

2006 - 2008 S.C. Sea Grant Consortium Implementation Plan



**The Changing
Face of Coastal
South Carolina**

**Valuing Resources
Adapting to Change**



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South Carolina

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Table of Contents

Introduction	4
The Changing Face of Coastal South Carolina	4
Implementation Plan Priorities	6
Programmatic Areas	7
1. Humans and the Coastal Landscape	7
2. Humans and the Risks of Coastal Natural Hazards	13
3. Coastal-Dependent Economy	17
4. Scientific Literacy and Workforce Development	21
Management Areas	24
1. Planning, Program Management, and Overall Performance	24
2. Connecting with Users	27
3. Human Resources	30
Review and Revision	31
National Relevance	32

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Introduction

The Changing Face of Coastal South Carolina

Every day, more and more people are competing for the use of the state's coastal and marine resources. Our challenge is balancing these competing uses while accommodating growth, fostering economic development, maintaining environmental quality, and supporting quality of life in South Carolina.

The South Carolina coast is blessed with a myriad of natural resources. There are 2,876 miles of tidal shoreline, 504,450 acres of salt marsh (20 percent of the East Coast's total), 165 linear miles of beaches, 10,000 square miles of continental shelf, more than 40 barrier and sea islands, and 500,000 acres of tidal bottomlands. This diverse, complex eco-region supports a wide range of living marine resources, and a diversity of human activities, including shipping, tourism, recreation, fishing, manufacturing, residential and commercial development, among others.

However, from 1990 to 2000, South Carolina's coastal population increased by more than 28 percent, and this trend is expected to continue for the foreseeable future. People are increasingly drawn to the shoreline, placing especially great pressures at the margins of the land-sea interface. Recent patterns of growth have resulted in changes in land use and an increased demand on our resources. Already, pollution, erosion, coastal storms, and poorly planned development have left their mark.

The challenges facing coastal South Carolina are complex. Where do we put all of the new people arriving on the coast? How do we maintain the environmental, cultural, and historical qualities that continue drawing people here to live, work, and play? In a 2001 survey of business leaders conducted by the Charleston Metro Chamber of Commerce, growth management was ranked second only to public education among the most important issues facing the region.

The coastal economy of South Carolina continues to evolve. The commercial fishing industry (fish, oysters, clams, shrimp, and crabs), although it represents a decreasing portion of the state's economy, remains important to the local cultural fabric and traditional way of life in the state. In 2005, 1,500 to 2,000 commercial fishermen harvested 11.2 million pounds of seafood worth about \$17.5 million. Modest but stable aquaculture operations in marine shrimp, crawfish, and hard-clam culture have been established. Recreational fishing and boating represent a significant contribution to the state's economy. According to the S.C. Department of Natural Resources, the annual impact of marine recreational fishing in South Carolina significantly exceeds \$300 million; more than 110,000 saltwater fishing licenses were sold in 2006.

In addition, tourism is now a \$16 billion industry, with the eight coastal counties accounting for more than 60 percent of the \$8.5 billion in domestic travel expenditures. Three of the eight coastal counties led all of South Carolina's 46 counties in domestic travel expenditures in 2005. The South Carolina State Ports Authority served over 2,000 vessels and had total operating revenues of \$154 million in 2006. The Port of Charleston is one of the busiest container ports on the East and Gulf coasts.

But South Carolina's challenges along the coast are not unique. Our coastline is shaped by influences, both natural and human-induced, that may originate both within and outside the borders of South Carolina. Many of our state's rivers and watersheds originate beyond our borders, within which sediments and contaminants may be fed.

Like other coastal states from Texas to Maine, naturally occurring coastal shoreline change, along with short-term episodic events (e.g., hurricanes) and long-term phenomena (e.g., sea level rise), threatens existing homes and businesses built along our shoreline. Episodic hazards events, such as wind, surge, and flood associated with hurricanes, tropical storms, and nor'easters, will also continue to threaten developed parts of our coast. Historically, major tropical storms have struck the South Carolina coast every seven to eight years. Many long-range climate forecasters argue that we are now entering a cycle of more severe coastal storms. If scenarios of sea level rise due to global climate change play out as predicted, impacts on the state's coastal population, infrastructure, and business and industry will be exacerbated in the future.

More and more, the state's coastal ocean is being viewed as a resource to be further explored and utilized. As increasing costs to the commercial fishing industry threaten its future, the potential for aquaculture development is being explored. As our beaches continue to require replenishment, sources of beach-compatible sands in the ocean are being sought. And as the costs of energy continue to increase, there is a renewed interest in looking to the ocean for potential sources of fuel, both traditional and alternative. The need for a regional planning approach for our coastal ocean resources will become increasingly important.

Accommodating the varied needs of those who use and enjoy our state's coastal and marine resources presents an enormous challenge. The S.C. Sea Grant Consortium is committed to optimizing the balance among economic, social, and environmental potential of the state's coastal and marine resources through the generation of science-based information to support integrated research, education, and extension programs. The Consortium does so by engaging the talents and expertise found at South Carolina's leading university and research institutions to increase our knowledge about the natural, cultural, economic, and social environments of South Carolina and the region.

Implementation Plan Priorities

The S.C. Sea Grant Consortium developed a four-year Strategic Plan for 2006-2010. The Strategic Plan was developed with a wide range of input from stakeholders to determine program priorities for the Consortium. The Consortium's Omnibus funding cycle was guided by the Strategic Plan with projects funded based on their scientific merit and relevance to the plan. The Consortium's Sea Grant research and outreach projects, including its extension, education, and communication efforts, funded during this two-year period serve as the foundation for the Implementation Plan.

The Consortium's 2006-2008 Implementation Plan is divided into two sections: Programmatic and Management. The Programmatic section includes the Consortium's planned activities and metrics for research, education, and outreach-based activities. The Management section includes process-based activities, which dictate how the Consortium will support its mission, assess customer satisfaction, ensure financial performance, and document human resource activities.

Within each section, the Consortium has identified major Strategic Areas of emphasis based on our Strategic Plan. Each Strategic Area includes a background statement, goal, objectives, outcomes, indicators, and actions. The definitions of each are as follows:

- **Background Statement** - the context and historical information for each Strategic Area.
- **Goal** - the overall anticipated outcome for each Strategic Area.
- **Objectives** - the specific program/management areas of emphasis to be addressed.
- **Outcomes** - the end results or consequences of the strategies employed.
- **Indicators** - the measures to be used to evaluate success in achieving objectives.
- **Actions** - the activities the agency is funding or undertaking with regard to research, extension, communications, and education.

Outcomes and Indicators will be used to report on the success of our actions. These will be assessed on annual reporting cycles.

Programmatic Areas

The Consortium's Strategic Plan identifies the agency's four main programmatic areas of focus: **1. Humans and the Coastal Landscape**, **2. Humans and the Risks of Coastal Natural Hazards**, **3. Coastal-Dependent Economy**, and **4. Scientific Literacy and Workforce Development**. The Consortium issues requests for proposals organized by Programmatic areas; however, actions to be pursued will be determined in part by those proposals that are ultimately selected for funding as a result of our review and evaluation process.

1. Humans and the Coastal Landscape

The coastal and marine resources of South Carolina are directly affected by both human influences throughout the watersheds in the coastal zone and by the physical and natural processes of the state's adjacent coastal ocean. The focus of this program is to provide research and outreach programs that assess the natural processes and valuation of resources as well as documenting the impacts of land use change on marine and coastal resources.

Goal

The ecological and economic value of coastal and ocean ecosystem processes are documented, the effects of coastal growth on these ecosystem processes are assessed, and state and local decision-makers, resource managers, and interested public have the information and tools to ameliorate these effects.

Objective 1 – Generate information about the function and value of South Carolina's coastal and ocean ecosystems, and communicate this information to decision-makers and the public.

Outcomes

- Science-based information is provided to natural resource managers and decision-makers to support national, regional, state, and local resource-management objectives.
- A research platform is developed for state management agencies, such as OCRM and DNR, to conduct economic valuation of resources based on priority needs.
- South Carolinians are more knowledgeable about the natural processes that influence South Carolina's estuaries and coastal waters.
- Coastal South Carolina property owners and communities are aware of the problems associated with invasive species (i.e., beach vitex).

- Models are made available to and used by the scientific community and natural resource agencies to assess and predict coastal and ocean processes (e.g., water quality).
- An effective regional association for Integrated Ocean Observing Systems (IOOS) in the Southeast is established.

Indicators

- Number of research studies funded to understand the natural processes of coastal S.C.
- Number of requests by natural resource managers for research results.
- Number of models developed to assess and predict the natural functioning of coastal S.C.
- Number of people who attend workshops on the development of economic valuation of coastal resources and ecosystem services.
- Evidence that Southeast Coastal Ocean Observing Regional Association (SECOORA) is providing data to users and members.
- Number of media hits for Consortium-funded information and products related to the function and value of South Carolina's coastal and ocean ecosystems.

Actions

- Develop a high-resolution numerical circulation model for Long Bay, South Carolina, to identify the physical scenarios under which hypoxia events in Long Bay may occur, and determine threshold conditions scientists and coastal managers can use to predict the occurrence of these events. (Voulgaris, R/CP-12)
- Document the processes that affect changes in nearshore circulation patterns and water quality parameters to better understand low oxygen (hypoxia) events in the coastal environment of Long Bay, and evaluate the potential and relative roles of marine, terrestrial, and atmospheric factors affecting oxygen levels. Couple hydrographic circulation information from Voulgaris with biogeochemical process rates to establish load threshold conditions favorable for the development of nearshore hypoxia. (Koepfler, R/CP-13)
- Identify locations and spatial extent of submarine groundwater seeps along the inner shelf of the Grand Strand area of South Carolina and determine the geologic controls of the locations

- of submarine groundwater seeps along this inner shelf. Show and quantify the extent of submarine groundwater discharge sites along the South Carolina inner shelf. (Viso, R/CP-14)
- Document and compare normal climate variability to the 1998-2002 drought and how a drought event and normal climate variability affect salt marsh dynamics, specifically hydrology and ecological productivity. Generate datasets to provide an empirical understanding of groundwater controls on marsh productivity. (Wilson, R/ER-30)
 - Identify the ecological, life history, and genetic factors critical to the establishment, success, and persistence of populations of beach vitex (*Vitex rotundifolia*), an invasive species, and to use this understanding to perform appropriately targeted management and restoration trials. (Murren, R/ER-32)
 - Administer the S.C. Coastal Erosion Study funded by the United States Geological Survey (USGS) to study the sand resources and sand movement in the Long Bay region of South Carolina.
 - Administer the “Expanding Existing Surveillance Systems to Include *Pfiesteria*, Other Harmful Algal Blooms, and Marine Toxins” grant from the Centers for Disease Control and Prevention including participation and coordination of the S.C. Task Group on Harmful Algae and publishing *SC HAB Review* three times yearly.
 - Conduct demonstrations of biological and chemical control techniques on *phragmites*, alligator weed, giant reed, and water hyacinths to develop further control programs in South Carolina.
 - Support the South Carolina Beach Vitex Task Force by teaming up with North Carolina Sea Grant communications to produce Beach Vitex Identification Cards to be used by both North Carolina and South Carolina Task Forces.
 - Publish an issue of *Coastal Heritage* magazine on invasive species.
 - Design and print a final report prepared on the *State of Knowledge of Coastal Wetland Impoundments* by Daniel Tufford.
 - Coordinate the development of the Southeast Coastal Ocean Observing Regional Association (SECOORA) framework for the Coastal Ocean Observing System of the southeastern U.S.
 - Design and print a State of Knowledge report about Coastal Ocean Observing Systems in the Southeast.

Objective 2 – Conduct investigations and outreach activities that document and provide science-based information to decision-makers to address the effects of population growth and land use change on coastal and ocean ecosystems.

Outcomes

- Existing population growth and land use change models are refined and improved.
- Resource management agencies and local governments in South Carolina understand the impacts of development on coastal and marine resources and develop strategies to address them.
- South Carolinians and decision-makers are more knowledgeable about the “cause-and-effect” impacts and influences from humans on South Carolina’s estuaries and coastal waters.
- The public’s knowledge of land use impacts on the estuarine environment is increased.
- Local officials are educated on non-point source pollution.

Indicators

- Frequency of use (i.e., number of Web site hits) of the population growth and land use change projection models by decision-makers, academics, and management officials.
- Number of research studies funded to understand the impacts of development on coastal resources.
- Number of elected and appointed officials targeted through workshops (SC NEMO).
- Number of developers, planners, landscape architects, and NGOs targeted through workshops.
- Number of municipalities that have incorporated policy changes as a result of Consortium outreach efforts.
- Identification of “indicators” used to assess ecosystem health.
- Number of models developed to assess the impacts of development on coastal South Carolina.
- Number of requests by resource managers and local officials for research results.

Actions

- Provide stakeholders with increased access to the relevant laws, regulations, and guidance documents related to coastal growth issues, and to the agencies that implement or enforce them by developing a Web site called Regulatory Pathfinder. (Connolly, A/CG-2)
- Use field and laboratory methods to analyze the usefulness of the diamondback terrapin (*Malaclemys terrapin*) as a sentinel species by detailing the bioaccumulation process of the metal mercury in the turtle; develop a biomonitoring tool for mercury in the estuarine environment to be used for environmental impact assessment and remediation efforts. (Owens, R/ER-28)

- Characterize the spatial and temporal variability in underwater light quality and quantity, nutrient form and concentration, fine-scale temporal variability in water chemistry and biology, including CDOM concentrations, and phytoplankton community composition along the Winyah Bay estuary in South Carolina. Characterize the potential changes in phytoplankton community composition due to alterations in the light and/or nutrient environment by three hypothetical land use change scenarios. (Richardson, R/ER-29)
- Address habitat alteration and loss of biodiversity due to pesticide contamination through research that determines the short-term sub-lethal effects of environmentally-relevant concentrations of atrazine on estuarine phytoplankton community structure and function. (Pinckney, R/ER-31)
- Conduct a regional watershed scale study of innovative Best Management Practices (BMPs) to quantify the potential impact of BMPs on tidal creeks. Toward this end, water budgets, flow rates, and pollutant masses and loadings for pre-, during-, and post-construction phases of both a control (suburban-no BMP) and a treatment (BMP) watershed in Oak Terrace Preserve, North Charleston, South Carolina, will be compared. (Porter, R/ER-33)
- Continue the coastal growth initiative to help individuals and groups understand the impacts of coastal growth and in particular the impacts of land-use decisions on coastal communities and their natural resources. (Turner, A/CG-1)
 - Administer the S.C. Coastal Communities Initiative (SCCCI), a small grants program designed to assist coastal communities with the development and implementation of land management policies and practices to reduce polluted stormwater runoff, protect local natural resources, and encourage sustainable development.
 - Develop and conduct three Coastal Growth Impacts Workshops to address land use and resource protection issues facing volunteer boards, council members, and staff in communities that share the South Carolina coastal zone.
 - Respond to citizen requests for S.C. Nonpoint Education for Municipal Officials (SCNEMO)/Water Resource Management information and guidance through workshops on the effectiveness, efficiency, and durability of stormwater management techniques.
 - Conduct Jasper County conservation planning effort in conjunction with the Jasper Soil and Water Conservation District (JSWCD), the USDA-Natural Resources Conservation Service (NRCS), and the S.C. Department of Natural Resources (SCDNR) to develop a Comprehensive Natural Resources Plan for Jasper County; publish the Comprehensive Natural Resources Plan for Jasper County.

- Create and coordinate the South Carolina Coastal Information Network (SCCIN), a group of coastal outreach institutions and constituencies working in partnership to improve intra-agency communication, coordination, and cooperation.
 - Maximize the efficient delivery of quality training and educational material to coastal decision-makers, community planners, local officials, and the public in South Carolina.
 - Develop and maintain a Web site for the SCCIN with a searchable database of outreach events for the eight coastal county region that will be publicly launched and marketed to local governments.
 - Expand the SCCIN Web site to include a resource portal of outreach and research materials provided by each Network partner.
- Administer the Land Use-Coastal Ecosystem Study (LU-CES) program with funding from NOAA including development of outreach and education implementation strategies.
- Participate in stormwater workshops to educate contractors involved in land clearing activities about the importance of erosion and sediment control Best Management Practices (BMPs).
- Partner with regional coastal stormwater education program providers to deliver programs to communities using a collaborative approach. One such example is the Coastal Waccamaw Stormwater Education Consortium (CWSEC), Coastal Carolina University, and the North Inlet-Winyah Bay National Estuarine Research Reserve Coastal Training Program (NI-WB NERR CTP).
- Initiate development of a conceptual model and framework for an integrated coastal demographic, economic, and environmental prediction and forecasting initiative to assess the impacts of land use change on coastal systems in South Carolina.

2. Humans and the Risks of Coastal Natural Hazards

South Carolina is vulnerable to most known natural hazards, including hurricanes, flooding, shoreline erosion, and earthquakes, which have the potential to cause substantial damage. Additionally, a modest increase in sea level would have profound impacts on the low-lying and minimal-relief landscapes found throughout coastal South Carolina; areas presently subject to short-term storm events and spring tides that significantly affect natural systems. When global phenomena are superimposed, the range of possible impacts is exacerbated. While their occurrence cannot be prevented, there is much that can be done to minimize exposure to these damages and facilitate recovery processes. The focus of this program is to provide research, technical, and educational programs that examine the forces of climate and hazards and their effects on the built and natural environment and socio-economic impacts. The program will also provide information to the public and private sectors on the nature of hazards and how to plan for and recover from them.

Goal

Coastal residents, communities, and businesses understand the risks and vulnerabilities associated with both chronic and episodic coastal natural hazard events, and are prepared for and able to recover from them with minimal disruption to social, economic, and natural systems.

Objective 1 – Generate and deliver information on the natural forces of climate (e.g., sea level rise) and weather (e.g., hurricanes and coastal storms) and their effect on the human, built, and natural environment.

Outcomes

- State and federal resource management agencies in S.C. are utilizing shoreline change information in management and policy decision-making.
- Data collection (real-time and near-real time) and interpretation are readily available to and usable by scientists, emergency managers, first responders, citizens, and policy makers.
- New and improved observation and data visualization tools provide pertinent, comprehensive, and timely information for planning and response.
- The public is more aware of coastal hazards, and has the information needed to assess hazards resiliency and further reduce vulnerability.
- Communities are able to assess their hazards resiliency in comparison with other communities, providing a catalyst for action to further reduce vulnerability through partnering activities.
- Partnerships are in place to improve communications concerning hazard issues.

Indicators

- Number of research applications and data visualization tools produced.
- Continued generation, use, and refinement of beach monitoring data and models in OCRM's beachfront management program.
- Use of NOAA/Sea Grant hazards research by public and private decision-makers as evidenced by requests for information and visits to 113 Calhoun Street.
- Number of communities that plan for and/or adopt community resilient practices and policies.
- Number of partnerships created among hazard mitigation-related service providers.
- Demand for outreach and technology transfer on beachfront management as evidenced by requests for and participation in extension programming.
- Demand for outreach and technology transfer on chronic and episodic coastal hazards as evidenced by requests for and participation in extension programming.
- Number of public presentations made by Consortium staff on coastal hazards topics.
- Number/distribution of printed materials, Web content, and other extension media.

Actions

- Apply a database-assisted design method to a single-family wood-framed house as a method for reducing home damage due to hurricane-strength winds and to improve the wind resistance of residential construction. (Prevatt, R/CE-7)
- Collect and incorporate data from the Beach Erosion Research and Monitoring (BERM) program and other relevant research programs into advanced and validated models that support an improved understanding of underlying geological, oceanographic, and meteorological processes.
- Develop the "Rip Current Awareness" program for South Carolina beach communities in Horry and Georgetown counties.
- Establish a regional climate extension program to provide leadership in establishing a climate extension network.
- Develop and deliver a HF Radar workshop on-site at Pritchards Island, South Carolina, for local/federal search and rescue organizations (Sea Rescue, Coast Guard), recreational fishermen, Power Squadrons, SCDNR, and National Weather Service staff to introduce HF Radar, operation of the system, and its applications for search and rescue and real-time weather data.

- Collaborate with University of South Carolina, CaroCOOPS, the University of North Carolina-Wilmington, and the NOAA National Weather Service on a “CAROLINA’S COAST” demonstration project, incorporating regional IOOS data into NWS marine weather forecasting.
- Conduct SEACOOS South Carolina: Coastal Hazards Outreach funded by the Office of Naval Research through the University of North Carolina-Chapel Hill to inform and educate students and the general public in uses of ocean observing data.
- Publish an issue of *Coastal Heritage* magazine about the impacts of climate change on coastal wetlands.

Objective 2 – Develop technology and extend information to at-risk homeowners, businesses, and government agencies to prepare for and mitigate the impacts from chronic and episodic coastal hazards.

Outcomes

- Awareness of coastal communities to socio-economic, structural, and natural resource impacts of coastal hazards is raised.
- Communities implement hazard mitigation strategies based on research results (e.g., “risk-wise” policies are adopted by coastal communities).
- Hazard mitigation technologies, such as disaster-resilient design and materials, which respond to changing conditions in hazard-prone areas are developed and used.
- Communication of hazard information (e.g., forecasts and warnings) to a population that understands, trusts, and responds appropriately to the messages.
- 113 Calhoun Street and HazNet Web sites are accessed at a greater rate.
- 113 Calhoun Street is a primary source of coastal hazard information.

Indicators

- Number of beachfront communities/businesses adopting rip current awareness activities.
- Number of coastal communities taking action to improve overall hazards resiliency.
- Number of individuals/groups participating in 113 Calhoun Street-related hazards awareness/mitigation activities, programs, and events.
- Number of hazards resiliency workshops and participants.

- Number of hazard mitigation tools and technologies and practices developed for individual property owners, businesses, and emergency/coastal managers.
- Evidence of communities incorporating hazard resilient policies and practices into land-use and other plans, ordinances, zoning regulations, and codes.
- Evidence of the use of Consortium-produced information in public and private decision-making related to coastal hazard resiliency.
- Number of unique visits to HazNet and 113 Calhoun Street Web sites.

Actions

- Create a nested storm surge modeling system in the Pamlico Sound (North Carolina) and surrounding waters such as the Tar-Pamlico and Neuse Rivers, linking atmospheric, coastal ocean, estuary, and river hydrodynamics to ecological impacts and assessments, leading to increased warning times for flash floods and other high-impact weather events. (Bacon, A/CH-1)
- Disseminate science-based information through the 113 Calhoun Street facility and Web site on cost-effective and structurally sound hazard mitigation strategies, tools, and techniques related to building design, construction methods, building code standards, infrastructure resiliency, and land use that can be applied to reduce coastal hazard risks.
- Engage hazards-oriented agencies and organizations such as Charleston County Project Impact and Sustainability Institute in the 113 Calhoun Street hazards resiliency program in the conveyance of community hazards resiliency principles and practices, including the linking of land-use planning and hazards mitigation planning, to coastal community decision-makers and the general public.
- Publish an issue of *Coastal Heritage* magazine on natural hazards and the relationship of climate change to coastal property insurance.
- Publish an issue of *Coastal Heritage* magazine on the importance of purchasing flood insurance and hazard mitigation techniques.

3. Coastal-Dependent Economy

The Consortium plans to continue examining coastal management issues and exploring sustainable economic development opportunities in cooperation with state and local management agencies and coastal resource users. Needs of the state and region will thus be served simultaneously in terms of decision-making, planning, and assessment related to all facets of coastal development. The coastal-dependent economy in South Carolina includes a wide variety of businesses including commercial fishing, recreational fishing, aquaculture, tourism, and future endeavors such as energy development. The focus of this priority area is to conduct research, education, and extension projects dealing with production and resource economics, policy, law, regulation, preservation, and development of coastal resources in relation to a coastal-dependent economy.

Goal

Sustainable economic development in the coastal region that is compatible with changing demographics, business development, regulatory environments, and long-term conservation of natural and cultural resources.

Objective 1 – Support research and technology transfer efforts to enhance viable and sustainable fisheries, aquaculture, and related industries.

Outcomes

- Aquaculture and commercial fishing industries are economically stable and diverse.
- Innovative shellfish restoration strategies are evaluated, tested, and implemented.
- Information is generated and provided to state and federal fisheries managers for use in identifying essential fish habitat and marine protected areas.
- Better fishing practices are necessary to sustain fisheries populations.
- Staff formally participates in the development of the statewide Aquatic Invasive Species Management Plan (AISMP).
- Improved understanding and communication is developed between commercial fishing stakeholders.
- Commercial fishermen use leadership skills to engage in the economic, political, and fishery management process.
- State and federal fisheries managers use Consortium-funded research information to identify essential fish habitat and marine protected areas.

- Recreational anglers have an increased understanding of the importance of stock enhancement efforts and respect the fragility of coastal ocean and estuarine environments.

Indicators

- Number of aquaculture firms that request and receive technical assistance from Sea Grant extension.
- Increased value of aquaculture businesses in South Carolina.
- Number of commercial and recreational fishermen served by Sea Grant extension.
- Number of newly created industry associations and partnerships.
- Extent to which degraded habitats are restored (e.g., oyster reefs, salt marsh) through research, information sharing, volunteer programs, and conferences.
- Number of fishermen and other attendees at leadership and business training programs.
- Number of Consortium representatives participating on fishery management advisory boards and committees.
- Evidence of research and extension information in the management and eradication of aquatic nuisance species in South Carolina.
- International Conference on Shellfish Restoration (ICSR) is held biennially in the U.S.
- Produce and distribute ICSR publications to facilitate information sharing among researchers and resource managers.

Actions

- Evaluate the effectiveness of a four-year program of stocking red drum in Murrell's Inlet estuary in South Carolina using classical field population studies and advanced laboratory HPLC genetics technology. (Smith, R/SE-3)
- Examine the temporal and spatial genetic structure of the gag (*Mycteroperca microlepis*) fishery in the southeastern U.S. in order to understand basic questions underlying the effective and sustainable management of this commercially and recreationally important fishery. (Sotka, R/CF-12)
- In conjunction with SCDNR, coordinate a cooperative fisheries grant program to facilitate collaborations between researchers and fishermen for specific cooperative fisheries research, both recreationally- and commercially-oriented.
- Develop techniques for the commercialization of bait shrimp farming based on specific pathogen-free stocks. (Browdy, R/NMAI-3)
- Examine potential for aquaculture development and fishery enhancement of Cobia. (Smith, R/NMAI-4)

- Conduct training programs for County Agents Continuing Certification Hour Sessions for Aquatic Pesticide Applicators and S.C. Department of Natural Resources (SCDNR) biologists with as many as 20 Continuing Certification Hours being presented annually.
- Conduct an annual workshop for the Carolinas Golf Course Superintendents Association on water quality, invasive species identification and control, and turf management BMPs as they affect water quality and fish-kill prevention.
- Host and moderate a regional fisheries management workshop on blue crab management for state fishery management agencies. Outcomes will include development of a list of priorities for possible regional management issues/solutions for all four states as well as outreach needs regarding the blue crab fishery.
- Develop five fact sheets (including one Spanish version) on Limited Access Privilege Programs (LAPP) for the South Atlantic Fishery Management Council's LAPP exploratory work group. Distribute fact sheets to all licensed snapper/grouper permit holders and dealers in the South Atlantic region (North Carolina, South Carolina, Georgia, and Florida).
- Administer the Characterization of Bait Shrimp Farming based on specific pathogen-free post-larval stocks to farms in South Carolina and Florida.
- Organize and lead roundtable discussions of various regulatory issues (non-native species, NPDES, Licensing and Permits, Structures) at meetings of the South Carolina Aquaculture Association, South Carolina Shellfish Association, and other formal and informal industry gatherings.
- Assist the South Carolina aquaculture industry in understanding and complying with the new Aquaculture Enabling Act, which dramatically changes the rules and regulations for aquaculture in South Carolina.
- Conduct county-level Fish Pond Clinics for the owners and managers of private fishing ponds and lakes.
- Update the aquatics section of the Clemson University "Pest Management Handbook," train Category 5 - Aquatic Pesticide Applicators and publish recreational fish pond publications in the Clemson University Home and Garden Information Center format.
- Develop local niche marketing efforts in coordination with the Clemson University Extension Service and the S.C. Shrimp Industry Task Force and Initiative, Wild American Shrimp, Inc., and Mark of Quality program.
- Continue providing logistical support, technical presentations, advisory services, and increased communication among S.C. Shrimpers Association, other fishing industry groups, Sea Grant programs, and state/federal fishery management agencies.
- Organize and convene the International Conference on Shellfish Restoration (ICSR) for 2006 in the United States.

Objective 2 – Identify sustainable community-based economic development and management strategies to support traditional and emerging coastal-dependent business and industry.

Outcomes

- Regional approaches are incorporated into coastal land use/watershed planning efforts by local governments.
- The value of coastal natural resource-based tourism and recreation businesses in South Carolina is increased.
- Relevant natural resource agencies involved in submerged land use issues use science-based information in decision- and policy-making.
- Economic models are used in guiding the land use planning process.
- Traditional uses become a prominent issue in the public dialogue on waterfront development.
- State or regional plan for ocean management and development is used.

Indicators

- Number of communities that recognize the value of maintaining working waterfronts (e.g., through changes in land use policies).
- Number of natural resource-dependent recreation and tourism opportunities along the coast.
- Number of community-based land use and watershed planning efforts incorporating a regional approach.
- Natural resource agency policy is developed to address private use of public trust waters along the coast.
- An ocean management and development strategy is developed for South Carolina with science-based information provided through Consortium efforts.
- Number of requests for economic information related to land use decisions.

Actions

- Conduct a Coastal Access/Waterfront Diversity Study investigating coastal waterfront access challenges and opportunities for marine fisheries stakeholders (both commercial and recreational) in South Carolina.
- Publish an issue of *Coastal Heritage* magazine on coastal growth along estuaries, which is diminishing water access.
- Publish an issue of *Coastal Heritage* magazine on the abolition of the slave trade.
- Publish an issue of *Coastal Heritage* magazine on the African contribution to the South Carolina rice industry.

4. Scientific Literacy and Workforce Development

The Consortium's scientific literacy program is focused on providing early awareness of information and career opportunities in coastal and marine areas for the students of formal and informal educators. Workforce development has provided research opportunities for college and graduate students through Consortium-funded research projects. Further, the ocean-based workforce for the future must also look at diversification of its ranks, and promote ocean and coastal-related careers to individuals of under-represented groups. The focus of this priority area is development and implementation of strategies and products to provide information to coastal constituents, particularly formal and informal educators as well as K-12 and college students, concerning sustained use, conservation, and management of coastal and marine resources. A well-informed constituency has proven to be essential for balanced coastal and marine resource management and economic growth.

Goal

Coastal and ocean education programs foster scientific literacy, stewardship, and a scientifically trained workforce.

Objective 1 – Design and implement K-12 educational programs for teachers that increase proficiency in science and knowledge of coastal and ocean ecosystems.

Outcomes

- Educational materials developed and promoted by the Consortium are being used in classrooms and informal education facilities throughout South Carolina.
- Pre-service and in-service teachers are teaching coastal and ocean concepts to K-12 students in South Carolina schools.
- An increase in K-12 teachers utilizing coastal and ocean science to further inclusive and multi-culturally diverse strategies in their classrooms.
- Copies of the textbook *Of Sand and Sea* are made available electronically to educational communities.
- Quarterly issues of *Curriculum Connection*, a supplemental classroom resource for educators based on topics covered in *Coastal Heritage* magazine, are produced and made available on the Web.
- The Consortium Web site reflects and links to all of the Consortium education materials (e.g., COASTeam lessons).

Indicators

- Percentage of South Carolina K-12 teachers participating in Consortium programs who continue to use ocean and earth science material in the classroom.
- Number of Web site hits on *Curriculum Connection*, COASTeam lessons, and other Consortium educational material.
- Number of South Carolina educators who are engaged in professional development conferences and workshops through Consortium funding.
- Number of South Carolina research proposals that include educational components.

Actions

- Produce quarterly issues of *Curriculum Connection*, a supplemental Web-based resource for K-12 educators based on the topics covered in *Coastal Heritage* magazine.
- Administer the Center for Ocean Sciences Education Excellence-Southeast (COSEE-SE), a National Science Foundation (NSF) funded program, for North Carolina, Georgia, and South Carolina to increase the interaction of scientists and educators and to extend ocean science information to regional formal and informal educators through a wide range of activities.
 - Design and implement annual week-long Coastal Legacy workshops for professional development of teachers in the region: one on cultural history of the southeastern coasts and the second on coastal processes of barrier islands.
 - Design and implement week-long COSEE-SE Institute workshops to highlight technology for professional development of teachers in the region.
 - Conduct Institute Ocean Awareness Days that extend the Institute technology projects to additional audiences. Conduct a workshop in South Carolina on the building of the MIT Sea Grant Sea Perch Remotely Operated Vehicle (ROV) to encourage this activity in the classroom.
 - Design and print a general information brochure about COSEE-SE.
- Develop a special edition insert for *The (Charleston) Post and Courier* newspaper through their Newspaper in Education program to highlight the issue of marine debris.
- Develop a poster on the issue of marine debris to educate teachers, students, and the public.
- Digitize the *Of Sand and Sea* publication.
- Publish an issue of *Coastal Heritage* magazine on inquiry learning and teaching techniques.

Objective 2 – Support the development of a diverse and scientifically trained workforce.

Outcomes

- Graduate and undergraduate student training continues to be a priority for Sea Grant-supported research projects.
- Sea Grant-supported graduate and undergraduate students secure ocean science-related employment opportunities upon graduation or pursue advanced degrees.
- South Carolina graduate and undergraduate students successfully compete for national fellowship opportunities and internship opportunities.
- Sea Grant-supported graduate and undergraduate interns and fellows obtain real-world experiences.

Indicators

- Number of new and continuing faculty supported at the Consortium's universities.
- Number of undergraduate and graduate students participating in Consortium-funded research projects.
- Number of graduate and undergraduate students applying and selected for national fellowships.
- Number of Knauss fellows selected from South Carolina.
- Number of undergraduates and graduate students participating in internship programs.
- Nature of employment of students upon graduation.

Actions

- Encourage applications from highly qualified and motivated graduate students for the John A. Knauss Marine Policy Fellowship.
- Recruit and place applicants for the NOAA Coastal Management Fellowship program (NOAA's Coastal Services Center).
- Administer NOAA's Center for Coastal Environmental Health and Biomolecular Research (CCEHBR) and Hollings Marine Laboratory (HML) scholarship program for graduate students.
- Collaborate with universities, government agencies, NGOs, and businesses to develop internships that provide an opportunity for college students, particularly undergraduates, to address important coastal issues and enhance their educational experiences.

Management Areas

Three management areas were identified as priorities for the Consortium over the next four years: **1. Planning, Program Management, and Overall Performance, 2. Connecting with Users, and 3. Human Resources.**

1. Planning, Program Management, and Overall Performance

The development and success of our Programmatic Areas is contingent on the success of our planning, program management, and overall performance. These serve as the foundation of effective and efficient programs. Program management and accountability are important components of the success of the S.C. Sea Grant Consortium. The Consortium must manage its program in accordance with State of South Carolina requirements as well as those of the National Sea Grant College Program. Therefore, the Consortium is accountable to both and receives internal (state) and external (federal) evaluations of its programs and finances. Strategic Planning, National Program Assessments (PATs), State Accountability Reports, State and Federal audits, and other reporting are all part of these reviews.

Goal

Maintain and enhance viable planning, financing, and performance efforts in support of the mission and programmatic goals of the Consortium.

Objective 1 – Ensure the programmatic mission of the Consortium is accomplished through planning activities and a viable administrative and management system which supports its programmatic themes.

Outcomes

- Strong short- and long-term planning is conducted by agency Core Group with support of the Consortium Program Advisory Board, extension specialist advisory committees, and other user input.
- Strategic and implementation plans are the foundation for the Consortium activities.
- Viable research and education programs funded through the Consortium meet constituent needs.
- Open communication with liaisons and methods for effective processing of paperwork between the Consortium and member institutions are maintained and fostered.

Indicators

- Program Advisory Board and extension specialist advisory committee engagement in short- and long-term planning.
- State and federal approval of strategic and implementation plans.
- Number of external peer reviews received per each proposal.
- Number of Sea Grant research and education proposals submitted and funded.
- Implementation planning milestones met.

Actions

- Prepare Consortium four-year strategic and two-year implementation plans.
- Create and engage Program Advisory Board (PAB) to assist Consortium leadership in strategic and tactical planning, priority setting, and policy directions.
- Convene monthly staff meetings, regular Core Group meetings, monthly Web Working Group meetings, and regular department staff meetings to evaluate progress toward short- and long-term goals and milestones.
- In association with Georgia, North Carolina, and Florida Sea Grant programs, represent South Carolina interests in the development of an ocean research plan for the South Atlantic region by engaging stakeholders and participating in planning activities.

Objective 2 – Develop, maintain, and enhance the Consortium’s funding levels and financial and reporting system to support the programmatic goals of the research, education, extension, and training programs of the Consortium.

Outcomes

- Increased level of both state and non-state financial support to further the Consortium’s program goals is obtained.
- Sound fiscal practices are implemented and maintained.
- A strong and diverse funding base to support Consortium programs, activities, and administrative needs is established.
- Consortium Management Information System (MIS) is fully implemented and used by staff and university partners.
- Statewide single agency audits will have no significant findings.
- Annual state and federal accountability reports will document the agency’s performance.
- The Consortium will be rated as one of the highest performing Sea Grant College Programs in the nation.

Indicators

- Amount of state recurring funds secured on an annual basis in comparison to the growth in the state budget.
- Return on investment (federal funding to state funding) ratio.
- Level of extramural (competitive and otherwise) funding secured from non-state sources.
- Number of extramural proposals submitted and funded.
- Approval of accountability reports by respective state and federal officials.
- Statewide single agency audit results.
- Number of grant award and interagency billing and accounting processes completed within a two-week timeframe.
- Rating by the external National Sea Grant Program Assessment process.
- Percentage of grant activities managed in MIS.

Actions

- Organize and coordinate a PAB Finance Sub-committee to explore and recommend actions in support of the diversification and growth of the Consortium's programmatic budget to meet increasing stakeholder needs.
- Compete for extramural funding (public and private) in support of S.C. Sea Grant Consortium and Extension Program projects and activities to further address Strategic Plan objectives.
- Prepare the annual S.C. State Accountability Report.
- Prepare the NSGO Annual Report.
- Complete conversion of Consortium competitive proposal and project management information system from paper to electronic.

2. Connecting with Users

The S.C. Sea Grant Consortium has two ways to connect with users: (1) input from our constituents, and (2) output to our constituents. This two-way communication is imperative to the success of the agency.

Goal

The Consortium effectively identifies and addresses the needs of its diverse constituencies throughout the state and region.

Objective 1 – Ensure that problems and needs of those who live and work along the coast are accurately identified.

Outcomes

- The problems and needs of those who live and work along the coast are accurately identified.
- Advisory committees, which represent our varied constituents, are engaged in program planning.
- Consortium-funded research, extension, and education projects gain more coverage in member institution print and Web publications.
- Consortium is partnering with a diverse group of organizations, institutions, and individuals.

Indicators

- Number of constituencies engaged.
- Engaging technically diverse groups of constituents.
- Number and diversity of partners.
- Engagement of Program Advisory Board in setting priorities.
- Percent return rate on constituent survey.
- Level of constituent survey responses regarding programmatic area.

Actions

- Perform stakeholder survey to acquire input for revision of the Consortium strategic plan (2006).
- Engage stakeholders in the identification of coastal and marine resource problems and needs, through sub-program advisory committees and meetings, specialist personal contact with user groups, and specialist interaction with partner agencies, organizations, and institutions.
- Conduct annual Program Advisory Board meetings to seek input for revision of Consortium strategic plan.
- Maintain and expand partnerships with federal, state, and local governments, business and industry, non-Consortium universities, and non-governmental organizations.

Objective 2 – Ensure that Consortium programs are effective in providing the necessary science-based information and that this information is delivered to target audiences in a timely fashion and appropriate formats.

Outcomes

- The public has a better understanding of Consortium-funded research, education, and outreach programs.
- High quality scientific and outreach publications are produced.
- Residents and visitors participate in Beach Sweep/River Sweep, people understand the impacts of litter and practice responsible disposal of debris, and businesses recognize the importance of litter cleanups by sponsoring Beach Sweep/River Sweep.
- The demand for the Consortium's regularly produced publications is increased.
- Consortium Web site continues to be a significant source of coastal and marine resource information.
- Informal educational programs have fostered a scientifically informed public and stewardship of coastal and ocean resources.
- Consortium programs are effective in providing the necessary science-based information.
- Consortium information is delivered to target audiences in a timely fashion and user-friendly formats.
- Constituents are utilizing the science-based information disseminated by the Consortium.
- Volunteers are engaged in Consortium outreach activities.

Indicators

- Number of awards and recognition for *Coastal Heritage*.
- Number of *Inside Sea Grant* newsletters produced and distributed.
- Formal and informal feedback from *Coastal Heritage* subscribers.
- Number of professional awards for Consortium programs, staff, and products.
- Number and quality of scientific publications.
- Number of Web hits, unique visits, downloads, and information requests.
- Percentage of Consortium Web sites that are ADA-compliant.
- Number of publications produced, requested, and distributed.
- Number of festivals and events at which there was a Consortium exhibitor.

- Number of Beach Sweep/River Sweep site captains and locations cleaned, total volunteers and number of community and school groups participating, number of tons of debris collected, and number of sponsors and amount of cash and in-kind donations for Beach Sweep/River Sweep.
- Number of presentations to rotary clubs, community associations, and schools.
- Number of and attendance at extension workshops and presentations.
- Number of news releases distributed; number of media placements as a result.
- Number of unsolicited media placements.

Actions

- Monitor, on a monthly basis, all Consortium Web site usage (including hits and unique visits).
- Conduct biennial reader survey for *Coastal Heritage*.
- Document Consortium efforts and outcomes through the preparation of an agency Biennial Report (Corporate Report).
- Submit Consortium publications and products to state, regional, and national award competitions.
- Publish *Coastal Heritage* on a quarterly basis and seek additional subscribers.
- Publish *Inside Sea Grant* on a bi-annual basis to highlight the significant outcomes of the agency and its partners.
- Conduct the annual Beach Sweep/River Sweep program in cooperation with the SCDNR.

3. Human Resources

The Consortium staff demonstrates excellence both within the agency and among its various partners. This excellence is achieved through dedication, loyalty, industry, and integrity. In addition the Consortium staff works to demonstrate leadership skills and agency engagement of the agency's diverse stakeholder community. One critical way that this is achieved is through its involvement in leadership roles with a number of public, private, and non-governmental organizations (NGOs). Consortium staff assumes key leadership roles in organizations, professional societies, and activities that advance the mission of the Consortium and the visibility of Sea Grant in the state of South Carolina, which enables it to better serve the needs of its constituencies.

Goal

Maintain and enhance a highly qualified, well-trained, and recognized agency staff.

Objective 1 – Encourage an “environment of excellence” to maintain and hire talented staff and support the development of professional and other skills among the Consortium staff in partnership with other federal, state, and local agencies and professional organizations.

Outcomes

- Staff is well-trained and engaged in internal and external agency activities.
- Staff is regionally and nationally recognized by peers and professional organizations.
- Staff assumes leadership roles within relevant professional institutions and organizations.
- Staff retention is high.
- Joint partnerships to support agency staffing needs and program responsibilities are developed.

Indicators

- Staff retention rates (e.g., FTE/TGE vacancy rate).
- Number of staff professional development opportunities.
- Number of staff recognized for performance.
- Staffing level of Sea Grant Extension Program.
- Number of leadership activities staff are involved in.
- Number of joint partnerships established.
- Level of Consortium staff and extension specialists participating on a variety of program-related, community-based committees and task forces.

Actions

- Employ a highly qualified staff through a rigorous recruitment and selection process.
- Fill position of Web Developer in the Consortium's communications section.
- Enhance skills, capabilities (including the possibility of cross-training), and professional development goals of the Consortium staff through attendance at workshops, seminars, and development events and activities.
- Encourage staff to become actively involved in professional organizations pertinent to their staff positions (e.g., as committee members, elected officers).

Review and Revision

Review of the 2006-2008 Implementation Plan will be conducted during the preparation of our annual reports to the NSGO and to the State of South Carolina. Report preparation provides us with a unique opportunity to assess the progress for each year based on the indicators and outcomes identified in this plan.

In addition, revisions to the 2006-2008 Implementation Plan will be conducted at several points in the two-year period, especially during the process of identifying specific Omnibus funding priorities. These priorities are developed within the context of the Consortium's Strategic Plan with input provided by the agency's Program Advisory Board, state resource management agencies including SCDNR and SCDHEC, and other prospective beneficiaries of the proposed work. Also, since one of the attributes of the Sea Grant program is the ability to respond to emerging issues, this Plan will also be assessed to determine if any emerging issues not previously identified should be included.

National Relevance

The NOAA 2006-2011 Strategic Plan identifies the following four goals: (1) Protect, Restore, and Manage the Use of Coastal and Ocean Resources Through an Ecosystem Approach to 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 Safe, Efficient, and Environmentally Sound Transportation (www.ppi.noaa.gov/pdfs/Strategic_Plans/NOAA_Strategic_Plan.pdf). Activities included within the Consortium's Implementation Plan will be assessed and organized to be consistent with relevant NOAA Mission Goals.

A series of cross-cutting priorities are also identified in the NOAA Plan, including: (1) Developing, Valuing, and Sustaining a World-Class Workforce; (2) Integrating Global Environmental Observations and Data Management; (3) Ensuring Sound, State-of-the-Art Research; (4) Promoting Environmental Literacy; and (5) Exercising International Leadership. The Consortium's Implementation Plan also conforms to these cross-cutting principles.

The strategic plan of the National Sea Grant Office is structured according to eleven theme areas that are also consistent with elements of the NOAA strategic plan and cross-cutting priorities. The Consortium's strategic and implementation plans will be assessed and modified in its regular planning cycle to align with both NOAA and NSGO strategic plans and guidance.

Therefore, the Consortium's Strategic Plan is directly informed by the NOAA and National Sea Grant Strategic Plans to provide the national context and direction for the agency's plans and programs at the regional, state, and local levels. The Consortium develops a synthesis of these inputs to create its final plans and programs.