

# Science Serving Florida's Coast

## **Florida Sea Grant College Program 2006 - 2007 Implementation Plan**

*A partnership program among the  
Florida Sea Grant College Program  
Florida Board of Education*

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*National Sea Grant College Program  
Oceanic and Atmospheric Research  
National Oceanic and Atmospheric Administration*

\* \* \*

*Florida's citizens, industries and governments*

\* \* \*

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# IMPLEMENTATION PLAN 2006-2007 FLORIDA SEA GRANT COLLEGE PROGRAM

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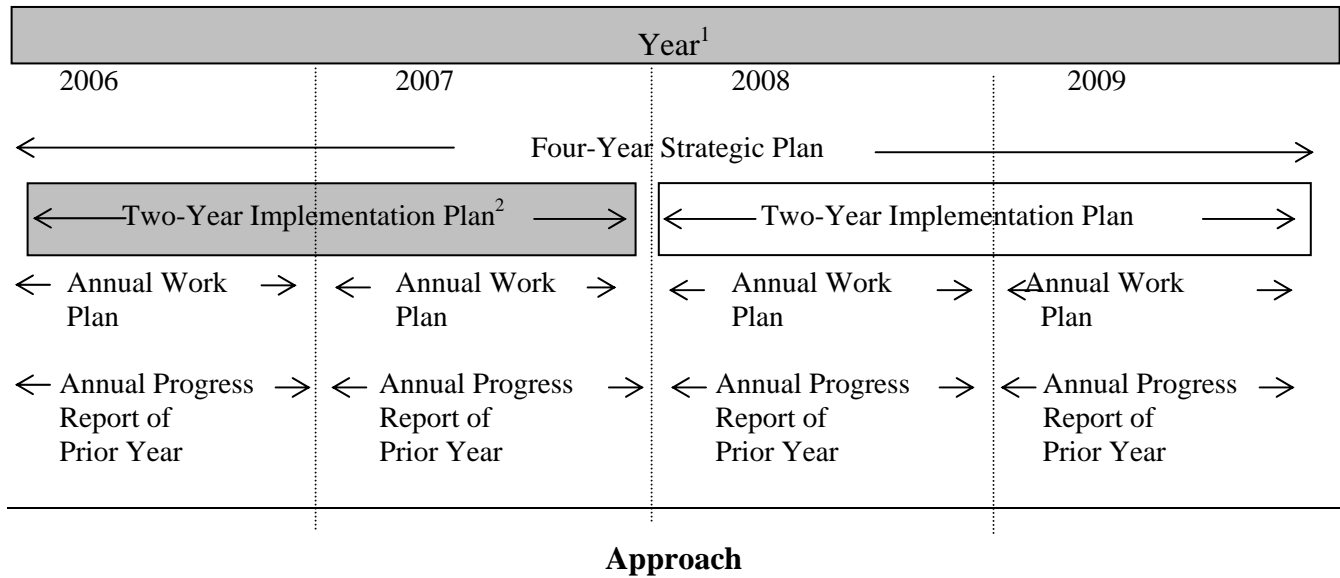
## Introduction

The Florida Sea Grant College Program is committed to enhancing the practical use and development of coastal and marine resources while at the same time creating a sustainable economy and environment. Florida Sea Grant's Strategic Plan sets the four-year stage for program priorities. A competitive research proposal process selects two-year projects twice within the period and program areas are enhanced with additional projects funded through national competitions and other sources of funding. Detailed, peer-reviewed proposals are developed every four years for Extension, Communications and Management activities and they are updated at the middle of the four-year period. An Implementation Plan is developed each two years and more detailed work plans and progress reports are written annually.

The Florida Sea Grant cycle of strategic planning, implementing of two-year activities, developing a detailed annual work plan and reporting on annual progress is shown in the table on the next page. Florida Sea Grant's Strategic Plan addresses issues that are important both nationally and in Florida, and reflects the input of hundreds of Floridians representing academia, government, industry and citizens. This plan defines Florida Sea Grant's strategic issues within the context of a number of strategic planning activities.

Every Florida Sea Grant activity outlined in this implementation plan satisfies three simple but tough criteria: 1) it is based on a strong rationale; 2) it demonstrates scientific or educational merit; and 3) it will 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: 1) **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; 2) **Participation**; High value is placed on the involvement of a large number of participating institutions in research, education and extension programs. Graduate student involvement is high and a diverse male and female faculty are involved, from assistant to full professors; 3) **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; 4) **Connection with Users**; A strong advisory process is used to define research priorities, to plan extension programs, and to measure the impact of programs. It is also used to build public and private support for Florida Sea Grant; 5) **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. Greater emphasis will be placed on developing partnerships.



The 2006-09 strategic plan built upon the structure and process begun with Florida Sea Grant’s first five-year plan in 1996. In the current cycle, a meeting was held with the FSG statewide extension faculty, who were asked to take the leadership in developing various sections of the plan along with FSG 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. FSG 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 priorities in the plan were used in the FSG call for 2006-07 research proposals issued in early January, 2005. Extension priorities also benefited from input during the UF extension focus group process and through the advisory committees of off-campus FSG extension faculty.

The priorities in the strategic 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,

<sup>1</sup> The current strategic plan, implementation plan, annual work plan and annual progress report are available at the Florida Sea Grant website [www.flseagrant.org](http://www.flseagrant.org).

<sup>2</sup> Representation of this document on the timeline.

extension 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 through the seeking of 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 Florida Sea Grant strategic 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 21<sup>st</sup> 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 21<sup>st</sup> 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 21<sup>st</sup> 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.

## **Institutional Setting**

Florida Sea Grant is a State of Florida Center within the university complex of the state. Ultimately, FSG reports to the Florida Board of Education, Division of Colleges and Universities, Vice Chancellor for Academic and Student Affairs. 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 State of Florida Center operates from a host campus (for Sea Grant: the University of Florida, the state's Land Grant University). Florida A&M University, the state's 1890 Land Grant University, is also one of the participating members. Research activities and general contact with the 16 universities and laboratories participating in Sea Grant are conducted through the Campus Coordinators. The coordinators are appointed by the Presidents of their institutions.

## **Outlook for 2006-07**

Two-year Florida Sea Grant research projects to begin in 2006 fall into six of the nine goal areas. Out of 76 Statements of Interest submitted in spring, 31 proposals were invited. In turn, 14 full proposals are scheduled for support at eight institutions. Statements of Interest were received from 15 of the 16 participating institutions in Florida Sea Grant and from three other universities or organizations in Florida.

## **Background**

The 76 Statements of Interest submitted reflected the priorities advertised in the February 2005 solicitation for project ideas. That solicitation was based on long-range planning that over several years has involved hundreds of faculty, agency scientists and administrators, business representatives, and citizens.

## **Proposal Review Process and Decision-making**

After Statement of Interest review by six visiting out-of-state scientists - - assisted by mail by two "non-visiting" panelists and a host of individual readers for selected items - - the 76 original Statements (i.e., 3-page preliminary proposals) were reduced to 31 full narrative proposals. This occurred during April 2005.

Thirty-one full proposals were received and subsequently reviewed during August 2005. Each received at least three peer reviews (the average was 5.7 per project). Readers included six visiting Technical Panelists, two non-visiting panelists who read certain projects in disciplines not represented on the technical panel, and scores of mail peer reviews from worldwide reviewers. Over a two-day period the Technical Panelists (again, all recognized experts from out-of-state) reviewed all external comments, their own reviews, and sometimes notes from FSG program management staff on program themes, extension aspects, etc. The National Sea Grant College Program monitor was also in attendance to participate in and observe the process.

It is important to note that after review of all proposals individually, the Panel and FSG managers re-visited the categories of rankings (Excellent, etc.) in order to develop a comparative sense of the scoring. This afforded an opportunity to examine how proposals fit into FSG theme areas or complemented one another.

## **Funding decisions**

*It was clear when the Panel adjourned that there were more proposals worthy of funding than there was available funding.* For three full days after the Panel dismissed, FSG program management compiled the review data in order to make decisions about funding. The guiding principle was to follow the Panel's recommendations. To aid in the decision process, a worksheet whereby numerical scores could be assigned to six review criteria -- namely project rationale (20%), scientific merit (40%), investigator qualifications (5%), external participants (15%), expected results (10%), links to other projects (10%) -- was employed, as has been done for several years. This worksheet was identical to the one used at the Statement of Interest level, thus each proposal writer had seen one prior to writing the full proposal. Assignments of scores reflected Technical Panel discussion (which sometimes brings out new information not recorded in written review sheets) and analysis by FSG staff. Other factors that came out in discussion included the quality of progress reports if a proposal is building on a current Sea Grant project, if other states are contributing funds for their personnel, if a multi-state investigator/student team is proposed, and how unique the program area was to Sea Grant as compared to other funding sources and the strength of the outside partner's participation.

All faculty received a worksheet and the technical panel summary with evaluation comments and anonymous copies of all written peer reviews, to maximize feedback of information. Investigators for accepted proposals are required to write detailed rebuttal letters addressing review comments, and those letters are included as part of the package sent to the National Sea Grant Office.

## **Performance Measures**

All NOAA programs are required to report annually on their performance to NOAA leadership, OMB and Congress. As part of the Ecosystem Research Program (ERP), the National Sea Grant Office (NSGO) will report on Sea Grant's contribution to the ERP performance measures. Three of the measures are well-suited to Sea Grant. They are:

*Measure 1: Return on investment from the discovery and application of new sustainable coastal, ocean, and Great Lakes products.*

*Measure 2: Cumulative number of coastal, marine and Great Lakes issue-based forecast capabilities developed and used for management.*

*Measure 3: Percentage/number of tools, technologies, and information services that are used by NOAA partners/customers to improve ecosystem based management.*

Florida Sea Grant's goal areas and their relation to NSG and NOAA strategic goals and mission strategies are shown in the following table. Within the NSG theme or priority area, each Florida Sea Grant (FSG) research project, and extension, communications and management activity for 2006-07 is shown, along with the performance measure that will be used to evaluate the project or activity.

FSG Goal	Corresponding National Sea Grant Theme or Priority Area and Florida Sea Grant Project or Activity for 2006-07	NOAA Mission Goal				NOAA Mission Strategy					National Sea Grant/NOAA Performance Measure in Ecosystem Research Program
		1	2	3	4	1	2	3	4	5	
1. Biotechnology	Biotechnology	X					X	X	X	X	
	R/LR-MB-22 -- “Chemical Variation in Marine Cyanobacteria for Drug Discovery”										1
	R/LR-MB-23 -- “Profiling the Marine Sponge ( <i>Discodermia</i> ) Transcriptome Enriched for Secondary Metabolite-coding Messages”										1
	R/LR-MB-24 -- “Cloning of the Terpene Synthase Involved in Eleutherobin Biosynthesis”										1
2. Fisheries	Fisheries; Fisheries Extension	X			X		X	X	X	X	
	R/LR-B-58 -- “Passive Acoustic Measurement of Black Drum Spawning Output”										2
	R/LR-B-59 -- “Recruitment Dynamics and Population Connectivity of Gray Snapper, <i>Lutjanus griseus</i> , Among West Florida Estuarine Systems”										2
	R/LR-B-60 -- “Developing a Multiple Genetic Marker Approach to Assess Global Scale Population Structure and Mating Systems in High Fin-market Demand Shark Species”										3
	SGEP-12-FE -- “Fisheries Extension Enhancement: Taking Fisheries Extension/Outreach to the People of Florida”										3
3. Aquaculture	Aquaculture	X					X	X	X		
	R/LR-A-39 -- “Enhancing Production of Cultured Hard Clams in Florida by Triploidy”										1
	R/LR-A-43 -- “Developing Improved Hatchery Technology for Marine Ornamental Fish Using Stage-specific Feeding Management Regimes”										2
	R/LR-A-44 -- “Sunray Venus Clam: A New Species to Diversify the Florida Aquaculture Hard Clam Industry”										1
4. Seafood Safety	Seafood Science and Technology	X					X	X	X		
	R/LR-Q-30 -- “Evaluation of QPCR Methods for Detection of <i>Vibrio vulnificus</i> ”										3
	R/LR-Q-31 -- “Objective Quantification of the Extent of Aquatic Food Product Enhancement with Carbon Monoxide”										3



FSG Goal	Corresponding National Sea Grant Theme or Priority Area and Florida Sea Grant Project or Activity for 2006-07	NOAA Mission Goal				NOAA Mission Strategy					National Sea Grant/NOAA Performance Measure in Ecosystem Research Program
		1	2	3	4	1	2	3	4	5	
5. Waterfront Communities	Coastal Communities and Economies; Urban Coasts	X					X	X	X	X	
	R/C-P-29 -- "Planning for Sustainable Coastal Communities and Waterways"										2
	R/C-P-30 -- "Promoting Policy Planning for Coastal Communities, Coastal Access and Coastal Hazards"										2
6. Ecosystem Health	Ecosystems and Habitats; Aquatic Invasive Species	X			X	X	X	X	X	X	
	R/C-E-52 -- "A Portable Enterococcus Sensor for Monitoring Coastal Water Quality"										2
7. Coastal Hazards	Coastal Natural Hazards; Digital Ocean		X		X		X	X	X		
	R/C-S-46 -- "Field Measurements of Hurricane Wave Processes"										2
	R/C-S-47 -- "Integrated Prediction of Hurricane Induced Inundation and Shoreline Change"										2
8. Graduate Education	Marine Aquatic Sciences Literacy	NOAA Cross Cutting Priority									
	Cross cutting across all projects										1, 2, 3
9. Marine Education	Marine Aquatic Sciences Literacy	NOAA Cross Cutting Priority									
	SGEP-14 -- "Florida Sea Grant Extension Program"										1, 2, 3
	COMM-6 -- "Florida Sea Grant Communications Program"										1, 2, 3

## Specific Goals and Measures

This FSG implementation plan contains two final elements. First, accomplishments over the last four years are provided in relation to each of the three ERP performance measures. Then, for each FSG goal area, more detail is provided for each project or activity specified for 2006-07. These are organized in tabular form to indicate the action, the audience, the products and activities, the implementer, short and long-term performance indicators, and the timeline for project completion.

### Recent Achievements Against Performance Measures

#### *Measure 1: Return on investment from the discovery and application of new sustainable coastal, ocean and Great Lakes products.*

##### **1.a. Developing novel pharmacological agents**

The smallest conotoxin described to date, and lacking the amino acids required for binding to certain sodium channels, has been discovered in work dedicated to isolation and characterization of novel pharmacological agents from Atlantic and Panamic cone snail species. Also, a breakthrough in protein biochemistry (concerning hydroxylated amino acids predicted to be too reactive to be part of a standard polypeptide chain) appears to define a novel neurochemical strategy used by *Conus* to capture its prey. (F. Mari, G.B. Fields, Florida Atlantic University)

##### **1.b. Development of ornamental shrimp culture**

The first documented observation of social control of sex change in decapod crustaceans (i.e., shrimp) resulted from a FSG pilot project on the reproductive physiology of *Lysmata wurdemanni*, a species of ornamental aquarium culture interest. With increasing group size, the ratio of simultaneous hermaphrodite-phase shrimp decreased. (This information was of immediate use to the project's industry partner.) (J. Lin, Florida Institute of Technology)

##### **1.c. Six marine biotechnology patents filed**

Across the eight program-focused goal areas of Florida Sea Grant, some are more likely to yield patents (e.g., marine biotechnology) than others (e.g., management biology). In fact, from 2000-2004, all six FSG patent applications have come from marine biotechnology projects. Comparing patent application production across SG programs is difficult. However, using one very gross method of comparison, FSG invested a total of \$10.5 million (used for research, education and Extension) in federal SG funds from 2000-2004, with a gross index of return of one patent for each \$1.75 million invested. Across the entire University of Florida, from 2000-2003, \$1,614 million in extramural funds (used for research, teaching and outreach) were generated with 537 patent applications filed, or an index of return of one patent for each \$3.0 million in investment. While six patents may not seem like a lot in five years, the rate is almost double the overall UF rate using this gross measure.

##### **1.d. Progress in eliminating *Vibrio vulnificus* from oysters**

To test hypotheses concerning virulence and avirulence of *Vibrio vulnificus* bacteria and the genetic basis for on/off switching of phase variation, preliminary work has identified phase variable genes within the capsular polysaccharide operon of this species. This opens the way for development of practices in handling of oysters that induce switching to the avirulent form in this infectious organism. (A. Wright, University of Florida)

### **1.e. Startup marine biotechnology company launched**

**Situation:** When marine organisms produce chemical compounds with commercial potential, one of the greatest hurdles is finding a sustainable means of producing the compounds in sufficient quantities. Collection of organisms from the wild may be possible at some limited scale, but this option is generally not sustainable because it is both ecologically harmful and prohibitively expensive.

**Response:** Florida Atlantic University researcher Russ Kerr, along with colleagues at Harbor Branch Oceanographic Institution, is exploring a number of potential solutions to the sustainable production problem for various compounds including anti-inflammatories and a potential cancer treatment. This work includes focus on a compound used in a U.S. manufactured cosmetic, which depends on coral that is under harvest restrictions in the tropical Atlantic. These solutions include work toward the genetic engineering of bacteria to insert genes that will allow them to produce compounds of interest discovered from other organisms. The team is also working to isolate and then raise under laboratory conditions the microorganisms that are often responsible for the production of important compounds first discovered in larger host animals. In one FSG project, the overall goal has been to develop a biotechnological production method of elisabethadione, a potent anti-inflammatory agent produced by the sea whip *Pseudopterogorgia elisabethae*.

**Impact:** The benefit of the research completed in this project is that key groundwork has been laid for the cloning of an important biosynthetic gene. This should greatly accelerate the completion of similar work from other marine organisms. Progress has been made in developing a sustainable production method of a group of marine natural products. Finally, based on success in this and other Sea Grant projects, the investigator and collaborators have formed Tequesta Marine Biosciences. This company arguably may be the first of its kind, devoted exclusively to marine biotechnology, in Florida.

### **1.f. Detecting fishery product fraud**

**Situation:** Scientists and resource managers are alarmed by documented overfishing and declines of 50 percent and more in shark populations in the northwest Atlantic. Experts suspect comparable if not greater declines globally.

**Response:** Genetics provides a useful way to collect catch and trade data for more effective fisheries management. A team of scientists led by Mahmood Shivji of Nova Southeastern University has developed a revolutionary, rapid and reliable method of DNA analysis to identify shark species from fins, carcasses and other body parts.

**Impact:** This one-step forensics technique now puts teeth in NOAA's efforts to identify and prosecute U.S. fishing vessels suspected of catching and selling protected species such as the dusky and the great white shark. In one recent period, this technology helped federal prosecutors confirm the presence of prohibited species in four of five investigations, resulting in fines of more than \$100,000. Thus far, the team has fully developed and tested DNA markers for 18 U.S. Atlantic shark species. Within the next two years, Shivji hopes to develop markers for more than 30 species likely to be found in the U.S. Atlantic and Pacific fisheries trade. Important partners in this long-term effort include the Wildlife Conservation Society, the David and Lucille Packard Foundation and Pew Institute for Ocean Sciences. The team is also beginning to determine how many and what kinds of sharks are being traded in fin markets worldwide, such as the main shark species sold in Hong Kong, the world's largest fin market.

### **1.g. HACCP and sanitation training**

**Situation:** Federal regulations imposed by the USFDA in December, 1997 mandated that all domestic seafood processors and importers adopt HACCP to identify and prevent the occurrence of hazards that could affect the safety of seafood.

**Response:** Steve Otwell led the creation of a Seafood Education Alliance in 1994 in anticipation the regulation, and the Alliance has continued under Otwell's leadership since that time. Partners include the USFDA; USDA's Cooperative States Research, Education and Extension Service; National Sea Grant College Program; National Marine Fisheries Service; National Fisheries Institute; National Food Processors Association; Interstate Shellfish Sanitation Conference; Association of Food and Drug Officials; and state agencies dealing with health,

food safety and commerce. The Alliance received the “Hammer Award,” and was recognized by USDA for a group honor award for excellence (both in 1999). Work has continued through 2004.

**Impact:** The Alliance became “self-sustaining” in 2001 through regulatory support, publication costs, registration fees and voluntary service to the industry and regulatory agencies. U.S. materials were developed in English and Spanish, and have been translated into over ten different languages including Russian, French, Chinese, Japanese and Thai. At least six other Sea Grant programs continue participation in the Alliance. Periodic evaluations have indicated that the teaching has been effective and in one survey, as many as 83 percent of the firms indicated they could not have complied with HACCP without the training. Alliance training efforts have provided seafood safety training for all federal USFDA inspectors in the nation, most state-based inspectors and over 90 percent of the nationally based seafood processing firms, plus over 5,000 international participants from at least 30 countries. A cadre of 400 trainers is now available to continue training in every seafood producing nation in the world. By 2004, more than 20,000 participants had been trained in both domestic and international settings. The U.S. General Accounting Office reported in 2004 that the number of U.S. importers documenting that foreign suppliers were complying with U.S. HACCP requirements increased from 27% to 48% from 1999 to 2002.

### **1.h. Making oysters safe to eat**

**Situation:** The genus *Vibrio* includes a number of bacterial species found naturally in coastal waters and thus in a variety of seafood species. Large concentrations of certain *Vibrio* species can accumulate in shellfish in summer months and lead to serious human infections, particularly when seafood is eaten raw, as is common with oysters. *Vibrio vulnificus* (*Vv*) causes about 50 infection cases per year; about half are fatal but occur only in people with certain underlying diseases. Preventing these illnesses is a priority of the USFDA, in order to first save lives, and then to allow the oyster industry to continue and thrive.

**Overall Response:** FSG has used a coordinated research, education and outreach approach to find scientific solutions to the problem, to educate medical professionals about how to be proactive in educating high risk consumers about consuming raw oysters, and to create new product forms that eliminate the bacteria from the product.

**Response A:** David Heil, Chief, Bureau of Aquaculture Environmental Services, Florida Department of Agriculture and Consumer Services, Steve Otwell, FSG seafood extension specialist and Bill Mahan, FSG Franklin County Sea Grant Extension faculty (the principal area of oyster production) served on the state’s work group to write the Florida *Vv* plan beginning in 2001 with the most recent revision in 2003. This plan mandates that the number of *Vv* infections recorded in Florida decline by 40% by 2005-6 and 60% by 2007-08.

**Impact A:** While a direct connection to FSG research and education efforts cannot be definitively proved, the illness rate from *Vv* in the four states (California, Texas, Louisiana and Florida) included in the baseline is declining. The rate was .218 in 2002 (29% decline) and .240 in 2003 (22% decline), the most recent years for which data are available.

**Response B:** David Heil, using NSGO national initiative funding, has also completed a train-the trainer workshop for 11 health professionals from six southeastern states and California.

**Impact B:** The training will now allow these professionals to deliver effective training to the medical community back in their states on the risks associated with consuming *Vv* infected oysters.

**Response C:** Anita Wright, Gary Rodrick and Keith Schneider, UF, are developing a more rapid and accurate commercial testing method to detect the presence of *Vv*. The method takes hours, not days or weeks.

**Impact C:** This work continues with funding from USDA, and Wright and Heil are also working on a current SG project to improve the molecular detection and typing methods for *Vv* in order to standardize the evaluation of oyster samples. A commercial lab, ABC Research, is partnering in the project as a way to evaluate its commercial potential.

**Response D:** Mahan, Otwell, Rodrick, Wright and Victor Garrido (FSHN, UF) have worked in concert with the Apalachicola Bay Oyster Dealers Association to secure major funding via an ongoing federal USDA appropriation to support educational activities in Franklin County.

**Impact D:** An industry oyster lab was dedicated in 2004. Congressman Alan Boyd assisted with the project and the lab will be the first U.S. industry oyster lab that will certify all oyster products, using FSG-developed technology before entering the marketplace.

**Response E:** Work on a FSG project a decade ago in several oyster plants to eliminate *Salmonella* in oysters by Rodrick, Scott Andre (former Sea Grant Extension agent) and graduate student Keith Schneider (now UF faculty member) indicated some freezing techniques might lower bacteria levels. Rodrick and Doriliz Mestey (funded on a Sea Grant Aylesworth scholarship) tested several freezing techniques with Leavins Seafood Company in Apalachicola in 2000-01. Freezing half-shell products in the past has produced an inferior product.

**Impact E:** Leavins Seafood has continued to use the advice of Rodrick and Otwell during product development. Preliminary research conducted by Rodrick, Otwell and Wright indicates that using a liquid-nitrogen process will produce a “frosted oyster” product at a lower cost with a significant decrease in pathogens. The product is now being tested and offers market promise.

### **1.i. Shrimp school training**

**Situation:** Shrimp is one of the leading imports of seafood into the U.S. Shrimp represent 34% of total U.S. edible seafood imports, and about 90% of all shrimp consumed in the U.S. is imported. It is critical that imported shrimp are high in quality and safe to consume, and that the number of rejected shipments is small in order to minimize economic losses.

**Response:** The annual shrimp school presented jointly by Florida Sea Grant and the Aquatic Food Products Laboratory (AFPL/UF) had its first school in 1995. The annual training program was conceived and organized by Steve Otwell, FSG seafood extension specialist, and has been conducted by Otwell and Laura Garrido, current shrimp school coordinator. The school is dedicated to advancing shrimp product quality and safety, and has become the leading academically based domestic and international training program for shrimp processors and regulators worldwide. Annual demand for the school always exceeds the number of seats (25) available. The training combines lectures with daily laboratory experience and demonstrations, and the topics change as processing and regulatory issues change; detecting chloramphenicol has been a recent topic. This three-day school is useful for experienced and new suppliers, processors, buyers, importers, exporters, inspectors and quality control managers.

**Impact:** The U.S. Food and Drug Administration (USFDA) now considers this school its principal training program for shrimp processors and importers into the U.S., and each year sends from two to four instructors to teach topics of current priority to FDA. All other training is conducted by experienced personnel from the University of Florida and private industry. Recent industry speakers have represented ABC Labs, Red Chambers Co., R-Biopharm, Inc, Charm Sciences, Darden Restaurants, Costco, Contessa Foods, Global Aquaculture Alliance, European Union and the National Fisheries Institute. From 2000-04, a total of eight schools were completed. Six were held at the AFPL/UF, one in Nicaragua and one in California (focused on Asia). Two were focused on Latin America and were taught in Spanish. From 2000-2004, 229 participants completed the schools, with 93 percent coming from industry. Attendees have come from 20 different countries. Forty-five percent have come from outside the U.S. The U.S. is one of the three major shrimp importing regions in the world, and major suppliers to the U.S. from China, Vietnam, Thailand, and Ecuador (some of the major exporting countries) have attended. The Nicaragua school was part the NOAA/Sea Grant Hurricane Mitch recovery effort. Ten of the world’s top 25 shrimp companies were in attendance at the 2004 school. Evaluations are conducted at the end of each school. For example, in the Nicaragua school, 87.5 percent rated the training as very effective; 12.5 percent as effective. All 24 participants indicated they would use the information during the next 12 months.

### **1.j. Foundations for a marine ornamentals industry**

**Situation:** In Florida, marine aquarium species are primarily collected from the wild (about \$4 million annually) while farm-level sales of freshwater ornamental fish and aquatic plants reached \$68 million in 2003. Florida Sea Grant’s goal is to increase the culture of marine ornamentals to generate economic activity in Florida while protecting wild-caught stocks and the coral reefs from which they are captured.

**Response A:** Florida Sea Grant was the lead sponsor and organizer of the international conference on marine ornamental species, Marine Ornamentals 2001: Collection, Culture & Conservation. Nineteen sponsors including nine Sea Grant programs joined to create a program that attracted to Florida 336 participants from 23 countries.

**Impact A:** Program evaluations showed that 67% of the attendees would attend a subsequent conference and 91% indicated that the conference should be continued as is or expanded. A book containing the scientific papers from the conference was published by Iowa State Press, titled *Marine Ornamental Species: Collection, Culture and Conservation*, and coauthored by Florida Sea Grant director James C. Cato and Christopher L. Brown, director of the marine biology program at Florida International University.

**Response B:** Atlantic surgeonfish have economic significance in Florida and are traded globally. An experimental diet that approximates the natural diet of these fish was developed and tested by an aquatic veterinary team led by Ruth Francis-Floyd of the University of Florida, to improve the health and management of this species and to enhance efforts for captive propagation.

**Impact B:** The project demonstrated that diet affects the growth rate of captive surgeonfish, that fatty liver syndrome does not seem to be a problem in fish fed the diets tested, and that a known lesion problem developed in fish fed one diet but not another. Success in demonstrating that either vitamin A or ascorbic acid are playing a role in these observations will be a huge step forward. There is a great deal of interest in this work by the aquarium community as tangibly demonstrated by Walt Disney World's "Living Seas" veterinary staff willingness to invest the matching funds for the project.

### **1.k. Clam farming rises to national prominence**

**Situation:** Hard clam (*Mercenaria mercenaria*) culture is a Florida Sea Grant priority. In 2002-2004 the farm-gate value of landings rose to \$13 million, making Florida the largest producer in the nation. FSG works with industry and the Florida Division of Aquaculture to assist this growth. As with any new industry, clam farmers had problems obtaining insurance, with business operations, demonstrating the value of the industry to lenders and regulators and with other technical issues.

**Response A:** As part of ongoing outreach to the clam industry, FSG extension staff in 2003, for example, met on 56 occasions with growers, insurance providers, field supervisors and loss adjusters to review various crop losses and policy provisions. FSG staff were requested by the U.S. Department of Agriculture (USDA) Risk Management Agency (RMA) to meet with their staff and with representatives from reinsurance companies who service the clam policy in Florida to discuss problems with the policy in the state, consider how to deal with insurance claims, and review risk factors and risk avoidance factors.

**Impact A:** Florida Sea Grant aquaculture specialists were instrumental in obtaining sanctions to allow hard clam growers to qualify for USDA crop insurance – the first eligibility of its kind for marine aquaculture in the United States. FSG staff were able to assist the USDA RMA in making significant changes to the policy and actuarials, which were being evaluated in 2004.

**Response B:** Faculty also developed a user-friendly Microsoft Excel program, Computer Logbook and Management (CLAM), to help commercial hard clam growers with day-to-day business decisions, periodic loan application information requirements, and the documentation of changes in inventory that may be needed for crop insurance. It also helps account for operating expenses and capital purchases.

**Impact B:** In 2003 alone, FSG staff taught clam growers how to use the CLAM software program during six training sessions at five key locations and in individual consultations. A free copy of the CLAM software program and a companion User's Guide were provided at these sessions. These efforts helped 42 clam growers, or 9% of the growers in the state, to better refine their business and record keeping practices through an understanding and adoption of computerized spreadsheets.

**Response C:** Another FSG effort documented the overall economic impact to the Florida economy from the culture and sale of hard clams to be approximately \$34 million. This study provided an overview of the market channels for cultured hard clams and an assessment of the economic impact of the industry on several regions of Florida.

**Impact C:** This report, SGR 123, has become an important tool for industry members, local government officials, economic planners, and state legislators. It was used by industry members to garner legislative support for funding in the 2002 state session. Subsequently, the Governor approved the 2002-2003 state budget in which \$100,000 was designated for marketing farm-raised clams.

## 1.1. Stabilizing dunes with sea oats

**Situation:** Coastal dune stabilization is a critical need along Florida's 1,350 mile coastline. Strong, stable dunes provide protection to the valuable properties behind them, create an environmentally friendly habitat for coastal plants and animals, and help prevent beach erosion. A "soft" approach to dune stabilization is to secure them with enhanced sea oat plantings. Beginning in 1996, FSG learned that commercial sea oat producers were limited in their ability to produce plant materials due to possible limitations in seed sources, lack of natural genetic diversity in nursery propagated plants, or unsuitable ecotypes collected from divergent populations distant from the planting sites (e.g., Atlantic Coast versus Gulf Coast). State regulations restricted the collection of plant source materials.

**Response A:** FSG extension agent John Stevely (Manatee County) "connected" several nurseries with researchers, and a research plan was conceived. The research and Extension team became a "de-facto" Sea Grant research and development "think-tank" for the commercial nurseries. Mike Kane (UF), Charles Guy (UF), and David Crewz (FDEP) provided the first genetic analysis of sea oats populations. Plantings of the genetically characterized sea oats from two Gulf and two Atlantic populations were studied between 2001 and 2003. Significant differences were observed in survival, growth and flowering.

**Impact A:** These results provided the first step in determining how restrictive the FDEP should be in controlling transport of plants among regions for restoration and micropropagation.

**Response B:** David Sylvia (UF) and Kane developed the most compatible plant/mycorrhizal fungus ecotype combinations to maximize sea oat survival and growth when planted on Florida beach dunes.

**Impact B:** The Florida Department of Recreation and Parks participated by allowing test collections and plantings at Anastasia State Park, Sebastian Inlet State Park, St. George Island State Park and Egmont Key National Wildlife Refuge. Sea Grant agent Andrew Diller, oversaw a test planting at the Santa Rosa Villa Townhouse Condominium on Pensacola Beach.

**Response C:** A third, and capstone project by Kane and Sandra Wilson (UF) is developing a protocol for efficient production of multiple genotypes. This will allow commercial nursery producers to fully utilize this technology to produce diverse sea oat genotypes possessing ecologically valuable characteristics that enhance dune stabilization and restoration.

**Impact C:** Commercial nurseries have not waited for the final research results in order to use them. The original and principal industry partner, EcoGroup International Corporation (formerly Bundy Nurseries) of Parrish, Florida was recognized in Florida Trend Magazine (the state's leading business magazine) in January 2003 as the largest producer of sea oats on the planet. AgriStarts II, Inc., Apopka, Florida, began using the research results in 2003 to adapt the sea oats micropropagation using their production systems. Sea Grant Communications assisted the technology transfer in 2003 by developing a brochure listing the 40 commercial suppliers/growers of sea oats in Florida. Some of these growers are using some aspect of the research to produce nursery-propagated sea oats as the most cost-effective way to control dune erosion in the Southeastern U.S.

### ***Measure 2: Cumulative number of coastal, marine, and Great Lakes issue-based forecast capabilities developed and used for management.***

## 2.a. Equipping volunteers for environmental monitoring

**Situation:** Trained citizens constitute an important technical resource to academic and governmental entities concerned with environmental quality, mostly at the local level, but also at state and even the international levels.

**Response:** Florida Sea Grant has a long history of training informed citizens on scientifically sound practices for monitoring coastal waters and habitats. In the Florida panhandle, for example, three Florida Sea Grant extension agents joined forces in a stormwater education program for the Blue Angel Lake homeowners association in Pensacola. The association was assisted in joining the Florida LakeWatch Program as a way to sample and monitor water quality in their lake. Meanwhile, the Okaloosa/Walton County agent is serving as an ex-officio member of the Coastal Dune Lakes Advisory Board and has provided educational opportunities for citizens where they live.

**Impact:** Support and organization of this board led to a proposed second site for a Florida Yards and Neighborhoods landscaping model for the Coastal Dune Lakes at Camp Creek. Currently, all 17 Coastal Dune Lakes in Walton County are consistently being monitored each month by volunteers. The coordinated LakeWatch/Choctawhatchee Basin Alliance program has received funding from the Walton County Board of County Commissioners, along with Grant funds from U.S. Fish and Wildlife Service, and private donations from the Northwest Florida Planning Foundation, Seaside Institute, and citizens.

## **2.b. Development of rip current prediction index**

The phenomenon of surf-zone rip currents that rapidly move large volumes of seawater away from beaches (and pose threats to swimmers) has been quantified more systematically and in greater detail than ever before. Among other attributes, they have been found to be more common and longer lasting than previously thought, and their seasonality and duration have been quantified. These data are the basis for a beach safety rip current index being evaluated. (R. Thieke, A. Kennedy, R. Dean, University of Florida)

## **2.c. Essential habitat and grouper fisheries conservation**

**Situation:** West Florida shelf-edge reefs (50 to 100 meters depth) are of major importance to reef fish fishery production in the Gulf of Mexico, yet little is known about the biological and geological characteristics of these reef systems. The commercial reef fish fishery of this region concentrates its effort on these shelf-edge reefs, whereas the recreational fishery operates in shallower water. Virtually all of the important reef species are considered overfished and some shelf-slope species (Warsaw grouper, and speckled hind) are considered threatened. Gag and scamp groupers spawn exclusively on shelf-edge reefs in aggregations, and both species have undergone significant changes in sex ratio.

**Overall Response:** Using both FSG core program funds and a National Sea Grant strategic initiative, two projects have developed scientific information that is used in management of the fisheries.

**Response A:** A study of the influence of physical properties of artificial reefs upon gag grouper life history determined that juvenile-to-adult gag prefer large patch reefs but grow better on small ones, and also discovered new scientific information about the prey consumed by gag grouper.

**Impact A:** One result of the project, conducted by William Lindberg and Debra Murie of the University of Florida, is that it forms part of the scientific basis for the Steinhatchee Fisheries Management Area (FMA) as a large-area artificial reef development for fisheries conservation and rural economic development. This 100 square mile FMA has been approved for a permit and will be constructed as a public-private partnership of the University of Florida, the Florida Fish and Wildlife Commission and the business community in Florida's Big Bend. The design of reefs will be based on the FSG research.

**Response B:** Sea Grant-funded work on shelf-edge habitat mapping was the first of its kind in such deep-water habitats. It combined quantitative estimates of fish density and spatial habitat features including geomorphology, habitat structuring organisms, and percent coverage. It also developed a protocol for such mapping using either submersibles or ROVs. Investigators Chris Koenig and Felicia Coleman of Florida State University monitored changes in the demographics of gag and scamp spawning aggregations, and found that the catch per unit effort of male gag was eight times higher within Marine Protected Areas (MPA) boundaries than it was within reference sites outside of MPAs, specifically in habitats of comparable type.

**Impact B:** Transfer of this information to fishery management authorities led the U.S. Coast Guard and the National Marine Fisheries Service Law Enforcement Division to become more actively engaged in fisheries enforcement in closed areas. Work with a remotely operating vehicle and with submersibles revealed that red grouper were acting as ecosystem engineers.

## **2.d. Scientists engaged to undergird fishery management**

**Situation:** Fisheries managers in the U.S. have a compelling need to receive the best scientific information available in the quickest way possible in order to appropriately manage the fisheries.

**Response:** A cadre of Sea Grant academic research and extension faculty are engaged in a host of activities to provide the best available technical information to fishery management authorities at the state, regional and



national levels. The faculty who conduct Sea Grant fisheries research and/or present extension programs have a strong commitment to extending technical results to managers and other stakeholders. Recent service by FSG personnel includes membership on the Sheepshead Technical Task Force for the Gulf States Marine Fisheries Commission; the Scientific and Statistical Committees of the South Atlantic and the Gulf of Mexico Regional Management Councils; the joint Gulf and South Atlantic Coastal Pelagics Stock Assessment Panel; the South Atlantic Black Sea Bass and Vermilion Snapper Stock Assessment Review Panel and the Gulf and South Atlantic Yellowtail Snapper and Goliath Grouper Stock Assessment Review Panel of the National Marine Fisheries Service.

**Impact:** This participation has caused the establishment of parameters that led to a conclusion that the yellowtail snapper fishery was healthy and not overfished (contrary to an outside panel findings). At the state level and at the request of the Governor's office, FSG conducted a workshop to help 50 shrimp fishermen evaluate the utility of various financial assistance programs, subsequent to economic hardship experienced by this domestic industry. FSG also held 16 workshops attended by 200 blue crab fishers, as the basis for developing a report to be used in developing a Florida Blue Crab Management Plan, at the request of the Florida Fish and Wildlife Conservation Commission.

## **2.e. Recognition of the importance of groundwater discharge**

**Situation:** All of Florida sits within the coastal zone, which means activities anywhere in the state have the potential to affect coastal water quality. For example, upland landscaping, agriculture and home maintenance put pressure on coastal water quality by adding nutrients and pollutants to watersheds. A major and rapidly growing source of non-point source contamination in the coastal zone is nutrient loading from septic and other types of on-site disposal systems.

**Response:** Using new radioisotope tracer methods, Florida Sea Grant researchers William Burnett and Jeffrey Chanton (FSU) determined rates of water and nutrient transport via groundwater from on-site disposal systems on St. George Island, a barrier island of Apalachicola Bay in northwest Florida.

**Impact:** The aerobic type of on-site disposal system for wastewater performs better than the anaerobic system in terms of nutrient reduction which would create significant benefits for Apalachicola Bay (and its large oyster industry) if this type of system is implemented on a larger scale. The use of multi radium isotopes (identical chemical behavior but different half-lives) appears very promising for estimating the mixing and residence times of waters in embayments. The team extended its work geographically to west-central Florida and the Keys. Results on the  $^{15}\text{N}$  of stormwater are (to its knowledge) the first measurements ever reported on this important source of nitrogen to coastal waters. Another new method is to add caffeine as a tracer to test linkage of septic tank contamination to groundwaters which then discharge to surface waters, a possible problem behind beach closings. This group also determined the extent of denitrification in the subsurface of the largest injection well in the Florida Keys, and that roughly 50% of the nitrate injected into the subsurface is denitrified.

## **2.f. Reducing hurricane wind damage**

**Situation:** Catastrophic loss due to hurricanes is the largest and most pervasive risk faced by the state of Florida. NOAA estimates that at least half the U.S. hurricane-related damage occurs in Florida. Insured losses from Hurricane Andrew in 1992 were placed at about \$20.0 billion, the highest ever for a natural disaster. In 2004, for the first time in history, four major hurricanes, Charley, Frances, Ivan and Jeanne, made landfall in Florida, with total damage estimates at slightly higher than those from Andrew.

**Response:** One way to reduce damage is create coastal structures that are more wind resistant. Anecdotal evidence coming post-2004 is that side-by-side structures fared quite differently. Those built to new construction standards in place since Andrew, suffered minor damage, while the older structures built to earlier standards were totally destroyed. The University of Florida (UF), the Florida Institute of Technology (FIT) and Clemson University (CU) formed a partnership in 1998 to address the issue of at-risk coastal structures and provide economically feasible engineering solutions to reduce wind damage. With the Florida Department of Community Affairs as the sponsoring agency, they created the Florida Coastal Monitoring Program (FCMP) to develop and deploy instrumentation to measure ground level wind turbulence and the resultant loads on homes during storm landfall. The FCMP database of 14 storms is now large enough to conduct analyses that produce

statistically significant findings about the behavior of ground-level hurricane winds. Many of the storms in the current FCMP database were captured with partial support from Florida Sea Grant. Florida Sea Grant funded two pilot projects (Kurt Gurley, UF, 1999; Jean-Paul Pinelli and Chelakara Subramanian, FIT, 2000) to measure wind data for three hurricanes (Dennis, Floyd, Irene) and to upgrade house-based sensors and software to analyze the data collected by the sensors. Two two-year projects followed. The three investigators partnered on a 2002-2004 project to develop new instrumentation to measure and characterize ground-level hurricane wind fields, to quantify and model the resultant wind force interaction with man-made coastal structures, and to test remote tower transmission of real-time data. In addition, they are partnering with engineers at Clemson University using South Carolina Sea Grant funding to work on joint aspects of the problem. The work has been highly successful, capturing vital data during all major landfall hurricanes in recent years.

**Impact A:** The FCMP places pressure reading instruments on lived-in residential structures along Florida's coast. Now on 32 homes, the system is activated and the wind pressure on the roof of the homes is collected during a land-falling hurricane. FSG researchers at FIT have developed a second generation version of the system, using wireless technology, reducing costs and allowing more sensors per house. The new system offers the advantages of ease of installation, capability for more than 48 hours of continuous data acquisition from up to 60 sensors at variable sampling rates, and a relatively easy maintenance. The FCMP collected wind data in all four Florida landfalling 2004 hurricanes, including load datasets on 16 houses from three storms. Six of these houses were subjected to sustained hurricane level winds, and two houses along the east coast collected data from both Frances and Jeanne. One house was subjected to the eye of Frances.

**Impact B:** During Hurricane Isabel in North Carolina in September, 2003, the research team placed mobile wind towers in front of the hurricane's landfall, and transmitted for the first time in history, real-time wind velocity data from portable stations during a hurricane. This technology was developed by UF researchers with partial Sea Grant funding. Researchers and forecasters, notably at the NOAA Atlantic Oceanographic and Meteorological Laboratory (AOML) and NOAA Hurricane Center (NHC) in Miami, received via a wireless Internet connection, real-time reports of ground-level coastal wind speed (at 17 and 34 feet off the ground), wind direction and barometric pressure. According to Peter Black at the NOAA Hurricane Center, "I was able to relay the reports to NHC forecasters, giving them a sense of how quickly conditions on the coast were deteriorating as Isabel approached land." The observations represent the highest wind speed for which continuous, high-frequency digital observations have been recorded in a U.S. land-falling hurricane. NOAA's experimental H\* Wind analysis model relied almost exclusively on this source of field information for much of Isabel, as the permanent weather stations experienced massive failure. Hurricane Hunters use the towers as a source of ground wind speed calibration for dropsonde experiments. FEMA also accessed the real-time data to calibrate their wind field model, which was used by HAZUS software to protect structural damage. FSG funding was a major resource for the Isabel deployment. The portable towers and real-time wind velocity measurement system also worked flawlessly during Hurricanes Charley, Frances, Jeanne and Ivan in 2004. During Ivan, several towers were too remotely located to communicate with cell towers and two others captured eye wall activity. Although the wind velocity data were still captured, only one tower relayed the information in real time. The positive response received by providing those data has helped secure supplemental funding for tower deployments from NOAA. Providing real-time data to NOAA has also secured their guidance on storm path and intensity directly to FCMP field teams looking for optimal deployment locations. FEMA uses the data in real time for their HAZUS wind loss projection models, with additional support anticipated from private companies. Supplemental funding from Florida Sea Grant financed the construction of wind measurement equipment to accompany the towers. The system allows teams to space wind measurement devices close to each other, providing a measure of the average physical width of turbulent wind gusts as they approach structures, with implications regarding appropriate modeling of structural loads for building codes.

***Measure 3: Percentage/number of tools, technologies, and information services that are used by NOAA partners/customers to improve ecosystem based management.***

**3.a. Educating educators and other elites**

**Situation:** With the entire state declared a "Coastal Zone," Florida has a very broad array of stakeholders somehow linked to the water of its estuarine and near shore ocean ecosystems. Cattle ranchers, golf course

operators, housing development interests, school children, retirees and a host of others need to know how these activities affect coastal waters.

**Response A:** During 2003, 25 county extension faculty in Florida who work in agriculture, natural resources and coastal issues participated in an in-service training program, “Watershed Water Quality: Non-point Source Pollution.”

**Impact A:** This activity raised participant knowledge by 30% according to pre and post-tests, and the faculty are in turn using this information to create educational programs (38%), address watershed issues in counties (25%) and address regulatory issues faced by their clientele (19%).

**Response B:** The Florida Master Naturalist Program is a national award-winning adult education program developed by UF/IFAS and provided by an array of participating institutions. It is developed principally as a train-the-trainer program. Florida Sea Grant contributed substantially to its Coastal Systems Module that increases participant knowledge of Florida’s estuaries and near shore marine environments. Water quality is a pervasive theme as the module addresses society’s roles in coastal areas.

**Impact B:** Since 2001, nearly 2,000 people have received this training, and they are now doing additional training at the community level. The program continues to grow as there are now course offerings in 40 counties throughout the state, involving more than 80 organizations.

### **3.b. Explaining the world’s largest ecosystem restoration program**

**Situation:** South Florida ecosystems— including The Everglades— are undergoing the largest ecological restoration program in history, at a cost of \$8 billion. Recently, more than 100 research projects per year, involving nine state and federal agencies, were being conducted on some aspect of the Florida Bay ecosystem.

**Response:** To inform a broad array of audiences, FSG initiated a number of activities. In the late 1990s Florida Sea Grant organized the Florida Bay Education Project, funded by NOAA, to disseminate the information gained from the research. An annual Florida Bay Science Conference was initiated in 1999, with participation of all the 250 scientists involved in Florida Bay research.

**Impact:** The conference continues to this day, and its organization was passed on to another entity. Other activities included organizing an ecosystem modeling workshop, topical research teams on subjects such as sea grass, a “Seahorse Sentinel” newsletter, an interagency sea grass summit outreach partnership, a Florida Bay research and education directory, a needs assessment on education needs about the bay, a series of Florida Bay Watch Reports, a mass media effort focused on the 5 million residents of the region, a low-power radio station that broadcasted educational messages, and a series of about 100 bilingual, lay language, one-pagers on each research project in the bay.

### **3.c. Preventing and minimizing invasive species impacts**

Florida faculty have been particularly successful in obtaining National Sea Grant (NSG) aquatic nuisance species “strategic initiative” funds for research and education purposes, thus addressing a priority for which Florida Sea Grant core program funds simply have not been available.

**Situation:** In the last decade populations of synbranchid eels, referred to the Asian genus *Monopterus*, “swamp eels,” have been discovered in aquatic habitats near Atlanta, Georgia, Tampa, Florida, North Miami, Florida, and most recently close to Everglades National Park.

**Response:** A university-agency team of fishery biologists and geneticists led by Timothy Collins of Florida International University has developed high-resolution microsatellite loci to determine both the native source populations, and local sources (fish markets, ornamental fish farms, aquarium stores, etc.) of introduced populations of these fish.

**Impact:** A significant discovery of the project is that a new, but as yet unreleased species of swamp eel, *Monopterus cucia*, is being sold live in U.S. markets. This finding may enable the prevention of yet another invasive species into U. S. waters. A second important discovery is that the Atlanta population is distinct from other U.S. introduced populations and related to populations from Japan, Korea, and Taiwan. This means that it is feasible and worthwhile to extirpate this restricted population. The investigators took part in an Aquatic Nuisance Species Task Force meeting on “Swamp Eels in the U.S.” Based in part on the genetic results they

presented, the task force recommended to “develop and implement a strategy to eliminate the population of *Monopterus albus* in the ponds at the Chattahoochee Nature Center” (Atlanta population).

### **3.d. Bringing marinas up to high environmental standards**

**Situation:** There are nearly 2,000 marinas operating in Florida and hundreds of thousands of boaters use Florida’s waters every day. According to the Marine Industries Association of Florida, boating is a \$14.2 billion dollar water-intensive industry that includes marinas, boatyards and boaters. The effects of year-round boating activities contribute to constant and growing pressure on the state’s marine ecosystems. Clean water is essential to this multi-billion dollar industry.

**Response:** The Clean Boating Partnership, the original clean marina program in the nation, is a collaborative effort with the Florida Department of Environmental Protection, Marine Industries Association of Florida, U.S. Coast Guard and Florida Sea Grant. The goal is to improve the health and cleanliness of waterways through voluntary implementation of environmental best management practices within the state’s public and private marinas, boatyards and related facilities. Opportunities have been developed for public and private entities to work together, proactively, to provide incentives and remove institutional roadblocks to resource stewardship of Florida’s waterways. Florida Sea Grant contributions have included writing the curriculum for workshops on clean marinas and clean boatyards, participating in the presentation of these workshops, and chairing committees of the partnership.

**Impact:** Certifications include 94 clean marinas and 17 clean boatyards, with about 150 more “in the pipeline.” Ten other states are now involved in clean marina programs and six more are discussing startup. Clean Marinas and Clean Boatyards estimated that in a recent year over 600,000 pounds of glass, 1.5 million pounds of paper, 3.7 million pounds of aluminum, 5.6 million gallons of oil, and over 1 million pounds of antifreeze were either recycled or properly handled to keep them from entering Florida waters as a result of the Clean Boating Partnership.

### **3.e. Regional Waterway Management System (RWMS) development**

**Situation:** The West Coast Inland Navigation District (WCIND) is a multi-county special taxing district, comprised of Manatee, Sarasota, Charlotte, and Lee counties, representing an estimated 1.1 million people. The District assists in the planning and implementation of waterway projects that promote safe navigation and enjoyment of water-based activities, such as boating, fishing, and beach recreation.

**Response:** FSG began partnering with WCIND and its executive director, Chuck Listowski, in the mid-1990s on a pilot waterway management project covering Sarasota Bay. Research, instructional workshops and a series of meetings have been conducted from 2000-2004 for industry, county and state officials to inform them about and teach the principles involved in the system.

**Impact:** The system has been adopted by Lee, Manatee and Sarasota counties, and in 2002, the state legislature passed a law (Chapter 62-341.490 Noticed General Permits for Dredging by the West Coast Inland Navigation District) applying to fifty-one Manatee and Sarasota County boat trafficsheds with high priority maintenance needs. The rule states that environmental restoration or enhancement projects must comply with the science-based procedures and methods of the FSG RWMS outlined in FSG technical publications. General permits result in more environmentally friendly dredging and savings in dollars and staff time.

### **3.f. Legal assistance**

**Situation:** Conflicts in waterway use sometimes lead to legal confrontations. The time and costs involved can often be reduced through up-front legal education.

**Response A:** Attorneys Richard Hamann and Tom Ankersen, Center for Governmental Responsibility, UF College of Law, participated as part of the boating and waterways management program to educate both private attorneys and government agency legal staff statewide.

**Impact A:** Following a successful statewide conference on recreational boating law issues in 1999, 120 people attended a second conference in 2002 that provided legal and technical education on issues associated with the use of the marine environment. The conference is given in cooperation with the Florida Bar Association and local chapters of the Marine Industries Association of Florida as a continuing legal education workshop, with

the attendees rating the event 4 on 5 point scale. The next conference is in 2005.

**Response B:** Anchorage issues (who, where, when, impacts) have been a high profile conflict issue for years.

**Impact B:** Ankersen, Hamann and their students developed an annotated model ordinance for local harbor management that was adopted by the Southwest Florida Regional Harbor Board in 2001, as the appropriate tool for local management of anchorages. It offers an alternative to the arbitrary and controversial length of stay restrictions provided in most anchorage regulations. Instead, the CGR model provides for local boater driven anchorage governance that involves temporal and spatial zoning of space within anchorages. The model was adopted in part in the Fort Myers Beach plan for the Matanzas Pass anchorage. More recently, Hamann, Ankersen and a law student assisted the City of Sarasota with its anchorage regulations.

### **3.g. Assisting local, regional, state and federal agencies**

**Situation:** Florida has almost one million boats registered in the state; another 400,000 enter the state each year as transit boaters. There is one boat registered for every 20 people in the state, or about one for every seven families. This many people using a set of finite waterways often leads to conflicts in resource use.

**Response:** FSG's goal is to educate those individuals and agencies that deal with boating and the waterways, to incorporate the appropriate legal framework in new management systems and to minimize expensive regulatory, legal and social confrontations.

**Impact A:** Navigational chart 11425 was redesigned for the NOAA National Ocean Service/Marine Chart Division by Gustavo Antonini (deceased), Bob Swett and Charles Sidman. The new format was based on boater needs, met operational safety requirements and provided information that will allow boaters to become better environmental stewards. Boater evaluations of new charting concepts were conducted, and NOS is implementing some of them in new nautical chart products.

**Impact B:** A five-year strategic plan for 2002-07 was completed for the West Coast Inland Navigation District (WCIND) by Charles Sidman. The plan included elements for waterways, anchorages, inlets, beaches, emergency management, infrastructure maintenance, dredge material management, sustaining the environment, permitting and coordination. FSG continues to assist WCIND in plan implementation through follow-up workshops and projects.

**Impact C:** Recreational boating characteristics have been completed for Charlotte Harbor, Tampa Bay and Sarasota Bay by Charles Sidman, Bob Swett and David Fann for the Florida Fish and Wildlife Research Institute, as part of their Blueways Initiative. The information is being used by the state as the basis for developing map-based products intended to improve boating experiences and promote resource stewardship.

**Impact D:** Charles Swett and David Fann developed for NOAA/Coastal Services Center a reliable and recurring source of bathymetric data, which meets NOAA standards, for areas where NOAA surveys do not show current conditions. The method, equipment and data are being used by the WCIND and other local and regional agencies when they contract with third-party organizations in collecting data to meet resource management needs and provide NOAA supplemental information for nautical charts.

**Impact E:** Bob Swett and Charles Sidman demonstrated that data from the state's Vessel Title Registration System (VTRS) is an adequate replacement for expensive on-the-water censuses of boats as a source of research and management information. The goal is to implement the process and replace or augment existing field survey methods used in the Regional Waterway Management System and other boating-related projects.

### **3.h. Assisting boaters and support groups**

**Situation:** At the same time that agencies deal with conflict resolution from a regulatory and management perspective, boaters and their support groups also need to be a part of the process.

**Response:** Florida Sea Grant participated as a founding member (1997) of MarinaNet that is now functioning as an industry-led nationwide effort. As an outgrowth of this effort, several activities in Florida have been targeted directly at boaters and marinas.

**Impact A:** Two volumes (1999; 2002) of a historical geography of southwest Florida [Anna Maria Sound to Lemon Bay (1999); Placida Harbor to Marco Island (2002)] were completed by Gustavo Antonini (deceased), David Fann and Paul Roat. Multiple partners were involved and thousands of copies of the documents have been distributed, providing scientific, technical and boating-related information on changes to the waterways.

**Impact B:** A “Panic Preventer File for Marinas” was completed in 2000 by Don Jackson. It has been continually updated and more than 2,000 copies have been distributed to marinas worldwide. It provides a plan for marinas to use in emergency situations such as overdue boaters, storms and accidents.

**Impact C:** 50,000 copies of a boater’s guide to Charlotte Harbor were completed and distributed by Rich Novak (deceased) in partnership with seven agencies and organizations.

### **3.i. Educating anglers about reef fish survival**

**Situation:** The growth of recreational fishing in Florida has been accompanied by increased participation in catch-and-release practices. In order to help maintain viable fish populations, each angler is responsible for carefully handling fish that are hooked, and releasing fish that are not harvested so they can spawn or perhaps be caught again. Reef fish may require special handling during release to decrease mortality, because gas in their swim bladder can over expand when fish are brought quickly to the surface by hook and line. This can result in serious injury to the fish, and if released in this buoyant condition the fish may float away and die from exposure to the elements or become an easy target for predators. This defeats the purpose of fishery management laws such as minimum size restrictions and daily bag limits.

**Response:** The practice of “venting” releases these gases from the body cavity. Venting also allows the fish to overcome buoyancy problems and swim down to habitat depth, enhancing its immediate survival. Subsequent to a research project conducted at Mote Marine Laboratory (Karen Burns, investigator), because no device for venting existed, the Novak Venting Tool was designed and developed by Florida Sea Grant in cooperation with Mote researchers. They also developed video and print educational materials to assist anglers in learning to vent reef fish.

**Impact:** A coordinated statewide effort to introduce fish venting was started in 2003, by 11 FSG extension faculty. Through educational workshops and sport fishing events, thousands of anglers were taught proper fish venting techniques, catch and release practices, and the benefits of using circle hooks to minimize gut-hooking fish. A mailed survey after three months indicated 66% said they used the tool while fishing. Thousands of anglers and charter boat captains have been exposed to the “FSG-invented” tool that is now sold commercially by Aquatic Release Conservation, Inc.

### **3.j. Sharks in perspective: from fear to fascination**

**Situation:** Shark management and conservation issues regularly are in the public eye. Much misinformation and sensationalism has been generated in the popular press that does not correspond to current scientific information.

**Response:** At the express request of the Undersecretary of Commerce for Oceans and Atmosphere (NOAA), the Florida Sea Grant Extension program and University of Florida Museum of Natural History conducted a national shark workshop to improve the decisions made by both the private and public sectors about the use, management and sustainability of the shark resource. The June 2002 program was attended by 110 educators, resource managers, scientists and fishers from 16 states, as well as from Puerto Rico and Bermuda. They increased their understanding and knowledge of shark management and conservation practices, as well as learned about the realities vs. myths about shark attacks, and the best beach practices to minimize shark attacks on humans.

**Impact:** A shark information network was established within the 16 states with individuals representing their respective state Sea Grant programs. Over 20 members of the TV and print media attended the conference, leading to responsible, science-based coverage on sharks in print and video media for several days following the conference. Funds were also provided to the Florida Museum of Natural History to assist in upgrading its shark website <http://www.flmnh.ufl.edu/fish/Sharks/sharks.htm> and to develop “Project Shark Awareness,” to educate the public about the myths and realities of shark biology, behavior and conservation.

### **3.k. Protecting human health with improved seawater monitoring**

**Situation:** When wastewater contaminates coastal waters there is an increased risk of infection by human pathogenic microbes. Such contamination can impact fisheries, shellfish, and the recreational water use industries which in total represent a multi-billion dollar industry in Florida. One group of wastewater pathogens

in seawater is the enteroviruses, which can cause severe to life-threatening infections in humans.

**Response:** Because the enteroviruses are genetically related and share some similarity in genome sequence, a group of at least 25 such viruses can be detected by a widely used RT-PCR method. Employing this method in the canals of the Florida Keys and Sarasota Bay, a team led by John Paul of the University of South Florida found that 79% and 90% of the samples examined, respectively, were positive for enteroviruses. These results are quite startling and cause the scientists to wonder if the values represent truly human pathogenic enteroviruses or perhaps an indigenous virus typical of the subtropics.

**Impact:** This Florida Sea Grant research led to development of the first method for detecting the quantity of enteroviruses in seawater samples, thereby enabling quantification of enteroviral nucleic acids in environmental samples. In turn this led to the first values for enteroviral quantities in the Florida Keys. Prior technology just detected the presence (or absence) of such viral particles. However, the health risk of infection is related to the number of infectious units. Using the new method, it is possible to differentiate waters that are a high risk from those of low risk. Secondly, the type of enterovirus present can be detected. In initial follow-up to the research, the technology has been transferred to staff of the U.S. Geological Survey. The investigator has been in the process of pursuing commercialization and been in contact with a company to discuss the use of one of their products in this technology.

### **3.l. Fisheries**

Scientific issues in shark phylogenetics and rates of molecular evolution can be more efficiently addressed by a new high-throughput (streamlined and high sample number processing ability) method employing genetic markers to distinguish among multiple species, and screen multiple shark samples simultaneously in the same, single-tube polymerase chain reaction (PCR) assay. The method can distinguish up to seven shark species simultaneously using just a single tube PCR. This assay is also novel in that it incorporates an internal positive control to prevent the occurrence of false negative results (a common problem in PCR diagnostic assays). (M. Shivji, Nova Southeastern University)

### **3.m. Biotechnology/New application for powerful technology**

DNA micro array technology, a powerful tool already used with other groups of organisms and based on hybridization of DNA fragments, has been applied to sponges for the first time. The intent is to characterize the mechanism-of-action of an anti-cancer compound derived from sponges, and identify genes important to this bioactive process. (A. Wright, S. Pomponi, Harbor Branch Oceanographic Institution)

### **3.n. High speed digital photography used in research**

High-speed digital video photography has been used for the first time to investigate feeding performance of cultured fish. Specifically, analysis of early stage jaw mechanics of larval fishes is enabled by this technology, so that an increase in prey capture by, for example, red drum larvae from 5% at first-feeding to almost 100% by 13 days could be explained in terms of development of the hyoid-opercula-mandible jaw mechanism for mouth opening. (R. Turingan, Florida Institute of Technology)

### **3.o. New method of analysis developed**

To reduce time, labor and costs, and to increase reliability of assays for detection of *Vibrio vulnificus*, a bacterial contaminant of oysters and cause of human illness and fatality, FSG investigators developed a new means of analysis. Comparison of alternate approaches such as DNA probes and microbiologic “most probable number” determined that an “R-PCR” (polymerase chain reaction) assessment provides higher “through-put.” The laboratory success is being scaled-up in field investigations with the oyster industry and U.S. Food and Drug Administration. (A. Wright, University of Florida; V. Harwood, University of South Florida)

### **3.p. Real-time data provided to NOAA**

A regional two-state, three-institution study of hurricane risk and damage has developed, deployed and successfully acquired data using sensors mounted on beachfront homes and mobile wind towers to measure and characterize ground-level storm wind fields. A second generation of the system successfully used wireless technology during Hurricane Charley in 2004. In 2003 and 2004, the system provided real-time data to NOAA's AOML Hurricane Research Division and in turn to National Hurricane Center forecasters, even after other wind sensing systems had stopped. (K. Gurley, University of Florida; J. Pinelli, Florida Institute of Technology)

### **3.q. Marine invasive species documented**

It has been discovered that a previously unrecognized invasive species of swamp eel, *Monopterus albus*, is part of the trade for this group of imported fishes sold in U.S. seafood markets, based on advanced population genetics approaches including high-resolution microsatellite loci. These results sound a warning that may prevent release of this non-native species in Florida and other ecosystems. (T. Collins, Florida International University)

### **3.r. New tracer technique developed**

Detecting and characterizing groundwater flow through Florida's vast limestone and other subsurface layers has been enhanced by development of new tracer techniques. A new radioisotope tracer method has been used to evaluate performance of wastewater disposal systems and nutrient dispersal ( $^{15}\text{N}$ ). Caffeine has been used as a tracer to assess septic tank contamination of beach waters. (W. Burnett, J. Chanton, Florida State University)

## **Goals, Actions and Measures, 2006-07**

The following sections present the broad goals, audience, products and activities, who will deliver the products and activities, the performance indicators and measures of impact and the exit strategy for each of FSG's nine goal areas. Then, within each goal area the same information is given in detail for each research project and for each extension and communication activity that will be carried out with core program Sea Grant funding for the two-year, 2006-07 program years.



**GOAL 1.0 BIOTECHNOLOGY: USE MARINE BIOTECHNOLOGY TO CREATE AND ENHANCE PRODUCTS AND PROCESSES FROM FLORIDA’S COASTAL RESOURCES**

The exciting discoveries of modern biotechnology are an extension of practices that are thousands of years old, such as using yeast in bread-making and fermentation in wine production. Within the general field of biotechnology as an applied science that seeks to enhance human life and environmental quality, the newer field of “marine biotechnology” is becoming established. Simply, marine biotechnology seeks to develop goods and services from the organisms and processes of the ocean. For example, a compound from coral is used as an anti-inflammatory drug, as part of a larger quest for new medicines. Other scientific investigations are seeking ways to detect environmental contaminants, discover new industrial compounds, or assure quality of seafood.

The rich and diverse ocean environments ringing Florida’s coastline are one of America’s most promising living laboratories for marine biotechnology research, development, education and commerce. Thus it is only logical that the Florida Sea Grant College Program does its utmost to nurture this field. Florida Sea Grant is continuing its leadership in research and education concerning marine biotechnology. It has surveyed the commercial marine biotech industry, participates with BIOFlorida on behalf of the marine biotech research community, and maintains a database of university faculty interested in and working with marine biotechnology projects. Its partners in academia, business and government have combined forces to analyze novel compounds with potential to treat cancer, arthritis and other diseases, to search for materials to reduce drag on boat hulls and to create methods to identify pollutants in the environment. Florida Sea Grant seeks to support Florida’s best scientists, train the scientists of the future, and then disseminate findings to lay and technical audiences.

Three projects scheduled to end in early 2008 result from the statewide competition held during 2005. Of 76 Statements of Interest (SIs) originally received, 14 were funded. Fourteen of the 76 SIs were in the area of marine biotechnology, and three were funded as full proposals. Florida Sea Grant management also continues its focus on developing this goal area.

Goal 1: Broad goals, audiences, products, performance, impact and exit strategy					
What are the broad goals?	Who is the audience?	What are the products and activities?	Who will deliver the products and activities?	What are the performance indicators and measures of impact?	What is the exit strategy?
Create and enhance products and processes from living coastal resources. Develop marine bioproducts and sustainable sources of supply. Improve health and production of marine organisms. Promote human health and environmental quality. Facilitate informed consumer, business and technical decisions.	Scientists. Executives in business, academia, government. Media. Funding organizations for research and outreach.	Technical knowledge. Inventions and patents on new products and processes. Trained students. Formats: primary literature, news releases, websites, workshops, briefings, conference displays, one-pagers, list serve.	Program management. Research faculty. Communications staff. Industry and agency cooperators.	New inventions, patents, products, business lines, technology licensing, investments, research funding, conservation of natural resources; greater reporting by media; increased awareness and understanding by technical and semi-technical audiences.	Research infrastructure established and funded sustainably. Expanded level of business activity. Enhanced natural resources management.

Specific Activities 2006-2007					
Action	Audience	Products and activities	Implementer	Short- and long-term performance indicators	Timeline for project completion
R/LR-MB-22 -- Discover new natural products from Florida benthic marine cyanobacteria that will be useful as drugs in the treatment of human disease.	Scientists. Regulatory agencies. Biotechnology companies.	Scientific journal articles. Scientific conference presentations.	Valerie Paul, - SMS; Clifford Ross (SMS); Lyndon West (UG); Hendrick Luesch (UF)	Patents. Licensing. Product testing. Knowledge of the chemical variability of marine cyanobacteria and the relationship between natural adaptive functions of cyanobacterial metabolites and their biomedical application.	2008
R/LR-MB-23 -- Provide a novel approach towards eventual recombinant production of potent bioactive compounds known to be produced by the marine sponge genus <i>Discodermia</i> .	Scientists. Regulatory agencies. Biotechnology companies. Industry partner.	Scientific journal articles. Scientific conference presentations.	Jose Lopez - (HBOD); Robert A. Feldman, (SBC)	Patents. Licensing. Product testing. Molecular sequence data will serve as a novel genetic resource (e.g., tool kit) for research and industry, enabling downstream experiments and sustainable production of unique bioactive marine natural products.	2008
R/LR-MB-24 - Purify the native terpene synthase leading to eleutherobin and clone the corresponding gene, as a means of increasing supply of bioactive coral-derived compounds.	Scientists. Regulatory agencies. Biotechnology companies. Industry partner.	Scientific journal articles. Scientific conference presentations.	Russell Kerr (FAU)	Patents. Licensing. Product testing. Develop a commercially relevant production method of eleutherobin combining recombinant technology with chemical synthesis.	2008
Advance science and commerce in Florida marine biotechnology. (M/PM-14)	National biotechnology companies. University scientists. Venture capitalists.	Membership on BioFlorida Board of Directors, Sea Grant National Theme Team. Maintain statewide faculty listserve. Briefings	Seaman, William (UF/FSG) Various faculty as needed. Industry advisory panel.	Growth in interest and engagement by: faculty, legislature, companies, venture capitalists,	Ongoing through 2008

Specific Activities 2006-2007					
Action	Audience	Products and activities	Implementer	Short- and long-term performance indicators	Timeline for project completion
	National Sea Grant researchers. BioFlorida. Legislators. Legislative staffs. Funding agencies. Foundations.	for legislative and trade groups. Marine Biotechnology Summit. Business plan.		foundations, agencies. Implement business plan milestones.	

**GOAL 2.0 FISHERIES: CREATE AND TEACH PRODUCTION AND MANAGEMENT TECHNIQUES THAT MAKE FISHERIES SUSTAINABLE AND COMPETITIVE.**

Recreational and commercial fisheries comprise multi-billion dollar industries in Florida. Increasing demands for both high quality seafood products and memorable recreational fishing opportunities have placed increased pressure on the stocks of finfish and shellfish species which inhabit the coastal waters of Florida. Increased usage associated with this demand dictates the need for more effective fisheries management programs. Effective management requires knowledge on the life history of the target species, sustainable catch levels, appropriate distribution of the catch among commercial and recreational users, by-catch associated with different types of fishing gear, impact of fishing activities on essential habitats, and many other issues. Biological, economic, and social expertise must be brought to bear by research and educational programs in a manner such that the sustainable use of Florida’s marine finfish and shellfish resources can be ensured.

The Florida Sea Grant College Program has a long history of funding research and educational programs associated with fisheries management. This research has focused on a wide variety of topics including biological modeling of fish stocks, understanding the economic characteristics of the fisheries-based industries, improving the design of artificial habitats, recognizing the social impact of marine resource regulations, measuring the contribution of marine habitats to fisheries production, and others. And making sure the findings are effectively transferred to industry participants, recreational fishers, and resource managers is vital. By focusing on the wise utilization of Florida’s fisheries resources, Florida Sea Grant can help ensure that these resources can be appreciated by generations yet to come.

The plan for fisheries represent two projects that end in early 2008 and an organized fisheries extension component. The three new fisheries projects were chosen from five full proposals that were invited from 13 SIs received in this area.

Goal 2: Broad goals, audiences, products, performance, impact and exit strategy					
What are the broad goals?	Who is the audience?	What are the products and activities?	Who will deliver the products and activities?	What are the performance indicators and measures of impact?	What is the exit strategy?
To ensure that fisheries 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. To reduce the number of overfished stocks.	Scientists. GMFMC. SAFMC. FFWC. GSMFC. ASMFC. Commercial and recreational fishermen. Conservation groups.	Serving on advisory committees of management councils and commissions. Journal articles. Workshops on fish management concepts. Reports and technical papers.	Research faculty. State Extension faculty, County Extension faculty. Communications staff.	Decreases in the numbers of stocks overfished. Achieving maximum economic yield from a fishery. Achieving sustainable stocks and level of fishing effort over time. Determining if management objectives are being met.	Exit when stocks are fished at a sustainable economic and biological level.

Specific Activities 2006-2007					
Action	Audience	Products and activities	Implementer	Short- and long-term performance indicators	Timeline for project completion
Determine whether sound analyses can yield quantitative data on the number of eggs spawned and identify spawning habitat of sound-producing fishes. (R/LR-B-58)	Fisheries scientists. FFWC.	Scientific journal articles. Scientific conference presentations.	David Mann (USF)	Estimate average sound levels and spatial variability in sound levels of estuarine fishes. Whether particular sounds are associated with particular behaviors.	2008
Develop an approach to evaluate the essential nature of gray snapper nursery habitat by linking region-specific juvenile production with eventual recruitment to adult habitat. (R/LR-B-59)	Fisheries scientists. FFWC. GSMFC. GMFMC. NOAA Fisheries.	Scientific journal articles. Scientific conference presentations.	William F. Patterson III (UWF) Richard S. McBride (FFWRI) Richard Allman (NOAA Fish SEFSC)	If differences in juvenile gray snapper density, growth, mortality, or production exist among west Florida nursery areas or between years. Develop natural tags of nursery areas based on otolith elemental and stable isotope signatures. Population dynamics specific to gray snapper. Establish a quantitative, process-oriented approach to assessing habitat value that could be applied to any finfish species with a bipartite life history that includes distinct nursery and adult habitats.	2008

Specific Activities 2006-2007					
Action	Audience	Products and activities	Implementer	Short- and long-term performance indicators	Timeline for project completion
Develop a multiple genetic marker approach to assess global scale population structure and mating systems in high fin-market demand shark species. (R/LR-B-60)	Fisheries scientists. NOAA Fisheries. United Nations.	Scientific journal articles. Scientific conference presentations.	Mahmood Shivji (NSU)	Develop informative microsatellite and mitochondrial DNA markers from great hammerhead and dusky sharks. Determine if market derived, genetically identified fins of these species can be assigned to population of origin. Develop an AFLP marker system for each species. Use polymorphic microsatellite markers to determine the genetic mating system of great hammerhead sharks. Delineation of genetic populations and identification of populations most exploited for their fins.	2008
Develop and teach new and innovative ways to manage fisheries and evaluate effectiveness of management decisions on resources and user groups: (a) improve fishery management models and forecasts; (b) provide social economic information through direct input to fishery management	GMFMC. SAFMC. NMFS. FFWC. USDA. GSMFC. Recreational anglers including youth. Specific fisheries and fishermen: sponge, black grouper, snook, shrimp, shark, scallops, red drum. Charter and party boat operators. County artificial reef coordinators.	Membership on GMFMC and SAFMC scientific and statistical committees and stock assessment panels. County-based workshops. Print and electronic media. Statewide conferences and workshops. Survey of sponge fishery. Tag and release efforts. Chair GSMFC task force. FFWC Working Group participation.	Mike Spranger (UF/FSG) Chuck Adams (UF/FSG) John Stevely (Manatee Co./FSG) Don Sweat (Pinellas Co./FSG) Doug Gregory (Monroe Co./FSG) Chris Combs (Brevard Co./FSG) Marella Crane (Miami-Dade Co./FSG) Scott Jackson (Okaloosa Co./FSG) Betty Staugler (Charlotte Co./FSG)	Determine if sponge stocks are increasing through surveys. Determine if science-based decisions come from fishery regulators. Determine if reef fish stock sizes are recovering. Determine if artificial reefs increase productivity of stocks and are useful in management. Measure survival rates of stocked	Ongoing through 2008

Specific Activities 2006-2007					
Action	Audience	Products and activities	Implementer	Short- and long-term performance indicators	Timeline for project completion
decisions; (c) minimize by-catch; (d) define the role of essential fish habitat (EFH) in ecosystems and their management; (e) measure the effects of fishery stock enhancement practices; (f) teach new innovative ways to manage fisheries and evaluate effects of management decisions. (SGEP-14)			Bob Wasno (Lee Co./FSG) Brian Cameron (Bay Co./FSG) To be hired (Collier Co./FSG) Richard Makopondo (UF) Steve Holland (UF) Bill Lindberg (UF/FSG) Bill Mahan (Franklin Co./FSG) Chris Verlinde (Santa Rosa Co./FSG) LeRoy Creswell (St. Lucie Co./FSG) Andrew Diller (Escambia Co./FSG) Justin Sapp (Taylor Co./FSG)	fish. Determine if shark buy-back program is feasible. Determine if information is used in implementing or influencing fishery management regulations. Determine effects of scallop restoration program on biology of stocks and economics of fishery.	
Increase the interaction among fisheries managers and scientists in Florida and countries sharing common fisheries problems (SGEP-14)	Fishery management agencies and scientists of Latin American and Caribbean countries. Members of the GCFI.	Seminars on topics relating to economics of fishery management, release mortality of reef fish and sponge biomass. Organize annual proceedings of Gulf and Caribbean Fisheries Institute.	Chuck Adams (UF/FSG) LeRoy Creswell (Martin Co./FSG) Don Sweat (Pinellas Co./FSG) John Stevely (Manatee Co./FSG)	Changes in management regulations among countries that consider economic and biological issues of all countries for linked stocks.	Ongoing through 2008
Continue a comprehensive marine resource economics program on the value on utilization of fisheries resources (SGEP-14)	GMFMC. GSMFC. SAFMC. FFWC. Commercial and recreational fishermen in southeast U.S. Fisheries economists in professional societies. Universities and agencies.	Applied research. Presentations at scientific conferences. Scientific journal articles. Workshops. SG Technical papers and reports.	Chuck Adams (UF/FSG)	Management options that include economics adopted. Surveys at workshops to measure knowledge changes.	Ongoing through 2008

Specific Activities 2006-2007					
Action	Audience	Products and activities	Implementer	Short- and long-term performance indicators	Timeline for project completion
Participate in the National Sea Grant five-year fisheries Extension project (SGEP-13-FE)	GMFMC. SAFMC. FFWC. Recreational and commercial fishermen.	Publications and articles on various fishery issues. Workshops on marine protected areas, essential fish habitat, and other fisheries topics.	Mike Spranger (UF/FSG) Chuck Adams (UF/FSG) Chuck Jacoby (UF/FSG) All FSG Extension county faculty Richard Makopondo (UF) Steve Holland (UF)	Increased knowledge about the status of Florida fisheries and management options.	Ongoing through 2009



### ***GOAL 3.0 AQUACULTURE: DEVELOP THE FOOD AND HOBBY SEGMENTS OF THE MARINE AQUACULTURE INDUSTRY***

The commercial aquaculture industry in Florida continues to grow in economic importance and diversity. The farm-gate value of commercial aquaculture in Florida is about \$100 million, while the number of species currently being cultured exceeds that found in any other state in the nation. Although most of the industry's value is associated with an incredible assortment of freshwater ornamental fish, a growing marine aquaculture sector is becoming more visible and attractive to potential investors.

The culture of molluscan shellfish, such as hard clams, now dominates the marine component of this new industry. However, increased attention is being directed to the culture of a host of other marine species, such as marine ornamentals, marine shrimp, and several marine finfish species. The commercial attractiveness of these candidate species is being driven by expanding domestic and global markets and improved culture technologies, each of which strengthens the economic viability of the culture process.

The culture of marine species for food purposes is only one of the factors motivating the expansion of this industry. The culture of larvae and fingerlings provides the necessary input for commercial grow-out and stock enhancement purposes. In addition, increased attention is being given to the culture of marine species for the aquarium trade, which represents the second largest component of the nation's pet industry. The fact that these culture activities are occurring in both confined systems and submerged leases in near-shore coastal waters further illustrates the diversity which characterizes this industry. Florida Sea Grant is uniquely situated to provide the applied research and technology transfer needed to support the continued growth in commercial aquaculture. Further research and educational efforts directed toward culture technologies and economic viability will help ensure continued growth in this exciting industry.

The plan for aquaculture represents three new projects. Initially, 16 aquaculture projects were submitted as SIs. Three full proposals resulted from the 16 and all three were selected for funding. Work in this area also represents an organized extension program in aquaculture, focused principally on the further development of the clam culture industry. Florida Sea Grant has chosen to focus priority on three areas in its call for work in aquaculture: marine ornamentals, enhance bivalve molluscan shellfish production and reducing bottlenecks in key species. It is clear the implemented work fits these areas.

Goal 3: Broad goals, audiences, products, performance, impact and exit strategy					
What are the broad goals?	Who is the audience?	What are the products and activities?	Who will deliver the products and activities?	What are the performance indicators and measures of impact?	What is the exit strategy?
To increase the volume and value of cultured marine species products in Florida. To increase the number and value of marine ornamental species products in Florida. To achieve an environmentally and economically sustainable collection rate of marine ornamentals from the wild stocks.	Scientists. Food species culturists. Marine ornamental species culturists. Local, state and federal regulatory agencies.	Scientific journals. Workshops, conferences, personal visits. Reports and training materials. Extension demonstration.	Research faculty. State Extension faculty. County Extension faculty. Communications staff.	Increase in the volume and value of food species cultured. Increase in the volume and value of marine ornamental species cultured. Sustained landings in wild harvest at regulated levels.	Successful culture of food target species achieved. Successful culture of marine ornamental target species achieved. Economically viable culture and trade target species. Then, move to next group of potential species. Permitted and sustained harvest of wild marine ornamental species.

Specific Activities 2006-2007					
Action	Audience	Products and activities	Implementer	Short- and long-term performance indicators	Timeline for project completion
Improve hard clam culture by determining if triploid clams exhibit superior survival during summer stress periods. (R/LR-A-39)	Scientists. Clam growers.	Scientific journal articles. Scientific conference presentations. Industry workshops. Technical reports and Extension publications.	John Scarpa (HBOI) Leslie Sturmer (UF/FSG) Roy Kibbe (Kibbe & Company) Dan Leonard (Bull Bay Clam Farm) Cedar Key Aquaculture Assn. Shirley Baker (UF) Chuck Adams (UF/FSG)	Use of triploid clams in clam production. Increase in survival rates of clams due to summer environmental stress.	2008

Specific Activities 2006-2007					
Action	Audience	Products and activities	Implementer	Short- and long-term performance indicators	Timeline for project completion
Develop improved hatchery technology for marine ornamental fishes using stage-specific feeding management regimes. (R/LR-A-43)	Scientists. Marine ornamental fish hatcheries. Students.	Scientific journal articles. Scientific conference presentations. Industry updates through list-serve. Trade magazine articles. Industry workshops. Technical manual.	Ralph Turingan (FIT) LeRoy Creswell (Martin Co./FSG) K. E. Gaines (ORA)	Determine development of feeding mechanism in marine ornamental fish larvae. Determine development of prey-capture performance and prey preference. Determine how swimming behavior and escape response of zooplankton prey influence the prey-capture performance. Determine if mortality and growth rates of marine ornamental fish larvae are influenced by single-species/size (i.e., "monotypic prey") or multi-species/size (i.e., "multitypic prey"). Develop feeding guidelines for marine ornamental fish hatchery managers. Develop effective and sustainable hatchery technology for the marine ornamental fish species <i>Centropyge flavissimus</i> (lemonpeel angelfish) and <i>Liopropoma carmabi</i> (candy basslet).	2008

Specific Activities 2006-2007					
Action	Audience	Products and activities	Implementer	Short- and long-term performance indicators	Timeline for project completion
Develop, test and demonstrate biological and technical methods to spawn and culture the sunray venus clam, <i>Macrocallista nimbosa</i> , as a new molluscan species for shellfish producers, to provide a different revenue source for improving farm income. (R/LR-A-44)	Scientists. Commercial shellfish growers. Economic development interests. Seafood consumers.	Scientific journal articles. Application in industry setting. Extension demonstrations and publications.	John Scarpa (HBOI) Leslie Sturmer (Levy Co./FSG) LeRoy Creswell (Martin Co./FSG) Jose Nunez (UF) Chuck Adams (UF/FSG)	Identify methods for clam broodstock handling and spawning. Establish hatchery protocols for rearing embryos through larval metamorphosis. Grow a group of sunray venus clams from post-set to commercial size using standard hard clam methods. Characterize financial considerations of hatchery production. Test market perception of cultured sunray venus clams at wholesalers and restaurants.	

Specific Activities 2006-2007					
Action	Audience	Products and activities	Implementer	Short- and long-term performance indicators	Timeline for project completion
Develop and teach information that will remove bottlenecks to the development of the Florida marine culture industry: (a) maintain a clam culture extension network; (b) maintain and evaluate CLAMMRS project; (c) conduct annual hard clam growers conference; (d) publish quarterly shellfish aquaculture newsletter; (e) improve culture practices of individual clam growers including the feasibility of new species; (f) update economic data on clam culture; (g) determine economic costs of biofouling; (h) determine feasibility of small-scale shrimp culture in Florida (SGEP-14)	Shellfish growers. Shellfish regulators. FAA. FDACS. FFWC. AICC.	County and statewide workshops and conferences. Newsletters. Individual consultations. Print and electronic media.	Chuck Adams (UF/FSG) Leslie Sturmer (Levy Co./FSG) Chris Combs (Brevard Co./FSG) LeRoy Creswell (Martin Co./FSG) Bill Mahan (Franklin Co./FSG) Betty Staugler (Charlotte Co./FSG) Bob Wasno (Lee Co./FSG) Don Sweat (Pinellas Co./FSG) Mike Spranger (UF/FSG)	Increase in profitable culture of hard clams success of new or modified species in commercial application.	Ongoing through 2008

## ***GOAL 4.0 SEAFOOD SAFETY: IMPROVE THE QUALITY AND SAFETY OF FLORIDA'S SEAFOOD PRODUCTS***

The U.S. seafood and aquaculture industry faces many challenges as it enters the 21<sup>st</sup> century -- global competition, complex trade policies, strict regulations and a limited seafood supply. Florida's seafood industry, consumer demands, demography and related environmental concerns exemplify these challenges, particularly in temperate and tropical regions. Florida's 400-plus licensed processing and wholesaling plants -- more than any other state -- account for over \$500 million in annual processed value, and include some of the world's largest shrimp and fish processors, as well as specialized processors of oysters, blue crabs, and calico scallops.

When you combine this industry with the emerging products of aquaculture and the value generated from recreational fisheries, Florida possesses some of the most valuable aquatic resources in the nation. Unfortunately, the state's waters and productive climates also promote the most prominent concerns for recurring aquatic food product safety and quality, including illnesses due to raw molluscan shellfish consumption, certain natural toxins and various cross-contaminants.

Florida Sea Grant's response is to invest resources to provide high-quality research and outreach programs that benefit the state's seafood industry and consumers. Sea Grant has been the driving force behind construction of the state-of-the-art Aquatic Food Products Laboratory at the University of Florida. Researchers at the facility have contributed to numerous advances in the development of anti-microbial treatments for shrimp, as well as rapid and sensitive methods to detect contaminated seafood.

Florida Sea Grant also provides national leadership to ensure a safe seafood supply in the U.S. Through its participation in the Seafood HACCP Alliance, a nationwide network of processors, university researchers, and governmental agencies, Sea Grant provides essential training that helps seafood processors and importers meet federal food-safety regulations. Since 1995, the seafood HACCP alliance has trained almost 90 percent of the nation's processors in compliance techniques.

Mandated regulatory approaches give some direction, but education and research offer the necessary understanding and solutions for change. Through its academic centers of technical expertise and training, Florida Sea Grant will continue to partner with business, consumers, and regulatory agencies to offer innovative and cost-effective responses to issues of seafood safety, and help the U.S. seafood industry prosper.

The plan for seafood safety and quality includes two new projects and the ongoing Extension effort. Five SIs were submitted in the area of seafood safety; three were invited as full proposals and two were funded.

Goal 4: Broad goals, audiences, products, performance, impact and exit strategy					
What are the broad goals?	Who is the audience?	What are the products and activities?	Who will deliver the products and activities?	What are the performance indicators and measures of impact?	What is the exit strategy?
To maintain the value and strength of seafood commerce in Florida, be it cultured, harvested, or imported.	Harvesters. Processors. Wholesalers. Retailers. Importers/exporters. Regulators. Scientists. Students. Secondly, consumers, media.	Science journals. Educational courses. Training schools. Websites. Seminars. Association meetings. Personal visits. Training materials to support all of these. Some in Spanish.	Research faculty. State faculty. County Extension faculty. Communication staff.	Value and volume of seafood commerce. Decreases in the number of seafood-borne illnesses. Fewer number of product recalls. Application of new technologies. Industry compliance.	Industry compliance. Periodic evaluations. Private sector taking over. Reduction of seafood-borne illnesses. Regulatory action reduced.

Specific Activities 2006-2007					
Action	Audience	Products and activities	Implementer	Short- and long-term performance indicators	Timeline for project completion
Evaluate QPCR methods for detection of <i>Vibrio vulnificus</i> , a human pathogen in oysters. (R/LR-Q-30)	Oyster industry. Processors. Field tests. Interstate Shellfish Sanitation Commission. Food & Drug Administration. Consumers.	Scientific journal articles. Scientific conference presentations.	Anita Wright (UF) Gary Rodrick (UF)	Improved detection of <i>Vibrio</i> with more cost effective and higher throughput technology. Establish most effective approach for seafood industry to address validation and verification of post-harvest handling for reduction of <i>V. vulnificus</i> in oysters.	2008

Specific Activities 2006-2007					
Action	Audience	Products and activities	Implementer	Short- and long-term performance indicators	Timeline for project completion
Quantify extent of aquatic food product enhancement with carbon monoxide. (R/LR-Q-31)	Seafood processors. Regulatory agencies. Consumers.	Scientific journal articles. Scientific conference presentations.	Murat Balaban (UF) Hordur Kristinsson (UF) Steve Otwell (UF/FSG)	Quantify the extent of color enhancement possible with CO for aquatic species where color measurement is difficult. Correlate the level of color enhancement with the initial quality and state of muscle. Give regulatory agencies a scientific basis for decision making. Guide the industry to develop effective CO treatment methodologies without the potential pitfalls and disadvantages of this technology.	2008



Specific Activities 2006-2007					
Action	Audience	Products and activities	Implementer	Short- and long-term performance indicators	Timeline for project completion
<p>Teach practices and techniques that incorporate the latest scientific findings and achieve the goal of safe and high quality seafood from processors and retailers; (a) domestic shrimp school; (b) international shrimp school; (c) clam processing school; (d) HACCP and SCP training; (e) coordinate national HACCP alliance SCP training; (f) develop clam processing school; (g) Franklin County Oyster Industry Workshop; (h) County sanitation workshops; (i) serve on Florida <i>Vibrio vulnificus</i> Risk Management Group; (j) provide leadership as Executive Director of SSTSA and U.S. Representative to IAFI; (k) produce book use of carbon monoxide in seafood processing; (l) determine proper ways to prevent histamine in tuna. (SGEP-14)</p>	<p>Scientists. Owners/operators of seafood processing and wholesaling companies. Individuals in regulatory agencies. FDA. FDACS. Firms importing seafood into U.S. SSTSA. IAFI.</p>	<p>Conferences. Workshops. Schools. Train-the-trainer workshops. Training manuals. Interaction with regulatory agencies. Book.</p>	<p>Steve Otwell (UF/FSG) Bill Mahan (Franklin Co./FSG) Don Sweat (Pinellas Co./FSG) Chris Combs (Brevard Co./FSG) Doug Gregory (Monroe Co./FSG) Leslie Sturmer (Levy Co./FSG) Mike Spranger (UF/FSG)</p>	<p>Reductions in the number of seafood related illnesses. Adoption of new practices by companies and regulatory agencies. Reduction in the number of plant closures and regulatory actions due to safety and quality.</p>	<p>Ongoing through 2008</p>

***GOAL 5.0 WATERFRONT COMMUNITIES: INCREASE THE ECONOMIC COMPETITIVENESS AND ENVIRONMENTAL SUSTAINABILITY OF COASTAL COMMUNITIES AND WATER-DEPENDENT BUSINESSES***

Florida's economic well-being is inextricably linked to its coastal and marine resources. Coastal communities face a difficult, yet critical management challenge: how to sustain economic viability while maintaining and restoring the environmental integrity of coastal resources.

This task is complicated by rapid population growth, a concurrent increase in recreational boating and other water-related activity, declining natural environments, and coastal and marine resources that are, in many cases, overburdened. The diverse and often competing uses of coastal resources have increased the number and intensity of user conflicts. For instance, the decline in public waterway access to recreational boaters, major contributors to Florida's economy, is a particularly contentious issue.

A compelling need exists to foster community development and resource management strategies that are compatible, sustainable and equitable. If coastal communities are to achieve sustainability, all stakeholders, including users, policy makers, regulators and resource managers need new methods and information sources with which to address pressing economic and environmental issues.

Florida Sea Grant, with its partners, aims to achieve an acceptable balance among environmental sustainability, recreational small-craft use, and growth in coastal communities through science-based research and extension. An operating principle is that self-regulation is an effective management framework to reduce regulatory costs, keep boating and its support industries economically productive, and reduce environmental impacts from boating.

Products and services have evolved within this science-based management framework to address boating-environmental issues that benefit regulators, agencies, industries and citizens. They include: economic and environmental assessments of the boating sector; Geographical Information System (GIS) procedures for ecological planning; prioritization systems for evaluating storm damage to vessels; boat traffic monitoring schemes; regional recreational boating characterizations; boat channel maintenance and spoil management planning; marine land and water use site planning; methods of shallow-water bathymetric surveying for charting recreating boating waterways and prioritizing waterway management; and the development of strategic plans for inland navigation districts.

The plan for water dependent businesses includes two projects related to the Sea Grant coastal communities funding. Research in this area is complemented by the nationally recognized extension program in waterways and boating management.

Goal 5: Broad goals, audiences, products, performance, impact and exit strategy					
What are the broad goals?	Who is the audience?	What are the products and activities?	Who will deliver the products and activities?	What are the performance indicators and measures of impact?	What is the exit strategy?
To reduce regulatory costs associated with waterway management and maintenance. To reduce the environmental effects on habitat from boating. To reduce the number of boating-related regulations by teaching boaters to self-regulate their boating activities. To cause boating regulations and behavior to be based on scientific principles.	Scientists. Resource managers. Navigation districts. Local, regional and state regulatory authorities. Boaters. Marinas and other boating support businesses.	Science journals. Training programs and materials. Workshops and conferences. Websites. Sea Grant Reports and Technical Papers.	Research faculty. State and County Extension faculty. Communications staff.	Decreases in waterway management/maintenance costs. Adoption of scientific principles for waterway and boating management by resource management and regulatory agencies. Reduction in the number of boating incidences that are harmful to habitat.	When the effects of boating on habitat is no longer a major regulatory issue. When statewide adoption of scientific principles occurs. When the number of boating regulations implemented is reduced to a level acceptable to industry and regulators.

Specific Activities 2006-2007 (continued)					
Action	Audiences	Products and activities	Implementer	Short- and long-term performance indicators	Timeline for project completion
Increase the ability of Florida coastal communities to plan and implement economically and environmentally sustainable growth strategies including: (a) characterize Sarasota County recreational boating; (b) characterize Greater Charlotte Harbor recreational boating; (c) design a manatee protection and decision and education support system; (d) develop a spatial model to optimize market areas and estimate launch demand for public boat ramps; (e) using GIS inventory and map Florida's boating regulation zones. (R/C-P-29)	NOAA (Marine Chart Division and NOS). FDCA/CZM. FDEP. FFWC. SWFRPC. WCIND. JID. Counties (Manatee, Sarasota, Charlotte, Lee, Collier); towns (Anna Maria, Bradenton Beach, Palmetto, Holmes Beach, Longboat Key). BAIL. SWFMTA. Extension faculty. EPA. SFMTA. Sarasota Sailing Squadron.	Provide science-based information, planning models, tools and methods. Employ geographic information technologies. Develop training opportunities.	Charles Sidman (UF/FSG) Mike Spranger (UF/FSG) WCIND Bob Swett (UF/FSG)	Fewer conflicts in boating and waterways. Increased knowledge and use of smart growth tools and techniques. Decline in the loss rate of working waterfronts.	2008

Specific Activities 2006-2007					
Action	Audiences	Products and activities	Implementer	Short- and long-term performance indicators	Timeline for project completion
Reduce negative impacts and costs on waterways in Florida by providing legal and policy assistance through the development of innovative policies that enhance coastal access, revitalize local communities, protect coastal ecosystem health and minimize coastal communities loss through hazard mitigation by: (a) developing models for innovative state and coastal policies; (b) assisting local communities in adopting the models; (c) training state and local policy professionals; (d) examining the adequacy of state and local laws in addressing long-term coastline change; (e) disseminating results to a broad marine and coastal policy community. (R/C-P-30)	City, County and State governments. Florida Bar Association. Sea Grant Extension faculty. FDCA. Waterfronts. Florida Partnership. WCIND. Caribbean Conservation Corporation. Ocean Conservancy. Save the Manatee Club. BAIL. Florida Boating Advisory Council.	Legal research. Training manuals. Technical publications. Waterfront policy toolkit. Statewide conference.	Thomas Ankersen (UF) Richard Hamann (UF) Timothy McLendon (UF)	Fewer conflicts in boating and waterways. Adoption and use of GIS decision-making tools by resource managers and decision-makers. Increased public awareness of boating activities and manatee protection measures.	2008

Specific Activities 2006-2007					
Action	Audiences	Products and activities	Implementer	Short- and long-term performance indicators	Timeline for project completion
Develop and teach new ways to keep water-dependent businesses sustainable: (a) workshops on waterfront access for commercial fishermen; (b) identify potential boat ramps and public access sites in Franklin Co.; (c) produce boating and anchoring guides for St. Augustine and Jupiter Inlet District; (d) create a dynamic web-based inventory of Southwest Florida anchorage; (e) provide technical assistance to Brevard Co. waterways management program; (f) conduct 3-5 case studies on using IOOS data in natural resource management; (g) develop boating guides for Lee County, Pensacola Bay, Duval and Flagler Counties; (h) assess boater awareness and impacts of the Clean Vessel Act and Clean Marina Program; (i) establish new clean marina and clean boatyards; (j) participate in Florida Clean Boating Partnership. (SGEP-14)	SWFHB. Extension faculty. Boaters. WCIND. Marinas. FDOT. FFWC. FFWRI. Local and County governments.	In-service training. Website. Reports and publications. Displays at boat shows. Marina surveys. Historical geography atlas. Workshops. Conferences.	Mike Spranger (UF/FSG) Bob Swett (UF/FSG) David Fann (UF/FSG) Charles Sidman (UF/FSG) Don Jackson (UF/FSG) Doug Gregory (Monroe Co./FSG) Bill Mahan (Franklin Co./FSG) Chris Combs (Brevard Co./FSG) Chris Simoniello (UF/FSG) Bob Wasno (Lee Co./FSG) Chris Verlinde (Santa Rosa Co./FSG) Maia McGuire (St. Johns Co./FSG) John Stevely (Manatee Co./FSG) Diane Behringer (Broward Co./FSG) Brian Cameron (Bay Co./FSG) Marella Crane (Dade Co./FSG) Andrew Diller (Escambia Co./FSG) Justin Sapp (Taylor Co./FSG) Betty Staugler (Charlotte Co./FSG) Bob Wasno (Lee Co./FSG)	Increase in number of clean marinas and boatyards. Less conflict in anchorages. Less environmental impact by boaters. More self-regulation by boaters. More public access to waterways.	Ongoing through 2008

## ***GOAL 6.0: ECOSYSTEM HEALTH: PROTECT, RESTORE AND ENHANCE COASTAL ECOSYSTEMS***

Florida's coastal waters support valuable coastal systems. If coastal water quality deteriorates, 80% to 90% of commercial and recreational fisheries, the annual revenues generated by up to one million boaters and divers, and the quality of life we all enjoy will be lost. Floridians recognize the importance of water quality, and they ranked it as their second most important issue in a recent survey of environmental concerns.

All of Florida sits within the coastal zone, which means activities anywhere in the state have the potential to affect our coastal water quality. We have significantly improved our management of sewage outfalls, industrial outfalls and other point sources of nutrients and pollutants, but diffuse sources associated with stormwater or the atmosphere remain a prime concern. For example, development, landscaping, agriculture and home maintenance put pressure on coastal water quality by adding nutrients and pollutants to our watersheds. Managing these diffuse inputs requires all of us to share and base our decisions on a strong scientific understanding of Florida's watersheds and their responses to our actions.

Coastal habitats represent ancient and productive natural areas that provide us with significant value. Along Florida's 1,350 mile general of coastline and 8,426 mile tidal coastline, habitats range from temperate saltmarshes and seagrasses in the north to subtropical mangroves and coral reefs in the south. These habitats shield Florida's coastline from damage by storms, provide food and shelter for 80% to 90% of all commercial and recreational fish and shellfish, draw over one million boaters and divers each year, and attract over 75% of Floridians to the state's 35 coastal counties.

Florida's residents and tourists value our coastal habitats, and also put pressure on them. Development, pollution, boating and other activities have removed 50% of our saltmarsh, 60% of our seagrass and 85% of our mangroves. We manage dredging, sewage inputs and other obvious pressures on coastal habitats far better now than in the past, but we have only begun to deal with impacts from stormwater and other diffuse sources of pollution. Effective management of our coastal habitats requires all of us to share and base our decisions on a strong scientific understanding of these habitats and their response to our actions.

A total of 13 statements of interest were submitted in this area, four were invited as full proposals and one was funded. This project will be complemented by a substantive extension effort in this goal area.

Goal 6: Broad goals, audiences, products, performance, impact and exit strategy					
What are the broad goals?	Who is the audience?	What are the products and activities?	Who will deliver the products and activities?	What are the performance indicators and measures of impact?	What is the exit strategy?
To reduce the sources, impacts and costs of non-point source contamination on Florida coastal ecosystems. To increase the involvement of citizens in improving the quality of Florida coastal ecosystems. To restore habitat essential to the production of fish. To prohibit and/or eliminate aquatic nuisance species from coastal waters. To increase the number of artificial reefs constructed using current scientific knowledge.	Scientists. Coastal homeowners. Local management agencies. Coastal businesses. Extension faculty. Local and state artificial reef managers and builders.	Scientific journal articles. Publications. Website. Workshops.	Research faculty. State and county Extension faculty. Communications staff.	Increase municipality use of methodology. Measureable increases in water quality/citizen participation. Increases in amount of habitat restored. No entry or elimination of nuisance species. Adaptation of artificial reef guidelines by local and state artificial reef managers.	When the state takes on a coastal water quality monitoring program. When education, legislation and enforcement abate pollution. When habitat levels are deemed adequate by managers and regulators. When aquatic nuisance species are no longer a threat. When reef guidelines become mandatory by rule or law.



Specific Activities 2006-2007					
Action	Audiences	Products and activities	Implementer	Short- and long-term performance indicators	Timeline for project completion
Develop portable sensor technology for rapid, sensitive and specific detection and enumeration of <i>enterococci</i> bacteria in coastal water. (R/C-E-52)	Environmental monitoring agencies. Public health agencies. Pinellas County Dept. Health. Florida Healthy Beaches program.	Scientific journal articles. Scientific conference presentations. Field tests. Demonstrations.	Stacey S. Patterson (USF) John H. Paul (USF) David Fries (USF) Andrew Farmer (USF)	To develop a sensitive NASBA based assay specific for the genera <i>Enterococcus</i> . To determine the quantitative ability of the assay using a portable handheld NASBA incubator and detector. Assay will be tested versus the standard culture method done at the state certified lab. Allow public health managers to make regulatory decisions based on near real-time data as they become available.	2008
Deliver educational programs that maintain and increase the quality of Florida's estuaries and ecosystems: (a) determine the economic consequences of red tide on southwest Florida businesses; (b) improve the quality of water in Sarasota Bay, in Pensacola Bay, Charlotte Harbor, Lemon Bay, Okaloosa County, Walton County, and Brevard County; (c) assist NOAA in developing an educational program on South Florida Ecosystem Restoration efforts; (d) develop and deliver training	Extension faculty. Citizens. Estuary program managers. Regulatory agencies.	Brochures. Reports and publications. Workshops. Displays.	Mike Spranger (UF/FSG) John Stevely (Manatee Co./FSG) Dianne Behringer (Palm Beach Co./FSG) Chris Combs (Brevard Co./FSG) Marella Crane (Miami-Dade Co./FSG) Andrew Diller (Escambia Co./FSG) Maia McGuire (Nassau/Duval/St. Johns/Flagler Co./FSG) Chris Verlinde (Santa Rosa Co./FSG) Bob Wasno (Lee Co./FSG) Scott Jackson (Okaloosa/Walton)	Declines in the number of water bodies with minimally acceptable water quality. Increased understanding and implementation by local officials of tools and methods that increase water quality. Increase in number of water quality management plans and monitoring programs. Establishment of NEMO programs.	Ongoing through 2008

Specific Activities 2006-2007					
Action	Audiences	Products and activities	Implementer	Short- and long-term performance indicators	Timeline for project completion
<p>programs on coastal water monitoring and water quality; (e) assist the FYNP and Lakewatch Program in Escambia County; (f) develop NEMO programs in Northeast Florida and Bay County; (g) develop materials and conduct educational programs on exotic marine species; (h) develop seagrass, dune restoration and beach renourishment educational materials and programs; (i) improve the quality of Broward County coral reef ecosystems. (SGEP-14)</p>			<p>Co./FSG)            Chuck Jacoby (UF/FSG)            Brian Cameron (Bay Co./FSG)            LeRoy Creswell (St. Lucie Co./FSG)            Don Jackson (UF/FSG)            Bill Mahan (Franklin Co./FSG)            Justin Sapp (Taylor Co./FSG)            Betty Staugler (Charlotte Co./FSG)            Don Sweat (Pinellas Co./FSG)</p>		

## ***GOAL 7.0 RESPONSE TO SHORELINE CHANGE AND COASTAL HAZARDS***

The Florida coastline is at risk from a variety of natural hazards, most notably the winds, waves, and floods generated by tropical storms. Risks to life and property from these recurring hazards will increase with the anticipated growth of coastal populations over the coming decades. What is needed is a dedicated effort to reduce the economic and social costs of natural hazards.

Through research and education, Florida Sea Grant is involved in several efforts to enhance preparedness for coastal storms and reduce their effect. One area of research has focused on loss prevention, design and retrofitting homes and buildings to better withstand storms. Another vein involves the analysis and management of costs associated with hurricane damage to assist community leaders with land-use planning and hazard mitigation. There is also research underway to study sand and sediment movement along coastal shores, which has helped project planners and developers deal with shoreline change from both normal and storm activity. Most recently, Sea Grant researchers are developing a predictive model of rip currents that may help dramatically reduce the number of drownings caused by rip currents each year. Florida Sea Grant researchers have collaborated with South Carolina Sea Grant and NOAA's Atlantic Oceanographic and Meteorological Laboratories (or NOAA's Hurricane Research Division) on the design and deployment of portable wind towers that recorded ground-level wind speeds and barometric pressure of Hurricane Isabel. It marks the first time detailed coastal tower wind data were transmitted in real time from the field to the National Hurricane Center during a land falling hurricane. The data gave hurricane researchers an unprecedented up-close view of Isabel's fury, providing a more accurate map of the approaching hurricane's wind speeds and forces.

Sea Grant's participation in a nationwide pilot project, the NOAA Coastal Storms Initiative, has helped emergency planners and the public in general better prepare for storm surges, flooding, spill tracking, mitigation and evacuation route planning. The project is actually a compilation of nine projects in Northeast Florida that will result in a large suite of new and improved tools, forecast models, and training for the coastal communities in the pilot study area.

Both research efforts and extension programs will continue to develop information and provide data for better prediction of, reaction to, and recovery from storms. New work in the area of coastal storms and hazards focuses on two new projects resulting from the biennial competition. Nine SIs were considered in this area; four were requested as full proposals, and two were funded.

Goal 7: Broad goals, audiences, products, performance, impact and exit strategy					
What are the broad goals?	Who is the audience?	What are the products and activities?	Who will deliver the products and activities?	What are the performance indicators and measures of impact?	What is the exit strategy?
<p>To improve the ability of coastal communities to identify risk and potential loss from storms and natural hazards.</p> <p>To increase the cost effectiveness of structure retrofitting and storm mitigation.</p> <p>To reduce the loss of human life, property and environmental resources from coastal storms and hazards.</p>	<p>Builders. Builders associations.</p> <p>Insurance industry. Public agency planners.</p> <p>Homeowners associations.</p> <p>Property management companies.</p> <p>Realtors.</p> <p>Homeowners.</p> <p>State building code inspectors.</p> <p>Banking industry.</p> <p>Community decision makers.</p> <p>Emergency preparedness officials.</p> <p>Environmental consulting firms.</p> <p>Scientists.</p>	<p>Beach signage.</p> <p>Trade journals.</p> <p>Builders shows.</p> <p>Website. Journal articles. Technical reports.</p> <p>Workshops, seminars.</p> <p>Extension agent newsletters.</p>	<p>Extension faculty.</p> <p>Research faculty.</p> <p>Energy Extension faculty.</p> <p>Communications staff.</p>	<p>Completion of risk management workshops by county officials.</p> <p>Decrease in post-storm erosion and damage estimates.</p> <p>Development of insurance incentives to get structures compliant.</p> <p>Decrease in insurance rates.</p> <p>Reduced loss of life, injury after storm.</p> <p>Adoption of retrofitting techniques into the building code.</p> <p>Increased acreage of restored shoreline.</p>	<p>Exit not likely due to continual threat of coastal storms and increased habitation at water's edge.</p> <p>Adoption of mitigation techniques in building code.</p> <p>When sufficient number of structures become compliant.</p>

Specific Activities 2006-2007					
Action	Audiences	Products and activities	Implementer	Short- and long-term performance indicators	Timeline for project completion
Field measurements of hurricane wave processes. Quantify and improve descriptions of hurricane wave transformation near the coast and its effects. (R/C-S-46)	Scientists. National Weather Service. Local governments. Coastal builders, homeowners, insurers.	Scientific journal articles. Scientific conference presentations. Wave transformation models.	Andrew Kennedy (UF) Kurtis R. Gurley (UF) Alexandru Sheremet (UF)	Quantify hurricane wave transformation over the continental shelf, near buildings likely to sustain structural damage, and to correlate this to the damage observed. Evaluate the accuracy and suitability of common existing wave transformation models during hurricane conditions. Improve surface roughness representations from hurricane wind evolution models. Numerical modeling groups will compare predictions with measurements.	2008

Specific Activities 2006-2007					
Action	Audiences	Products and activities	Implementer	Short- and long-term performance indicators	Timeline for project completion
<p>Integrated prediction of hurricane induced inundation and shoreline change. Validate newly developed integrated storm surge and coastal flooding modeling system (CH3D-SSMS) which consists of the new generation “wetting-and-drying” CH3D hydrodynamic model with the new generation wave model SWAN. (R-C-S-47)</p>	<p>Scientists. National Weather Service. Local governments. Coastal builders, homeowners, insurers.</p>	<p>Scientific journal articles. Scientific conference presentations. Hydrodynamic and wave models. Hazard maps.</p>	<p>Peter Sheng (UF)</p>	<p>Validate several NOAA wind models vs. field data collected during 2004 hurricanes in Florida. Feasibility of using CH3D-SSMS and a shoreline model (SBEACH) for predicting storm surge, coastal flooding, and shoreline change. Usefulness of forecast three hazard (flooding, erosion, and rip current) maps to coastal communities. Advance predictive ability of coastal hazards (flooding, erosion, and rip current) to mitigate damages to coastal communities.</p>	<p>2008</p>

Specific Activities 2006-2007					
Action	Audiences	Products and activities	Implementer	Short- and long-term performance indicators	Timeline for project completion
<p>Develop mitigation techniques and products: (a) establish a Specialized Marine Action Response Team (SMART) and conduct training; (b) revise and adapt existing hurricane preparation educational materials; (c) research legal questions and utilize GIS tools relating to derelict vessel designation and removal; (d) provide beach safety and hurricane preparedness information. Incorporate ocean and shoreline process and change data into coastal planning: (a) provide regional educational leadership for SEACOOS project; (b) participate in regional GCOOS project; (c) develop educational materials on COOS projects. (SGEP-14)</p>	<p>County Chambers of Commerce. Coastal Business Operators. County Extension faculty. County school districts.</p>	<p>Workshops. Specialized Teams. Publications. Fact Sheets. Methodology. Brochures.</p>	<p>Don Jackson (UF/FSG) Dianne Behringer (Broward Co./FSG) Brian Cameron (Bay Co./FSG) Chris Combs (Brevard Co./FSG) Marella Crane (Miami/Dade Co./FSG) Andrew Diller (Escambia Co./FSG) Scott Jackson (Okaloosa/Walton Co./FSG) Bill Mahan (Franklin Co./FSG) Maia McGuire (St. Johns Co./FSG) Justin Sapp (Taylor Co./FSG) Chris Simoniello (UF/FSG) Betty Staugler (Charlotte Co./FSG) John Stevely (Manatee Co./FSG) Don Sweat (Pinellas Co./FSG) Chris Verlinde (Santa Rosa Co./FSG) Bob Wasno (Lee Co./FSG) Mike Spranger (UF/FSG)</p>	<p>Reduction in the negative impacts of coastal storms on watersheds and communities. Establishment of SMART team. Utilization of SMART team in post-hurricane recovery. Use and adoption of best practices by residents and tourists to increase safety from coastal hazards. Development and use of ocean observing systems by coastal businesses.</p>	<p>2008</p>

## ***GOAL 8.0 GRADUATE EDUCATION: PRODUCE A HIGHLY TRAINED WORKFORCE IN MARINE AND COASTAL RELATED SCIENCES***

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 21<sup>st</sup> 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. Florida Sea Grant has responded 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 becoming a part of a 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.

Florida Sea Grant’s support for graduate 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.”



Goal 8: Broad goals, audiences, products, performance, impact and exit strategy					
What are the broad goals?	Who is the audience?	What are the products and activities?	Who will deliver the products and activities?	What are the performance indicators and measures of impact?	What is the exit strategy?
Produce a highly trained force of multidisciplinary professionals to work in academics, government and industry	Graduate students. Secondly, undergraduate students.	Research assistantships. Industry Fellowships. Knauss Fellowships. SG/NMFS Fellowships. Aylesworth and Old Salt Scholarships. Skoch Scholarships. Seminars. Conferences. Workshops.	Sea Grant Management. Research faculty. Communications staff. Management staff.	Percentage of total SG funds supporting assistantships. Success rates in competitions for funds. Amounts of private funds raised for scholarships. Numbers of students completing degrees.	Track which disciplines are being funded. Focus funds in disciplines where graduates are in short supply. Never will exit completely, but more a refocusing from time to time. Track where students are employed.

Specific Activities 2006-2007					
Action	Audiences	Products and activities	Implementer	Short- and long-term performance indicators	Timeline for project completion
Participate in National Sea Grant competitions for fellowships: (a) Knauss Marine Policy; (b) Industrial Fellowships; (c) SG/NMFS Fellowships; (d) NOAA CSC Fellowships	Graduate students	Advertise and encourage applicants from Florida universities.	Jim Cato (UF/FSG) Campus Coordinators	Achieve at least an average of one fellowship per program per year.	Ongoing through 2008
Support graduate research assistantships as part of each funded research project from core budget.	Graduate students	Require graduate students be included in research proposals.	Jim Cato (UF/FSG) Campus Coordinators	An average of one MS or Ph.D. student graduate per project each year. At least 30% of core research funds used for graduate student support. Track students to determine placement in industry, agencies or organizations.	Ongoing through 2008

Specific Activities 2006-2007					
Action	Audiences	Products and activities	Implementer	Short- and long-term performance indicators	Timeline for project completion
Support graduate and undergraduate students through private funding: (a) Aylesworth Scholarships; (b) Old Salt Scholarships; (c) Skoch Scholarship	Graduate students. Undergraduate students.	Advertise and encourage applicants from Florida universities.	Jim Cato (UF/FSG) Campus Coordinators	A minimum of five graduate students and one undergraduate receiving funds each year.	Ongoing through 2008
Sponsor Elise B. Newell Seminar Series	Faculty. Graduate students.	Advertise and encourage seminar applications from Florida universities.	Bill Seaman (UF/FSG) Campus Coordinators	At least four seminars funded annually.	Ongoing through 2008
Encourage broad participation from Florida universities and wide participation from academic disciplines in FSG programs	Faculty. Graduate students. Academic departments.	Advertise funding opportunities widely at FSG's 16 participating institutions. Maintain fair and transparent funding process.	Jim Cato (UF/FSG) Bill Seaman (UF/FSG) Campus Coordinators	At least 15 different academic disciplines and six different universities receive funding during each proposal cycle.	Ongoing through 2008
Use program development funds to support travel to conferences and workshops to present FSG funded results and FSG participation	Faculty. Graduate students.	Encourage faculty and graduate student participation at local to international conferences.	Bill Seaman (UF/FSG)	Fund trips where possible if consistent with published guidelines.	Ongoing through 2008
Provide in-service training to Sea Grant Extension faculty: (a) annual SGEF staff meeting; (b) biennial workshops of South Atlantic and Gulf of Mexico SG programs; (c) formal Extension training; (d) attendance at professional meetings	Sea Grant Extension faculty	Attendance at meetings. Participation through posters and papers at professional meetings.	Mike Spranger (UF/FSG) All SGEF faculty	Incorporation of learned skills in county and statewide programs. Attendance by each faculty member at one professional meeting.	Ongoing through 2008

**GOAL 9.0 MARINE EDUCATION: CREATE SCIENTIFICALLY AND ENVIRONMENTALLY INFORMED CITIZENS**

Florida Sea Grant seeks to increase marine literacy among people of all ages and offers a variety of programs and resources in marine and environmental sciences. Florida is a major marine and coastal state. Its 16 million residents and over 70 million visitors have a special interest and attraction to this marine environment.

Florida Sea Grant faculty provide marine education programs to formal educators who teach pre K-12 students and to non-formal educators in aquaria, environmental education centers, and museums. Florida Sea Grant faculty also work closely with 4-H youth faculty and their volunteers in the development and delivery of marine science educational programs.

These programs range from developing “training-the-teacher” programs in such topics as marine invasive species, ocean science, marine ecology, fish management and environmental stewardship to working directly with youth at such events as state and county marine camps, kids’ fishing days, coastal beach clean-ups, dune restoration projects, state marine ecology contests, ocean day poster contests, and field trips to local coastal sites. In most cases, these activities involve both classroom activities and field experiences with hands-on exposure to the marine habitats.

Through these programs, it is Sea Grant’s goal that Florida’s citizens will have a better understanding and better appreciation of our marine and coastal systems. Our young people will not only learn more about our marine resources, but also be stimulated to explore future careers in the marine and coastal sciences so they have the skills and expertise to deal with the future issues that face Florida.

Goal 9: Broad goals, audiences, products, performance, impact and exit strategy					
What are the broad goals?	Who is the audience?	What are the products and activities?	Who will deliver the products and activities?	What are the performance indicators and measures of impact?	What is the exit strategy?
To increase the knowledge of citizens about coastal and marine issues and increase the use of science in decision-making about the use and conservation of coastal and marine resources	Florida citizens. Citizens outside Florida where appropriate. K-12 teachers. Non-formal educators involved in outreach programs.	Website. Publications. Workshops and conferences. Advisory panels. Partnerships with other marine/coastal local, state and federal programs. Citizen-based activities.	Research faculty. State and county Extension faculty. Communications staff. Management staff.	Increases in the amount of knowledge gained from a particular event or activity. Feedback from advisory panels. Determining the amount of science-based information used in designing management regulations or the way that business is conducted. Evaluation by external groups.	Education is a never-ending process. The key is to move to new issue areas when success has been achieved on an area of focus.

Specific Activities 2006-2007					
Action	Audiences	Products and activities	Implementer	Short- and long-term performance indicators	Timeline for project completion
Educate the 21 <sup>st</sup> century workforce toward literacy in marine and aquatic sciences: (a) marine science; (b) beaches and sea turtles; (c) artificial reefs; (d) angling ethics; (e) aquaculture; (f) aquatic nuisance species; (g) food safety; (g) fisheries management; (h) ocean observing systems; (i) marine debris. (SGEP-14)	4-H youth. Minority youth. High school students. Teachers. Coastal homeowners and renters. Beach tourists and tourist bureaus.	4-H marine science camps. 4-H statewide marine ecology event. Smithsonian Ecosystem Exhibit. Kid's Day Fishing Tournament. Teacher training workshops. National Marine Educator Association Conference. Newsletters. Newspaper articles. County school presentation. Elite dive team.	Andrew Diller (Escambia Co./FSG) Scott Jackson (Okaloosa Co./FSG) Bill Mahan (Franklin Co./FSG) Chris Verlinde (Santa Rosa Co./FSG) Chris Combs (Brevard Co./FSG) Maia McGuire (Nassau/Duval/St. Johns/Flagler Co./FSG) LeRoy Creswell (Martin Co./FSG) Don Sweat (Pinellas Co./FSG) Mike Spranger (UF/FSG) Dianne Behringer (Broward Co./FSG) Brian Cameron (Bay Co./FSG) Marella Crane (Miami/Dade Co./FSG) Doug Gregory (Monroe Co./FSG) Don Jackson (UF/FSG) Justin Sapp (Taylor Co./FSG) Chris Simoniello (UF/FSG) Betty Staugler (Charlotte Co./FSG) John Stevely (Manatee Co./FSG) Leslie Sturmer (Levy Co./FSG) Mike Spranger (UF/FSG) Bob Wasno (Lee Co./FSG)	Pre- and post-tests of increased knowledge. Increased requests for information after educational program.	Ongoing through 2008

Specific Activities 2006-2007					
Action	Audiences	Products and activities	Implementer	Short- and long-term performance indicators	Timeline for project completion
Support FSG research extension and education programs by developing and implementing diverse and wide ranging communication efforts that deliver relevant information (COMM-6)	Sea Grant partners. Florida and U.S. residents. Visitors to Florida. All audiences for research and Extension described in individual actions within each of the 9 goal areas.	Scientific journal articles. Workshop training materials. Brochures. Videos. Website. Electronic databases. Pell Library. SG reports. SG Extension Fact Sheets. Sea Grant Technical Papers. Book chapters. Books. Conference proceedings. Staff papers. Newsletters. Posters. Signage. CD-ROMS. Thesis and dissertation abstracts.	Dorothy Zimmerman (UF/FSG) Steve Kearn (UF/FSG) Campus Coordinators	Feedback from recipients of information. Sales of publications. Increases in number of requests for information.	Ongoing through 2008

### Investments, Audiences and Implementers

Florida Sea Grant's recent funding history indicates an increased reliance on funding from other than federal Sea Grant dollars. Over the last three years, federal NOAA Sea Grant core program funds represented about 37 percent of total Florida Sea Grant program effort. Federal NOAA Sea Grant national competitions have represented another 14 percent. The remaining funds have come from faculty match, other federal and non-federal grants and state and county appropriations. The work presented in this implementation plan is funded from just the federal NOAA core program funds. In keeping with National Sea Grant Office policy, the core program elements of the implementation plan represent the following investments for 2006-07: research (51%), extension (31%), communications (8%), management (10%).

Florida Sea Grant audiences and the faculty and other implementers who will produce the products and activities designed to educate those audiences are provided within each action in each of the 9 goal areas. However, to make clear the diversity of the audiences, e.g., from individuals to businesses to regulating agencies and scientists, and from local to international, the audiences are summarized by goal area in the following table. The diversity of the academic institutions and cooperators who will implement these actions are also summarized. They also range from county governments to international organizations.

Summary of local, state and national participants partnering with Florida Sea Grant in this implementation plan		
Goal	Audiences	Implementers
1. Marine Biotechnology	Scientists. K-12 and university educators. Regulatory agencies. Congressional and legislative staff. Foundations. National Sea Grant researchers. Paint companies. Biotechnology companies. Venture capitalists. BioFlorida. Industry partners.	FAU. HBOI. UF. SMS. UG. SBC, TMB.
2. Fisheries	Scientists. NOAA. NOAA/AOML. CCAF. FFWC. GCFL. GMFMC. NMFS. SAFMC. SFA. OFF. GSMFC. Commercial and recreational fishermen. USDA. Fishery management agencies of Latin America and Caribbean countries. County artificial reef coordinators.	NSU. UF. USF. UWF. FFWRI. NOAA/SEFSC. Florida coastal counties.
3. Aquaculture	Scientists. FAA. FDACS. Clam growers. Marine fish growout facilities. Marine ornamental growers. Shellfish growers. Shellfish regulators. Students. ORA Seafood Consumers. FWCC. AICC.	FIT. HBOI. UF. Bull Bay Clam Farm. Cedar Key Aquaculture Assn. Kibbe & Company. Ocean Reefs and Aquariums. Florida counties.
4. Seafood Safety	Scientists. FDA. FDACS. NFI. SFA. ISSC. IAFI. Regulatory agencies. Oyster processors. Seafood importers. Seafood processing companies. Wholesalers. Retailers and consumers. At-risk consumers.	UF. Florida counties.
5. Waterfront Communities	Scientists. FOCA/CZM. NOAA/NOS. BNL. EPA. Florida Bar Association. FDEP. FDOT. FFWC. FMRI. JID. MIAF. SFWRPC. SWFHB. SWFMTA. WCIND. Sea Grant Extension faculty. Individual boaters. Counties: Charlotte, Collier, Lee, Manatee, Sarasota. Towns: Anna Maria, Bradenton Beach, Holmes Beach, Longboat Key, Palmetto. SWFRPC. BAIL. Sarasota Sailing Squadron. Waterfront Florida Partnership. Caribbean Conservation Corporation. Ocean Conservancy. Save the Manatee Club. Florida Boating Advisory Council	UF. Florida counties.
6. Ecosystem Health	Scientists. Regulatory agencies. Florida Healthy Beaches Program. Estuary Program Managers. Public Health Agencies. Pinellas County Health Dept. County and city environmental departments.	UF. USF. Florida counties.

7. Coastal Hazards	Scientists. NWS. Local governments. Insurers. Coastal builders. Chambers of Commerce. Coastal Business Operators. Marine Extension faculty. Florida Aquarium. Tampa Bay Watch. Florida conservation organizations. Informal marine science educators, high school science teachers in coastal Florida. K-12 teachers. Marinas and boatyards. Homeowners.	UF. Florida coastal counties.
8. Marine Education	Graduate students. Undergraduate students. Faculty. Academic departments. Extension faculty.	UF. Campus Coordinators at each of 16 participating Florida institutions. NOAA. All SGEP faculty.
9. Graduate Education	Scientists. 4-H youth. Minority youth. High School students. Coastal residents. Tourists and tourist bureaus. Florida residents.	UF. Florida coastal counties. Coordinators at each of 16 participating Florida institutions.

## Appendix I

### Acronyms Used

AICC - Aquaculture Interagency Coordinating Committee  
AOML - Atlantic Oceanographic and Atmospheric Laboratory  
ASMFC - Atlantic States Marine Fisheries Commission  
BAIL - Boating Action and Information League  
CCAF - Coastal Conservation Association of Florida  
EPA - Environmental Protection Agency  
FAA - Florida Aquaculture Association  
FAU - Florida Atlantic University  
FCZM - Florida Coastal Zone Management Office  
FDA - Food and Drug Administration  
FDACS - Florida Department of Agriculture and Consumer Services  
FDACS/AG - Florida Department of Agriculture and Consumer Services/Aquaculture Group  
FDCA/CZM - Florida Department of Community Affairs/Coastal Zone Management  
FFWC - Florida Fish and Wildlife Conservation Commission  
FIND - Florida Inland Navigation District  
FIT - Florida Institute of Technology  
FMFMC - Gulf of Mexico Fishery Management Council  
FFWRI - Florida Fish and Wildlife Research Institute  
FSG - Florida Sea Grant  
GCFI - Gulf and Caribbean Fisheries Institute  
GMFMC - Gulf of Mexico Fishery Management Council  
GSMFC - Gulf States Marine Fisheries Commission  
HBOI - Harbor Branch Oceanographic Institution  
IAFI - International Association of Fish Inspectors  
ISSC - Interstate Shellfish Sanitation Conference  
JID - Jupiter Inlet District  
NMFS - National Marine Fisheries Service  
NMFS/SEFSC - National Marine Fisheries Service/Southeast Fisheries Science Center  
NOAA - National Oceanic and Atmospheric Administration  
NOS - National Ocean Service  
NSU - Nova Southeastern University  
NWS - National Weather Service  
OFF - Organized Fishermen of Florida  
ORA - Oceans, Reefs and Aquariums  
SAFMC - South Atlantic Fishery Management Council  
SBC - SymBio Corporation  
SFA - Southeastern Fisheries Association  
SGEP - Sea Grant Extension Program  
SMS - Smithsonian Marine Station  
SSTSA - Seafood Science and Technology Society of the Americas  
SWFMTA - Southwest Florida Marine Trades Association  
SWFRPC - Southwest Florida Regional Planning Council  
TMB - Tequesta Marine Biosciences  
UF - University of Florida  
UG - University of Georgia  
USF - University of South Florida  
UWF - University of West Florida  
WCIND - West Coast Inland Navigation District



## Appendix II

### Key to Individual Responsibilities

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