea Grant management provided oversight and provided the overarching components of the plan. Priorities for each goal area were developed from May to November, 2004. The draft plan was then completed and sent to the campus coordinators for final review, comment and approval.

The following table provides a summary of the process used for each goal area. Over 300 people provided direct input into the strategic plan by the time it was completed; hundreds more provided indirect input through county advisory committees. The process was tailored to best fit each goal area.

Goal Area	Process; May to November, 2004
1. Biotechnology	Faculty and industry workshop at BioFlorida meeting in Boca Raton
2. Fisheries	Statewide mail survey of faculty, agency and industry
3. Aquaculture	Statewide mail survey of faculty, agency and industry
4. Seafood Safety	Workshop of faculty in Gainesville and meeting with industry advisory committee in Orlando
5. Waterfront Communities	Web-based survey of faculty, agency and industry
6. Ecosystem Health	Position paper and requested review by faculty, industry and agency
7. Coastal Hazards	Survey and workshop at Florida Shore and Beach Preservation Association annual conference in Naples
8. Graduate Education	Update and analysis of graduate student support and workshop with Campus Coordinators in Ft. Lauderdale
9. Marine Education	Statewide survey of marine education groups and teachers; Extension advisory committees and focus groups; Input from agency information officers, and collaborators in the public and private media

The priorities in this plan will be used in the Florida Sea Grant call for 2006-07 research proposals issued in early January, 2005; for 2008-09 proposals two years later; and to guide the Florida Sea Grant extension and communications programs. Extension priorities also benefited from input during the UF extension focus group process and through the advisory committees of off-campus Florida Sea Grant extension faculty.

Review

The priorities in this plan are subject to programmatic review and revision. Priorities that are addressed by a research project during 2006-07 will not be included in the call for 2008-09 projects. Priorities that require an extension or communications effort are evaluated through annual extension focus group meetings and through input of local and statewide advisory groups. Specific work tasks conducted through research, extension, education and communications in response to the strategic plan priorities are

outlined in the two-year implementation plans that will be developed during the four-year strategic plan period. Annual work plans will be developed and evaluated each year across the entire Florida Sea Grant program. New priorities that may emerge during the four-year strategic plan are addressed through the use of program development funds, and by seeking extramural funds (outside of Sea Grant) until the priorities can be integrated into the next strategic plan.

Florida Sea Grant also employs an exit strategy concept to determine when priorities have been addressed and/or a problem solved. The exit strategy for each goal area is listed in the two-year implementation plan along with performance indicators that can be used to measure when it is time to exit a goal area or individual task within the area.

Context

The plan was also created within the context of the National Sea Grant strategic plan, "Sea Grant in the New Century, 2003-08 and Beyond," which defines the overall Sea Grant issues at the national level. It also considered the updated NOAA strategic plan for 2005-10, "New Priorities for the 21st Century." The plan also reflects priorities and opportunities as outlined in the report of the U.S. Commission on Ocean Policy, "An Ocean Blueprint for the 21st Century," delivered to the President in September, 2004.

The National Sea Grant strategic plan defines 11 theme areas. Florida Sea Grant participated in the development of those areas and the nine Florida Sea Grant goal areas in this plan contain the elements of the national theme areas important to Florida. Florida Sea Grant also participated in the ongoing long-range planning effort of UF/IFAS Extension, "Preparing for Challenges and Changes of the 21st Century," as it updated statewide goals and focus areas, most recently for 2004-07.

NOAA has adopted four overarching research mission goals for 2003-08. They are 1) protect and restore and manage the use of coastal and ocean resources through ecosystem-based management; 2) understand climate variability and change to enhance society's ability to plan and respond; 3) serve society's needs for weather and water information; and 4) support the nation's commerce with information for safer, efficient and environmentally sound transportation. NOAA has also identified five common strategies: 1) monitor, describe and track earth's changing systems; 2) understand and describe natural systems; 3) assess and predict natural systems; 4) engage, advise and inform stakeholders; and 5) manage coastal and ocean resources.

National Sea Grant's eleven theme areas and national priority areas fit within NOAA's mission goals and strategies, as do Florida Sea Grant's goals. The following table makes the links evident.

FSG Goal Areas	Corresponding National Sea Grant Theme or Priority Area	NOAA Mission Goal				NOAA Mission Strategy				
		1	2	3	4	1	2	3	4	5
1. Biotechnology	Biotechnology	√					√	√	√	√
2. Fisheries	Fisheries; Fisheries Extension	√			√		√	√	√	√
3. Aquaculture	Aquaculture	√					√	√	√	
4. Seafood Safety	Seafood Science and Technology of Gulf of Mexico Oyster Program	√					√	√	√	
5. Waterfront Communities	Coastal Communities and Economies; Urban Coasts	√					√	√	√	√
6. Ecosystem Health	Ecosystems and Habitats; Aquatic Invasive Species; Harmful Algal Blooms	√			√	√	√	√	√	√
7. Coastal Hazards	Coastal Natural Hazards; Digital Ocean		√		√		√	√	√	
8.Graduate Education	Marine Aquatic Sciences Literacy	NOAA cross-cutting priority								
9. Marine Education	Marine Aquatic Sciences Literacy	NOAA cross-cutting priority								

Values

Every Florida Sea Grant activity must satisfy three simple but tough criteria: 1) be based on strong rationale; 2) demonstrate scientific or educational merit; and 3) produce results that are clearly useful and applicable in industry, management or science. A number of core values allow Florida Sea Grant to deliver results based on these criteria.

Excellence—Research is funded on a competitive basis, with scientific merit as the most important criterion. Extension programs are based on reviewed faculty plans of work. Communications efforts use the latest technology to achieve maximum output, visibility and citizen receipt of our science-based information.

Participation—High value is placed on the involvement of a large number of participating institutions in research, education and extension programs. Graduate student involvement must be high and a diverse male and female faculty, from assistant to full professors, must be involved.

Accountability—Both external and internal processes are used to measure a wide range of achievements. These include tracking the scientific publication output of faculty and students, understanding the contribution to society of scientific discovery, measuring the way citizens receiving educational programs change their behavior and determining the economic impact or level of new business activity resulting from a research project.

Connection with Users—A strong advisory process is used to define research priorities, to plan extension and education programs and to measure the impact of programs. It is also used to build public and private support for Florida Sea Grant.

Partnerships—Faculty, students and citizens all benefit when functioning in a partnership mode. Scientific results and education projects reach greater success levels and are implemented when partners, from agencies to businesses, provide financial support to an activity. Emphasis is placed on developing partnerships.

Implementation

Responding with Research, Education, Extension and Communications

Scientific discovery alone can not ensure a viable economy for Florida or the sustained use of the state's coastal environment. Discovery must be accompanied by a speedy transfer of scientific results to the public and private sectors in a format they can use. Making the discovery and accomplishing this transfer of information is what the Florida Sea Grant College Program is all about. Being a part of a national network, having a statewide vision, being multi-institutional and interdisciplinary and having funding with a research, education and extension focus will make Sea Grant successful.

Research and education priorities are set by widespread public input from research, extension and communications faculty, professionals in local, state and regional agencies, industry and citizens. This strategic plan results from that input. To implement the strategic plan, research projects are chosen through a stiff biennial peer review competition. Extension major focus areas are planned on a four-year basis, with annual adjustments. Research and extension priorities then drive the communications process, along with communications priorities derived on the basis of continuing input from the media sector.

Results can only be achieved through the work of dedicated professionals and the support of the Florida academic institutions who participate as partners with Florida Sea Grant. Once the formal and lengthy two-year implementation plan is submitted to the National Sea Grant office in proposal format, a two-year implementation plan in lay language is developed for Florida Sea Grant participants and

stakeholders that defines measurable goals, the audience, the products and activities, who will deliver the products and activities, the performance indicators and measures of impacts and the exit strategy. This is complemented each year with an annual work plan containing specific faculty tasks, and an annual performance report that documents accomplishments and benefits against each task from the previous year.

Role of Management

The plan is built around goals that when addressed will solve problems or create opportunities. It is not built around processes. Using research, education and technology transfer to address societal needs requires a strategic approach along with tailored tools and techniques designed to solve specific problems. One problem may require a substantial research effort. Another may need the transfer of existing information. The solution to a third problem may depend on an intensive educational effort to develop a new source of human capital. Solving other problems may require substantial extension networking with agencies, industries or communities to bring people together in a common activity. Of course, the successful solution to some problems will require all these elements. Florida Sea Grant has a demonstrated record of success in designing the best possible approach to solving the problems resulting from human interaction with the state's coastal environment. Florida Sea Grant thrives on accountability. It is the role of management to help determine the highest priority needs, keep the correct balance of research, education, extension and communications focused on solving the problem or creating the opportunity, to recruit the best talent to work on the issue, to secure the funds to support the work and to track progress against the performance goals. It is also the role of management to create an environment in which faculty, agency and industry partners thrive and prosper.

Products, Programs and Markets

One of Florida Sea Grant's major products is research that can be provided on a rapid response schedule to address priority problems identified by faculty, agencies, businesses and citizens. Sea Grant's state/local network provides valuable access to grassroots constituencies and a way to get programs and solutions out to those who need them. Sea Grant can also use this network to form collaborations between local interests and researchers to see that the most pressing research questions are addressed.

Sea Grant has many markets and constituents, from state governments, to coastal environmental managers, to local fishing industries. It serves as a clearinghouse for the latest research results related to marine sciences and as a neutral broker on marine-related issues. Sea Grant's wide range of programs ensures that all constituencies have access to this information to help make policy and business decisions. It provides educational briefings and seminars for federal and state policy makers, as well as for the public at large. It helps local government officials, planners and developers integrate scientific information into practical decision making in ways that promote sound land use and sustainable development. Sea Grant's extension programs provide technical assistance to the full spectrum of coastal dependent industries—aquaculture, marinas, commercial and recreational fishing—to help them with product and market development. Beyond technical assistance, Sea Grant invests in coastal and marine education that delivers to community and industry groups. Others programs are geared to scientific and professional groups, and to agencies and organizations. Sea Grant faculty are also active in formal K-12 and youth education.

As a consequence of the reach of the program, Sea Grant has become a training ground for skilled researchers and outreach workers in marine science disciplines. Sea Grant recruits, trains and employs graduate students, post-doctoral students and senior researchers and professionals, helping to build a statewide and national "brain trust" for dealing with economic and environmental challenges and opportunities in the coastal arena.

Strategic Goals

Florida Sea Grant's overarching goals focus on providing economic leadership for 1) biotechnology, 2) sustainable fisheries, 3) aquaculture, 4) seafood safety and 5) waterfront communities; enhancing coastal stewardship and public safety through 6) ecosystem health and 7) response to coastal hazards; and, improving scientific literacy through 8) graduate education and 9) marine education.

Within its role of research, education and extension from a university setting, the overarching goals include goals that are specific to Florida; but in some cases are important both nationally and internationally. They are the ones most critical to Florida, as determined by Florida's faculty, its government agencies, its industries and its citizens.

Economic Leadership

1. Use marine biotechnology to create and enhance products and processes from Florida's coastal resources
2. Create and teach production and management techniques that make fisheries sustainable and competitive
3. Develop the food and hobby segments of the marine aquaculture industry
4. Improve the quality and safety of fish and seafood products
5. Increase the economic competitiveness and environmental sustainability of coastal communities and water-dependent businesses

Coastal Ecosystem Health and Safety

6. Protect, restore and enhance coastal ecosystems
7. Respond to shoreline changes and coastal hazards

Scientific Literacy

8. Produce a highly trained workforce in marine and coastal related sciences
9. Create scientifically and environmentally informed citizens

The following sections provide a brief description for each of these three overarching goals. Then, for each goal area, the following information is presented: 1) description of the area; 2) forces of change; 3) measurable goal; 4) audiences; 5) products and activities; 6) performance indicators; 7) objectives; and, 8) additional resources needed.

Economic Leadership

Marine biotechnology in Florida represents an opportunity for both university scientists and biotechnology-based companies to have an impact on the growth and duration of this field. Using natural products from the sea to create pharmaceutical compounds of commercial importance is just one example. Florida leads the nation in terms of the economic value from all uses of its marine fish and shellfish. However, Florida's fisheries are affected by multiple-use conflicts, global trade, overfishing and coastline development that contributes to habitat loss. Worldwide, aquaculture provides almost 30 percent of the fish and shellfish consumed by people. In Florida, aquaculture provides only a small amount of the state's total. The largest segment of the industry is freshwater tropical fish for the hobby aquarium trade. Growth potential exists for the food and hobby marine aquaculture industries. Florida's seafood processing plants and seafood firms range from the nation's largest firms to many small independents. Each is attempting to respond to seafood safety issues, increasing demand, shifts in seafood supply, increasing international trade and competition, new regulatory inspection mandates and environmental concerns. Managing coastal development is a critical challenge facing Florida's water-dependent enterprises. Traditionally, small businesses engaged in tourism and the marine trade are at risk and need to increase productivity and efficiency by adopting new technologies, adapting to regulatory changes and maintaining access to coastal waters.

Goal 1. Biotechnology

Use Marine Biotechnology to Create and Enhance Products and Processes from Florida's Coastal Resources

Description

Marine biotechnology seeks to discover, develop and use products and processes from the living resources of the sea, apply biotechnological advances to protecting ocean resources and promote health and security as people interact with the ocean environment. Particularly through investigations at the cellular and molecular levels, scientists address very diverse subjects including bioactive compound characterization and synthesis, detection and remediation of coastal environmental contaminants, identification of ocean products, improvement of aquaculture practices and biomedical research using marine systems as models. In the words of the European Strategy for Marine Biotechnology, marine biotechnology is a scientifically fascinating and economically expanding enterprise which harnesses the enormous but uncharted gene pool and functional diversity of marine life toward finding new genes, organisms, biosensors, natural products and unusual biochemical processes of importance to industry, nutrition, medicine and the environment.

Florida's overall biotechnology industry ranks 10th in sales among all states nationally. The marine biotechnology business sector is equally small, with only a few aquatic-oriented companies identified in a recent Florida Sea Grant survey. In 2004 what may be the state's first exclusively marine-focused bioproducts life science company was established. But Florida researchers are going beyond bioscience-oriented product development, with efforts to perfect cheaper and faster diagnostic procedures for coastal environmental, industrial and natural resource management applications. About 75 faculty in 10 universities are engaged in aspects of marine biotechnology. Some of their work is facilitated through a "virtual department" organized by Florida Sea Grant. The principal biosciences industry organization, BioFlorida, encourages of marine-related efforts.

Forces of Change

National and perhaps world attention focused on Florida in 2003, with announcement of a blockbuster $500 million state and local package of incentives to create a Florida facility of The Scripps Research Institute (San Diego, California). Partly as a result, out-of-state venture capitalists are expressing serious interest in Florida for the first time, in a climate of heightened energy for Florida biotechnology. Meanwhile, slightly earlier State Legislature establishment and creation of high

technology initiatives in academia included formation of a $10 million Center of Excellence in Biomedical and Marine Biotechnology at Florida Atlantic University. The coastal and ocean research and education faculty of Florida's universities and nonprofit laboratories are positioned for active participation in growth in this field, by virtue of some longstanding academic programs. One entity nurturing this trend has been Florida Sea Grant, which may support the largest marine biotechnology theme area of any Sea Grant program in the United States. One consequence has been the series of Florida Marine Biotechnology Summits, which have fostered networking and awareness for the state's marine biotechnology sector.

Measurable Goal

The primary goals for this area are to develop marine bioproducts and sustainable sources of supply; promote human and ocean health, productivity and security; improve the health and production of marine organisms; and facilitate informed consumer, business and technical decisions. A final goal that crosses all these areas is to advance Florida marine biotechnology to a position of national leadership.

Audiences

The collection of "marine biotechnologies" represented in this priority area reflects a wide diversity of users concerned with, among other things, fisheries, seafood production and aquaculture, with ecosystem conservation and environmental security, and harvest and synthesis of bioactive compounds for medicines, cosmetics and industry. Many of the small and large companies that will seek to develop opportunities are represented by BioFlorida (the states' biosciences and biotechnology industry organization). Other users are governmental agencies concerned with managing or regulating life science industries or ecosystems, such as NOAA's National Marine Fisheries Service and the U.S. Food and Drug Administration, active partners in recent projects. Clearly, the audiences for this field extend well beyond Florida borders, as evidenced by the significant presence of out-of-state sponsors that provide matching funds to Florida Sea Grant research projects or have various agreements with Florida research groups for product screening, clinical trials or technology licensing.

Products and Activities

Scientific information, trained students, technical practices and products result from research and education sponsored by Florida Sea Grant. Their incorporation by stakeholders may be through a job-hire, technology licensing or education, for example. Delivery of results is by principal investigators, technology offices on their campus, Florida Sea Grant media and the Florida Marine Biotechnology Summit series which in 2004 was held as an invited part of the BioFlorida statewide conference. As noted below, the exit strategy for a given project or effort is determined by attainment of carefully defined and measurable objectives.

Performance Indicators

Achieving these goals is measured by: graduation, placement and recognition of undergraduate and graduate students and their contribution of theses and dissertations; top-rank journal articles and other publications reporting all aspects of research findings, as contributions both to the scholarly literature and to stakeholders able to apply findings; patents and technology licensing agreements; establishment of entire new companies or addition of product-lines or industrial processes at existing firms; development and adoption of scientific practices for monitoring and detection of constituents in ocean-derived products and ocean ecosystems; publications and other communication media and educational events that are requested or actively used by lay and technical stakeholders; and investments and partnerships established to develop short and long-term objectives in Florida marine biotechnology.

Objectives

A. Develop marine bioproducts and sustainable sources of supply

1. Develop either biological routes for synthesis, or culture procedures for production of compounds of commercial, health and environmental importance, such as small molecules or enzymes.

2. Determine the mode of action and properties of compounds derived and isolated from marine organisms and with apparent or preferably defined applications in medicine, non-toxic control of biofouling or corrosion, and other commercial and industrial applications.
3. Create novel methods for marine by-products utilization in situations where demand can be established reasonably.
4. Isolate, identify and determine the function of enzymes controlling processes of potential or preferably characterized commercial benefit.

B. Promote human and oceans health, productivity and security

1. Develop cost-effective diagnostic tools including chemo- and bio-sensors for assessment of seafood contaminants and waterborne pathogens and pollutants and improved evaluation and prediction of human and environmental health risks.
2. Develop forensic and monitoring practices for taxonomic identification in situations including possible economic or natural resource management fraud involving either seafood products or marine species of endangered/threatened status, for consumer, business, conservation and regulatory applications.
3. Develop habitat restoration and remediation techniques, using molecular and cellular approaches for improvement of coastal plant strains, hybrid development and production technology for coastal emergent and aquatic vegetation and improvement of methods for microbial remediation of polluted environments.

C. Improve health and production of marine organisms

1. Promote the health of sustainably cultured and collected captive marine plant and animal species of economic importance through attention to pathogens, diagnostics, treatments, drug delivery systems, immunology, physiology and pharmacology, to positively affect growth rate, disease resistance, survivorship and reproduction.
2. Develop technology to culture cells of marine organisms with desirable properties to produce useful biochemicals such as enzymes, pharmaceuticals and agrochemicals for which economical supply is required.

D. Facilitate informed consumer, business and technical decisions

1. Identify and act upon economic, social, ethical and regulatory issues, constraints and opportunities to further the development of marine biotechnology for viable commercial and environmental management applications.
2. Train students in technical subjects in areas of reasonably demonstrated employment opportunity and promote scientific/education career opportunities in order to retain Florida-trained students in the state.
3. Extend research results to industry, media, specific audiences and the public to explain opportunities and issues related to the responsible, sustainable application of marine biotechnology.

Florida Sea Grant will not sponsor expeditions, explorations or laboratory programs for mass screening and discovery of novel biologically active compounds. Consistent with the two-year nature of its research grants, it will not engage in clinical trial-related medical studies that require many years and orders of magnitude higher levels of funding.

Florida Sea Grant will reach beyond academia to engage industry and governmental interests that may not realize the opportunities held by marine biotechnology. Florida Sea Grant also will reach beyond its state borders at a time when other Sea Grant programs are less vigorous in this theme area, in order to engage national corporations and federal agencies as partners. Development of long-term stable funding will require persistence and creativity.

Florida Sea Grant offers a means of organizing a strategically planned and coordinated approach to marine biotechnology research, development and education, whereby the whole may be greater than the sum of the parts. As new funds can be realized, these capabilities can be further developed to help Florida garner the full effects of worldwide markets and a clean, high-wages enterprise.

Additional Resources Needed

Florida has a rightful and perhaps advantageous place in the worldwide quest to discover new products and processes from the ocean's living resources. With an enormous natural storehouse of biodiversity and an extensive university-based network of scientific talent, Florida boasts strengths for developing new medicines, industrial products, methods of detecting contaminants and practices for restoring damaged environments, all adapted or derived from coastal and ocean systems. Florida Sea Grant is providing leadership to set the key priorities for this emerging field known as Marine Biotechnology and requires funding above and beyond what may be available from Sea Grant for just a few annual research projects and from the university for staff support that also is spread over other theme areas.

To properly exercise the statewide leadership—and emerging national prominence—that Florida Sea Grant has demonstrated, sufficient funding is required for staff and operations in three areas: 1) research funding from external sources for use in a matching capacity to leverage larger grants, including Sea Grant funds and for pilot studies to generate data to build a case for longer-term investigations; 2) student funding, particularly at the graduate level, to support both research assistantships and for activities such as travel for conference presentations; and 3) a new faculty outreach/extension and program development position to properly coordinate the overall Florida Sea Grant research effort and ongoing activities such as the summit (especially if it becomes an annual event) and the statewide "virtual department" that Florida Sea Grant has brought into existence. The feasibility of re-energizing previous State Legislative opportunities for funding should be determined. With the advances in Florida's overall biotechnology sector in the last few years, new opportunities for state and national support should be identifiable.

Goal 2. Fisheries

Create and Teach Production and Management Techniques That Make Fisheries Sustainable and Competitive

Description

The recreational fishing industry in Florida generates an economic impact to the Florida economy of over $2 billion. Approximately one million saltwater recreational fishing licenses are sold each year, of which approximately 40 percent are non-resident licenses. Non-resident recreational anglers create positive economic impacts in the local communities where the fishing activities occur. In addition to individual licenses, several thousand charter and party boat licenses are sold each year to saltwater anglers.

The commercial fishing industry in Florida generates annual dockside sales of $200 million. Approximately 14,000 individuals hold licenses to commercially harvest seafood in Florida. These individuals use approximately 8,000 craft in the harvesting sector.

Over 200 species of marine finfish and shellfish restricted species are managed by the Florida Fish and Wildlife Conservation Commission (FWC). These include a large number of marine ornamental species, mullet, spotted sea trout, sheepshead, blue crab, pompano, flounder, bluefish, black drum and others located within the state waters of Florida. For most of the individual species managed specifically by state agencies, not much is known regarding the status of the stocks (i.e., whether or not the stocks are overfished or overcapitalized). For the fewer species of federally managed stocks, more information exists regarding the individual status of the stocks and industry capacity. These species are managed on the basis of achieving specific stock status targets, which embody such parameters as biomass, recruitment, fishing mortality, sex ratios, length, weight and geographic distribution. The principal federally managed stocks and their stock status are king mackerel, Spanish mackerel, gag grouper, shrimp, stone crab, spiny lobster (all not overfished with no overfishing occurring); red snapper, vermillion snapper and red drum (all overfished with overfishing occurring); and red grouper (not overfished but with overfishing occurring).

Florida has the most active, diverse and progressive artificial reef program in the country. Florida's artificial reef program is the only one in the Gulf and South Atlantic region that is not exclusively run by a state agency. Florida's program is a cooperative partnership among local coastal governments, qualified nonprofit corporations, universities, Florida Sea Grant extension and the FWC. All but one of Florida's 35 coastal counties have been involved with reef development, and since 1920 more than 2,000 documented public reefs have been placed in state and federal waters. Currently, 30-70 public artificial reefs are being deployed annually off Florida's coast. As an example of reef-related economic activity, a 2001 study in southeast Florida reported that annual artificial reef-related sales expenditures totaled $1.6 billion across Palm Beach, Broward, Miami-Dade and Monroe counties. These expenditures provided a total of $782 million in annual income for 26,800 jobs across the four counties. In 2002 the State of Florida established a 15-member Artificial Reef Advisory Board, which includes Sea Grant faculty and in November 2003, the state officially adopted its Florida Artificial Reef Strategic Plan to guide this program over the next five years.

Forces of Change

The growing number of saltwater anglers and demand for high-quality seafood are placing increasing pressure on the marine fishery resources of Florida. Marine resource managers need to cope with these pressures with more effective management tools that will allow long-term, sustainable resource use. State and federally mandated resource management processes have placed more stringent legal and empirical mandates on the management process. New, innovative and effective approaches are needed to maintain

critical habitats, manage resources and to evaluate the effect of management decisions on fishery resources and the people that use these resources.

Measurable Goal

The primary goal for the Florida Sea Grant investment in marine fisheries is to ensure the sustainable use of the marine fisheries resources in Florida's coastal waters. This goal will be achieved if the marine fishery resources are managed based on the best scientific analysis, to ensure that fisheries are managed to achieve maximum sustainable economic and biological returns from the fishery.

Audience

The audiences for fisheries education, research and extension include private industry, resource managers, conservation groups and the general public. Private industry includes those enterprises directly involved in the utilization of the fisheries. Recreational users are bait and tackle shops, charter boats, fishing guides and individual anglers. Commercial users include commercial fishers and fishing equipment retailers. Marine resource managers include the Gulf of Mexico and South Atlantic fishery management councils and the Florida Fish and Wildlife Conservation Commission. These managers are located primarily in Florida, but effective management of the migratory nature of many marine stocks located in Florida's coastal waters includes regional and/or national regulation. Thus, the management of marine resources in Florida is a responsibility shared by local, regional and national marine resource managers and conservation groups.

Products and Activities

Primary products include journal articles, scientific and technical reports, and activities include workshops on fishery management concepts, technical presentations at professional meetings, advisory roles with state, regional, and national fishery management agencies, and direct involvement with user groups. These products and activities will allow for the dissemination of research findings and application of educational materials developed. The products and activities will be delivered by Florida Sea Grant-funded research faculty, statewide extension specialists, county marine extension faculty and Sea Grant communications staff. Research faculty will disseminate immediate research results, whereas the educational materials developed will be extended to the various user groups by the extension faculty and communications staff.

Performance Indicators

The primary performance indicators will be an enhanced status (i.e., not overfished or no overfishing occurring) of the fishery stocks toward which Florida Sea Grant funding was directed. This will result in a movement toward optimum yield. Such progress will provide for sustainable use and a non-declining share of the allowable catch by the various user groups included in the management process.

Objectives

A. Develop models and related information to improve management and fishery forecasts (species with largest volume and value of landings)

1. Determine critical biological structure and processes controlling the abundance, distribution and replenishment of fishery resources on recreational, food and marine ornamental trade species.
2. Measure multi-species and multi-gear interactions and how these interactions can be modeled and considered in management strategies.
3. Define responses of fishery populations to anthropogenic stresses and how these responses vary with environmental conditions.
4. Predict the effect of ocean and atmospheric processes on stocks and management of the stocks.
5. Assess and contrast new stock assessment models with older models including those used for stock complexes.

6. Provide new and more accurate stock assessment models to fisheries managers and decision makers.
7. Develop methods to provide for effective ecosystem-based management techniques.
8. Establish protocols for data development that would enhance modeling and decision making with respect to commercial and recreational fisheries management, industry capital investment, market change and environmental fluctuation.

B. Determine social and economic impacts of fishery management strategies

1. Determine preferences and acceptability by individuals, industry groups and communities of various regulatory techniques.
2. Document economic, social and cultural impacts of regulation and policy, including effective methods for outreach, education and enforcement, on both consumptive and non-consumptive users of marine resources.
3. Define methods for implementing adaptive management strategies.
4. Define innovative economic and social management strategies and determine how these strategies would cause change in participants among fisheries, including the effects on the commercial and the recreational for-hire charter, for-hire head boat and individual fisher sectors of controlled access to a fishery.
5. Conduct demand and supply analyses to measure changes in economic values resulting from alternative uses of fisheries resources.
6. Measure the effects of new management strategies on fishing behavior and practices and develop protocols for their implementation.
7. Refine empirical techniques that can measure the market and non-market value of fish stocks allocated to alternative uses.
8. Develop coupled regional growth and fishery utilization models that consider changes in environmental quality, technological change and regulatory policy that allow for the description and prediction of fisheries structure, conduct and performance industry over the next decade.
9. Evaluate the precautionary approach, the burden of proof and the use of ecocertification as an incentive for fishermen.
10. Develop collaborative projects with stakeholders within the fishing community that extend innovative management plans.
11. Assess the impact on food and non-food fishery markets resulting from changes in global competition, ecological awareness and other factors influencing the behavior of domestic consumers.

C. Minimize bycatch

1. Identify, evaluate and extend fishing behaviors and gear that will reduce bycatch and bycatch mortality, including mortality from catch-and-release fisheries.
2. Assess the impact of bycatch on stock-recruitment.
3. Develop bioeconomic models including demonstrating savings resulting from economic incentives, better technology and effort allocations to bycatch reduction.

D. Define the role of essential fish habitat in ecosystems and their management

1. Define and develop quantitative measures for habitat assessment, comparisons and monitoring related to fish stocks.
2. Develop models that can be used to determine the impact of potentially damaging practices to critical habitat, the level of the damage and the resulting population responses.
3. Compare the impacts on fish stocks of non-fishing control areas and fishing areas.
4. Determine recovery rates and stages for stocks in disturbed and undisturbed areas.
5. Continue to develop and evaluate artificial habitat as a powerful management tool to enhance fish production and divert negative impacts from natural habitat.
6. Assess the costs and benefits of marine protected areas as a tool to address management objectives.
7. Assess the prevalence and impacts of invasive species and emerging marine diseases on marine fishery resources, implications for impacted stocks and methods of control.

E. Measure the effects of fishery stock enhancement practices

1. Develop procedures that will maximize the benefit from hatchery releases into the wild by considering optimal release tactics, effects of releases on catches, ecological and genetic effects of cultured organisms on wild stocks (especially protected species) and effects and contributions of released stocks on stock biomass and spawning potential.
2. Measure the success or test the concept of using marine protected areas to enhance habitat and stock enhancement techniques.
3. Assess the economic costs and benefits of stock assessment programs.

F. Teach new and innovative ways to manage fisheries and evaluate the effectiveness of management decisions on resources and user groups, using the results of research projects and information developed through the Sea Grant extension program.

1. Increase the interaction among fisheries managers and scientists in Florida and countries sharing common fisheries problems.
2. Continue a comprehensive marine resource economics program on the value and optimum utilization of fisheries resources, including educational programs for the stressed shrimp industry.
3. Participate in the national, Gulf of Mexico and South Atlantic regional fisheries extension programs, including focused effort on the charter boat fleet.
4. Design with other Sea Grant programs in the Southeast U.S., an educational program on ethical angling for the purpose of enhancing fisheries conservation.
5. Conduct analysis and educational programs that relate to deployment and economic development/tourism aspects of using large ships as artificial reefs, local deployment of small habitats (under docks) and the overall fish enhancement and habitat aspects of artificial reefs.
6. Analyze and conduct educational programs based on the perceptions from regulatory managers and recreational fishers from ethnic and diverse backgrounds.

Florida Sea Grant operates in the overall realm of scarce funds. Priority program efforts focus on those research and outreach activities that provide the greatest contribution to achieving the measurable goal. Thus, program effort will not be directed toward activities that are already being addressed by existing agencies and industry organizations (i.e., product marketing, large-scale data collection, routine

ecosystem monitoring, etc.). Research and extension efforts will no longer be directed toward a fishery stock and related user groups when management objectives are achieved and maintained on a continuous basis. Rather, Sea Grant will focus on those "cutting edge" issues that are currently not being addressed by resource managers and industry and that, if addressed, would further advance fishery management in Florida toward the goal of long-term sustainable use. Species with the highest volume and value of landings (or potential to lose the volume or value) and under the most biological or economic stress will receive the highest priority.

Additional Resources Needed

Accomplishment of fishery goals requires maintaining a critical mass of research/extension faculty who can effectively address the problematic topics concerning fishery management in Florida. This includes specialists in the fields of marine economics, fishery management and recreational fisheries. In addition, maintaining a viable off-campus faculty well-trained in fishery management issues is vital. Additional off-campus faculty are needed in some counties of the state where no funding exists for positions and in some counties where one faculty member may be covering multiple counties. Currently, two faculty members are devoting part-time outreach efforts to recreational fishing. Funding is needed to expand this to one full-time position.

Approximately 18 percent of Florida's almost 17 million people are Hispanic and a large number of them speak only Spanish. Both federal and state resource managers indicate a high priority in bilingual educational materials for Spanish speaking fishers. A bilingual fisheries communicator is a high priority.

Goal 3. Aquaculture

Develop the Food and Hobby Segments of the Marine Aquaculture Industry

Description

Commercial culture of aquatic products for food, industrial and hobby purposes represents a growing natural resource based industry in Florida. Commercial aquaculture in Florida generates approximately $100 million in farm-gate value each year. The primary components are tropical fish ($47.2 million), aquatic plants ($20.4 million), mollusks ($13.0 million), shrimp ($5.1 million), alligators ($2.5 million), catfish ($1.5 million), tilapia ($1.5 million), other finfish ($2.8 million), live rock ($0.7 million) and other assorted aquatic species ($0.9 million). There are 544 aquaculture operations using 6,450 acres, with about 1,700 individuals employed. The facilities are located throughout the state, with regional concentrations of specific culture types. For example, most of the tropical fish culture occurs in Polk and Hillsborough counties, catfish in Escambia County and mollusks in Levy and Dixie counties. Florida is the largest producer of freshwater ornamentals and cultured hard clams in the U.S. The marine ornamental industry is growing, but represents a much smaller component of the tropical fish culture industry in Florida.

Forces of Change

The market for cultured food fish and shellfish is becoming more competitive. Cultured finfish and shellfish imported from foreign sources represent a growing share of the domestic supply. This is particularly true for species such as shrimp, tilapia and catfish. In addition, growers in other regions of the U.S. are accounting for a larger share of the market. Thus, food fish and shellfish growers are facing a much more competitive market characterized by continual downward pressure on prices. These growers must become more efficient in their production process so as to minimize costs. Suppliers of ornamental fish, particularly marine ornamentals, are becoming pressured by buyers to obtain wild caught supplies in an environmentally sustainable manner. Ornamental growers must also become more efficient in the culturing process. New culture techniques are needed for marine ornamentals to provide for a growing domestic hobbyist market for alternative species, while addressing the environmental concerns of buyers.

Measurable Goal

The primary goal for the Florida Sea Grant investment in aquaculture is to increase the volume and value of food fish and shellfish species cultured in Florida, increase the number and value of marine ornamental species cultured in the state, and to achieve an environmentally and economically sustainable collection rate of marine ornamentals from wild stocks. The goal of the program is not to promote aquaculture in a marketing sense, but to encourage consideration of investment in species that are technically and economically feasible, or have the greatest potential to become feasible.

Audience

The audience for marine aquaculture education, research and extension includes research scientists, private food and ornamental culturists, resource managers, hobbyists, the import/export wholesale sector and the interested general public.

Products and Activities

The primary products include journal articles, scientific and technical reports, workshops on marine aquaculture concepts, technical presentations at professional meetings, advisory roles with state aquaculture management agencies (e.g., Aquaculture Interagency Coordinating Committee) and direct involvement with growers and other user groups. These products and activities will allow for the dissemination of research findings and application of educational materials developed for aquaculture producers and other related user groups. In addition, demonstration-type activities may be conducted to

help potential growers better understand the technical and economic characteristics of the culture process. Products and activities will be delivered by Florida Sea Grant-funded research faculty, statewide extension specialists, county marine extension faculty and the Sea Grant communicators. Research faculty will disseminate immediate research results, whereas the educational and extension materials developed will be extended to various user groups by extension faculty and communications staff.

Performance Indicators

Primary performance indicators are an increase in the total number of economically viable aquaculture operations, an increase in the number of species cultured and an increase in the total farm gate sales of aquaculture products in Florida. In addition, a less easily measured performance indicator will be those individuals who avoided making an unwise investment decision in commercial aquaculture. Potential investors will be able to assess the financial opportunities via extension materials that describe the economic characteristics and market opportunities of commercial aquaculture in Florida. Some will invest; others will not. Providing the necessary information so that poor investment decisions are avoided is a valid goal for the program. Research and extension efforts will no longer be directed toward the culture of a given species when production methodologies are technically and economically efficient and environmental concerns are addressed. In addition, efforts will be minimized for those species when the current culture supply can satisfy foreseeable market demand.

Objectives

A. Foster Sustainable Ornamental Aquarium Species Culture, Collection and Conservation

1. Breed marine species whose economic value, hardiness in captivity and degree to which they are "highly prized" are demonstrated as viable.
2. Develop feeds, including live feeds, suitable for the varying nutritional needs of aquaculture and collected ornamental species.
3. Enhance post-hatching and post-harvest survivorship of traded species from point of origin—whether from production facilities or wild collections—to the end consumer, through better shipping and handling protocols.
4. Promote higher survival of collected ornamental organisms, and minimize impacts of harvest through practices to reduce mortality; determine sustainable long-term harvest.
5. Extend culture, collection and conservation techniques to the marine aquaculture industry.

B. Enhance bivalve molluscan shellfish production

1. Improve production practices for bivalve molluscan shellfish of demonstrated commercial viability, from early life history stages to product quality and provide such practices to shellfish growers.
2. Diversify bivalve molluscan shellfish production opportunities.

C. Promote industry development by eliminating technical and non-technical barriers using sustainable, environmentally responsible practices

1. Determine the financial feasibility and market characteristics for species of greatest potential with regard to all phases of the culture process.
2. Evaluate the technical, biological and economic feasibility of innovative marine aquaculture operations in the near shore/coastal region, on the seafloor and in open surface and water column applications.

3. Help business and public interests understand regulatory and permitting processes, risk management, assist streamlining and development of best management practices for culture and shipping and provide guidelines for entry in commercial aquaculture.
4. Resolve constraints and bottlenecks for both species and systems of demonstrated viability in commercial production, market development, or natural resource management settings.
5. Refine production techniques for commercial aquaculture, especially focusing on those system components that can provide the greatest marginal advancement toward technical feasibility.

D. Increase technical and economic knowledge

1. Educate the Florida marine aquaculture industry in investment, production, diversification and expansion decisions and Florida's citizenry about the role of aquaculture in sustainable, environmentally responsible food production, ornamental ownership and stock enhancement.
2. Train aquaculturists in financial and technical aspects of production and train individuals moving out of fishing into aquaculture.
3. Develop better health management protocols for ornamental and food fish production, which are linked to disease diagnosis, nutrition management and water quality maintenance.
4. Provide in-service training to faculty and others to increase knowledge and skills that can be transferred to others.

Assessing the likelihood of completing the stated objectives of proposed research is an integral part of the scientific review process by which all Florida Sea Grant-funded research and extension activities are subjected. Risky efforts in aquaculture will involve: those species that are not found in traditional seafood or hobby markets; those species where the key life history factors are unknown; production systems reliant upon technologies that are of long-term development; or, non-native species and production systems that pose inherent environmental risks.

Additional Resources Needed

Accomplishment of aquaculture goals requires maintaining a critical mass of research/extension faculty who can effectively address the problematic topics concerning commercial aquaculture in Florida. This includes specialists in marine economics and aquaculture production. In addition, maintaining a viable off-campus faculty well-trained in commercial aquaculture issues is vital. Additional field staff is needed in some counties of the state where no funding exists for positions and in other counties where faculty members cover multiple counties. The greatest need is for a statewide extension aquaculture specialist that can address issues in food fish and marine ornamental culture and that can complement the work of the regional shellfish extension specialist.

Goal 4. Seafood Safety

Improve the Product Quality and Safety of Florida's Seafood Products

Description

Product quality and safety remain the common denominators linking most goals for seafood technology within the Florida Sea Grant Program. The products of concern include harvest and aquaculture operations in both domestic and international settings destined for commerce all across the U.S. This approach accounts for Florida's traditional role with state landings of the higher valued items—shrimp, lobsters and stone crabs, plus emerging in-state aquaculture—hard clams and shrimp. Likewise, it accounts for Florida's increasing role as one of the nation's leading ports of entry for aquatic products from about the world.

Food safety and quality remain the measures for value and competition of aquatic products whether they are harvested, cultured or imported. Florida is recognized as a center for high-valued aquatic products that balance trade and attract tourists. Florida's seafood producers and importers land over 150 individual aquatic species that, combined with the potential value of emerging aquaculture and dynamic retail commerce, represent the most valued aquatic food industry among all states in the nation. The value of seafood imports directed through Florida is second only to the imported value for cars and clothing. Comparative studies have shown that the per capita consumption of aquatic food products by Florida residents is at least twice that reported on the national level.

Typical tallies of annual landings no longer portray the real values of the seafood industry in Florida. More accurate assessments are needed to account for the explosion of imported products through Miami, Jacksonville and Tampa and the concurrent state-based commerce through further value-added processing, distribution and retail. Florida is home to some of the nation's largest processing/wholesale operations, e.g., Beaver Street Fisheries and ConAgra Foods/Singleton Seafood; major seafood distributors, Sysco Foods/Seafood Division and U.S. Foods; regional retail firms, Publix Supermarkets and Winn Dixie Supermarkets; and national restaurants chains Darden Restaurants/Red Lobster and Outback Restaurants. The combined value of this commerce and related employment represents one of the largest concentrations of seafood activity in the United States.

Not all values in Florida's seafood commerce are measured by dollars. For example, the vitality of the oyster industry, primarily based in Apalachicola, represents one of the most significant measures for water and environmental quality in Florida. Simply stated, the oyster industry is the "canary in the coal mine" for water quality in Apalachicola Bay. Harvest and consumption are dependent on maintaining state approved waters. Coastal water quality and related oyster product safety contribute to the value of related regional businesses and essential tourism.

Forces of Change

At the beginning of the 21st century, Florida's seafood and aquaculture industries are experiencing more dramatic changes in all aspects of production, commerce, regulation and public perception than experienced in any previous decade. Elevated concerns for food safety, losses in traditional supplies and increasing demands for product quality present constraints that must be addressed to maintain the income and reputation of one of Florida's most unique, valued and expected food industries. The scope of concern involves fishermen, aquaculture farms, processors, importers, exporters, retail operations, restaurants and all consumers.

Florida ranks in the top 10 states for food-borne illnesses and its aquatic foods contribute to this record due to the unique environmental setting. The top three recurrent causes for seafood-borne illnesses (raw shellfish, histamine in fish and ciguatoxic fish) all occur in the warm climates about Florida. Since food safety has emerged as one of the most significant factors influencing product choice, the value and

reputation of Florida's aquatic food products continue to be questioned by the public media, buyers and consumers including tourists. Liability cases and necessary insurance have escalated and threaten future commerce. Although less than 5 percent of the reported illnesses have involved events during processing, the food safety regulatory response was a non-funded federal mandate (HACCP) which is imposing historical changes in the responsibility for processors and importers. (The Hazard Analysis and Critical Control Point, or HACCP Alliance was created to devise and implement seafood safety training to food processors following federal legislation in 1994 mandating industry improvements in this area.) State authorities have mirrored the response with additional scrutiny for the retail and food service sectors. The regulations are based on predictions of 20 to 50 percent decreases in illnesses with cost savings to the public ranging from $15 to $75 million annually. Industry and state agencies know these figures can not be realized without education and use of new technical developments.

World supply predictions forecast million-metric-ton shortfalls in available aquatic products by the end of the next decade. Florida's aquatic food resources are threatened by coastal development and the balance between recreational and commercial interests. Competition will become more intense for both traditional items and new varieties. Attempts to maintain and mimic traditional products may encourage economic fraud (e.g., species substitution) and compromise product integrity (inferior grades). Aquaculture will offer new resources, but will introduce environmental challenges and stimulate keen foreign competition. Recent domestic concerns for use of illegal antibiotics in certain aquaculture imports have stirred regulatory barriers to free trade and public suspicion for all seafoods. New production efforts and value-added concepts will require technical support and innovation aligned with new marketing efforts.

Florida's response to the increasing dependence on imported aquatic foods will set the pace for future cooperation in all international commerce of foods. Currently, over 70 percent of all seafood consumption in the United States involves imported products. In terms of total world production, international trade of aquatic food involves nearly 40 percent of world aquatic resources. Florida seaports handle a majority of seafood imports, particularly from the Latin American nations. Florida's geographic setting and reputed international relations will serve in leading our nation's participation in international commerce of all aquatic foods.

Measurable Goal

The broad goal of this area is to maintain and enhance the value and volume of seafood commerce in Florida and the U.S.

Audience

The intended audience includes all persons and firms that handle, address, regulate, market, use and consume seafood in Florida derived from domestic or international sources from harvest or aquaculture production. This includes fishermen, aquaculture farms, processors, importers, exporters, retail operations, restaurants and all consumers. In addition, this goal area maintains a high level of activity with federal agencies (e.g., U.S. Food and Drug Administration), state agencies (e.g., Florida Department of Agriculture and Consumer Services), regional organizations (e.g., Interstate Shellfish Sanitation Conference, key organizations (e.g., National Academy of Sciences seafood panels) and international organizations (e.g., International Association of Fish Inspectors).

Products and Activities

Products and activities in this area include scientific journal articles, educational courses, training schools, seminars, presentations at academic and industry association meetings and consultations with those involved in seafood commerce. Training materials, including websites, to support these activities will be developed. Some materials will be in Spanish and English. The products and activities will be delivered by the research faculty, statewide extension faculty and support staff. The communications staff will also play a key role.

Performance Indicators

Indicators will be increases in the value and volume of seafood imported, processed and produced in Florida for use in Florida and elsewhere. Other indicators will be decreases in the number of seafood-borne illnesses, fewer number of product recalls, the application of new technologies developed by both industry and agencies and industry compliance with safety, quality and regulatory guidelines.

Objectives

A. Develop and enhance production and marketing

1. Improve and implement safe post-harvest processing treatments for oyster products.
2. Determine controls for proper use of gasses in processing and packaging fish.
3. Determine handling and processing methods that will yield safe and high quality cultured shrimp, clams and other seafood.
4. Determine appropriate methods and controls for reduced oxygen packaging and applications of carbon monoxide and related smokes for color retention in fish.
5. Develop functional protein based foods and determine protein functionality in byproducts development.
6. Determine proper time-temperature monitoring and inconsistencies in HACCP regulations for ready-to-eat and reduced-oxygen-packaging seafoods in storage and transit.
7. Determine appropriate approaches for possible product code dating and more uniform product specifications for quality and safety.
8. Develop instrumentation to measure and monitor seafood product quality through applications of light, imagery and olfaction-sensory tools.

B. Eliminate biological and chemical hazards in seafood

1. Determine analytical methods to detect microbial pathogens and pathogenicity in raw oysters.
2. Determine consequences of and controls for potential toxic histamines in scombroid fishes, including reasonable HACCP controls in harvest and distribution.
3. Determine controls and guidance for the proper use of phosphating and sulfating agents.
4. Determine appropriate controls for potential *Listeria monocytogenes* and *Salmonella* through commercial channels and retail settings.
5. Provide technical support to address increasing concerns for allergens from or added to seafood.
6. Develop new methods to monitor microbial pathogenicity in seafood.

C. Improve skill levels of professionals in agencies and industry

1. Hold annual training schools on shrimp and spiny lobster and develop smoked seafood and seafood packaging schools.
2. Provide leadership for and maintain the HACCP training program for seafood processors and importers.
3. Give priority in all technical training programs for train-the-trainer courses that could then be used internally by individual companies. Technical assistance will focus on company-based development of value-added and convenience-added products.

4. Create a national sensory training program to monitor seafood quality and allow problem aversion linked with FDA, USDA, NMFS and the National Fishery Institute.
5. Advise in advance of public concern on emerging seafood safety issues related to the use of antibiotics in aquaculture products, environmental contaminants and seafood safety.

Additional Resources Needed

The highest priority is a for a bilingual laboratory and training technician. More virtual link capability is needed for distant, international, bilingual audiences and clientele. Priorities outlined here far exceed program capabilities in terms of personnel time and available funds. In addition, they are based on avoidance of pending consequences, in the form of regulatory warnings; the realization of potential opportunities, such as the development of innovative products; or available research funds. Constraints to adequately address the needs in seafood quality and safety are the lack of technical, permanent salary personnel and lack of recurring funds that allow more long range planning and response capability. There is also a lack of funding and proper protocols to encourage, facilitate and support necessary international response that is more proactive and prevention oriented, rather than resolutions after problems are discovered through product imports.

Goal 5. Waterfront Communities

Increase the Economic Competitiveness and Environmental Sustainability of Coastal Communities and Water-Dependent Businesses

Description

The draw of Florida's coasts is undeniable; people relish the opportunity to live, work and play as close to her shorelines and waterways as possible. The state's economic well-being is inextricably linked to its coastal and marine resources. It leads the nation in saltwater recreational boating—nearly 1 million boats are registered here, approximately one for every 17 citizens. On the east coast of Florida alone, recreational boating activities help contribute $7.5 billion annually to Florida's economy. Florida's marine industry generates over 180,000 jobs and represents a total economic output of over $14.1 billion.

Florida's coastal communities and water-dependent businesses face difficult, yet critical challenges: how to balance population growth, development pressure, recreational demands and tourism with maintenance and enhancement of coastal environmental quality. There is a compelling need to foster strategies for community development and business growth that are compatible with the environment and that are sustainable.

Forces of Change

By the year 2025, the population of Florida's coastal counties is projected to approach that of the entire state in 2000. Coastal communities are experiencing greater competition for limited near-shore resources and a corresponding increase in the number and intensity of conflicts over waterside and waterfront use patterns. A November 2004 study by The Florida Senate's Committee on Community Affairs suggests that growth in boating far outstrips the construction or enhancement of public boating access facilities. Since 1987, the number of facilities has remained relatively steady (or increased slightly), while the number of registered boats has grown by 56 percent. Compounding this trend are long-term economic forces that promote the conversion of publicly accessible waterfront property to private uses.

The increasing use of Florida's waterways and waterfronts creates competing and conflicting pressures among boaters, waterfront users and the natural environment. This is exemplified by the often-bitter controversy over manatee protection measures—such as restricted boat traffic speeds—which has led to litigation at local, state and national levels. Marine industry representatives cite a permitting process associated with waterway maintenance and facility construction that becomes ever more expensive and time-consuming. A universal complaint is lack of adequate scientific information to make informed resource management decisions and to monitor long-term impacts.

Water-dependent enterprises—traditionally small businesses engaged in recreation, tourism and the marine trades—are at risk and need to increase their productivity and efficiency by adopting new technologies, adapting to changes in the regulatory environment and maintaining access to coastal waters. For sustainable development to succeed, all stakeholders—including users, decision makers, regulators and resource managers—need new methods and information sources with which to assess the individual and cumulative links between communities and industries and their physical, economic and environmental impacts.

Measurable Goal

The broad goal for this strategic area is to reduce regulatory costs associated with waterway management and maintenance while simultaneously reducing the environmental damage caused by boating and water-dependent use of the waterways. Another goal is to cause boating and waterway management to be based on scientific principles.

Audience

Principal audiences for this goal area are local, state, regional or federal agencies that have management responsibility for water-dependent uses of Florida's waterways, marina operators, boaters and other waterway users, elected officials, non-governmental organizations, consulting engineering firms and the water-dependent marine industries.

Products and Activities

Principal products and activities for this goal area are: the production of boater information guides, training programs and materials to be delivered via workshops and the Internet; scientific journal articles; and, decision support tools and resource management models that incorporate geographic information technologies.

Performance Indicators

The broad performance indicators will be measurement of changes (decreases) in waterway management and maintenance costs, the adoption of scientific principles for waterway and boating management by resource management and regulatory agencies, and a reduction in the number of boating incidences that are harmful to habitat.

Objectives

A. Foster economically and environmentally sustainable growth for coastal communities and water-dependent businesses

1. Develop environmental and economic sustainability goals that assist public policy decision makers in managing coastal communities and water-dependent businesses; develop corresponding indicators that measure progress towards goal attainment.
2. Evaluate social and economic costs and benefits that derive from public to private conversion of waterfronts and waterway access points, examine the causes of decline/growth in recreational and working waterfronts and analyze incentives to retain water-dependent and water-related facilities that serve public needs and reflect social values. Extend research findings to community decision makers.
3. Evaluate public policy and regulatory and non-regulatory tools that increase/decrease the rate of public to private conversion of waterfronts and waterway access points.
4. Create and extend new technologies and products that meet emerging business opportunities, ranging, for example, from concepts that improve charts for recreational boaters, public access to ocean observation system information and equipment modifications for vessels that reduce or eliminate environmental impacts.

B. Develop decision support tools and information to guide public policy and to support coastal zone management

1. Evaluate the cumulative and secondary impacts on coastal ecosystems due to development, tourism and recreation; develop the capacity to forecast the long-range sustainability of coastal ecosystems; and provide comprehensive spatial/temporal perspectives on environmental/economic impacts of various coastal development scenarios. Extend research findings to decision makers and the public.
2. Analyze the bio-physical effects of navigational improvements and boating activity on waterways and adjacent habitats.
3. Link decision concepts —such as place-based management, growth management and water surface zoning— with the application of geographic information technologies (geographic information systems, global positioning systems, remote sensing, etc.) to plan for optimal use of coastal shorefronts and adjacent waterways.

4. Develop methods to characterize, map and forecast recreational boating patterns and activities, both in time and geographic space.
5. Measure the economic value to coastal communities and water-dependent businesses of natural resources ("natural capital") and develop and extend informational products for citizens and community decision makers.

C. Create a regulatory and non-regulatory framework for sustainable community development and business growth

1. Determine the efficacy of best management practices (BMP) for water-dependent businesses, such as those employed in the Clean Marina Program; develop non-regulatory mechanisms that enhance voluntary compliance with environmental BMP; and examine empirical relationships between voluntary compliance strategies and actual results.
2. Determine how new technologies and decision concepts that pertain to near-shore waters fit into the complex federal, state and local jurisdictional framework for marine waters.
3. Develop a legal concept for the most common issues that give rise to coastal and marine conflicts and evaluate alternative dispute resolution mechanisms.
4. Assist coastal communities that have endured declines in their economic bases to refocus and use existing resources to their economic and environmental advantage.

D. Facilitate informed public, business and policy decisions

1. Develop and provide training in geographic information technologies for coastal resource managers and policy makers that incorporate case studies relevant to Florida coastal management issues.
2. Develop and disseminate materials for owners/operators of water-dependent businesses and for their clientele that increase environmental stewardship, provide information for safe on-water behavior, increase economic competitiveness and enhance the recreational experience.
3. Facilitate disaster preparedness and response for marine interests, particularly the boating-related sector.
4. Participate as a principal partner in the Clean Boating Partnership and its Clean Marina and Clean Boatyards programs.

Additional Resources Needed

Florida Sea Grant recently added an extension specialist in the area of boating and waterway management. To complement this added expertise, a statewide specialist is needed in the area of coastal management and growth to address economic and environmental issues associated with land-side coastal development patterns that influence waterway resources. At least a half-time legal specialist would also be helpful. In tandem, the two specialists could also address priorities outlined in ecosystem health (Goal 6) and coastal hazards (Goal 7).

Coastal Stewardship and Public Safety

Florida estuaries, where freshwater from the land meets saltwater from the sea, are characterized by enormous ecological, social and economic diversity. Most of the species that support Florida's multi-billion dollar fisheries depend on estuaries to complete their life cycle. Meanwhile, most of Florida's urbanization is taking place alongside estuaries and placing stress on the quality and quantity of these valuable habitats. The Florida shore and its coastal inhabitants are at risk from a variety of natural hazards, most notably the winds, waves and floods generated by hurricanes. Risks to life and property from these recurring hazards can only increase, given the anticipated growth of coastal populations over the next several decades. There needs to be a dedicated effort to reduce the economic, social and personal losses due to natural hazards. All stakeholders share an interest in pursuing loss (or cost) control which is a proven risk management technique.

Goal 6. Ecosystem Health

Protect, Restore and Enhance Coastal Ecosystems

Description

Coastal waters around the world represent less than 10 percent of the ocean's surface, yet they account for 50 percent of its biological productivity. People make extensive use of coastal areas and their productivity. For example, a wide variety of commercially and recreationally valued species find shelter and food in healthy coastal habitats. Unfortunately, people's activities can lower coastal productivity by degrading water quality and habitats. Altered inputs of freshwater and nutrients can degrade water quality leading to loss of habitats. Habitats can also be lost to direct destruction, whether it is accidental or for coastal development or other purposes.

In Florida, coastal waters are critical to the state's beaches, estuaries and bays. Florida's coastal habitats include beaches, salt marshes, mud flats, mangroves, sea grasses, open sand, bivalve and tubeworm reefs, hard bottom and coral reefs. The productivity and beauty of these coastal ecosystems create significant benefits for the state. Coastal waters and habitats provide support during a part of the life cycle for up to 90 percent of the fish and shellfish species that comprise commercial and recreational harvests. High-quality coastal waters and habitats represent a key reason that millions of boaters, divers and tourists visit the state each year. Coastal ecosystems attract people. They also help shield the state's coastline from storm damage, so all Floridians have a stake in the quality of coastal waters and the health of coastal habitats. Since all of Florida sits within the coastal zone, activities anywhere in the state have the potential to affect coastal ecosystems.

Forces of Change

In terms of water quality, Florida has reduced the amount of pollution coming from non-point sources and pollutants, but diffuse sources associated with storm water or atmospheric deposition remain prime concerns. For example, landscaping, agriculture, home maintenance and use of internal combustion engines affect coastal water quality by adding nutrients and pollutants to Florida's watersheds and air sheds. In general, diffuse sources of pollution increase along with the annual increase in Florida's population. In response to the cumulative stress generated by these diffuse sources, management of coastal water quality has shifted from a focus on permits for point sources to a focus on ambient conditions and total maximum daily loads. Management focused on ambient conditions and loads will benefit from stronger scientific analysis of Florida's watersheds and "airsheds" and their responses to our actions.

Florida's coastal habitats are also subject to a variety of stresses, including accidental destruction, loss due to development, pollution of coastal waters, reduced freshwater flow and introduction of non-native species. Habitat destruction and loss produce relatively obvious effects and management of these pressures is improving. Attention has turned to management of the more subtle effects of poor water

quality, reduced freshwater flow and non-native species, which are more significantly influenced by natural, spatiotemporal variation. For example, minimum flows and levels are being set to maintain appropriate freshwater flow to coastal areas and early detection and rapid response plans are being developed to deal with invasions by non-native species.

Measurable Goal

Protecting, restoring and enhancing the quality of Florida's coastal ecosystems remains a key goal for the Florida Sea Grant College Program. Important, long-term performance measures include reduced pollution loads; decreased degradation of water quality; less loss of habitat; successful restoration, mitigation, or enhancement of ecosystems; increased use of best practices; and increased citizen involvement in management.

Past efforts by Florida Sea Grant focused on two separate goals targeting water quality and habitat. Recent work addressing water quality primarily comprises outreach and education projects targeting watersheds, the Comprehensive Everglades Restoration Plan, the urban-wild land interface, volunteer water quality monitoring, monofilament recycling and coastal clean-ups. Research and outreach projects dealing with Florida's habitats focused on plankton as invasive species in the Indian River Lagoon; general education on invasive species; assistance for 32 county artificial reef programs around the state; and assistance with efforts to restore dunes, beaches, mangroves and oyster reefs. The two goals have been combined in keeping with their interrelatedness and the shift to ecosystem management.

Audience

Due to the ubiquitous importance of coastal ecosystems, Florida Sea Grant targets many audiences. In particular, the program works with researchers, state and local management and regulatory agencies, coastal residents, extension faculty and formal and non-formal educators. The program delivers value by supporting the production of articles in scientific journals, more publicly accessible publications, a web site, training workshops and organizational meetings. Researchers, extension faculty and the communications staff generate these products and activities. Researchers receive direct funding supported from Florida Sea Grant and support during national competitions. Florida Sea Grant's statewide specialists and county faculty provide support to education and outreach efforts.

Performance Indicators

Successful efforts produce short-term to medium-term outcomes and long-term impacts. Key performance measures for outcomes include proof of concept for management practices and increased awareness and knowledge among managers, regulators and citizens. Long-term impacts stem from uptake and application of best practices by managers, regulators and citizens.

Objectives

A. Improve tools and techniques to measure non-point source pollution

1. Improve tools and techniques to identify sources and measure loads to coastal waters from non-point sources, with recognition of natural, spatiotemporal variation in loadings.
2. Improve tools and techniques to reduce non-point source pollution, including proof of concept for best practices to be implemented by citizens, businesses and agencies.

B. Increase the knowledge base that causes the protection, restoration and enhancement of coastal systems

1. Increase knowledge and predict changes in coastal habitats arising from changes in freshwater flow to the coast, especially by elucidating cause and effect linkages.
2. Increase knowledge and predict changes arising from restoration, mitigation, or enhancement of coastal habitats, especially changes related to the deployment of artificial reefs.

3. Raise awareness and knowledge of key issues related to coastal ecosystems, including non-point source pollution, watersheds, invasive species, restoration and ecosystem function.
4. Promote citizen and affected business involvement in the protection, restoration and enhancement of coastal ecosystems, including volunteer monitoring, clean-ups and use of best practices.

Florida Sea Grant will continue to pursue this goal until management of coastal ecosystems is effective. Effective management will be adaptive, with a strong base in scientific understanding, rigorous monitoring and in-depth reporting to all concerned parties. In addition, effective management will involve citizens as active participants. The program will help state and local managers and regulators, as well as citizens and businesses. Florida Sea Grant's focus on basic research linked strongly to management and public education distinguishes it from other organizations pursuing a similar goal. In an effort to promote differentiation in research funding, the program will not fund studies that focus on identifying new influences on water quality or new indicators of ambient water quality without evaluating them in relation to existing influences and measures. Such studies provide little help to stakeholders who must prioritize influences and indicators in order to deliver effective and efficient management. In addition, Florida Sea Grant will not fund baseline sampling to establish loads or long-term monitoring of water quality because such efforts fall in the purview of agencies. Research on water quality will not be funded unless it takes place at sites with existing management in order to leverage resources more fully. Florida Sea Grant also will not fund studies examining the effects of direct habitat loss or how habitats support fisheries because such studies fall in the purview of agencies. The program also will not fund studies that focus on invasive species because support is available through national competitions for aquatic nuisance species from the National Sea Grant College Program.

Florida Sea Grant has the potential to be in the top 5 percent of all Sea Grant programs addressing coastal ecosystems. It has access to many qualified scientists and outreach personnel. In addition, Florida is moving to address non-point source pollution through Phase II of the National Pollution Discharge Elimination Scheme and use of total maximum daily loads. In the near future, minimum flows and levels will be set for many of the state's waters. Florida Sea Grant can contribute by funding rigorous small-scale and short-term studies that provide managers, regulators, businesses and citizens with improved understanding of causal links driving changes in coastal ecosystems and science-based tools and techniques that have been proven in concept.

Most of the priorities associated with this goal carry moderate to high risks. Non-point sources of pollution are awkward to identify and manage. These risks should be faced because non-point source pollution represents the major reason that over 40 percent of the rivers, lakes and estuaries in the United States do not support swimming, fishing and other basic uses. Efforts to understand changes in coastal habitats must address the uncertainties introduced by natural, spatiotemporal variation. These risks should be faced because coastal habitats play such critical roles in the economy and environment of Florida. Risks become smaller if projects have strong and viable links to existing management of coastal ecosystems and outreach efforts that form part of coherent, long-term programs building from basic, generic concepts to specifics tailored to the state's coastal counties.

Additional Resources Needed

Florida Sea Grant has a statewide specialist that works in the area of coastal ecosystems education. Thus, adding resources to this goal area is not the highest need at this time. State and federal agencies also are investing millions of dollars annually to support research in this area, thus Sea Grant can complement this activity through extension-based public education.

Goal 7. Coastal Hazards

Respond to Shoreline Change and Coastal Hazards

Description

As coastal communities have grown, Florida has experienced higher property losses and relief costs, more business interruptions and failures, greater social disruption and dislocation and more natural resource damages than perhaps any other state due to its geographic location within the potential track of hurricanes. Florida has 20 metropolitan statistical areas and 16 of them lie around a bay or estuary or at the mouth of a river that flows into the sea.

Florida's sandy coastline is about 825 miles long. There are over 400 miles of eroding beaches, with a large percentage critically eroding and the percentage is continuing to increase. Beach use in Florida creates a huge economic impact, but both life and property are continually threatened by living, working or playing so near the shore.

In 1992, Hurricane Andrew, killed 43 people in South Florida and caused about $20 billion in property damage. In 2004, for the first time in history, four major hurricanes, Charley, Frances, Ivan and Jeanne, made landfall in Florida during the same year, causing statewide damage at a level about equal to that of Andrew.

About 30 people drown each year after being caught in rip currents while using the beach in Florida. It is clear that Florida's coastline attracts both people and money, but at the same time can present dangerous and serious threats.

Forces of Change

The fact that more and more people will continue to move to the coast means that more people and more property will be affected by shoreline change and coastal hazards. Both the public and private sectors thus need to determine ways to protect the natural shoreline and environment and determine ways to make people and property safe from natural events. Response to these events and the shoreline will necessitate university cooperation with state and federal agencies and it will require both basic and applied interdisciplinary research, education and technology transfer.

Measurable Goal

The broad goal is to improve the ability of coastal communities to identify risks and potential losses of human life, property and natural coastal environmental systems from natural coastal processes and from storms and natural hazards and to reduce the losses and increase the cost effectiveness of mitigation measures.

Audience

The audience for this goal area includes the home building industry and its associated sectors such as property management companies and realtors, the insurance industry, public agency planners including state building code inspectors, community decision makers and emergency preparedness officials and environmental consulting firms that focus on coastal issues relating to natural systems and coastal restoration and protection projects. A high level of interaction will also be maintained with the Bureau of Beaches and Coastal Systems, Florida Department of Environmental Protection, the Florida Shore and Beach Preservation Association, the Florida Department of Community Affairs and the Institute for Business and Home Safety, among others. Audiences also include citizens that live along the coast and the portion of the 78 million tourists each year that visit the state to enjoy its shorelines and beaches.

Products and Activities

Products and activities for work in this area include publication in trade and scientific journals, technical reports, seminars and workshops. Research faculty and communications staff will play a key role in delivering the products and activities directly to the principal audiences, while the extension faculty will deliver more general information to the public via newsletters.

Performance Indicators

This is a very difficult area in which to assign performance indicators due to the magnitude of the problems being faced. However, such indicators as the completion of workshops by planning officials, decreases in post-storm erosion and damage estimates (after recommended mitigation measures are in place), reduced losses of life and injuries from coastal events and hazards, the adoption of retrofitting techniques into building codes and increased mileage of restored shoreline can be used, depending on the specific work that is undertaken.

Objectives

A. Develop mitigation techniques and products

1. Determine who pays and who benefits from storm loss prevention techniques.
2. Design retrofitting techniques for homeowners and educate them on techniques.
3. Determine ways to evaluate severity and recurrence of hurricanes as it relates to building practices and land use, including ground level wind measurement.
4. Evaluate cost effectiveness of storm mitigation measures.

B. Establish technical basis for risk sharing, pricing and financing programs.

1. Determine standards to rate dwellings in risk areas.
2. Determine market, tax and legal incentives to cause retrofitting and mitigation.

C. Incorporate ocean, coastal and shoreline process and change data into coastal planning.

1. Develop coastal construction and design practices related to reducing shoreline erosion.
2. Determine role of shoreline in reducing wave and flood damage, including ways to implement shoreline protection measures that do not damage the coastal onshore and offshore environment.
3. Improve prediction techniques that warn coastal users of dangerous conditions.
4. Participate in outreach and communications projects related to coastal ocean observing systems in the South Atlantic and Gulf of Mexico.

D. Refine public policy for storm mitigation and preparation.

1. Develop and recommend policies, mitigation techniques and update redevelopment policies that affect coastal natural systems and their relation to growth management.
2. Determine public clean-up costs, infrastructure damage and replacement costs, business failure and job/loss interruption costs.
3. Create ways to advise decision makers on public policies that reduce social and economic costs of mitigation and preparation.
4. Design incentive measures that cause mitigation through building standards, development regulations, critical property acquisition, taxation, etc.

E. Document lessons learned from the landfall of four hurricanes in Florida in 2004.

1. Create technical fact sheets related to hurricane protection, particularly from a natural coastal resources perspective.
2. Participate in constructive dialogue among various stakeholders to evaluate the usefulness of beach renourishment projects on shoreline protection.

Additional Resources Needed

The priorities outlined in this area are vastly beyond the financial capabilities of Florida Sea Grant. However, they are a priority where university research faculty have the expertise to contribute to the overall goals of the state relating to coastal processes and coastal hazards. In particular, Florida Sea Grant does not have a coastal engineering and hazards extension specialist and work on many of the educational and training priorities will depend on acquiring this expertise through additional funding. An extension specialist did work in this area until the mid-1980s, when federal funding cuts caused the elimination of the position.

Scientific Literacy

Investment in the future of Florida's coastal resources requires both capital and labor. It is critical that the labor force be highly trained and skilled. As a university- and issue-based research and education program, Florida Sea Grant draws upon its partnership of people, universities, governments and businesses to ensure that Florida has a technically trained work force and scientifically and environmentally informed citizens.

Through support to undergraduate and graduate education and through skill-based training, Florida Sea Grant produces highly trained scientists, social scientists, engineers and other professionals that increase Florida's economic competitiveness both nationally and internationally and who devise and lead creative management concepts to keep Florida's coastal environment sustainable for future generations. Florida Sea Grant also designs and implements education programs that use local concepts in youth education and, through its Sea Grant extension and communication programs, creates changes in the informal education system as it interprets and delivers information for over 17 million residents and 78 million tourists.

GOAL 8: Graduate Education

Produce a Highly Trained Workforce in Marine- and Coastal-Related Sciences

Description

The investment of significant Florida Sea Grant and private funding has trained a cadre of professionals. Past analyses of Florida Sea Grant graduate student programs supported by federal Sea Grant funds indicate that the top disciplines (of about 35 supported) are biology, engineering, chemistry/biochemistry, fisheries/aquatic sciences, food science and human nutrition and oceanography. Fifty-two percent of the graduates are working in Florida, 42 percent in 28 other states and 6 percent internationally. They are working in the following classifications (by percent): industry/non-governmental organizations (19); government agencies (16); university teaching/research (17); pursing additional education (12); in degree progress (19); not known (17). Of Florida Sea Grant's 28 completed Knauss Fellows, 11 now work for NOAA. Florida Sea Grant has the opportunity to contribute to the national pool of trained professionals from its base of 11 public and three private universities functioning in the nation's fourth largest state.

Forces of Change

The future quality of science related to ocean and coastal economic well-being, environmental quality and national security depends on high-caliber graduate education programs. Nowhere is this more critical than in state and federal agencies that manage the coast and in industries that rely upon coastal resources. Over the past several decades, graduate education support for the ocean sciences has been less than the support for the life sciences. The looming "bubble" of retirees during the first decade of the 21st century is compounding the situation and a critical shortage of scientists, ocean policy experts and industry leaders is predicted. That is why producing trained scientists is a high priority.

For a number of years mission agencies, particularly in the federal sector, have been encouraged to support a significant number of graduate student opportunities in a range of marine fields to ensure well-educated professionals in the coming decades. The NOAA strategic plan for 2003-08 includes a priority to increase the number and diversity of college students each year in ocean, climate, atmospheric and social sciences. Of NOAA's employees, 58 percent are in scientific and technical occupations and about 70 percent of NOAA employees retire by the fifth year of eligibility. It is expected that NOAA will lose a large number of its senior scientists during the next decade. The Department of Interior, the Forest Service and the Environmental Protection Agency will lose over half of its Senior Executive Service by 2007. NSF's goal statement in 2003 made a priority to prepare the future environmental workforce at

many levels—researcher, teachers, resource managers and technicians. These large departures in such a short time create difficulties in maintaining core scientific competencies and lost institutional memories.

Florida Sea Grant is responding to this challenge. Financial support is provided to graduate students for scientific investigation guided by a faculty mentor. The results are answers to scientific questions and solutions to real-world problems. Another result is the completion of a masters or doctoral degree with the student graduating to become a part of the highly trained work force. These individuals will one day design the creative management concepts to protect the coastal environment and provide economic sustainability to the industries that use coastal resources.

Measurable Goal

The measurable goal is the production of a highly trained workforce of interdisciplinary professionals that are hired to work in the academic sector, in government and in industry and who will make major contributions to science and management.

Audience

The first line audience for this goal area is both undergraduate and graduate students in Florida's universities and their faculty mentors. The indirect audience is the academic, agency and industry groups that hire the students.

Products and Activities

The products and activities used to achieve the goal are: 1) core and national competition Sea Grant assistantships and student support, 2) Sea Grant industry fellowships, 3) Knauss Fellowships, 4) SG/NMFS fellowships, 5) Aylesworth and Old Salt scholarships, 6) Skoch Scholarships, 7) seminars, and 8) workshops.

Performance Indicators

The performance indicators will be the percentage of Sea Grant funds that are used to support assistantships; tracking disciplines funded to ensure students are being supported in disciplines where graduates are in short supply; success rates in national fellowship program competitions; the amounts of private funds that are raised for student scholarships; the numbers of students completing degrees; and tracking the employment locations of graduated students by academic, agency and industry employment status.

Objectives

A. Train future decision makers and scientists

1. Encourage and prepare student applications for national competitions. These include the: John A. Knauss Marine Policy Fellowship; Sea Grant Industry Fellowship; National Marine Fisheries Service and Sea Grant Fellowship in Population Dynamics and Marine Economics; and NOAA Coastal Management Fellowship.
2. Solicit and use funds from private, state and federal sources to support students. Sources include: Aylesworth Foundation for the Advancement of Marine Science; Old Salt Fishing Club; and Skoch/Sea Grant Scholarship through the Florida Science and Engineering Fair.
3. Involve students as a priority consideration in funding research projects, among successful peer-reviewed projects. At least 30 percent of Florida Sea Grant federal research funds will be used for student support.
4. Develop Florida's position of leadership in coastal and ocean subject areas to promote the flow of information and expand the funding base to build a responsive marine academic resource capability.
5. Examine opportunities and programs to increase the involvement of undergraduate students.

B. Promote faculty and staff development

1. Enhance faculty and staff development through an annual statewide Newell seminar series.
2. Encourage faculty and staff participation at in-service training workshops.
3. Support faculty and staff participation at appropriate professional association and industry association meetings.
4. Encourage sabbatical and/or exchange programs with other universities, agencies or industry.

Florida Sea Grant's support for graduate and undergraduate education includes various scholarship and fellowship opportunities, as well as traditional research assistantships funded from both public and private sources. Sea Grant's multidisciplinary approach gives students scientific knowledge with interdisciplinary perspective; they use multiple contexts to solve problems; and they learn to communicate complex ideas. Over time, this support has produced significant results. Former scholars now hold professional roles in education, resource management and business. They have indeed positively influenced sustainable use of marine and coastal resources — in Florida, nationally and internationally. Their performance affirms Florida Sea Grant's role in the training of future scientists as part of its total commitment to "Science Serving Florida's Coast."

Additional Resources Needed

From 1972-1986, Florida Sea Grant supported an average of 40 graduate students per year using federal Sea Grant funds. Level federal budgets and the effects of inflation reduced the average to about 22 from 1987 to 1996. The implementation of management policy to give priority to federal research proposals that included graduate student support and the addition of funds from private sources caused an increase in the number of graduate students supported from 1997 to 2004 to 25 from federal Sea Grant funds and 9 from private sources, for a total of 34. Additional funds are needed to support at least 30 additional graduate student assistantships.

Undergraduate students have been heavily involved in supporting research projects, but they often become involved in the project after the principal investigator received funding for the project. Summer internships devoted to undergraduates would enhance undergraduate involvement in programs. Ten summer internships are required.

Goal 9. Marine Education

Create Scientifically and Environmentally Informed Citizens

Description

Sustainability of Florida's economy is dependent on continued economic development, environmental stewardship and social well-being. All three elements are essential to meet the continued growth demands that are occurring in the state. The economic prosperity of Florida is inextricably linked to its coastal and marine resources. Creating a scientifically and environmentally informed citizenry is essential as Floridians find an acceptable way to satisfy the demands for these resources while protecting their environmental integrity.

Forces of Change

Florida has one of the fastest growing populations in the United States, while many current residents and the majority of new residents have a limited scientific knowledge base about the state's marine and coastal resources. The challenge is to create an environmentally literate citizenry that allows Florida to remain competitive in the national and world economy while conserving its marine and coastal resources.

Additionally, national studies indicate that youth graduating from our schools, when compared to those educated in many other countries, are not competitive in the sciences and math. They also have little or no understanding of the marine and aquatic sciences, a tragedy for a state with the nation's second longest coastline. With over 8,000 miles of tidal shorelines it has a wide diversity of living and non-living marine resources unmatched by any state in the United States. It has both temperate and tropical ecosystems and is the only state in North America with a shallow water marine ecosystem containing mangroves, sea grasses and coral reefs. To compound this problem, many science teachers in the K-12 system do not have science degrees in any of the marine disciplines. The NOAA strategic plan for 2003-2008 includes a priority to establish an environmental literacy program to education present and future generations about the changing earth and its processes and to inspire our nation's youth to pursue scientific careers. The need for science-based information related to Florida's coastal and marine resources – and to their use and stewardship – has never been more apparent.

Sea Grant engages 10 specialists and 17 extension faculty working in outreach capacities in Florida's coastal counties. Their activities are both specific to the needs of coastal communities and to 14 focus area groups that span regional and thematic interests under Sea Grant's goal and program areas. These, collectively, create a demand for communications services to help develop the tools and materials needed to deliver information and educational programs to program constituents.

At the same time, there are more than 200 research projects over a four-year period that are supported completely or in part by Florida Sea Grant, as more than half of Florida Sea Grant's core funding continues to be invested in this research on a statewide, competitive basis. Most of this research is conducted by scientists at the 16 Florida Sea Grant partner institutions. These researchers and their campus coordinators, together with their media services or information officers, form another outlet for Sea Grant communications. This clientele of research-related faculty and scientists generate findings that warrant communications support and recognition.

Nearly 80 percent of the population lives in the 35 coastal counties. In addition to this resident population there are nearly one million additional seasonal residents in Florida during the winter months. Besides residents there are 78 million visitors to the state annually. Surveys indicate that vacationing is their primary reason for coming to Florida, and their top activity is visiting the beaches. Thus there is a substantial "general public" that can be reached through the media markets that exist in Florida, including three of the nation's top 20 television markets, and major newspapers covering all coastal cities.

Florida Sea Grant is responding to these challenges and opportunities. It has developed an active communications and marine education program at local, state and regional levels that contribute to marine and coastal literacy by facilitating the delivery of science-based information, programs, materials and resources to the education community and citizenry at large. This effort provides an awareness of Florida's marine and coastal environment and begins to instill an environmental ethic into its people of all ages.

Measurable Goal

The broad goal for this strategic area is to increase the knowledge of citizens in all age categories about coastal and marine issues and increase the use of science in decision making about the use and conservation of coastal and marine resources.

Audience

Target audiences will include classroom teachers (K-12), utilizing the "training the trainer" methodology to reach a maximum number of educators in Florida; 4H agents, volunteers and youth in individual counties; and the Florida citizens that attend Florida Sea Grant programs and special events. Citizens outside Florida will also be an audience where appropriate.

Audiences also include the scientific community, civic leaders, legislators, decision makers, resource managers and the media.

Products and Activities

Products and activities used to achieve this goal will: 1) design hands-on formal and informal educational programs for Florida's citizens; 2) develop expanded professional development programs for current classroom teachers, as well as future teachers; 3) produce high-quality marine and aquatic educational materials that are based on sound science and national and state standards; 4) foster increased education of traditionally under-represented and under-served youth groups in marine and aquatic sciences; 5) deliver a statewide marine extension/outreach program across all strategic goal areas, as identified in within each goal area; and 6) serve in a leadership role to create or strengthen existing collaborations and partnerships with other Florida universities and organizations in marine and aquatic education efforts.

Performance Indicators

Measurement of performance will include professional assessments and observations, quantifiable self-reports, quantifiable reports of others, tests and individual assessments that will indicate change in attitude, skill, behavior or knowledge by program participants and feedback from advisory panels.

Objectives

A. Increase marine and coastal science in the formal education classroom (K-12 community)

1. Develop partnerships that support programs and training opportunities for K-12 educators.
2. Support development of materials and programs that provide both content knowledge and process skills and that meet national and state education standards.
3. Develop partnerships with other entities that support the creation of electronic technology products and Internet linkages.
4. Participate in the programs of the two Centers for Ocean Science Education Excellence (COSEE) that cover Florida (Florida; Gulf of Mexico).

B. Increase marine and coastal science literacy of citizens through non-formal and informal channels

1. Support citizen-based education programs that allow the public to become involved with coastal environmental stewardship and economic issues.
2. Support development of materials and programs that can be used for informal groups, including 4-H, youth and aquaria.
3. Identify research funding from NOAA, Sea Grant and other agencies and universities that can be incorporated into programs to create public understanding or marine and aquatic systems.
4. Create relevant communications products and outreach programs for use by state, national and international audiences.
5. Collaborate with other educational institutions and state agencies to maintain and develop the Florida Sea Grant website as a dynamic repository of marine and coastal information, with linkages to support educational and research efforts and to provide a resource to connect people, projects and information in Florida and around the nation and globe.
6. Produce high-quality publications and productions that effectively communicate the results of Florida Sea Grant research that addresses key environmental, policy and management issues in Florida and the Southeast to civic leaders, policy and decision makers and to the scientific community.

Additional Resources Needed

County extension faculty, under the leadership of the assistant director for extension, whose specialty is marine education, provide the bulk of the adult and youth related marine education activity (e.g., teacher training workshops, 4-H and youth activities at the county level, state marine ecology camps, state ecology contests, county coastal cleanups, marine stewardship). In fact, about 2.7 person years are dedicated to marine education across the 17 county-based faculty. This may be the largest marine education effort among all Sea Grant programs, when just core program support is considered. However, a full-time marine educator would provide a more coordinated, consistent statewide program effort.

Florida Sea Grant does not have adequate resources to provide complete coverage of all of Florida's 35 coastal counties. There is a need for an additional nine county faculty, at a minimum, to provide geographic coverage to the state for educational programming. Florida Sea Grant normally provides 60 percent funding for a county faculty position and the county provides 40 percent plus office space and other contributions. Some counties currently are requesting Sea Grant faculty and have their funding in place, but Florida Sea Grant is unable to respond due to lack of funds. In addition, a communicator is needed just to support the existing Sea Grant extension faculty and their diverse and varying needs, both in scope and to respond in a timely fashion.

Program Summary of Additional Resources Needed

Federal

Research, extension and communications priorities were identified that total to $3.4 million in recurring dollars. For the complete complement of needs, $87,500 in one-time start-up costs would be needed and annual recurring expenses of $47,500 would be required. These estimates are for direct costs only; added indirect costs would drive the total in federal grant dollars to approximately $5 million. This set of needs will be used over the next four years to guide Florida Sea Grant as the program seeks to increase its funding from all revenue streams.

Additional Resources Needed (Direct Costs Only)

Goal	Description	Costs		
		One-time Start-up	Annual Expense	Recurring Annual Salary and Benefits
Research (Goals 1-7) and Graduate Education (Goal 9)	Competitive Research Funds			$1,500,000
	30 Graduate Student Assistantships			450,000
	10 Undergraduate Summer Internships			30,000
Biotechnology (Goal 1)	Extension Specialist	$5,000	$5,000	$83,200
Fisheries (Goal 2)	Recreational Fishing Extension Specialist	5,000	5,000	83,200
	Bi-lingual Communicator	5,000	5,000	55,000
Aquaculture (Goal 3)	Extension Specialist	5,000	5,000	83,200
Seafood Safety (Goal 4)	Bi-lingual lab and training technician			64,000
Waterfront Communities (Goal 5)	Extension Coastal Management Specialist	5,000	5,000	83,200
	Legal Specialist (.5 FTE)	7,000	5,000	41,600
Coastal Hazards (Goal 7)	Extension Specialist	5,000	5,000	83,200
Marine Education (Goal 9)	Communicator to support Sea Grant Extension Faculty	5,000	5,000	52,200
	Extension Marine Educator	5,000	5,000	83,200
	Nine County-based Faculty (.6 FTE each)	22,500	2,500	242,000
	Secretarial Support for Additional Faculty (.5 FTE per Faculty)	20,000		225,000
Management Costs Across All Areas	Fiscal and Secretarial Support			283,000
Total		**$87,500**	**47,500**	**3,442,000**

The Florida Sea Grant core federal Sea Grant funding for the last few years has been about $2 million on an annual basis. On average, another $600,000 has been earned annually in Sea Grant national strategic funding. Because Florida Sea Grant was not one of the first Sea Grant programs to receive funding, the program is also behind in federal funding relative to the other large Sea Grant programs. Federal Sea Grant core funding for Florida Sea Grant should be in the $3.5 million per year range, based on the current federal Sea Grant appropriation.

In addition, recent NOAA administrators and the U.S. Commission on Ocean Policy have indicated that annual federal Sea Grant funding should be doubled; an amount that would be about $110-$120 million. It is realistic to assume under this funding scenario that Florida Sea Grant's federal Sea Grant core funding level would be approximately $5 million, an increase of $3 million over current levels. Even this level of additional resources would not allow appropriate attention to all the priorities outlined in this strategic plan.

Non-federal

The receipt of federal Sea Grant funds requires that those funds be matched on a 2-to-1 ratio (one dollar of matching funds for every two dollars received). Thus, an increase of federal funds as outlined above would require an increase in non-federal funds from the various revenue streams that currently fund overall Florida Sea Grant activities: state appropriations, faculty match provided by universities, non-federal grants and contracts, Florida counties or foundation and endowment revenue.

Specifically identified during the strategic planning process as non-federal funding needs was a $2 million appropriation for marine biotechnology competitive projects and an additional $1 million in funding for marine biotechnology graduate student assistantships. Also identified was the need for permanent recurring funding to stabilize the seafood safety and quality program. Its success is highly dependent on the generation of "soft" or grant funds outside of Sea Grant. Florida Sea Grant will also continue to pursue additional funding sources, including the generation of private gifts that can create endowments by using these same priorities.

Building on the Past

Florida Sea Grant earned a rating of "Excellent" for its performance from a federally mandated review by the National Sea Grant College Program in 2000. This is the highest score possible. It positioned Florida's program with the highest priority for any available merit budget increase in the federal program. The next federal review will occur in Spring, 2005. A few highlights of accomplishments for the 2000-04 time period are noted below.

Biotechnology

1. At least four genes have been identified that may be regulated in pancreatic cancer cells treated with lasonolide. This may have important implications for cancer treatment and will help facilitate the genetic basis for the production of marine natural products in general.
2. A statewide, virtual academic department of about 75 individuals for marine biotechnology created and organized by Florida Sea Grant continues to function and thrive and is now linked to the fledgling marine biotech industry thorough periodic marine biotechnology summits and the state's biotechnology industry association.
3. In 2004 what may be the state's first exclusively marine-focused bioproducts life science company was established, based in part on achievements resulting from Florida Sea Grant marine biotechnology research.
4. Genetic signatures have been established for dozens of common shark species. This information has been used to study the global trade in sharks and has been used by the NOAA Office of Law

Enforcement to help in identifying illegally harvested sharks. The data have been used to not only make convictions but to exonerate innocent traders.

Fisheries

1. Shelf-edge habitat mapping in deep water habitats combined quantitative estimates of fish density and spatial habitat features for grouper in the Gulf of Mexico. Gag and scamp grouper were documented as more abundant inside protected areas than outside protected areas when habitat was similar.
2. An ecological model on marine ornamental species was developed that incorporated the conflicting effects of density dependent settlement and survival on reef fish dynamics and the influence of harvesting. Some collectors with live-rock lease sites now view these sites potentially more valuable for ornamental aquarium species production than for live-rock production.
3. Over 100 attendees including 50 local lobster fishermen attended a Florida Keys spiny lobster workshop. Nine scientific presentations were made followed by a panel discussion on future research needs that has helped develop a dialogue among fishermen, scientists and managers. Seventy-three percent of the attendees said they learned information useful to their fishing business.
4. Sixteen workshops were held around the state for blue crabbers. More than 200 fishermen participated to characterize their operations and industry conditions. Their opinions and concerns have been used by the Florida Fish and Wildlife Conservation Commission in developing a management plan for blue crabs in Florida.
5. Florida Sea Grant fisheries extension faculty continue to serve on the scientific committees of the Gulf of Mexico and South Atlantic fishery management councils. Direct input was provided relating to management plans for reef fish, coastal pelagics, snapper and grouper.
6. About 3,000 recreational anglers were taught proper fish venting techniques, catch and release practices and proper hook utilization to increase undersized released fish survival. One survey of 77 anglers indicated that 66 percent of them were using the techniques three months later.

Aquaculture

1. Research proved that typical spawning techniques used in clam hatcheries will also produce blood ark and ponderous ark clam seeds with minimal operational changes in early hatchery stages. This may provide species alternatives for clam growers.
2. Digital high-speed videography was used to determine the feeding performance of hatchery reared marine fish larvae. Based on this research, pilot studies are being conducted at a commercial hatchery to determine the feasibility of commercial application of the technology.
3. The 14th International Scallop Biology and Culture Workshop was held in St. Petersburg, Florida and attended by 122 participants from 21 countries.
4. Clam growers were taught how to use Sea Grant developed the Computer Logbook and Management (C.L.A.M.) software for record-keeping and management decisions. Eight workshops enabled 42 clam growers to refine their business and recordkeeping practices.

Seafood Safety

1. More than 225 students from the seafood industry — across every shrimp processing operation in the U.S and at least 12 countries— have been trained in shrimp safety and quality through eight shrimp schools; the U.S. Food and Drug Administration considers this its principal training program for shrimp processors and importers into the U.S.. Many of the world's top shrimp companies have attended.
2. A focused research and education program to reduce illnesses resulting from Vibrio vulnificus, a bacteria in raw oysters, has been ongoing. While the decrease in the illness rate from the 1995-99 baseline in 2002 (29 percent) and 2003 (22 percent) can not be definitively proved the result of Florida Sea Grant work, it is declining.

3. Leadership continued for the National Seafood HACCP Alliance in training HACCP and sanitation procedures. This multi-partner program began in 1994 and has trained over 22,000 people worldwide. The U.S. General Accounting Office indicated in a 2004 report that the number of U.S. importers documenting that foreign suppliers were complying with U.S.HACCP requirements increased from 27 to 48 percent from 1999 to 2002.

Waterfront Communities

1. An annotated model ordinance was developed for local harbor management and was adopted by the Southwest Florida Regional Harbor Board. A training workshop on legal issues associated with waterways use was conducted with the Florida Bar Association and received a rating of 4 on a 5-point scale.
2. Florida Sea Grant is a member of the Clean Boating Partnership and has assisted 90 marinas and 15 boatyards in becoming certified as a "Clean" marina or boatyard. Over 2000 copies of a "Panic Preventer File for Marinas" have been distributed worldwide.
3. State legislation was passed in 2002 which created a "Noticed General Permit for Dredging by the West Coast Inland Navigation District." This is one part of a regional waterway management system developed by Florida Sea Grant and adopted by Lee, Manatee and Charlotte counties. The legislation specifies that Florida Sea Grant -developed scientific procedures must be followed which results in lower cost and more environmentally friendly dredging.
4. The Boating and Waterway Management program has been repeatedly recognized through awards; the Council for Sustainable Florida for leadership in 2000 and the Sea Grant Association for the top extension program nationally in 2003. Several private and substantial donations are now helping fund the program.

Ecosystem Health

1. In-service training for 25 extension faculty was provided on "Watershed Water Quality: Non-Point Source Pollution." The training raised the participants' knowledge by 30 percent according to pre and post-tests, 38 percent will use the information to create educational programs, 25 percent to address watershed issues and 19 percent to address regulatory issues.
2. A workshop with 75 attendees was held on "Invasive Species: Where We Are and Where We're Going." Participants were educators, researchers and managers from universities, governmental agencies, non-governmental groups and consulting firms. A set of priorities was developed with a focus on education and outreach.
3. A six-hour teacher workshop on invasive species in the south Florida ecosystem was held for 16 K-12 teachers and environmental educators. Knowledge gained was determined by an increase from 60 percent pre-test score to an 80 percent post-test score.
4. A research project to study the rates of water and nutrient transport via groundwater from on-site disposal systems on St. George Island determined that aerobic on-site wastewater systems perform better than anaerobic systems. If these systems are implemented on a larger scale, nutrient reduction would significantly benefit Apalachicola Bay.
5. A rapid and sensitive method for the quantitative detection of pathogenic human enteroviruses in environmental waters was used to determine that nine of 15 sample sites in the Florida Keys were found to be positive. Three strains of enteroviruses were identified and a lower cost technique for the rapid identification of enteroviruses was developed.

Coastal Hazards

1. A program to use sea oats to stabilize coastal beach dunes assisted the Florida Department of Environmental Protection in setting regulations for the collection of sea oats from various regions of the state. Commercial nurseries are now adapting research results to their production protocols.
2. A research team continues its work to develop a predictive index for rip current warnings. The team is working with the NOAA Weather Service and lifeguard associations on the methodology that hopefully can eliminate some of the 100 drownings each year from rip currents.
3. A Simulation Training on Recovery and Mitigation (STORM) protocol was developed and 78 state and local officials were trained with the materials.
4. For the first time in history, real-time wind velocity data from portable stations were measured and transmitted to the NOAA National Hurricane Center. The process is also developing data that can be used in home construction to better prepare the structure to withstand certain levels of hurricane winds. The work occurred in Hurricanes Isabel (2003) and Charley, Frances and Ivan (2004).

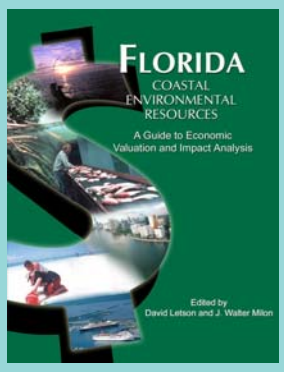
Graduate Education

1. From 2000-04, 36 percent of Florida Sea Grant research funds supported graduate student assistantships. 65 MS and 23 PhD students graduated or are in process during this time period.
2. The top six disciplines supported have been biology, engineering, chemistry/biochemistry, fisheries/aquatic sciences, food science and human nutrition, and oceanography.
3. Following graduation, 52 percent of former students are working in Florida, 42 percent in other U.S. states and 6 percent internationally.
4. During 2000-06, three industrial fellows have been funded, 10 Knauss fellows have represented Florida Sea Grant and 39 percent of Florida Sea Grant former Knauss Fellows are working for NOAA.
5. Private foundation funding has supported 25 Florida Sea Grant students from 2000-04.

Marine Education

1. Florida Sea Grant for a two-year period (2002-03) conducted 841 educational events, reaching an estimated 213,350 people. This also translates to 1.15 events per day over the 730 day, two-year period. Fisheries, coastal habitats, citizens in general and aquaculture were the highest ranked audiences. Most of the events – 82 percent – took place in Florida, 13 percent elsewhere in the U.S. and 5 percent internationally.
2. The Florida Sea Grant website was expanded and redesigned in 2003, to align with Florida Sea Grant strategic goal areas. In 2003, Florida Sea Grant publications were downloaded 38,750 times from the National Sea Grant's holdings in the Pell Library (a 41 percent increase from 2002) and far more than any other Sea Grant program.
3. Florida Sea Grant is a strong participant in the Gulf of Mexico Center for Ocean Science Education Excellence (COSEE) and the Florida Ocean Alliance and is contributing to an increase in the overall knowledge of industry, agencies and the public about Florida's marine and coastal issues.

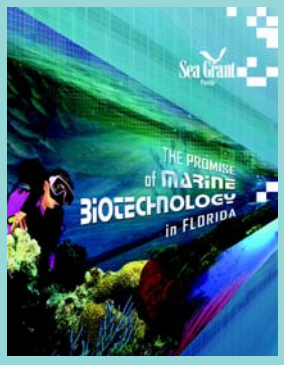
A Selection of Florida Sea Grant Publications Addressing Strategic Issues



SGR 124

Florida Coastal Environmental Resources:
A Guide to Economic Valuation and Impact Analysis

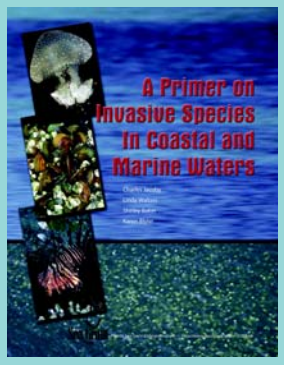
This 230-page volume (2003) presents principles, methods, applications, and case studies of coastal resource economic valuation and impact analysis, stressing the importance of environmental economics in coastal and marine management and the need for professionals in this community to better understand basic concepts such as trade-offs, willingness-to-pay, cost-benefit analysis, and environmental valuation.



TP 132

The Promise of Marine Biotechnology in Florida

This 16-page magazine offers a well-illustrated, up-to-date (2004) review of some major scientific advances by Florida's network of research faculty and students. Topics include potential medical products from ocean organisms and the use of genetic fingerprints and molecular sensors to detect product quality and environmental contaminants.



SGEB 060

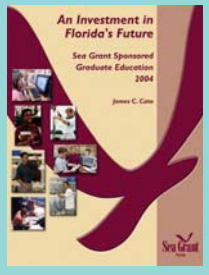
A Primer on Invasive Species In Coastal and Marine Waters

What are invasive species? How long have invasive species been around? These questions and more are answered in this 24-page publication (2004). The management of invasive species can be improved by looking at the history of species introductions, the harm they cause, how invasive species are introduced and become invasive, and how we can manage our own actions and activities to help solve the problem.

SGR 119, SGR 120, SGR 121, SGR 122, SGR 125

Seafood Hazard Analysis and Critical Control Point (HACCP) Library

The HACCP series of seafood sanitation manuals assists the seafood industry in developing and implementing sanitation control procedures as mandated by the U.S. Food and Drug Administration. More than basic training, these manuals feature the regulatory requirements for monitoring sanitary conditions practices, and encourages development of written sanitation standard operating procedures. Also available in Spanish.



TP 117

An Investment in Florida's Future Through Sea Grant Sponsored Graduate Education

Florida Sea Grant does not "teach" or "graduate" students in the tradition of an academic department. However, the program provides funding and support for graduate students in many academic departments across Florida through the research projects and scholarship programs that Sea Grant supports. This publication (2004) includes photos and quotes from former students who now work in the real world in marine-related fields.

Sea Grant
Florida

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