"We will never go back to 1491. We need to go forward and envision 'coastal futures.'"

— Jerry Schubel, National Sea Grant Review Panel

RHODE ISLAND
SEA GRANT
COLLEGE PROGRAM

Strategic and Organizational Development Plan

2006–2010

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Sea Grant Rhode Island

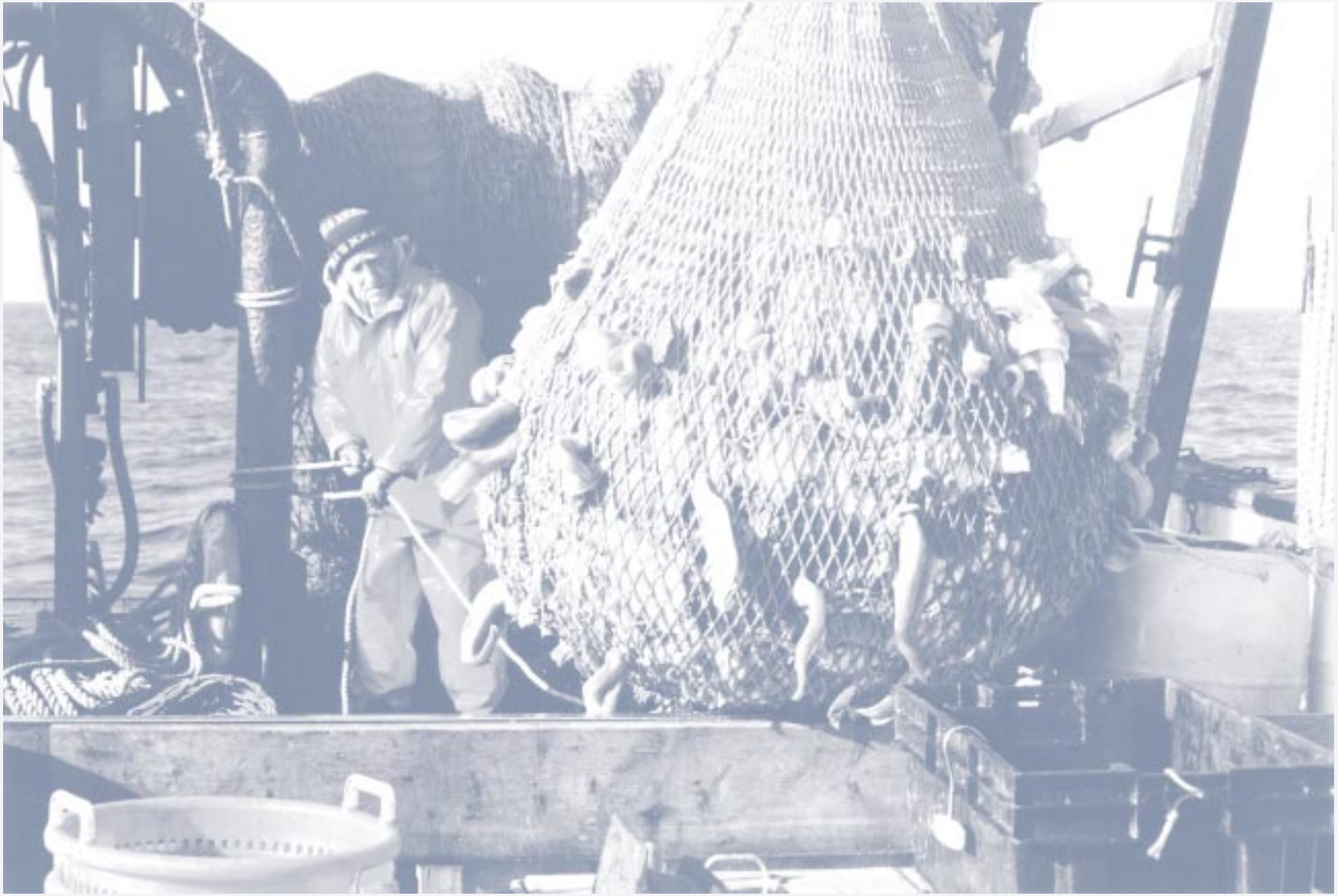
NOAA

UNIVERSITY OF Rhode Island

2006–2010

Rhode Island Sea Grant College Program
2006–2010 Strategic and Organizational Development Plan

"Only within the moment of time represented by the present century has one species—humans—acquired significant power to alter the nature of this world."
— Rachel Carson, *Silent Spring*



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Executive Summary

The 2006–2010 Rhode Island Sea Grant Strategic and Organizational Development Plan was prepared over a 12-month period by the Rhode Island Sea Grant Leadership Team in partnership with many of our valued stakeholders and constituent groups and with the assistance of Page Nelson, a consultant from Working InConcert, Inc.

Our plan describes the numerous challenges facing coastal America and beyond, detailing current trends for Rhode Island's coastal waters, watersheds, and marine economy. It also outlines our roles and responsibilities to work with others to meet these challenges and reflects our intent to focus our efforts where we have expertise and critical mass and can be of greatest assistance to our partners and constituents.

This plan reflects Rhode Island Sea Grant's integrated "functional" (research, education, outreach, and management) and "thematic" (fisheries, coastal communities) programming (Fig. 1; Table 1). Based on this approach, Rhode Island Sea Grant is conducting a parallel organizational development process of "internal alignment" to ensure consensus and cohesiveness for the effective implementation of this plan.

Our plan begins with a statement of Rhode Island Sea Grant's overarching vision and mission and an analysis of coastal trends we grapple with as scientists, outreach specialists, and educators. It then seeks to define our two core thematic areas: Sustainable Coastal Communities and Ecosystems and Sustainable Fisheries. For each of these two themes, we articulate the relevant contexts and develop a comprehensive framework of goals, objectives, and short- and long-term implementation targets (Tables 2 and 3). This plan establishes for each core theme a five-year planning framework for programming in research, education, extension, legal, communications, and program management. Our vision and mission statements for individual thematic and functional areas expand on Rhode Island Sea Grant's overarching vision and mission. We conclude this plan with a brief discussion of still-emerging international and Northeast regional programs that will be the focus of new development initiatives. We have sought to establish program development priorities and implementation targets that leverage our institutional and environmental strengths and that will maintain Rhode Island Sea Grant's responsive capabilities critical for taking advantage of new opportunities or unanticipated changes in the natural, built, and governmental environments in which we function.

The Rhode Island Sea Grant Strategic and Organizational Development Plan for 2006–2010 will be utilized as a living document, intended for reference in the course of our daily activities and subject to careful reevaluation, particularly in development of the next two omnibus proposals and implementation plans that will occur during this planning cycle.

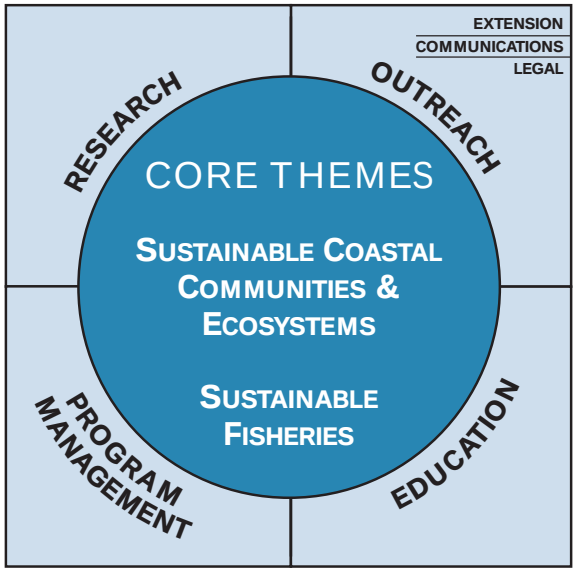

Figure 1. Rhode Island Sea Grant integrated thematic and functional planning processes

Respectfully submitted by the Rhode Island Sea Grant Leadership Team

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Table 1. Strategic Goals

Functional Areas	Strategic Goals for Sustainable Coastal Communities and Ecosystems	Strategic Goals for Sustainable Fisheries
Research	• Characterize and quantify dynamics of change in coastal ecosystems • Improve scientific understanding of acute and cumulative effects of physical, chemical, and biological contaminants on coastal ecosystems • Develop innovative techniques and related science-based indicators to characterize the sources, pathways, and effects of nutrients, toxins, and biocontaminants	• Explore the links between ecosystem-based management and fisheries management • Elucidate emerging industry and consumer priorities regarding seafood • Increase knowledge of biology and ecology of commercially and recreationally valuable species
Outreach & Education	• Educate a new generation of coastal scientists, policy-makers, and managers to advance coastal stewardship • Mentor the next generation of coastal/marine leaders; foster life-long learning and wise use of marine resources • Nurture/develop scholarly learning communities in the state, region, nation, and world to foster integrated coastal management • Implement ecosystem-based and adaptive management approaches to evolve more sustainable human-dominated coastal ecosystems • Improve adaptive management of coastal communities and ecosystems	• Educate the current and next generation of fisheries scientists, fisher-men, and managers • Facilitate and guide the evolution of comanagement processes and institutions locally, regionally, nationally, and internationally
Law & Policy *Cross Cutting*	• Provide legal analysis of coastal management issues and research to develop innovative approaches toward policies in fisheries management and coastal management	
Communications *Cross Cutting*	• Utilize appropriate communications technologies to facilitate the transfer of information to key Sea Grant audiences and stakeholders • Develop and refine communications strategies for building informed constituencies for improved coastal management, fisheries management, and the coastal sciences	
Management *Cross Cutting*	• Enhance Rhode Island Sea Grant organizationally through effective program administration, leadership training, team development, and the cultivation of alternative funding sources • Develop accessible knowledge management systems • Enhance links between Rhode Island Sea Grant's programs and projects, and between local, regional, national, and international partners • Advance program-wide monitoring and evaluation	

Table 2. Sustainable Coastal Communities and Ecosystems

Functional Areas	Strategic Goals	Strategic Objectives	Near-Term Targets[1]	Five-Year Targets
Research	• Characterize and quantify change in coastal ecosystems • Improve understanding of acute/cumulative effects of physical, chemical, and biological contaminants on coastal ecosystems • Develop innovative techniques to characterize the sources, pathways, and effects of nutrients, toxins, and biocontaminants	• Assess ecosystem production dynamics in response to reduced nutrient loading to Narragansett Bay • Establish baselines for assessing ecological impacts of reductions in point source nitrogen discharges to the upper Bay • Improve understanding of impacts of climate change related to coastal habitat quality • Improve understanding of groundwater hydrology and watershed flows to coastal waters • Improve understanding of manmade habitats as a component of urbanizing coastal ecosystems • Improve understanding of socioeconomic dynamics and their relation to coastal ecosystem–based management	• Establish a baseline of primary and secondary production, biodiversity, and multispecies interactions in Narragansett Bay • Assess upper Bay as quahog spawning habitat • Assess the impacts of water quality improvements on quahog fisheries management practices in the Bay • Assess the way the entire Bay will respond to a projected 25 percent reduction in nitrogen discharges • Assess changes in the timing, frequency, and duration of phytoplankton blooms in Narragansett Bay and the ecological impact of such blooms on benthic and planktonic species communities • Assess impacts of increased water temperature on multispecies interactions • Quantify the shallow-water habitat impacts of hypoxia and changes in long-term average temperature • Develop coupled land-use and groundwater hydrodynamic models to assess the ecological risks of watershed and land-use alterations • Assess the habitat values of marinas in urbanized coastal ecosystems • Evaluate the public health impacts of increased consumption of seafood produced in urbanizing estuaries • Quantify public health benefits and habitat impacts of increased public access to upper Narragansett Bay • Identify research needs and initiate research for a legal regime toward regional governance • Improve understanding of socioeconomic factors critical to the implementation of ecosystem-based management • Assess the long-term ecological and socioeconomic consequences of coastal habitat restoration • Enhance assessment methods to ensure that coastal economic development in Rhode Island adequately accounts for environmental conservation, multiple-use management, and ecosystem-based management • Improve understanding of coastal storm and flood hazards to enhance predictive capabilities • Improve understanding of the impacts of shoreline armoring, inlet dredging, and stabilization on nearshore physical processes, fish and shellfish recruitment, and coastal water quality	• Deliver comprehensive assessments of the impact of nutrient loadings on production and habitat quality in Narragansett Bay • Develop methods for accurately quantifying secondary production rates in the Bay and sounds • Apply stable isotope ratio analysis to determine the sources of nitrogen discharges to the upper Bay • Assess ecological gradients in Narragansett Bay that may have emerged as a consequence of nitrogen inputs and frequent hypoxia • Assess the impacts of varying dissolved oxygen concentrations and temperature changes on biogeochemical cycling of nitrogen in the benthos, particularly nitrification and denitrification rates • Define space and time scales needed to capture physical and biological drivers required for ecosystem forecasts for Rhode Island coastal waters • Evaluate the costs and benefits of manmade habitats, particularly marinas, docks, and piers • Verify economic values of ocean and coastal resource utilization • Design tools for estimating nonmonetary ecosystem value for ecosystem stewardship • Develop ecosystem, law, and policy models for New England ecosystem-based management • Develop methods for assessing the socioeconomic and environmental impacts of development to improve selection of options for coastal resource and community development • Develop innovative methods for implementation of Rhode Island economic development strategies targeting the regional marine-based economy

Table 2. Sustainable Coastal Communities and Ecosystems (cont.)

Functional Areas	Strategic Goals	Strategic Objectives	Near-Term Targets[1]	Five-Year Targets
Outreach & Education	• Educate a new generation of coastal scientists, policy-makers, and managers to advance coastal stewardship • Mentor the next generation of coastal/marine leaders; foster life-long learning and wise use of marine resources • Nurture/develop scholarly learning communities locally, regionally, nationally, and internationally to foster integrated coastal management • Improve ecosystem-based and adaptive management of coastal communities and ecosystems	• Support graduate trainees through Rhode Island Sea Grant's research investments • Support URI undergraduate Coastal Fellows • Foster training of environmental leaders in coastal management • Build government capacity for integrated coastal management • Integrate Legal Program results to enhance outreach and education efforts	• Implement a pilot project, Institute for Graduate Environmental Leaders (IGEL), for graduate students at URI and RWU • Conduct educational programs for the general public or specific groups • Train regional planning councils to apply smart growth practices to coastal issues • Host a forum that addresses issues such as ecosystem change in Rhode Island coastal waters (climate change, reduction in nutrient loading, fisheries shifts) • Institute an annual law and policy forum to present and discuss legal research conducted on salient issues • Bring national and international experts to Rhode Island to share models for coastal management for decision makers and students • Establish a forum for NGOs and municipal and state government to address key issues, allocate funds, and coordinate work plans for integrated management of upper Narragansett Bay • Develop a framework and facilitate a process for urban coasts that incorporates environmental, social, and economic values into decision making	• Expand IGEL to southeastern New England • Create a professional association for coastal managers in collaboration with the URI Coastal Resources Center • Create a learning network among academic institutions to foster the application of science for the management of marine resources • Develop a mechanism to exchange legal and policy research on regional governance efforts nationally and internationally • Model special area management plans (SAMPs) of urban coasts for the National Coastal Zone Management toolkit • Build capacity within the R.I. Coastal Management Program to implement SAMPs • Synthesize knowledge on Rhode Island's coastal ecosystems to support relevant statewide forums
Law & Policy	• Provide legal analysis of coastal management issues and research toward innovative coastal policy approaches	• Develop a policy and legal research knowledge base and network • Develop institutional connections between the SCCE Program and RWU's Marine Affairs Institute	• Determine near-term priority issues in coastal communities and ecosystems to guide development of advisory research services • Develop Rhode Island Policy Fellows Program to serve as commentators and experts on coastal management issues	• Expand advisory research service to include regional perspective and offer via Northeast Sea Grant Extension programs • Expand Policy Fellows Program regionally in conjunction with SCCE Program's regional partners and other Northeast Sea Grant programs

Functional Areas	Strategic Goals	Strategic Objectives	Near-Term Targets[1]	Five-Year Targets
Communications	• Utilize appropriate communications technologies to facilitate the transfer of information to coastal community stakeholders • Develop and refine communications strategies for building informed constituencies for improved coastal management	• Assess effectiveness of a variety of communications techniques to increase awareness and change behavior of different stakeholder groups • Work with SCCE researchers and extension staff to develop new communications vehicles that best target stakeholder groups	• Develop and maintain specialty websites in support of SCCE goals • Produce print publications as needed • Facilitate, as appropriate, submission of peer-reviewed articles for publication • Write feature articles for *41°N* magazine on coastal communities and ecosystems issues • Develop partnerships with coastal community agencies and groups that share common goals to develop quality products	• Capitalize on the Sea Grant network and better utilize communications products from other programs in Rhode Island
Program Management	• Enhance Rhode Island Sea Grant organizationally through leadership training, team development, effective program administration, and cultivation of alternative funding sources • Develop accessible knowledge management systems • Enhance SCCE Program links with the Sustainable Fisheries Program, other Rhode Island Sea Grant programs, and local and national partners • Advance program-wide monitoring and evaluation	• Disseminate information to multiple audiences on Sea Grant's accomplishments and impacts • Provide training and professional development opportunities for staff • Implement web-based data and knowledge management systems • Promote partnerships within the Sea Grant network regionally and nationally • Assess need for formation of a Rhode Island Ocean Research Council • Fully develop Outcome Mapping organizationally	• Develop a project-management database system • Develop an on-line proposal competition system for omnibus development and production • Convene an annual science symposium • Prepare for and conduct a successful external program evaluation in 2007	• Establish a line item in the Rhode Island state budget to provide match for federal funding for Rhode Island Sea Grant

[1]Near-term implementation targets consist of activities and milestones to be achieved during approximately the first 2.5 years of the strategic plan period. Long-term implementation targets focus on activities and milestones to be achieved during the entire five-year period.

Table 3. Sustainable Fisheries

Functional Areas	Strategic Goals	Strategic Objectives	Near-Term Targets[1]	Five-Year Targets
Research	• Explore the links between ecosystem-based management and fisheries management • Elucidate emerging industry and consumer priorities regarding seafood • Increase knowledge of biology and ecology of commercial and recreational species and stocks	• Increase social, economic, and ecological understanding of the entire harvest cycle from sea to consumer • Conduct collaborative research involving fishermen and managers on gear, fish behavior, and bycatch • Increase knowledge of selective fishing gear and fish and fishermen behavioral responses to it • Increase knowledge of anthropogenic impacts on marine ecosystems and harvest fisheries • Enhance stock assessments of commercially and recreationally valuable species	• Collaboratively research disease and management in changing environments • Develop law and policy models for decentralized fisheries management in Rhode Island • Better utilize data provided by the fishing sector • Improve provision of data to bycatch management processes • Develop innovative fishing methods and gears based on improved understanding of marine fishery species behavior to reduce bycatch • Develop better biological, physical, and socioeconomic tools to manage multiple-use conflicts, scale back capitalization of commercial fisheries, and reduce gear impacts on habitat • Collaboratively research socioeconomic impacts of fisheries management strategies • Collaboratively research seafood quality and safety • Develop probes and techniques for real-time measurements of seafood contamination • Comprehensively assess the socioeconomic consequences of area closures on commercial and recreational fisheries • Collaboratively research biology and ecology of commercially and recreationally important species • Assess the ecological and socioeconomic feasibility of wild stock enhancement techniques	• Develop stakeholder-based funds for research • Apply law and policy models for comanagement in New England • Develop fisheries management frameworks and models based on scientific understanding of marine ecological functions
Outreach & Education	• Educate the current and next generation of fisheries scientists, fishermen, and managers • Facilitate the evolution of comanagement processes and institutions locally, regionally, and nationally	• Support fisheries graduate trainees through better connections to research portfolio • Support URI Coastal Fellows focusing on fisheries science and management • Improve organization of URI fisheries' informal education programs • Integrate Legal Program results to enhance fisheries outreach and education efforts • Offer focused, relevant training programs and workshops for stakeholders	• Create internship opportunities for law students • Conduct educational programs for the general public or specific groups • Develop a formal working group for gear conservation engineers • Develop a formal working group for comanagement institutional development with fishermen, Sea Grant programs, universities, and fisheries managers • Lead Northeast Regional Fisheries Extension Program • Institute an annual law and policy forum on legal research devoted to New England	• Facilitate development of a true comanagement system for Rhode Island • Develop mechanisms to exchange fisheries law and policy research and results nationally and internationally

Functional Areas	Strategic Goals	Strategic Objectives	Near-Term Targets[1]	Five-Year Targets
Law & Policy	• Improve legal analysis of issues related to sustainable fisheries, focusing on proactive law and policy approaches	• Develop a policy and legal knowledge base and network to enhance fisheries management • Foster institutional connections between URI Fisheries and RWU Marine Affairs Institute	• Determine priority areas in fisheries policy and law to guide development of advisory research services • Develop Rhode Island Policy Fellows Program to provide commentators and experts on fisheries management issues	• Expand advisory research service regionally • Expand Policy Fellows Program regionally
Communications	• Utilize appropriate communications technologies to facilitate the transfer of information to fisheries stakeholders • Develop and refine communications strategies for building informed constituencies for fisheries management and science	• Identify communications products that best target fisheries stakeholder groups • Develop partnerships with fisheries agencies and groups to develop communications products	• Develop and maintain specialty websites dedicated to sustainable fisheries theme • Publish research reports, proceedings, and publications as needed • Facilitate submission of peer-reviewed articles for publication • Write press releases and publicize events on pertinent fisheries topics • Track and distribute communications products	• Facilitate development of a true comanagement system for Rhode Island • Develop mechanisms to exchange fisheries law and policy research and results nationally and internationally
Program Management	• Enhance Rhode Island Sea Grant organizationally through leadership training, team development, effective program administration, and cultivation of alternative funding sources • Develop accessible knowledge management systems • Enhance Sustainable Fisheries Program links with the SCCE Program, other Rhode Island Sea Grant programs, and local and national partners • Advance program-wide monitoring and evaluation	• Disseminate information to multiple audiences on Sea Grant accomplishments and impacts • Provide training and professional development opportunities for staff • Implement web-based data and knowledge management systems • Promote partnerships within the Sea Grant network regionally and nationally • Assess need for formation of a Rhode Island Ocean Research Council • Fully develop Outcome Mapping organizationally	• Strengthen the R.I. Commercial Fisheries Center and the URI fisheries faculty • Develop a project-management database system • Develop an on-line proposal competition system for omnibus development and production • Convene an annual science symposium • Prepare for and conduct a successful external program evaluation in 2007	• Develop the Point Club Endowment for the URI College of the Environment and Life Sciences in support of new faculty and staff positions in fisheries • Establish a line item in the Rhode Island state budget to provide match for federal funding for Rhode Island Sea Grant

VISION

We envision a future where Rhode Island's coastal communities are recognized as stewards of the state's unique ecological, economic, and cultural assets. These coastal stewards enhance the Ocean State's intellectual capital in ocean and marine activities, and nurture strategic partnerships that contribute to the state's marine economy, prosperity, and unique quality of coastal living.

MISSION

Rhode Island Sea Grant implements integrated, systems-oriented research, education, and outreach strategies designed to foster leadership dedicated to the increased stewardship of marine ecosystems and their allied marine economies. Our core mission is to apply university-based talent to creating more sustainable and secure "coastal futures."

Congress created the National Sea Grant College Program in 1966 to increase the public's understanding and appreciation of marine resources and their economic value. The Ocean State and its ocean university—URI—had a seminal role in creating Sea Grant. Dean John A. Knauss, along with then-URI President Francis Horn and Sen. Claiborne Pell, sensed a growing national interest in the Sea Grant idea and organized the first national Sea Grant Conference, which was convened in Newport, R.I., in 1965. The following year, Pell introduced the National Sea Grant College Program Act in Congress. The first senate hearing on the Sea Grant bill was held at URI—the first time a U.S. Senate hearing was convened at a state university. URI was selected as one of the first four universities officially designated as a "Sea Grant College"—the others being Oregon State University, Texas A&M University, and the University of Washington. Today at least one Sea Grant program is located in each coastal and Great Lakes state.

"We stand at a critical moment in the Earth's history, a time when humanity must choose its future (which) at once holds great peril and great promise. Fundamental changes are needed in our values, institutions, and ways of living. We must realize that when basic needs have been met, human development is primarily about being more, not having more."
— Preamble to the Earth Charter, 1992 Earth Summit

Part I
Planning for Rhode Island Sea Grant's Future

Rhode Island Sea Grant plays a critical role in helping to balance environmental issues with issues of economic and resource productivity. It is a fundamental, overarching principle of Rhode Island Sea Grant that the economic prosperity of Rhode Island is inextricably entwined with the improved health of the state's marine and coastal environments.

Introduction

Rhode Island Sea Grant in the Ocean State

The Rhode Island Sea Grant College Program is a unique federal-state-university partnership based at the University of Rhode Island (URI). It designs and supports research, education, outreach, legal, and communications programs that foster the stewardship of coastal and marine resources for the public good. Since 1971, Rhode Island Sea Grant and URI have played pivotal roles in the evolution of the national network of 31 Sea Grant College and Institutional programs based at the world's leading oceanographic and Land Grant universities throughout coastal America. URI was one of the first four Sea Grant universities; the Sea Grant Association (SGA) is incorporated in the state of Rhode Island; Rhode Island Sea Grant's first leader was the first dean of URI's Graduate School of Oceanography (GSO), John A. Knauss; and the National Sea Grant Library is located at GSO.

Rhode Island Sea Grant recognizes that the future economic prosperity of Rhode Island and southern New England is inextricably entwined with enhancing the ecological integrity and resource productivity of the region's marine and coastal environments. In this strategic and organizational development plan, Rhode Island Sea Grant is committing to addressing the urgent needs of the state's rapidly expanding coastal communities, its endangered habitats and cultures, and its coastal oceans by addressing strategic priorities in two core thematic areas: 1) sustainable coastal communities and ecosystems, and 2) sustainable fisheries. In addition, the Rhode Island Sea Grant Leadership Team has developed a rigorous two-track strategic planning and organizational development process, recognizing that adherence to and pursuit of thematic goals must be carried out with skilled leadership, team-building, planning, and management for the program-wide functional areas of research, education, outreach, and program management. We have developed new organizational learning processes and made difficult choices, paying special attention to the opportunities and constraints engendered by:

- Our covenant with URI as a Sea Grant College and a world-class center of marine environmental research, education, and outreach
- Dynamic new partnerships with Rhode Island's environmental agencies and other academic institutions in Rhode Island and southern New England, particularly Roger Williams University (RWU) and Brown University
- Evolving institutional partnerships with the National Sea Grant College Program Office, based within the National Oceanic and Atmospheric Administration (NOAA) Office of Oceanic and Atmospheric Research, other NOAA line offices, and other federal agencies
- Our unique organizational design and available human and financial resources

Plotting a Sustainable Future for Marine Environments

Continued global human population growth and the rapid urbanization of the world's coasts is altering the biosphere at rates inconceivable a few decades ago. People are unaware of how the biosphere is responding to the anthropogenic perturbations under way or remain skeptical that what is happening is even possible. Yet it is now scientifically incontrovertible that humans are altering the planet's climate and precipitating the greatest extinction of fellow species since the massive die-offs of the dinosaurs in the Mesozoic era 65 million years ago. We are shifting Earth's biogeochemical cycles that govern the distribution of fresh water and the production and distribution of nutrients required by photosynthetic organisms. We are destroying habitats critical to global ecological functions, such as wetlands, coral reefs, estuaries, and old growth and tropical forests. Cruzan and Stoermer (2000) have coined the term "Anthropocene" to describe a new geological era in which the combined forces of human activity equal or surpass those of nature in modulating the functions and capacities of the planet's biosphere. The rate of these global-scale alterations is being measured in decades and centuries, and not in the millennia that 50 years ago we comfortably assumed was the pace at which our planet evolved (Olsen, 2003).

At the dawn of the 21st century, continued coastal urbanization threatens the vitality of the planet's invaluable marine environments. Also vulnerable to loss are traditional waterfront communities and activities. But these tremendous challenges also offer an unparalleled opportunity to explore the ecological and social links among the oceans, coasts, and humanity in recognition of the human-dominated nature of our coastlines and the inherent need to proactively manage these coastal environments. Public, private, industry, and government groups are recognizing the importance of an appreciation for the ways that human activities are altering natural processes. As continued residential and commercial coastal development shrinks wildlife habitat, diminishes water quality, and depletes groundwater resources, communities are striving to develop sustainable, ecologically compatible practices. These intentions speak to the heart of Rhode Island Sea Grant's mission. Over the next five years, the challenge before Rhode Island Sea Grant is to be a leader in helping to guide change in coastal environments toward a more sustainable future.

According to Constanza et al. (1997) the annual value of the goods and services produced by coastal ecosystems is more than four times greater than the per unit area value of terrestrial systems and 16 times greater than those produced by the open ocean.

Rhode Island Sea Grant's Planning Process

Integration of Functional and Thematic Strategic Planning

In addition to the traditional Sea Grant mandate to conduct strategic planning that identifies thematic priorities and integrates into them the "three legs of the stool"—research, education, and outreach—another key focus emerging from this strategic planning process was the need for Rhode Island Sea Grant to do better functional strategic planning across its primary thematic focus areas. Each core thematic area is now organized along four overarching functional areas: program management, research, education, and outreach. In addition, outreach is composed of three functional units—extension, communications, and legal (Fig. 1; Table 1). Tables 2 and 3 describe the major strategic goals, objectives, and implementation targets for Rhode Island Sea Grant's two core thematic areas.

Parallel Tracks: Integrating Strategic and Organizational Development Planning

In an era of burgeoning environmental concerns, with great changes affecting Rhode Island's coastal environment and communities, it was urgent that our strategic planning process for the next phase of Rhode Island Sea Grant's investments and activities involve the many concerned partners in the coastal/marine area. The Rhode Island Sea Grant Leadership Team worked with key stakeholders and partners throughout 2004 to elicit their input on the 2006–2010 Strategic and Organizational Development Plan. Some of the most important stakeholder input was provided by Rhode Island Sea Grant's University Advisory Committee, Senior Advisory Council, and members of other Sea Grant advisory groups. The current NOAA and National Sea Grant Strategic plans for 2003 to 2008 were also essential in developing this plan.

The Leadership Team contracted with an organizational development and strategic planning consultant to set its own team goals. The consultant, in conjunction with the Rhode Island Sea Grant Leadership Team, developed a planning process to ensure organizational consensus and cohesiveness to effectively develop and implement this plan.

A Strategic Planning Road Map and Timeline (Fig. 2) became the blueprint for a year-long collaborative process that addressed the need for both external and internal alignment and included key Rhode Island Sea Grant stakeholders in a series of forums, focus groups, and advisory meetings throughout 2004 (Appendix).

The internal alignment process included building mutual respect and individual, as well as team, empowerment within Rhode Island Sea Grant's Leadership Team and staff.

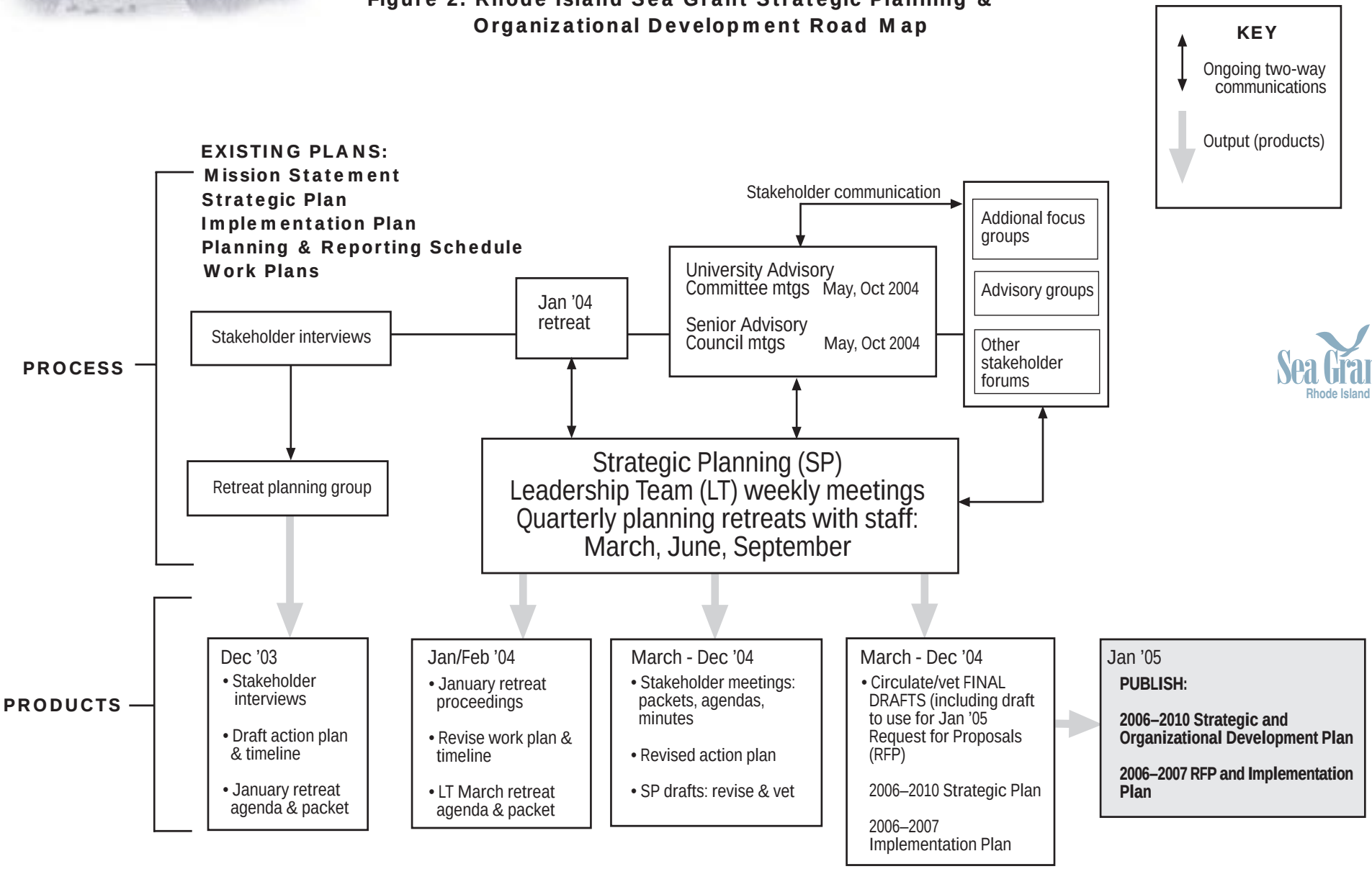
Agreed-upon objectives of this organizational development process included:

- Fostering trust and alignment within the organization and between the organization and its partners
- Improving communication and conflict resolution skills
- Increasing participation in and commitment to Rhode Island Sea Grant's vision, goals, and objectives
- Helping Rhode Island Sea Grant more effectively solve problems and achieve desired results
- Helping to develop an atmosphere that encourages individual growth and learning, open dialogue and team-building, and innovative systems thinking and awareness

As the 2006 to 2010 strategic planning milestones were reached (Fig. 2), the Rhode Island Sea Grant Leadership Team participated in facilitated off-site retreats to further develop organizational objectives. This work involved, and continues to involve, experiential learning and development of strategies and skills needed to address organizational challenges, such as improving organizational culture, unity, and leadership, and the development of new skill sets with which the Leadership Team can cultivate the next generation of coastal leaders. Rhode Island Sea Grant has incorporated this internal organizational development work into this plan.

"The simplest definition of leadership is 'the ability to produce change': We used to operate that way; now we operate this way. Every change process that I've seen that was sustained and that spread has started small, usually with just one team. The most fundamental reinforcer of such a change process is hearing people say that they've found a better way of working."
— Interview with Peter Senge, Fast Company

Figure 2. Rhode Island Sea Grant Strategic Planning & Organizational Development Road Map



Our Innovative "Glocal" Approach

For this 2006 to 2010 planning period, Rhode Island Sea Grant has committed to take on coastal stewardship issues at multiple geographic levels of science, management, and education. We call this our "glocal strategy." Such a strategy tackles the most important goals from our core thematic and functional areas and develops them across local, regional, national, and international arenas.

This innovative glocal strategy is one important way to make this plan a living document. Strategic prioritization and continual review of previous organizational decisions are required to ensure that Rhode Island Sea Grant programming at local, national, and international levels contributes to outstanding environmental scholarship but does not overwhelm the program's limited human and financial resources, inadvertently resulting in programming that is a mile-wide and an inch deep. Implementing our glocal strategy requires better organizational development and management skills over the next five years, adherence to Rhode Island Sea Grant's well-developed partnership principles, development of carefully designed external and internal communication strategies, and development of knowledge management systems that more closely track and report program outcomes, particularly how outcomes from distinct programs relate to each other.

Given the ambitiousness of this glocal strategy, Rhode Island Sea Grant has committed to participatory planning and implementation processes that involve a limited number of strategic partners, while allowing broad external engagement for comment and review.

Partnership Principles

The following set of principles, developed by the Rhode Island Sea Grant University Advisory Committee, help determine which programs are ripe for partnering and possible investment by Sea Grant.

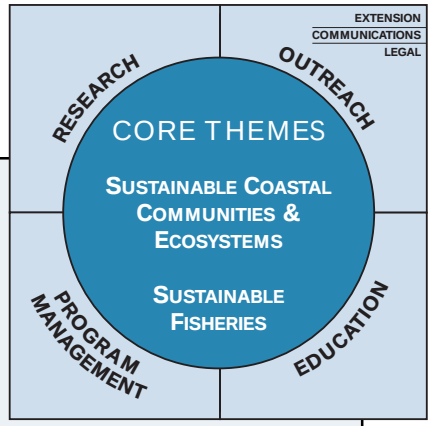
- **Scientific Expertise and Track Record:** Program is grounded in sound science with proven knowledge and links to a larger body of academic marine and environmental science expertise. Program has an excellent record of follow-through on commitments.
- **Commonality:** Program shares common goals or common audience with Rhode Island Sea Grant.
- **Leveraging:** Program has proven capacity to deliver applied research and/or outreach so that Rhode Island Sea Grant's investment will pay incremental costs rather than bear the full cost of programs.
- **Two-Way Street:** Both programs can articulate the mutual benefits (both strategic and specific) derived from a Rhode Island Sea Grant partnership and have a mutual understanding of mandates of the parent organizations.
- **Responsible Cadre of Interested Partners:** Groups have a cadre of qualified, responsible partners who express a strong interest in partnering with Rhode Island Sea Grant on a strategic, long-term basis.
- **Fiscal Stability:** Program has stable staff and funding base to ensure that Rhode Island Sea Grant investments will generate long-term returns.
- **Joint Evaluation:** Partners express strong interest in incorporating evaluation and outcome criteria into joint activities from the outset to rigorously assess whether the partnership has been successful and has had beneficial impacts on stakeholders.

"High above the earth, satellite eyes have watched Rhode Island grow for nearly 30 years. They have recorded patterns, tracked changes and assembled digital data and photographs in much the same way camera-clutching parents record each stage in their children's lives… On Wang's maps, urban land appears bright red. It creeps west from Providence, Pawtucket and Cranston… The state's shoreline is almost completely red… During the last three decades, urban land in Rhode Island increased 44 percent. It's similar to the 49 percent urban land increase in the eight-county area surrounding Chicago… Wang says that the darkest spector of sprawl—of any hard surface development—is its permanence… Over 100 years ago, the whole Northeast area was deforested for farming and it recovered. But once forest and farms are converted to urban land, it's almost always irreversible…. Roughly 30 percent of Rhode Island is developed. Another 30 percent, including wetlands, lakes and rivers is protected… now the cities and seaports are oozing inland."

— Neil Shea, "Pavement vs. Preservation," *Providence Journal*

Part II
Strategic Planning for Rhode Island Sea Grant's Core Themes

We will invest in improved understanding of ecosystems, identification of regional ecosystems, development of ecosystem health indicators, and new methods of governance to establish the necessary knowledge, tools, and capabilities to fully implement ecosystem-based management.
— NOAA Strategic Plan, 2004



Sustainable Coastal Communities and Ecosystems

VISION

We envision a future for coastal communities and ecosystems in which:

- Public awareness of environmental issues continues to rise, because Americans will be increasingly concerned about the ways that healthy, productive, coastal ocean environments enhance quality of life and overall well being
- Ecosystem-based approaches for management of coastal and ocean resources are widely used to bring about major reforms to coastal ocean management and to increase public awareness of the links between the anthropogenic impacts on the marine environment, including pollution and unsustainable consumption of resources. These management reforms will parallel the development of more enlightened consumption patterns, such as stronger consumer demand for seafood products that are not only nutritious but are produced in an ecologically sustainable manner
- Greater coordination of environmental management and resource allocation decisions among national, state, and local governments in the United States and between nations globally. There will be an increasing recognition that states cannot manage environmental issues unilaterally, resulting in better multi-state management of resources that transcends borders such as watersheds
- Coastal scientists and managers will receive greater depth and breadth in their training, possessing skills in natural resource and social sciences, as well as greater skills in the legal and political aspects of environmental management, particularly better communication skills and strategies

MISSION

The Rhode Island Sea Grant Sustainable Coastal Communities and Ecosystems (SCCE) Program implements innovative, ecosystem-based management and governance of coastal ecosystems locally, regionally, nationally, and internationally. The program works with its partners to bring about healthy and sustainable coastal ecosystems through applied research, outreach, and education programming. This mission encompasses the protection and restoration of living marine resources and their habitats, while considering user groups directly affected by and benefiting from advances in the ecosystem-based management approach.

The SCCE Program emphasizes interdisciplinary approaches to coastal ecosystems science, governance, and education. The program seeks to draw together the multidisciplinary community of social and natural scientists at URI with outreach teams and external partners to address coastal management. It assesses societal and ecosystem change and facilitates the pursuit of desired short-term and long-term outcomes at a range of spatial and governance scales.

In this strategic plan, the SCCE Program has developed strategic goals, objectives, and targets for a five-year period that seek to integrate all functional areas of the program into a comprehensive plan (Table 2).

Sustainable Coastal Communities and Ecosystems

America's Coastal Challenges

In 1800, a mere 2 percent of the human population lived in urban environments. In 1900, no city exceeded 10 million residents. By 2000, 19 cities exceeded 10 million, with the Mexico City metropolitan region being the largest at approximately 17 million. By 2010, most of the world's people will live in cities. But these cities will bear little resemblance to those considered large 50 years ago.

The United States is the only advanced industrialized country continuing to experience rapid human population growth. Most of this growth stems from immigration. The United States takes in about 1.1 million of the world's two million migrants annually, more than five times the next largest recipient nation, Germany.

Where is population growth concentrated in the United States? Coastal cities or megalopolises. U.S. coastal counties encompass a small fraction of the nation's land, but they are home to over half the U.S. population. Between today and 2015, the U.S. coastal resident population is expected to increase by 27 percent to 25 million people. In addition, more than 180 million people visit or seasonally reside along the nation's coasts annually. It is estimated that of all U.S. land that has been converted from rural to urban area since European settlement, one quarter has been converted during the last 15 years (an area the size of Ohio). If this urbanization trend continues, 68 million acres of additional land will be developed in the United States by 2025 (Beach, 2002).

Urban sprawl increases the extent of the built environment, including industrial facilities, commercial buildings, residential houses, parking lots, and roads. By 2025, more than 25 percent of U.S. coastal watersheds will be covered by impervious surfaces—60 percent in the mid-Atlantic region. Studies indicate that ecosystem health is seriously impaired when the impervious area in a watershed reaches 10 percent. If current coastal growth trends continue, many healthy coastal watersheds will cross the 10 percent threshold over the next 25 years.

As coastal communities expand, so does their vulnerability to coastal hazards—winds, waves, and floods generated by hurricanes and other major storms—and to geophysical hazards such as land subsidence and shoreline erosion. Excessive nutrient inputs and other forms of pollution will increasingly exert toxicological effects and alter ecosystems. The impacts of these climatic, geological, and pollution hazards will be compounded by projected rises in sea level due to global climate change. Even in absence of such combined effects, the social and economic consequences of these events have been dramatically increased by coastal population growth and urbanization, as exemplified by the hurricanes that ravaged Florida and the U.S. Gulf Coast in 2004.

The cumulative environmental consequences of coastal development are insidious:

- More than 20,000 acres of vital coastal habitat are significantly altered each year
- Sixty percent of U.S. coastal rivers and estuaries suffer major impacts from nutrient discharges and runoff
- Wastewater effluent discharges exceeding 2.3 trillion gallons enter U.S. coastal waters daily
- Oil discharges equivalent in volume to the 1990 Exxon *Valdez* spill enter U.S. coastal waters every eight months

Finally, the unsustainable use of energy, water, and materials in our coastal communities contributes to the degradation of coastal habitats and contamination of our air and water. Polluted waters impact water-based businesses and recreational activities, with attendant economic costs. Largely unrecognized is the fact that the physical design of our buildings and communities greatly affects the health of habitats and ecosystems. Currently, the built environment in coastal areas is remarkably inefficient in its use of energy and water—two precious natural resources—and in its handling of waste materials. Addressing the numerous impacts of paved coastal watersheds, unsustainable consumption of our natural resources, and waste assimilation practices is just part of the daunting challenge the United States faces in managing coastal urbanization to ensure long-term sustainability of coastal communities and ecosystems.

Rhode Island: The Ocean State

There is much in Rhode Island and its surrounding marine waters to celebrate and protect. Rhode Island offers exceptional historical and cultural attractions, unparalleled boating and fishing, superb swimming, and scenic vistas. From the early 1600s to the present day, Narragansett Bay, the south shore's coastal beaches and lagoons, and Rhode Island and Block Island sounds have shaped Rhode Island's identity and economy. The state's 425-mile coastline offers ocean beaches, coastal lagoons, tidal rivers, pristine salt marshes and tidal flats, miles of rocky shoreline, and historic urban waterfronts. These habitats support a wide variety of fish and wildlife, contribute greatly to the state's biological integrity and diversity, and help support the state's economy: $75 million in commercial fishery landings, a recreational fishery valued at $150 million, and a tourism and recreation industry valued at $2 billion on Narragansett Bay alone. The Ocean State has the largest water area to total area of any New England state. It is also the second most densely populated state in the United States, with about 1,000 people per square mile.

Significant components of Rhode Island's economy depend upon the quality and productivity of the state's marine and coastal resources. Rhode Island hosts a robust, globally competitive marine economic cluster consisting of the following industries and institutions (Rhode Island Senate Policy Office, 2004):

- Marine transportation
- Research and ocean technology development
- Military
- Fisheries and aquaculture
- Boatbuilding
- Boat-related (marinas and other boating support services)
- Tourism, recreation, and events
- Shipbuilding

Narragansett Bay is one of the best known recreational boating areas in the world, particularly for sailing. During the summer, major yachting events cater to national and international clientele, generating millions of tourism dollars for Rhode Island. In addition, in the year 2000, some 300,000 saltwater anglers made one million fishing trips, with the majority of the anglers coming from out of state (Lazar and Lake, 2001).

Rhode Island's Coastal Challenges

Many of the U.S. coastal development trends are mirrored in Rhode Island. Rhode Island grapples with the challenges of intensifying marine and coastal uses and continued residential and commercial development. Essentially a city-state located in southern New England at the northern end of the Washington–Boston megalopolis, Rhode Island continues to experience significant development pressures as well as numerous other coastal environmental management challenges.

As in other U.S. coastal regions, sprawl development, nonpoint source pollution, habitat degradation and destruction, invasive species, climate change, harmful algal blooms, shoreline development, and armoring continue to threaten the quality of Rhode Island's coastal habitats, waters, and resources. Between 1990 and 2000, Rhode Island experienced very little net gain in population, yet 25,000 additional acres of land were developed for suburban homes, retail shopping districts, and industrial parks. The drought of 2002 revealed the many wasteful and ultimately unsustainable drinking-water consumption practices associated primarily with suburban communities but also with agriculture.

Rhode Island Sea Grant's Strategic Responses

Rhode Islanders are currently investing $318 million in collecting and treating storm water in the Providence metropolitan region via the Narragansett Bay Commission's Combined Sewer Overflow (CSO) Abatement Project. Until completion of this project by 2008, much of upper Narragansett Bay will remain closed to commercial and recreational shellfishing, and Bay beaches will remain vulnerable to public health closures following major rainfall events due to CSO and stormwater discharges.

Recent Rhode Island Sea Grant–funded research has demonstrated how nutrient loading and long-term warming of nearshore marine waters by global warming may contribute to the continued loss of eelgrass beds, to poor-to-nonexistent recovery of local winter flounder stocks, to reductions in estuarine ecological community structure and diversity, and may lead to the proliferation of lobster shell disease in regional stocks.

In addition to major investments in wastewater treatment infrastructure, in 2004, Rhode Island began a new era of marine planning with the passage of several planning and management reform acts by the state legislature. This new legislation reflects heightened concerns regarding the health and resource productivity of Narragansett Bay, Rhode Island's south shore coastal lagoons, and territorial seas. Continued shoreline development has also increased user conflicts such as marina expansions. Many Rhode Islanders and their government leaders now recognize that superb quality of life is one of Rhode Island's most important assets for attracting service economy businesses.

The elements of public concern and scientific and technical insight necessary to launch a new era of integrated marine environmental management have been evolving steadily over the last 25 years (Rhode Island Senate, 2004). As with the rest of New England, Rhode Island endured a tumultuous transformation from a manufacturing economy with center-city dominance to a service economy with a more distributed population. Environmental and natural resource planning and management have become core state and municipal governmental functions. Median incomes decreased 4 percent in Rhode Island from 1989 to 2003, while median incomes across New England grew over the same time period. Since the early 1970s, Rhode Island's employment base has gravitated from relatively higher-wage manufacturing jobs toward relatively lower-wage service and tourism economy jobs. The Providence metropolitan region experienced the most dramatic declines in incomes, whereas Washington County, in the southwestern coastal region of the state, experienced dramatic income growth from 1989 to 2003 (Federal Reserve Bank of Boston, 2004). Mirroring the rest of the United States, Rhode Island's cities and urban environments are getting poorer, and the less-urbanized coastal counties are getting richer, fueling sprawl patterns in coastal development.

Rhode Island serves as a living laboratory for coastal governance reforms because of its small size, progressive environmental management systems, and unique historical and contemporary orientation to the coastal marine environment. It is therefore possible to identify and address key coastal issues by formulating, adopting, and implementing new policies and management approaches relatively quickly. For more than three decades, Rhode Island Sea Grant has drawn from its field experience in Rhode Island and beyond to identify the practices that generate progress towards sustainable coastal communities, resources, and ecosystems in a host of contexts. Based on Rhode Island Sea Grant's organizational glocal strategy, even greater emphasis will be placed on identifying issues and designing initiatives that are important locally and also relevant nationally and internationally. As a microcosm of the U.S. coast, Rhode Island is particularly well suited for this approach to programming.

Rhode Island Sea Grant's Strategic Investments in Sustainable Coastal Communities and Ecosystems

Sustainable Coastal Communities

For 2006 to 2010, the SCCE Program will focus on instituting ecosystem-based management of urban coastal ecosystems. Largely a SCCE Extension Program initiative, a primary strategic priority will be to spearhead the development of a Special Area Management Plan (SAMP) for upper Narragansett Bay with additional funding from the R.I. Coastal Resources Management Council (CRMC) and in partnership with the cities of Providence, East Providence, Cranston, and Pawtucket. Upper Narragansett Bay runs from Gaspee Point and Bullock's Cove northward to the falls at the head of the Seekonk River and the tidal portions of the Woonasquatucket and Moshassuck rivers.

"Each generation writes its own biography in the cities it creates."
— Lewis Mumford

The SAMP development process provides an opportunity for Rhode Island Sea Grant to contribute to the sustainable growth and stewardship of a vibrant community around upper Narragansett Bay. This strategic priority has the following objectives:

- Facilitate urban waterfront and watershed development planning that explicitly recognizes economic and environmental sustainability
- Develop regional solutions to issues such as public access, brownfields, port redevelopment policy, marine debris removal, and natural hazard mitigation planning and recovery
- Better incorporate applied research to the development and implementation of the upper Narragansett Bay SAMP
- Help urban coastal communities to identify themselves as beneficiaries of coastal environmental resources and values

Marina Ecosystems Initiative

The recreational boating industry, with nearly 30,000 businesses, is a key component of the national economy. Boats and related products total more than $25 billion in annual retail sales and provide direct jobs for 550,000 workers nationwide who, in turn, generate multiplier effects throughout the economy with their expenditures. While the economic benefits that accrue to coastal communities from the marina industry are impressive, it is difficult to gauge what the future holds. There are emerging factors that will enhance waterfront access and recreational boating, such as port revitalization, and others that threaten their economic viability, like fewer government dredging dollars and displacement due to other forms of coastal development. These factors are exacerbated by pressure to increase environmental standards coupled with daunting regulatory guidelines. The National Sea Grant Network's Ecosystems and Habitats Theme Team is responding to these challenges by renewing and expanding on historical Sea Grant partnerships with the Marine Operators Association of America (MOAA), the National Marine Manufacturers of America (NMMA), BoatUS, and the Marina Education and Environmental Foundation (MEEF). Rhode Island Sea Grant will play a lead role over the next several years in helping the National Sea Grant Network formulate and implement a Marina Ecosystems Initiative.

Currently, 17 states are either developing or implementing clean marina programs. These programs evolved from an Environmental Protection Agency (EPA)-NOAA effort to reduce nonpoint source pollution through the use of best management practices (BMPs) by marina owners, boatyards, and boaters. Sea Grant is involved in the majority of these programs through research and extension activities. In spite of this effort, information is scattered and not readily accessible to the industry or other practitioners. As funds for environmental management shrink, effective implementation of clean marina programs will become more important. The economic value of BMPs has been amply demonstrated through numerous public and private marina case studies.

In terms of coastal ecology, these case studies have illustrated how some marina efforts may enhance the environment, such as shellfish aquaculture practices or naturalized shoreline protection systems. A broader and more comprehensive scientific evaluation of the ecological benefits due to these and other clean marina practices is urgently needed to help the marina industry function as a green industry.

Additionally, there is an urgent need to develop low-cost methods of dredged material disposal (Costa-Pierce and Weinstein, 2002). This need, combined with the desire to restore wetlands as healthy ecosystems, provides an opportunity for future research. Building on the work done to date on beneficial use of dredged material, there is a need to synthesize information and provide specific guidance to the industry, while working to expand the research and technology efforts to improve the viability of alternative options in dredge management and disposal.

Rhode Island Sea Grant will work with other Sea Grant programs and the boating industry nationally to pursue the following broad activities:

- Develop a Marina Ecosystems Extension Network that will build capacity and strengthen the marina industry—a key Sea Grant constituent in coastal states and the Great Lakes region
- Initiate a Clean Marina Information Clearinghouse that will be a knowledge-management system for clean marinas in collaboration with the Sea Grant Network, MEEF, EPA, NOAA, and other representatives from the industry
- Quantify the effectiveness of BMPs, in terms of ecological and economic benefits
- Promote habitat creation and restoration in coordination with the recreational boating industry

Coastal Ecological Sciences

An ecosystem-based approach to marine science is increasingly recognized as essential and is strongly recommended in the 2004 report of the U.S. Ocean Commission on Ocean Policy, the current NOAA strategic plan, and the National Sea Grant College Program strategic plan. Rhode Island Sea Grant has long emphasized the importance of ecosystem-based natural and social science research and has made major contributions to knowledge of coastal ecosystem processes as well as to more informed management of our estuaries, coastal bays and lagoons, and urbanizing coasts.

As one of the most densely populated coastal states, Rhode Island is among the first to see the impact of human development and exploitation of coastal and marine resources. We have witnessed the impact of increased loadings of toxic metals, organic hydrocarbon, and sewage pollutants from the industrial revolution and post-war suburban sprawl as well as more recent declines in these loadings. We have pioneered the use of multidisciplinary science, computer models, and mesocosm research facilities to better understand the impacts of such shifts in the drivers of ecosystem change. We are in the initial stages of major environmental change for which Rhode Island may be the bell weather. Global climate change interacts with local environmental processes and activities, such as changes in productivity and nutrient loadings, to significantly alter Rhode Island's coastal ecosystems. Potential changes to the basic trophic status due to reductions in point source nutrient inputs to coastal ecosystems are not well understood. Moreover, basic research is needed on the effects of reducing inorganic nitrogen, a potent bio-stimulant, on the biogeochemistry of coastal systems.

"We produce food for a hungry planet, and we'd like that to be considered a noble pursuit."
— Henry Copestake, 2004 International Responsible Fishing Symposium, Providence, R.I.

Over this strategic planning period, Rhode Island Sea Grant priorities in coastal ecosystems will concentrate on assessing the impacts of nitrogen reductions to Narragansett Bay ecosystems and determining the links between climate change and hypoxia/anoxia with regard to the ecological functions of Rhode Island's coastal waters. Specific priorities are to:

- Establish baselines for assessing the ecological impacts of significant reductions in point source nitrogen discharges to upper Narragansett Bay
- Develop methods for accurately quantifying secondary production rates in Narragansett Bay, Rhode Island Sound, and Block Island Sound
- Apply stable isotope ratio analysis to determine the sources of nitrogen discharges to upper Narragansett Bay especially with regard to sewage-derived nitrogen
- Determine the presence of ecological gradients in Narragansett Bay that may have emerged as a consequence of significant nitrogen inputs and frequent hypoxia in upper Narragansett Bay
- Assess the degree to which the entire Bay (versus just the upper Bay) will respond ecologically to a projected 25 percent reduction in total nitrogen discharges
- Assess the impacts of varying dissolved oxygen concentrations and temperature changes on biogeochemical cycling of nitrogen in the benthos, particularly nitrification and denitrification rates
- Quantify the shallow-water habitat impacts of low dissolved oxygen and significant changes in long-term average temperature
- Assess changes in the timing, frequency, and duration of phytoplankton blooms in Narragansett Bay and the ecological impact on benthic and planktonic species communities of such major alterations in primary productivity pulses

Sustainable Fisheries

America's Fisheries Challenges

Fisheries are the largest extractive use of wildlife in the world. Fisheries products are the primary protein sources for almost 950 million people worldwide (Costa-Pierce et al., 2002). In 2000, landings from the 70,000 U.S. commercial fishing vessels totaled 9.1 billion pounds with a gross revenue of $3.5 billion dockside and contributed more than $27.8 billion to the gross national product (GNP). Commercial fisheries employ more than 170,000 people in the United States, the majority in family-owned and operated businesses. The U.S. commercial fleet is the fourth largest in the world. In addition, the 10 million U.S. recreational fishermen harvested over 254 million pounds of fish and shellfish or 75 million fishing trips, contributing $25 billion to the GNP (Hogarth, 2002).

Despite the socioeconomic importance of fisheries nationally and globally, marine fisheries science and management continues to be buffeted with controversy and uncertainty. Recent reports issued by Beach (2002), Myers and Worm (2003), and the Marine Fish Conservation Network (2003) paint a dismal picture for Northeast fisheries, but NOAA (2003) and the U.S. regional fishery management councils continue to state that many important commercial stocks are recovering, and that federal, regional, and state management processes are achieving their legally mandated conservation and recovery objectives. For the 163 stocks for which data are available and their status known with reasonable certainty, NOAA Fisheries considers 40 percent to be overutilized and 17 percent underutilized, while the status of an additional 68 commercial stocks and the impacts of intensifying recreational fishing are little known. Coincident with these disputes among nongovernmental organizations, scientists, and fisheries managers, the commercial and recreational fishing industries are struggling to find ways to maintain economic and social solvency within a more restrictive, and less predictable, management regime.

Developing Sustainable Fisheries Practices

The foundation of fisheries management begins with the science of fish ecology and biology, which forms the basis for developing meaningful harvesting strategies. Single-species management approaches are being replaced with ecosystem-based management approaches, incorporating known food chain dynamics, species interactions, and relationships with the physical, chemical, and biological functions of the marine environment. Fisheries may be viewed as the interaction among the fishing gear, fish, harvesters, processors, and consumers. In the past decade, the effect of fishing on habitat has been identified as an important aspect of these activities. Essential fish habitat (EFH) has been identified as an important component to understanding fish population dynamics.

"Effective resource management is a necessary condition for the viability of fisheries communities, but I argue that viable communities are also an important contribution to the preservation of healthy fish stocks. Thus, before one can hope to rebuild fish stocks, one must start to rebuild communities; one cannot succeed without the other."
— S. Jentof, 2000

Sustainable Fisheries

VISION

We envision:

- The Rhode Island Sea Grant Sustainable Fisheries Program to be a leader in developing the knowledge and the skills needed for the sustainable future of fishery resources
- A future in which consumers demand and pay a premium for seafoods that are not only healthy but have been produced in an ecologically sustainable way
- Increasing recognition that nation-states cannot manage marine fisheries unilaterally will result in more collective action on issues such as overfishing, habitat degradation, erosion of biodiversity, and pollution
- International arrangements such as the United Nations (UN) Convention on the Law of the Sea, the Convention on Biological Diversity, the Food and Agriculture Organization (FAO) Code of Conduct on Responsible Fishing, and the UN Convention on Straddling Stocks and Highly Migratory Species, will become more important in managing fisheries
- The quality of our environment will be a critical success factor in decreasing imports (and/or increasing exports) of primary marine products
- Major structural reforms will occur in the management of fisheries and other marine resources; for example, widespread adoption of rights-based methods and comanagement. Stakeholders will actively conduct research and implement community-based comanagement of local fisheries and other marine resources
- The numbers of fisheries and aquaculture researchers and managers will grow 10-fold, employed not only in government and academic institutions, but also by companies, local communities, and environmental organizations
- Demand will grow for fisheries and aquaculture researchers and managers who possess both depth and breadth in their training, ranging from the natural resource sciences and social sciences to the legal and political aspects of management
- New technologies will emerge for research, reduction of fish-processing wastes, multispecies ecological modeling, acoustics, and satellite-based navigation
- Major innovations will occur in ecological aquaculture and fisheries enhancement technologies

MISSION

The Rhode Island Sea Grant Sustainable Fisheries Program engages stakeholders to play critical roles in science and management of the fisheries; creates opportunities and options for decision makers; brings forward innovative ideas and technologies; respects the balance and differences among decision makers; and creates a neutral platform for the discussion of key issues.

The Pioneering Role of the University of Rhode Island in America's Commercial Fisheries

URI committed itself to the study of marine resources worldwide in the early 1960s. The effort was multidisciplinary and included fisheries science and technology, economics, food science, oceanography, and social sciences. The original fisheries technology program was conceived in 1966 as a result of a cooperative effort between the university, the Point Judith Fishermen's Cooperative, and various state and federal agencies. At the time, the U.S. catch from the northwest Atlantic was declining, while the overall catch by all nations from the same waters was increasing markedly. URI developed a curriculum for a two-year vocational program that provided students with an associate of science degree in fisheries and marine technology. URI was the first U.S. academic institution to offer a fisheries technology degree program, with the first class entering the program in September 1967. The goal of the program was to produce knowledgeable and experienced fishermen to lead the U.S. industry. The need for increasing capacity in the fishing fleet peaked in the late 1980s, directly impacting enrollment. The last students graduated from this program in September 1986. The new fisheries program at URI was designed as a bachelor of science, master's, and Ph.D. program in fisheries science and technology. With this change to a more academic program, there was a need to create a separate outreach branch. Thus the first Rhode Island Sea Grant Fisheries Extension Program was started in 1986 with fishing vessel safety courses.

Rhode Island's Fisheries Challenges

Rhode Island's commercial marine fisheries continue to be an important part of the state's economy and way of life. More than 3,000 boats, from quahog skiffs to draggers, engage in commercial fishing in Rhode Island. In 2003, 103 million pounds of fish were landed in Rhode Island, with a dockside value of more than $64 million. Nearly 800 workers are employed in 69 fish wholesale businesses and fish processing plants in the state. The estimated impact of recreational anglers can be seen in the most recent statistics provided by NOAA Fisheries: In Rhode Island, nearly 300,000 recreational marine anglers—more than half from out-of-state—made over 1.4 million trips, catching 4.1 million pounds of sport fish and releasing about 50 percent of them in 2003.

Since many of the species important to the Rhode Island fishing industry are managed on a regional basis through the local and regional fishery management councils or the Atlantic States Marine Fisheries Council, critical fisheries management and allocation decisions that affect the local industries transcend state jurisdiction. At any given time, the condition of a fishery resource and its management needs vary among the state's three major fishing sectors: shellfish, lobster, and finfish. In 2004, in the shellfishing sector, resource managers report that the quahog resource may be reaching a point of being susceptible to overharvesting. Past trends indicate that the number of participants in this sector varies closely with the trends in the state and regional economy. Given the relatively low capital investment involved in participating, people turn to shellfishing as an alternative means of making a living during bad economic times. At the same time, market demand for shellfish typically declines during economic slowdowns.

Lobster

In the lobster fishery, all indications are, from both management and industry perspectives, that the southern New England resource is in a serious state of decline. With the decline of the inshore stocks most prevalent, lobstermen are forced to pursue stocks further offshore, resulting in the need to acquire larger vessels, incur higher fuel costs, invest more time in harvesting, and in some cases, cut crew and take on additional safety risks. While the decline is most likely attributable to a variety of factors, including overfishing, the end result is that the lobster resource is in a very vulnerable state. There has been a major effect on the number of fishermen involved in the fishery: Recent informal surveys point to over 100 fishermen selling their boats or not renewing their licenses. Managers have stated that rebuilding the lobster resource will require implementing a variety of fishing restrictions, some already in place. Without added controls on entry into the fishery, management measures likely to expand include closed seasons, closed areas, and quotas—blanket measures that are viewed by some as fair and equitable but by others as having very serious consequences for invested lobstermen and for the overall economic stability of the fishery.

"An ecosystem-based approach to management is management that is adaptive, geographically specified, takes account of ecosystem knowledge and uncertainties, considers multiple external influences, and strives to balance diverse societal objectives. NOAA recognizes that the transition to an ecosystem approach to management needs to be incremental and collaborative."
— Mike Sissenwine, 2003

Finfish

The finfish sector encompasses a variety of species, gear types, and user groups, with the central management issue being the allocation of quotas. As part of stock recovery programs, many of Rhode Island's valuable finfish species are under federal, regional, and state quota restrictions. Managers divide these yearly quotas into quarters, and institute daily possession limits to extend the harvest over time and give access to all user groups. When the quotas are reached, the fisheries close. Limited total catch levels result in intense competition among the various user groups, all competing for what they view as their fair share of the harvest. The competition appears to be strongest between the growing number of part-time, rod-and-reel fishermen and the year-round, full-time otter trawl fishermen. Smaller, part-time operations seem to have the advantage in the summer months, when the weather is calmer, the resource is closer inshore, and lower daily catch limits are in effect. Larger operations, which tend to be full-time fishermen, find the lower daily catch limits difficult to balance against their higher costs of operation and are forced to seek out other species that may be less available and/or marketable.

Reducing Bycatch

The elimination or reduction of unwanted bycatch continues to be a driving force in fisheries management. Historically, fishermen and fishing gear specialists have been modifying fishing equipment for increasing efficiency. In the last decade, gear modifications have been employed to reduce bycatch. The Nordmore Grate, turtle excluder devices, trawl net mesh size, cod-end mesh shape and size changes, and raised foot rope trawls are all examples of successful gear modifications to reduce bycatch and to keep fishermen fishing in the face of stricter regulations. In several fisheries, the reduction of bycatch is imperative for the continued ability to harvest fish. Fishermen need to be part of the solution since they are the most severely affected by many of the regulations and have cumulative experience, knowledge, and innovative ideas on bycatch reduction.

Recreational Fishing

The recreational fishing sector in Rhode Island has continued to grow and has organized under the Rhode Island Saltwater Anglers Association (RISAA). RISAA's mission is to provide education to members concerning fishing techniques, improved catches, and overall enjoyment of fishing; to foster sportsmanship; to support marine conservation and sound management of fisheries resources; and to provide a unified voice to preserve and protect the rights, traditions, and future of recreational fishing in Rhode Island. Sea Grant assists RISAA in the educational aspects associated with scientific and management issues and facilitates better communication among the various user groups.

Seafood Processing and Safety

For the seafood processing industry, Food and Drug Administration (FDA) regulations are clear regarding Hazard Analysis at Critical Control Points (HACCP) for seafood processing, but new safety issues and concerns about old safety issues continually arise. The hazard and control guidelines for seafood change frequently, and the industry needs to be kept abreast of these changes and issues.

FDA regulations exempt the harvesting sector and do not cover aquaculture, retail, commercial transport, or the recreational fishery. Many of the food safety concerns that are targeted for control by the processor must also be made clear to the other elements of the seafood industry. Inadequate education with regard to proper handling of the enormous diversity of fish and shellfish species offered in U.S. seafood markets can result not only in poor quality in many retail markets and restaurants but also in food safety problems. Most seafood-related illnesses could be prevented with proper education on handling, storage, and preparation at the consumer and food service level. While safety and quality issues are being addressed within one facet of the overall commercial industry, there are educational gaps that continue to require significant attention.

Rhode Island Sea Grant's Organizational Investments in Sustainable Fisheries

The core principles of the Rhode Island Sea Grant Sustainable Fisheries Program align with the FAO Code of Conduct for Responsible Fisheries. The code serves as a practical foundation on which to establish criteria for sustainable fisheries.

This basic structure is further articulated to encourage implementation and corresponds roughly to the major fisheries stakeholders (commercial and recreational fishermen, managers, processors, traders, fish farmers, and scientists). Through the efforts of the Rhode Island Sea Grant Sustainable Fisheries Extension Program, Rhode Island was the first state in the Northeast to have all its commercial fishing associations (representing gillnetters, shellfishermen, lobstermen, and draggers) adopt this code of responsibility in 2000. This, in turn, led to the establishment of the Rhode Island Commercial Fisheries Center at URI in 2004, the development of a research trust fund and enhanced cooperative research, and participation by the industry and the state in the recent fisheries reform process for Rhode Island. With this firm foundation in place, fisheries will continue to make progress toward a sustainable future.

For this strategic and organizational development plan, the Rhode Island Sea Grant Sustainable Fisheries Program has formulated goals, objectives, and targets (milestones) for two implementation periods, as summarized in Table 3. These strategies incorporate the primary functional areas of research, outreach, education, law and policy, communications, and program management into a comprehensive strategy for the program.

There are three central goals for research to be funded through Rhode Island Sea Grant's research portfolio and via external grants made directly to Sustainable Fisheries Extension Program staff. The first goal is to clarify the key linkages between ecosystem-based management of coastal and marine waters and environments and commercial and recreational fisheries management.

"As regulatory pressures increase, fishermen are recognizing the need to contribute their vast empirical knowledge of the region's fisheries and their superb technical skills to advance research that addresses many of the questions that fishermen, scientists, and regulators share. Scientists and managers, too, are realizing the great value of this input and of incorporating it into the early stages of research projects and decision-making processes."
— William Hogarth, Keynote Speech at Fish Expo., Providence, R.I. 2004

The second goal of elucidating emerging industry and consumer priorities regarding seafood covers efforts to train seafood processors and consumers on the safest procedures for handling and preparing seafood under HACCP guidelines. Also covered by this goal are industry priorities regarding the development and application of selective fishing gear and the effects of such new gears on harvesting behaviors and the socioeconomics of the fishing industry.

Collaborative approaches to research will also be essential to meeting the Sustainable Fisheries Program's third goal of increasing knowledge of the biology and ecology of commercial and recreational species and stocks. Of particular importance will be to increase knowledge of anthropogenic impacts on marine ecosystems and harvest fisheries and to enhance stock assessments of commercially and recreationally valuable species.

Within the first strategic goal, two objectives will be key to gaining insight into how fisheries management should be embedded within the larger contexts of ecosystem-based management for the marine environment. These objectives are to increase social, economic, and ecological understanding of the entire harvest cycle from the sea to the consumer and to conduct collaborative research involving fishermen and managers on gear, fish behavior, and bycatch. Research conducted collaboratively by managers and fishermen not only will improve the relevance and comprehensiveness of fisheries science data, particularly survey data and information on gear technology advancements, it will also foster greater cooperation and mutual understanding between the fishing industry and state and federal fisheries managers.

The program's robust research initiatives contribute directly to Sea Grant Sustainable Fisheries Extension initiatives that seek to educate the current and next generation of fisheries scientists, fishermen, and managers.

Specifically, graduate and undergraduate students seeking degrees in fisheries science and management are recruited to participate in Sustainable Fisheries Extension Program–sponsored research projects dedicated to fisheries science, management, planning, stock assessments, and policy analysis. The Sustainable Fisheries Extension Program will also work to improve organization of its free-choice, informal education programs.

Finally, the Sustainable Fisheries Extension Program will continue to emphasize efforts to facilitate and guide the evolution of comanagement processes and institutions locally, regionally, and nationally. The evolution of comanagement processes and institutions will be encouraged and guided in partnership with the Rhode Island Sea Grant Legal Program and through focused, relevant training programs locally, regional, and nationally.

Part III
Strategic Planning for Rhode Island Sea Grant's Program-Wide Functional Areas

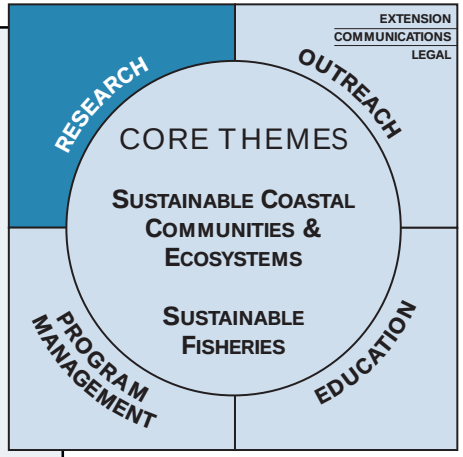
Research

VISION

Integrated, multidisciplinary research that bridges the natural and social sciences will be adequately funded and effectively applied to management and development decisions in the public and private sectors that promote resource and ecological sustainability and implement ecosystem-based management strategies.

MISSION

Rhode Island Sea Grant competitively evaluates and funds the best possible research that advances applied scientific and technical understanding of coastal and ocean ecosystems and their human uses in order to inform the concerns of ocean and coastal managers, resource users, educators, scientists, and the interested public.



Rhode Island Sea Grant intends to optimize its functional strategic planning across its two primary thematic focus areas. Each core thematic area is organized along four overarching functional areas: research, education, outreach, and program management. Outreach is composed of three units—extension, communications, and legal (Fig. 1; Table 1). Tables 2 and 3 describe the major functional goals, objectives, and implementation targets for Rhode Island Sea Grant's two core thematic areas. This chapter describes Rhode Island Sea Grant's strategies for its research, education, outreach, and program management functions.

Research

Conservation, restoration, and resource utilization are intimately connected in ways that science and society continue to discover. Developing the broad, sophisticated perspective needed to balance and shape these interests requires an integrated systems approach to the pursuit and advancement of the coastal environmental sciences.

In the 1970s, marine ecologists began articulating numerically based theories of systems ecology to spearhead the analysis of system-wide functions. It quickly became apparent that basing integrated environmental management models on numerical ecological systems models was not sufficient. Humans' interactions with their environment needed to be considered as well. The 1980s witnessed a growing realization of the importance of assessing social, political, and community ecologies and incorporating this information in biophysical ecological models. Gregory Bateson emphasized the importance of discerning the pattern that connects the social and natural sciences, and of including psychology and human behavior issues in planning for sustainable ecosystems. Sophisticated planning and management tools, such as Geographic Information Systems (GIS), are needed to incorporate socioeconomic values with the natural sciences.

Continued advances in the environmental sciences will build on the accomplishments of previous research and develop better theoretical models based upon systems science. It is only now becoming possible to assemble a reasonably comprehensive picture of Narragansett Bay's physical, chemical, and biological components and functions, its physical and ecological links to larger-scale oceanographic and climatological systems, and major long-term trends of critical importance, such as increases in average water temperature and sea level. Thus, the scientific data and knowledge painstakingly assembled over the past century for Narragansett Bay and other Rhode Island marine waters serve as an irreplaceable foundation for advancing the marine sciences for the good not only of Rhode Islanders, but also for all who depend on and value the health of Earth's coastal and marine resources. As the largest single funder of ocean and coastal science in Rhode Island, Rhode Island Sea Grant prioritizes multidisciplinary research as a central means for advancing the coastal and ocean sciences. But, given the complex nature of coastal ocean science, it also must interpret and synthesize scientific outputs so they can be properly incorporated into policy and management processes. Rhode Island Sea Grant will continue its work toward meeting these challenges.

"Ecological understanding still often lags behind the scale and rapid pace of changes that occur on the planet. The extent of human-induced environmental change is making the science of ecology increasingly critical to the future of life on Earth. We must anticipate the scientific needs, not simply react to and report on them."
— Palmer et al., 2004

Rhode Island's Research Institutions

Rhode Island's estuaries, embayments, and coastal lagoons are considered to be among the world's best-studied estuarine ecosystems due largely to the dedication of scientists affiliated with URI and other institutions of higher education in the state and southern New England. URI's commitment to marine science and policy dates back to the establishment of the Narragansett Marine Laboratory in the mid-1930s. In 1961, the university formally established GSO, which houses Rhode Island Sea Grant. GSO was designated a Center of Excellence in coastal marine studies in 1989 by NOAA. The National Research Council ranks the GSO Ph.D. program as one of the top graduate education programs in the United States, placing it fifth among America's oceanographic institutions. In 2002, GSO was rated by *Science Watch* as one of the world's five most influential research institutions in geosciences. GSO shares its 165-acre waterfront campus with other institutions of marine science and management, including the URI Department of Ocean Engineering, URI Coastal Institute, URI Coastal Resources Center, GSO Office of Marine Programs, GSO Pell Marine Science Library, EPA Atlantic Ecology Division National Health and Environmental Effects Research Laboratory, NOAA Fisheries Narragansett Laboratory, the National Sea Grant Library, and the Narragansett Bay Estuary Program.

Rhode Island Sea Grant's future research mission will align closely with the interests and capabilities of GSO and other URI colleges. But new, innovative science proposed by investigators at other institutions in the state will be encouraged as well, particularly researchers at RWU and Brown University and the Narragansett Bay National Estuarine Research Reserve.

The University of Rhode Island's Marine Programs

"The University of Rhode Island has developed one of the strongest and most diverse marine programs in the country. The linkage of terrestrial and coastal elements with marine elements has allowed faculty and students to be at the forefront of integrated approaches to marine problems that recognize the importance of watersheds and airsheds to the health of the marine environment. Linking policy, management, economics, planning, and design with science will enable the University of Rhode Island to lead initiatives in integrated coastal and marine management worldwide."

Margaret Leinen,
Assistant Director of the National Science Foundation for Geosciences,
Former Vice Provost for URI Marine Programs

Research-Management Forums

One of Rhode Island Sea Grant's most important research support services is the development and pursuit of prudent, integrated research strategies that address today's marine environmental challenges. Rhode Island Sea Grant will develop new forums to bring scientists and resource users together. One such model being considered is that of the Georgia Coastal Research Council (www.marsci.uga.edu/coastalcouncil/) (Alber and Flory, 2003). The forum will be developed in conjunction with environmental management reforms under way in response to 2004 state legislation and will be developed in close consultation with the URI Coastal Institute.

Another means for Rhode Island Sea Grant to strengthen its science policy leadership is the convening of an annual Sea Grant Science Symposium. Each symposium draws together scientists and interested observers for two days of presentations and discussions. The symposia seek to identify what is known scientifically about a particular topic and what is currently uncertain. Consensus is sought on the most critical knowledge gaps to be addressed. Rhode Island Sea Grant is committing to developing, publishing, and distributing widely the proceedings and synthesis documents resulting from these annual think tanks on critical coastal/ocean issues. These science-based communications initiatives will dovetail with related outreach initiatives. Tables 2 and 3 illustrate the links between research and education in recognition of the resources provided to graduate education via Rhode Island Sea Grant's research agenda and to the educational opportunities inherent in a research council and annual science symposium.

A continuous exchange of information between scientists and managers to develop and use scientific results effectively is enhanced through: formal mechanisms for scientific review of coastal programs; regional problem-solving task forces that target coastal issues; science syntheses on important coastal problems; removal of barriers that prevent information exchange between government agencies and scientists; policymakers clearly identifying their research needs; results of policy-relevant scientific research being summarized and disseminated.
— National Research Council, 1995

Research Priorities: 2006–2010

Rhode Island Sea Grant places great emphasis on funding the best quality scientific research possible, relying on a comprehensive proposal review process to establish its 2006–2008 and 2008–2010 research portfolios. Additionally, Rhode Island Sea Grant, and Sea Grant nationally, prioritizes the funding of applied science over basic science, while acknowledging the difficulty of defining the difference between the two. Sea Grant does not fund monitoring programs, although research intended to enhance monitoring does fall under Sea Grant's purview. For this strategic and organizational development planning period, Rhode Island Sea Grant seeks to develop ever-tighter connections among its research, outreach, and education programming. The following topical priorities are drawn directly from Tables 2 and 3, which synthesize all strategic priorities for the core themes of Sustainable Coastal Communities and Ecosystems and Sustainable Fisheries, respectively.

Research Priorities for Sustainable Coastal Communities and Ecosystems

The Science of Sustainable Ecosystems

There are a number of important questions in coastal ecological sciences that merit sustained attention and funding. Rhode Island Sea Grant believes that the following priorities require continued attention and analysis:

- Assessing biodiversity, trophic shifts, multispecies interactions, and ecosystem production dynamics in response to future reductions in point and nonpoint source nutrient loadings to Narragansett Bay and other Rhode Island marine waters
- Improving understanding of the physical and chemical processes that contribute to eutrophication and hypoxia in Rhode Island's and other marine waters
- Documenting changes in marine water quality due to nutrient discharges from specific land uses or point sources
- Elucidating the biophysical and socioeconomic effects of climate change, such as changes in temperature, precipitation, and freshwater flows, upon coastal ecosystems
- Improving scientific understanding of human-dominated or urbanized habitats as functional components of coastal ecosystems
- Improving scientific understanding of acute and cumulative effects of physical, chemical, and biological contaminants on coastal ecosystems
- Improving scientific understanding of the hydrology of groundwater and watershed flows to coastal lagoons and other coastal waters, particularly the fate and impacts of septic system pollutants.
- Developing coupled land-use and groundwater hydrodynamic models to assess the ecological risks of watershed and land-use alterations
- Developing innovative techniques and related, science-based indicators to characterize the sources, pathways, and effects of nutrients, toxins, and biocontaminants

Nutrients in Narragansett Bay

In recent years, much attention has been focused on the ecological impacts of large nitrogen discharges, particularly in upper Narragansett Bay. Based on a facilitated series of discussions that took place at the fall 2004 Rhode Island Sea Grant Science Symposium, the following research questions and priorities were articulated. The overall concern was to gain insight into the environmental and ecological impacts of nitrogen discharges to upper Narragansett Bay and the ensuing consequences of their planned reduction via enhanced wastewater treatment:

- Establishing baselines for assessing the ecological impacts of significant reductions in point source nitrogen discharges to upper Narragansett Bay
- Developing methods for accurately quantifying secondary production rates in Narragansett Bay, Rhode Island Sound, and Block Island Sound
- Applying stable isotope ratio analysis to determine the sources of nitrogen discharges to upper Narragansett Bay especially with regard to sewage-derived nitrogen
- Determining the presence of ecological gradients in Narragansett Bay that may have emerged due to significant nitrogen inputs and frequent hypoxia in upper Narragansett Bay
- Assessing the degree to which the entire Bay (versus just the upper Bay) will respond ecologically to a projected 25 percent reduction in total nitrogen discharges
- Assessing the impacts of varying dissolved oxygen concentrations and temperature changes on biogeochemical cycling of nitrogen in the benthos, particularly nitrification and denitrification rates
- Quantifying the synergistic impacts on shallow-water habitats of periodic hypoxia/anoxia combined with significant changes in long-term average temperature
- Assessing long-term changes in the timing, frequency, and duration of phytoplankton blooms in Narragansett Bay and the ecological consequences of such changes on benthic and planktonic species communities

Socioeconomic Analysis, Planning, and Management for Sustainable Communities

The achievement of community and resource sustainability in coastal waters and watersheds will require comprehensive research in critical socioeconomic functions and development of effective policy and management tools for decision makers. Sea Grant is a leader nationally in funding social science research to support coastal management. Rhode Island Sea Grant encourages social science proposals for its research competitions and devotes research funds specifically for social scientific endeavors (e.g., our Economic Research Initiative of 2003–2004). From 2006 to 2010, Rhode Island Sea Grant will be working in the following priority areas:

- Improving scientific understanding of socioeconomic factors and values critical to the implementation of ecosystem-based management frameworks to coastal ecosystems

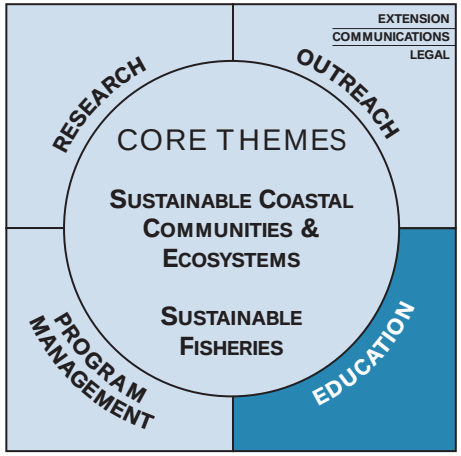
Knowledge rapidly becomes obsolete, and knowledge workers regularly have to go back to school. Continuing education of already highly educated adults will therefore become a big growth area in the next society. Money is as important to knowledge workers as to anybody else, but they do not accept it as the absolute yardstick, nor do they consider money as a substitute for professional performance and achievement. In sharp contrast to yesterday's workers, to whom a job was first of all a living, most knowledge workers see their job as a life. — The Economist, 2001

- Assessing the long-term ecological and socioeconomic consequences of coastal habitat restoration projects in Rhode Island
- Developing innovative methods for assessing the socioeconomic and environmental impacts of development to improve assessment of coastal resource and community development
- Enhancing assessment methods to ensure that coastal economic development planning and policies in Rhode Island adequately account for priorities in environmental conservation, multiple-use management, and ecosystem-based management
- Developing innovative methods for implementation of state and local development strategies intended to enhance Rhode Island's marine-based economy
- Improving scientific understanding of coastal storm and flood hazards to enhance predictive models and mitigation response capabilities
- Improving scientific understanding of the impacts of shoreline armoring, inlet dredging, and stabilization on nearshore physical processes on fish and shellfish recruitment and coastal water quality

Research Priorities for Sustainable Fisheries

The Sustainable Fisheries Program focuses on identifying and conducting science needed to enhance outreach and educational efforts in fisheries management. The following priorities areas are highlighted for the 2006–2010 strategic plan period:

- Conducting collaborative research involving fishermen and managers on gear, fish behavior, and bycatch
- Increasing knowledge of biology and ecology and enhancing stock assessments of commercially and recreationally valuable species
- Improving scientific understanding of how anthropogenic activities affect critical habitat and other ecological functions critical for the support of marine fishery stocks
- Increasing socioeconomic and ecological understanding of the entire fisheries harvest cycle, from sea to consumer
- Developing innovative fishing methods and gears based on improved understanding of the behavior of marine fishery species in order to reduce bycatch
- Improving scientific understanding of selective fishing gears and the behavioral responses of fish to their utilization
- Developing biological, physical, and socioeconomic analytical tools that support efforts to optimize fishing effort and scale back capitalization in U.S. commercial fishing sectors
- Assessing the ecological and socioeconomic feasibility of wild stock enhancement techniques
- Developing probes and techniques for real-time measurements of seafood contamination
- Assessing the socioeconomic consequences of area closures on commercial and recreational fisheries
- Developing fisheries management frameworks and models based on marine ecological functions and trends



Education and Environmental Literacy

Because an increase in public understanding of marine resources is critical to their wise use and sound management, environmental literacy and training programs are integral to our work. The changes in societal behavior that are required by a stewardship ethic will demand inspired leadership from a generation of professionals with an unusual combination of skills and knowledge. Rhode Island Sea Grant sees the education of these agents of change as its most lasting contribution.

In response to its November 2002 Technical Advisory Team Report on Education, Rhode Island Sea Grant assessed its education options, including the performance of its small investment in K–12 programs. In this tiny state, Rhode Island hosts seven K–12 programs that dedicate approximately $3 million per year towards delivering outstand-

Education and Environmental Literacy

VISION

Rhode Island Sea Grant envisions a well-educated corps of ocean and coastal environmental leaders and resource managers and a more informed public able to access a wide variety of ocean education opportunities offered at institutions of higher education and dedicated to the principles of life-long learning.

MISSION

Rhode Island Sea Grant will lead the development of new formal and informal education opportunities for graduate and undergraduate students in order to make innovative connections between its research and outreach programs. Rhode Island Sea Grant will also invest in new diversity education initiatives.

"Increased participation in environmental education and research by members of minority groups is imperative to achieving and shaping the current and future environmental and research agenda. Fortunately, there is evidence that environmental themes can be particularly useful in attracting young women and minorities to science."
— J. Weld, 1999

ing, nationally relevant, K–12 marine and environmental education opportunities. As a result, during this next strategic plan period, Rhode Island Sea Grant will focus its core priorities and investments on graduate, undergraduate, and adult (free choice) education. Rhode Island Sea Grant will help build the continued excellence of GSO's Office of Marine Programs and other Rhode Island K–12 centers of marine environmental education by passing through any new K–12 opportunities to them.

A top education priority for Rhode Island Sea Grant in this strategic planning period is to implement a Sea Grant Graduate Research and Outreach Program. This initiative will team scientists, graduate students, and outreach professionals. Rhode Island Sea Grant will work to adapt a model developed by California Sea Grant. This new program will provide funds for Sea Grant Graduate Fellows, via the Rhode Island Sea Grant research competition, who will work under the direction and supervision of Sea Grant–funded researchers, and who will have an innovative connection to Rhode Island Sea Grant. The hope is that, in addition to secured research funding, these Rhode Island Sea Grant Graduate Fellows will identify strongly with Sea Grant and will gain professional development opportunities by working with Sea Grant leaders in outreach, legal, and other areas.

The URI Coastal Fellows Program is Rhode Island Sea Grant's principal undergraduate education investment. Rhode Island Sea Grant collaborates with the URI Coastal Fellows Program by specifying research and outreach opportunities for prospective fellows on Sea Grant–sponsored projects. Funded researchers are encouraged to support additional Coastal Fellows by including Coastal Fellows positions to their research budgets. From 2006 to 2010, Rhode Island Sea Grant will work to leverage additional funds and fellowship opportunities for this outstanding program. Additional support to the URI Undergraduate Research Grant Program that offers funding for undergraduate research/creative projects in marine areas is another priority. Rhode Island Sea Grant will also explore the development of new, multidisciplinary Environmental Science Scholarships that will provide scholarships to undergraduates with an interest in physical oceanography and physics or chemical oceanography and chemistry.

Rhode Island Sea Grant has identified diversity as one of its education priorities. Sea Grant contributes to capacity-building and leadership training by incorporating greater cultural, ethnic, and international diversity into its programming. Encouraging diversity will allow a new organizational perspective focused more actively on the future and the globalization of our society. Rhode Island Sea Grant proposes to fund, in cooperation with the URI College of the Environment and Life Sciences (CELS), "Coastal Diversity Fellows." Fellowships would be advertised widely among the marine science programs in the state and at historically black colleges and universities. Rhode Island Sea Grant would provide stipends for fellows to complete a summer research experience at a Rhode Island ocean/coastal/marine or other aquatic environmental research and/or field laboratory. CELS and Rhode Island Sea Grant would work to link the Coastal Diversity Fellows and the URI Coastal Fellows and to to secure housing for students at the homes of interested hosts, which are proposed to be URI faculty and staff.

In the thematic area of sustainable fisheries, the new Rhode Island Commercial Fisheries Center will develop public awareness of fisheries issues by facilitating communication among scientists, fishermen, environmentalists, managers, policy advisors, elected officials, and the general public. This is our most important public education component in sustainable fisheries. In addition, health agencies and professional organizations are key partners in Sea Grant's food safety programming. Many of these groups are responsible for setting guidelines, policies, or regulations that greatly impact seafood establishments and consumers. Communication among organizations may be inadequate, and Sea Grant facilitates the exchange of scientific information among these many stakeholders. HACCP education and outreach services must be maintained to train newly hired workers, to train additional personnel with expanding or new businesses, and to respond to inquiries from existing seafood processing operations. Recent changes to regulations empower the R.I. Department of Environmental Management to inspect boats for purposes of public health issues relating to the handling of shellfish. While Rhode Island Sea Grant has been instrumental in designing and presenting an educational program for Rhode Island shellfish harvesters prior to implementation, further information efforts are necessary.

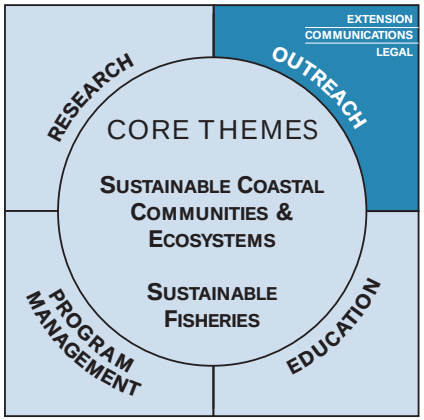
In order to achieve our mission and goals for education and environmental literacy, specific priorities for this strategic plan are to:

- Establish a Rhode Island Sea Grant Graduate Research and Outreach Program that will provide new marine educational, outreach, legal, and other professional developmental opportunities for graduate students supported via Rhode Island Sea Grant–funded research projects.
- Commit programmatic funding to URI undergraduates in critically needed environmental sciences, principally the URI Coastal Fellows Program and through new URI Environmental Science Scholarships.
- Foster the inclusion of groups traditionally underrepresented and underserved in marine and aquatic sciences by establishing new Coastal Diversity Fellowships
- Better leverage and deliver Rhode Island Sea Grant's adult, free choice learning programs

"The symptoms of environmental deterioration are in the domain of the natural sciences, but the causes lie in the realm of the social sciences and humanities."
— David Orr, *Ecological Literacy*

Outreach

The functional area of outreach is composed of extension, legal, and communications. The efforts of extension are divided between the two thematic areas of sustainable coastal communities and ecosystems and sustainable fisheries.



Rhode Island Sea Grant Extension Programs

As previously noted, a number of the priorities mentioned for the two thematic areas of Rhode Island Sea Grant are spearheaded by the two Sea Grant Extension arms of Sea Grant—the Sustainable Coastal Communities and Ecosystems Extension Program and the Sustainable Fisheries Extension Program. A "summary" of the Sea Grant Extension strategic priorities is contained in Tables 2 and 3 under "Outreach."

Rhode Island Sea Grant Legal Program

Creation of the Rhode Island Sea Grant Legal Program

In collaboration with URI's marine affairs department and RWU's Ralph R. Papitto School of Law, Rhode Island Sea Grant created the nation's third Sea Grant Legal Program during the 2004 academic year. The purpose of the Legal Program is to enhance Rhode Island Sea Grant's three core components of research, outreach, and education by providing objective legal research, education, and outreach on local, state, and regional issues facing Rhode Island Sea Grant's partners and constituents. Legal Program research concentrates on salient ocean and coastal law topics that affect sustainable coastal communities and ecosystems and sustainable fisheries in Rhode Island and the New England region. The Legal Program trains law students who work as Sea Grant Law Fellows on defining and resolving marine resource management and conservation issues and performing legal research and writing. It also cosponsors programs and projects to expose students at the RWU School of Law and URI marine affairs to holistic approaches to solving legal problems.

The Legal Program is located with the Marine Affairs Institute at the RWU School of Law. The institute analyzes legal and policy issues raised by the development and use of the ocean and coastal zone, coastal zone law, fisheries law, and traditional admiralty law and practice. The institute links RWU faculty and students with counterparts at URI's marine affairs department through a joint degree program through which students acquire a juris doctor degree from RWU and a master of marine affairs degree from URI.

Legal

VISION

We envision the development of more proactive laws and policies through researching and analyzing legal issues affecting oceans and coasts, educating and training students in marine law, and providing timely legal outreach to coastal users and policymakers.

MISSION

The Rhode Island Sea Grant Legal Program contributes to the development of innovative ocean and coastal laws and policies through interdisciplinary legal research that contributes legal literature, analysis, and education, thereby enabling its graduates to acquire relevant skills and knowledge to advance their development and that of society through the competent and ethical practice of law.

Role of the Rhode Island Sea Grant Legal Program

In U.S. ocean and coastal law and policy, fragmentation of jurisdictions and authorities plagues movement toward holistic management. Coastal and ocean law comprises aspects of property law, land-use regulation, water law, natural resources law, constitutional law, federal and state statutory law, and international law in the context of the ocean environment. Interrelations of land, water, and natural resources are complex, with legal consequences that have resulted in ongoing conflicts over public and private rights, boundaries, jurisdictions, and management priorities. Policies implemented based on this system of laws are often fragmented. Geographically, U.S. ocean regulation is based on a fragmented map of the ocean. When authority is divided among agencies and parties, resource management suffers due to the ecosystem connections that have been ignored. Some of this geographic fragmentation results from international law that recognizes several zones in the ocean and grants coastal nations certain rights within these zones. Furthermore, U.S. law divides authority and responsibility between state governments and the federal government. Title to the lands beneath coastal waters out to three miles is held by the states, but resource management from that three-mile line out to 200 miles belongs to the federal government. Necessarily, ocean and coastal federal laws incorporate these lines, sometimes providing different levels of protection for different regions without correlation to ocean or coastal ecology.

Coordination by state and federal agencies is required by law but is difficult with the existing patchwork of resource-by-resource regulation. Generally, this approach does not address the health or productivity of the ecosystem or interconnectedness with activities in watersheds. Environmental law on land has shifted to biodiversity and

restoration: Rather than solely aim regulation at the individual factory or discharge pipe, the focus has changed to terrestrial ecosystems. Using examples of land-based ecosystem management combined with efforts at the program level, a movement is emerging to adapt coastal laws and policies to respond to coastal watershed needs, rather than to individual resource or species problems. As cited by both the Pew Commission and U.S. Commission on Ocean Policy, by defining the resource as an ecosystem affected by human activities and their impacts, managers can seek coastal and ocean resource health through management of entire ecosystems.

Ocean and coastal managers confronted with fragmented laws, obsolete policies, and crisis management are now being told to reform the current regimes using principles of holistic management without adequate funds or useful examples. Thus, Rhode Island Sea Grant will seek to offer these leaders, as well as students who represent emerging ocean and coastal leaders, opportunities to develop interdisciplinary solutions as well as to cultivate their understanding and appreciation for the perspectives that other disciplines bring to resource management problem-solving. The partnership between RWU and URI provides an excellent opportunity for the Legal Program to use interdisciplinary classes, outreach symposia, and research to address ocean and coastal issues within the well-established Rhode Island Sea Grant Extension programs of Sustainable Fisheries and Sustainable Coastal Communities and Ecosystems.

The Legal Program will act as a conduit for experts in fisheries science, policy, and law to move toward an interdisciplinary approach to marine fisheries management—both in the context of how the law is written and the interconnectedness of (and, sometimes, conflict between) relevant laws and their implementation. For example, a legal research project to analyze the hurdles in the current law and regulatory structure and recommend changes for the upcoming Magnuson-Stevens Act reauthorization could combine information and analysis from fisheries scientists, the fishing community, economists, social science experts, and lawyers. The research would then be presented through seminars or other outreach forums, gathering practitioners' feedback. Finally, such a research project could serve as a basis for a class of graduate students from URI and RWU to engage in an interdisciplinary analysis of the case study.

As ocean and coastal management efforts move toward more holistic approaches, policy-makers often look toward the law for answers on how such approaches should be designed and implemented. Resource-oriented laws, however, were not written to promote such approaches. Therefore, managers must seek solutions that are nontraditional and that incorporate societal considerations usually inadequately considered in the structure of the law.

The Legal Program's strategic priorities for 2006–2010 are to:

- Develop a Rhode Island Law Associates Program for long-term engagement of experts on ocean and coastal legal issues and build a regional network of associates
- Effectively integrate the Legal Program with other components of Rhode Island Sea Grant
- Develop a model for engagement of legal scholars with experts of other disciplines in further proactive legal research and solutions
- Implement the Graduate Environmental Leadership Institute to build a cadre of young professionals who seek interdisciplinary solutions for legal problems

It's official: The Rhode Island Sea Grant Legal Program was established by an MOU signed by (seated left to right) Sea Grant Director Barry Costa-Pierce; David Logan, RWU Law School dean; Jeff Seemann, dean of the URI College of the Environment and Life Sciences (CELS) and Land Grant director; and Dennis Nixon, CELS associate dean. Kristen Fletcher (center) is the program's first director.

To achieve these strategic priorities as the newest component of Rhode Island Sea Grant, the Legal Program must build certain institutional elements from 2006 to 2010, including internal and external Legal Program Advisory groups and a process for coordinating between them, annual law and policy forums to present and discuss legal issues in fisheries and sustainable communities, internship opportunities for law students with Rhode Island Sea Grant partners and constituents, forums for marine faculties from URI, RWU, Brown, and other universities to discuss legal issues and recommend policy solutions, and mechanisms to exchange legal and policy research regarding regional governance efforts. These institutional elements include the following:

- *Legal Outreach Service:* The Legal Program will focus on the research and analysis needs of state entities, especially in projects with regional and national relevance, including analyzing legal and policy issues raised in the Pew Commission and U.S. Ocean Commission reports and submitting faculty and student-written articles for publication to regional and national legal journals and reporters.
- *Sea Grant Law Fellows:* Students at the RWU School of Law will serve as Sea Grant Law Fellows to conduct research on specific projects from Sea Grant constituents, varying from short summaries of case law to lengthy legal analysis. The Legal Program will continue to provide a forum for members of student organizations—Maritime Law Society and the Environmental Law Society—to discuss ocean and coastal issues and develop legal skills in research, writing, professional debate, and policy analysis.
- *Marine Law Symposia and Seminars:* The Legal Program will cosponsor programs of interest to academics, practitioners, members of the bench and bar, policy-makers, and graduate students, including a lecture series, a biennial international symposium, and faculty exchanges. The biennial Marine Law Symposium will focus on legal topics of national interest while annual events will focus on topics most relevant to sustainable coastal communities and fisheries in Rhode Island and New England.
- *Legal Research Services:* To advance effective ocean and coastal law and policy, Legal Program investigators will perform marine law research that analyzes existing hurdles or problems in an area of marine law and recommends changes to the law or its interpretation.
- *Legal Program Staff:* Recognizing that the successful pursuit of these elements requires a fully functioning Legal Program staff, a top priority for the program is to increase its staff by at least one attorney by the end of 2005 and to assist the RWU School of Law to pursue a total of three full-time environmental, maritime, and marine-related faculty members by the end of 2007.

"In the past, pollution concerns were addressed through regulation and mandates. New challenges of urban runoff, brownfields, mobile sources and habitat loss need new tools of multimedia approaches, strong partnerships and market-based incentives."
— Thomas J. Gibson, 2004

Rhode Island Sea Grant Communications Program

Embedded in each functional area and core theme, communications is key to formulating and implementing strategies for achieving the behavior changes essential to Rhode Island Sea Grant's multifaceted vision and mission. Professionally designed publications, websites, audiovisual products, and news stories are the primary tools that Rhode Island Sea Grant communicators use to inform people of the progress stemming from public investment in Rhode Island Sea Grant and the National Sea Grant College Program.

We are witnessing accelerating demands for accurate monitoring, interpretation, and synthesis of scientific and technical knowledge, insight, and data by highly diverse audiences in government, business, and the general public. Rhode Island Sea Grant serves a societal role of growing importance in providing unbiased scientific and technical information to a growing constituency for whom such information is indispensable. The primary goal of Sea Grant Communications, nationally and in Rhode Island, is to disseminate useful information on marine, coastal, and Great Lakes scientific and management topics—critical issues that require prudent, collaborative decisions in policy, law, planning, and management. The challenge we face in the next five years is to meet more effectively the growing demand for such communications products.

During this planning period, the strategy of the Rhode Island Sea Grant Communications Program will be to assess and build on our strongest communications modes and products.

Print publications are lasting as a medium, and in general, Rhode Island Sea Grant publications are designed to be long-lived, from field guides that biologists carry around for years to technical reports that municipal planners continually reference. Rhode Island Sea Grant Communications is probably best known and relied upon for its high-quality print publications, which will continue to figure prominently in this planning period. Under current and projected federal and state funding regimes, Rhode Island Sea Grant Communications will not have staff time and/or funds necessary to develop and maintain a regular radio program, TV programming, or video production. However, we will continue to explore new communications opportunities as they arise.

Rhode Island Sea Grant Communications will concentrate on timely state, regional, and national issues identified by NOAA, Rhode Island Sea Grant's constituents, and via the national Sea Grant Theme Team process. To accomplish this, the Communications Program will continue to integrate its activities with Rhode Island Sea Grant research, outreach, education, legal, and program management activities.

We will also focus on developing communications products in partnership with and for other organizations whose missions and audiences dovetail with Sea Grant's goals. Successful partnerships to date include numerous collaborations within URI as well as outside the university.

With the advent of ever-faster means of exchanging information, many Americans are looking for immediate answers to their questions, even about complex issues of marine science and policy for which there are no easy answers. The Communications Program seeks to satisfy these demands through continued enhancement of the Rhode Island Sea Grant website and related sites. Electronic communications technologies not only speed the provision of information to target audiences, they enable Rhode Island Sea Grant to provide communication products at lower cost. For example, Rhode Island Sea Grant's general circulation magazine *41°N* is distributed on-line as well as in print. The Rhode Island Sea Grant Website now is visited on average about 30,000 times monthly. Our web visitors—local, national, and international—request publications as well as access information directly available on the site. For future development of the Rhode Island Sea Grant Website, two strategic principles guide us: keep it simple and keep it updated. We will enhance the website's design and functionality to make information more easily available by topic and to incorporate features that help visitors who are "lost." We will add materials to attract people to the site who are not necessarily familiar with Sea Grant but are interested in topics such as marine food webs, ecosystem-based management, fisheries, or coastal communities and tourism. Communications will also enhance its regional and national on-line profiles via the Northeast Fisheries Extension Website to serve clients who know Sea Grant and are looking to it to provide more regional information.

We will also strengthen our news program, placing greater emphasis on communicating Sea Grant research and outreach activities to a broader audience. We will engage other URI news outlets to help us tell those stories that have broader university impact. We will build our connections with public relations and news professionals, to make more marine-related information available to and through the media. In addition to stories that will appear in the media through Sea Grant contacts, Communications staff will regularly contribute articles and news briefs to newspapers, magazines, and other periodicals. Communications will provide reporters with tip sheets, think broadly about placement of stories, and better monitor the hot issues in the news in order to target Rhode Island Sea Grant's contributions.

We strive to accomplish our mission through activities that:

- Strengthen the Rhode Island and National Sea Grant College programs by increasing awareness of marine and coastal issues through efforts such as *41°N*, science symposium syntheses and workshop proceedings, and by maintaining an active news media program
- Integrate more closely with other segments of Rhode Island Sea Grant through coordinated efforts that draw on available expertise and yield high-quality communications products

Communications

VISION

We envision an informed citizenry whose knowledge of marine and environmental issues is used to make informed policy and environmental decisions and to enrich their lives.

MISSION

The mission of the Rhode Island Sea Grant Communications Program is to get the results of marine-related research, education, and outreach activities into the hands of those audiences best served by the information.

- Take advantage of innovative means to communicate marine/coastal issues and Sea Grant research by exploring and adopting new communications technologies and methods that fit the needs of our users
- Forge new partnerships with agencies and groups, within and outside URI, that share common missions and goals.
- Continue our participation in Northeast Sea Grant regional activities

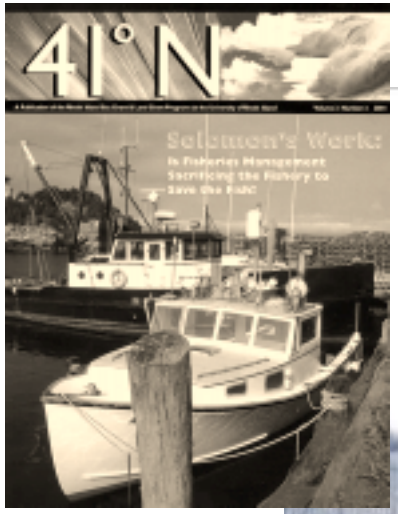
Within URI several strategic opportunities have arisen that the Communications Program will be working to develop in 2006–2010:

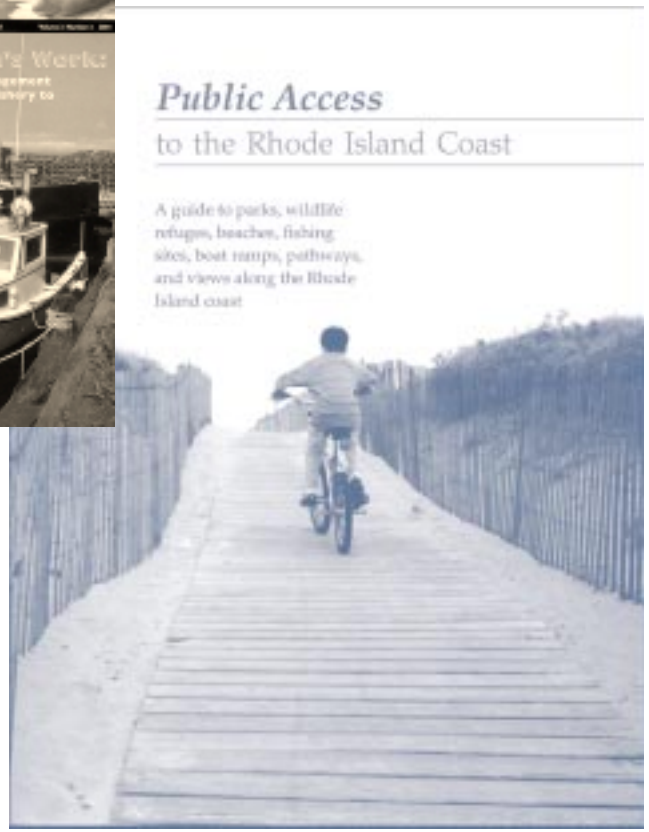
- *Sea Grant-Coastal Institute Collaboration:* The Coastal Institute at URI represents a potential partner for Sea Grant Communications—a collaboration that would allow us to expand our Sea Grant audience by addressing issues of interest to both groups. Together, we are exploring the possibility of collaborating on our magazine, *41°N*. In this strategic planning period, the Sea Grant Communications Program will explore formalizing a new relationship with the Coastal Institute to assist in meeting our joint communications needs. We have made inroads in this regard by producing a glossy brochure/folder highlighting all of the outreach programs at URI.

- *Sea Grant-Cooperative Extension Collaboration:* We also share much in common with URI Cooperative Extension (CE) and address many of the same issues from different angles. Sustainable communities, ecosystem-based coastal and watershed management, water quality—all share interest from the two programs. CE does not have an in-house communications program. Rhode Island Sea Grant will seek to strengthen its partnership with CE by assisting the program in developing their communications products. This makes sense because many of CE's priority topics are also of interest to Sea Grant constituents, thereby broadening our own audience.

- *Specialty Web Sites:* The Communications Program continues to receive requests to develop and maintain specialty websites in support of Sea Grant and external programming. Below are a few examples of successful sites and several that are planned.

  - *41°N* Website: The on-line version of *41°N* gives readers an expanded learning experience from the printed magazine.
  - Daytripper's Guide to Narragansett Bay: This website presently combines information from two popular publications, *Public Access to the Rhode Island Coast* and *A Guide to Rhode Island's Natural Places.* The website allows visitors to gain up-to-date public access information to Rhode Island's coast, as well as seeing a "teaser" version of the field guide with ordering information available.
  - Conservation Gear Engineers Website: In an effort to help reestablish a Northeast regional network of conservation gear engineers who are dedicated to developing innovative fishing gears, a new website has been created. The site allows members of the network and other interested individuals to keep abreast of the latest developments in gear technology research. The site hosts project updates and project results, a "researcher's page" that gives contact information for all members of the network, and provides links to useful information, such as research RFPs, relevant publications, and contacts for other agencies and groups.
  - Northeast Sea Grant Regional Fisheries Extension Webpage: Rhode Island Sea Grant has taken over the development of this site and now hosts the site as a specialty page. We are exploring ways to increase the site's visibility and enhance its direct access.
  - Legal Program Website: Rhode Island Sea Grant is in the initial stages of de signing a website for the new Rhode Island Sea Grant Legal Program.

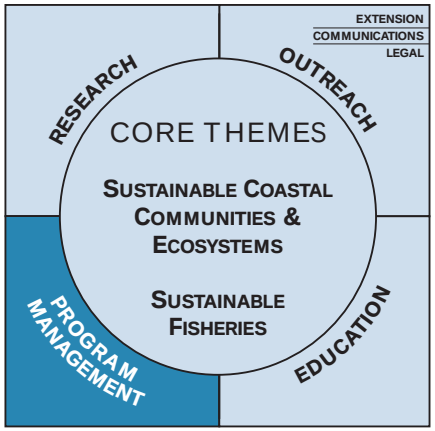




Sea Grant
Rhode Island

"Lack of trust and dialogue is often stated as a reason for the failure of promising management approaches."
— C.J. Walters, 1998

Program Management



Rhode Island Sea Grant Program Management oversees, mentors, monitors, and evaluates all programs sponsored, funded, and/or managed with federal, state, and other funds channeled through Rhode Island Sea Grant. It performs a wide variety of functions, including planning, grant administration, communications, competitive proposal review and selection, fund-raising, program evaluation, human resource management, proposal development, mentoring, and advising.

As illustrated in Figure 3, Rhode Island Sea Grant consists of five distinct teams or offices. The leader of each team participates in the Leadership Team along with the Rhode Island Sea Grant director. As director of Rhode Island Sea Grant, Barry Costa-Pierce reports directly to David Farmer, GSO dean. The Leadership Team consults directly with the Rhode Island Sea Grant Senior Advisory Council and the University Advisory Committee, which are convened at least annually by the director. Additional advice and input are sought from leaders of the institutions in which Rhode Island Sea Grant's teams are housed. Virginia Lee, in addition to leading the SCCE Extension Program, also serves as assistant director for outreach and education and is responsible for coordinating the outreach activities of Rhode Island Sea Grant.

In the next five years, Program Management will lead the transformation of Rhode Island Sea Grant to a unified organization of committed professional colleagues operating as a Leadership Team in a "think tank–type" environment. Therefore, a key program management goal for the next five years is to increase the level and quality of interactions among Rhode Island Sea Grant's management leaders to increase organizational unity and attainment of our broader vision and mission.

Outreach Coordination

The leaders of each outreach team—the SCCE Extension Program, the Sustainable Fisheries Extension Program, the Communications Program, and the Legal Program—coordinate respective programming and planning functions through regular meetings and communications. In addition, coordination within the Rhode Island Sea Grant College Program is accomplished by:

- Regular conference calls and monthly strategic meetings of the Leadership Team with the director assuming responsibility for setting up additional meetings to ensure timely response to issues and needs that arise
- Staff meetings to keep program staff up-to-date about ongoing projects, including project status, problems encountered, and pending deadlines

Program Management

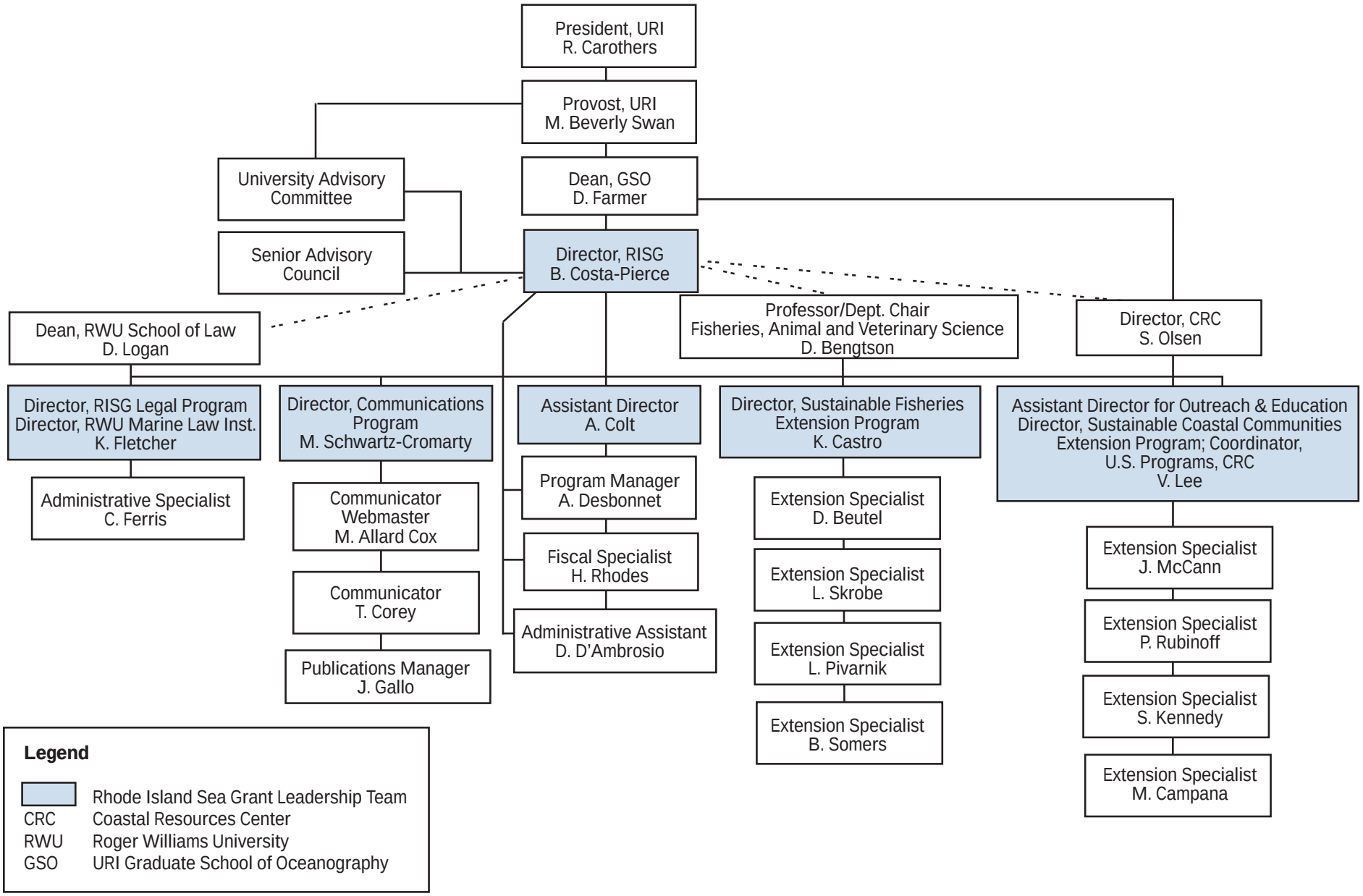
VISION

Rhode Island Sea Grant Program Management is committed to national, regional, and local leadership in research, education, and outreach programs that generate scientific information and knowledge to meet the urgent needs of coastal communities, watersheds, and coastal oceans. Programmatic excellence has, at its core, a management philosophy of continual organizational development and self-improvement. We envision that our organizational design and development will seek maximum internal alignment of Rhode Island Sea Grant's teams and programs in order to maximize our external impacts and effectiveness. We seek maximum transparency in the processes by which we define programmatic and funding priorities, design programs, and evaluate outcomes. Transparent management processes will enhance engagement with constituents, sharpen strategic planning, and help us continuously refine organizational development and innovative programming. Our administrative and program management processes will enable us to respond effectively to a host of future changes—in our operating environments, in national and state coastal management and science priorities, and in our funders' priorities and expectations.

MISSION

The mission of Rhode Island Sea Grant Program Management of is to conduct research and other types of peer-reviewed proposal competitions, administer grants and programs for the university and the state, and develop and apply science-based management systems for coastal management. We will continue to develop the Rhode Island Sea Grant Leadership Team, revamping our external and internal advisory bodies, developing opportunities for directed staff leadership and personnel development and training, convening and delivering results from an annual science symposium, and convening a facilitated, annual organizational retreat.

Figure 3. Rhode Island Sea Grant's Organizational Structure



- Biweekly updates of the web-based "Publications Tracking System" to assure that all authors/contributors and program management know the current status of their publications
- Regular meetings between the outreach staff and appropriate research groups to provide for more direct assessment of needs and upcoming events and publications
- Convening of regular professional development sessions when opportunities arise
- Northeast Sea Grant regional meetings convened approximately every 18 months to enable Rhode Island Sea Grant staff to discuss new regional initiatives and connect to the themes of the national Sea Grant network
- Rhode Island Sea Grant staff attend SGA and National Sea Grant meetings of communicators, educators, and extension personnel, attend the biennial Sea Grant gathering (Sea Grant Week), and participate fully in national theme team discussions and meetings

Linking Sea Grant's Strategic and Organizational Development Plan, Implementation Plans, and Omnibus Proposals

During development of Rhode Island Sea Grant's next two biannual omnibus proposals (2006–2008, 2008–2010), the 2006–2010 Strategic and Organizational Development Plan will serve as an important, but not exclusive, basis for funding decisions and program design. Implementation of Rhode Island Sea Grant strategic priorities occurs simultaneously in a variety of policy and science settings and across short- and long-term time frames. Thus, it is exceedingly difficult to project how progress toward these goals and objectives will occur over the next five years, as well as the degree to which goals and objectives will require refinement in response to changes in Rhode Island Sea Grant's operating environment, constituents, and strategic partners. Figure 4 diagrams the multifaceted process by which Rhode Island Sea Grant links this plan with ongoing management decision making.

Two-year implementation plans are developed in conjunction with each biannual omnibus proposal. They are intended to articulate implementation pathways and milestones for tracking achievement of research and outreach priorities. Assessments of milestone achievements and necessary corrections to implementation strategies will occur annually in conjunction with annual progress reports submitted for each funded project and the development of annual project budgets and work plans. In addition, it is important to recognize that the omnibus proposal itself delineates specific goals and milestones on a project-by-project basis for annual and biennial timeframes. Implementation plans are distillations of the strategic commitments specified in the omnibus proposals and organized in accordance with the overall framework, strategic and organizational, laid out in this plan. This nested hierarchy of strategic planning and implementation processes is designed to provide essential discretionary authority to Rhode Island Sea Grant Program managers, investigators, and outreach staff to establish and pursue specific long-term goals and make mid-course corrections over 12-to-24-month timeframes in order to act strategically and responsively.

The following sections briefly summarize Rhode Island Sea Grant's omnibus development process. This process is a central means by which Rhode Island Sea Grant makes research-funding and program-design decisions.

Omnibus Proposal Development

Development of the biannual omnibus proposal begins as Rhode Island Sea Grant issues a Request for Research Proposals (RFP). Building on this plan, the RFP identifies Rhode Island Sea Grant's strategic priorities for the forthcoming omnibus proposal and is distributed widely throughout the marine community in Rhode Island, as well as to other Northeast Sea Grant programs. Pre-proposals must be submitted in advance of full proposals and are evaluated based on their compatibility with the priorities identified in the RFP, the program plan, and relevant local, state, and federal coastal and marine priorities. If opportunities for collaboration among investigators become apparent from review of the pre-proposals, Rhode Island Sea Grant will strongly encourage them to develop collaborative projects.

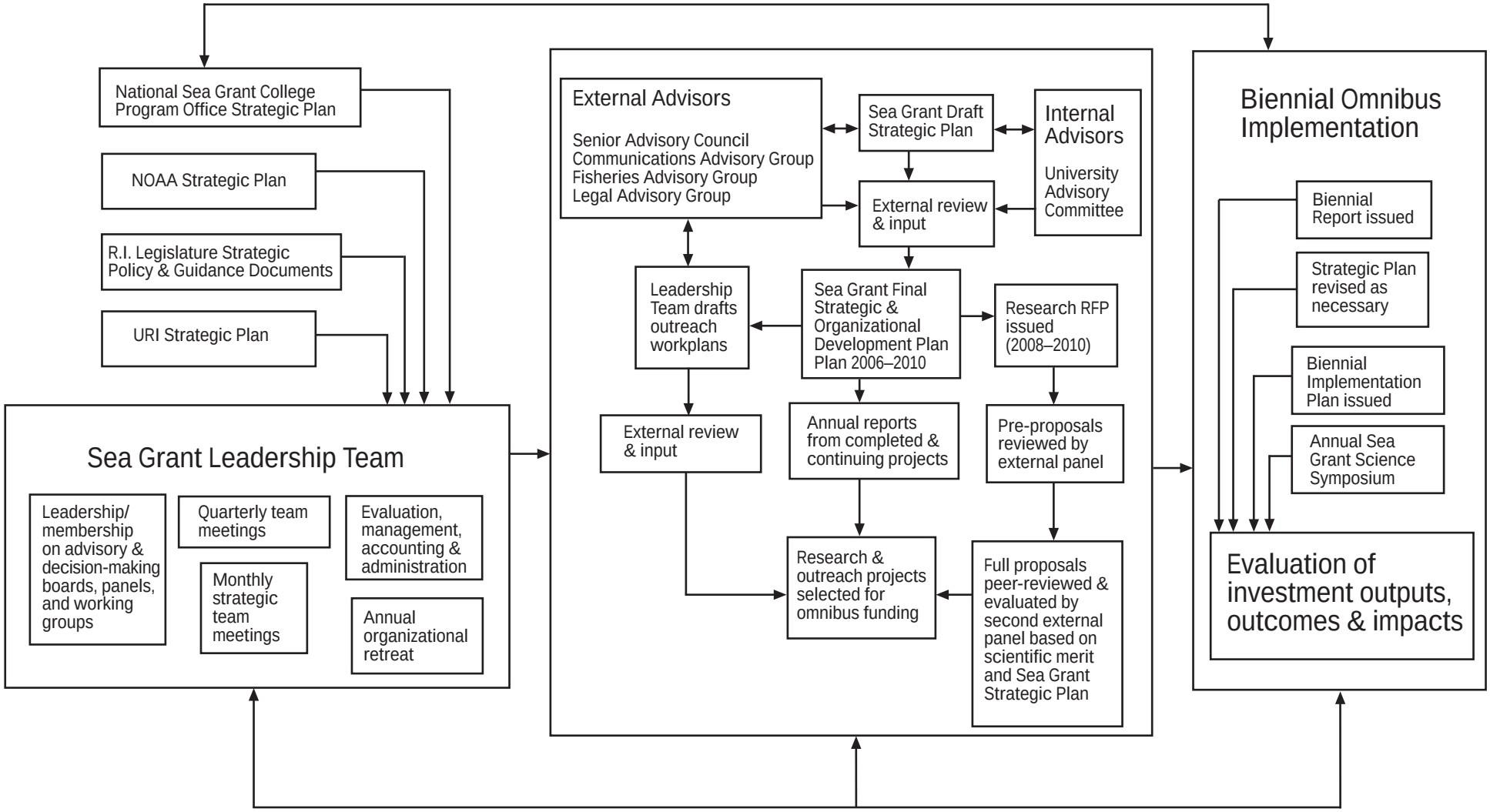
Upon careful review by Rhode Island Sea Grant program staff, external advisors, and at least one independent technical review panel, a subset of the pre-proposals is invited to submit full proposals to Rhode Island Sea Grant. Those investigators whose pre-proposals are not invited for full submission may still submit a full proposal if they choose. Full proposals are evaluated along a number of dimensions, including:

- Scientific merit and scientific feasibility
- Priorities and objectives identified in this strategic plan
- Relevance to NOAA regional and national strategic goals
- Degree of, or potential for, interdisciplinary collaboration
- Quality and relevance of the proposed outreach component

Each full proposal is evaluated by at least three independent peer reviewers who are based outside of Rhode Island. A technical review panel examines and evaluates the proposals, their peer reviews, and any responses by the proposers to the peer reviews to judge overall quality and advise the Rhode Island Sea Grant director on which proposals should be incorporated into the omnibus proposal to be submitted to the National Sea Grant Office (NSGO). The Rhode Island Sea Grant director then finalizes research funding decisions, which, with rare exceptions, are based solely upon the recommendations of the full proposal technical review panel. Rhode Island Sea Grant then immediately notifies the NSGO in writing of the final outcomes of the research competition. The NSGO must review and approve the competition's outcomes before Rhode Island Sea Grant can notify all who submitted full proposals.

Outreach program proposals developed by the outreach team leaders are also subjected to independent peer review. A single, integrated outreach proposal is developed and sent for review and comment to at least three outreach leaders from other Sea Grant programs and to other qualified peer reviewers as deemed necessary by the Rhode Island Sea Grant director and assistant director.

Figure 4. Ontogeny of Rhode Island Sea Grant Program Investment & Management



Ongoing Program Management Responsibilities

Other Program Management decisions governed by this plan include:

- Review and selection of development proposals presented for funding to the Rhode Island Sea Grant Program Development Fund
- Periodic refinement of outreach projects on a semi-annual to annual basis
- Development of collaborative proposals with other Northeast Sea Grant programs, particularly in relation to the Sea Grant Network theme teams
- Assessing, evaluating, and documenting the progress of funded research and outreach programs by the Leadership Team
- Review and evaluation of Rhode Island Sea Grant program functions and projects by the Rhode Island Sea Grant Senior Advisory Council and outreach advisory committees (Fig. 4)

Program Evaluation

Program management is responsible for monitoring and evaluating all projects funded by Rhode Island Sea Grant. Annual progress reports from each project are submitted by May 1 for the previous year of work ending February 28. Personal interviews are conducted annually, and the assistant director is responsible for ensuring that the Leadership Team develops and maintains close, productive ties between Rhode Island Sea Grant–funded research and outreach projects and investigators.

Detailed information on the purpose, methods, and accomplishments of each project will be assembled and entered into the Rhode Island Sea Grant "Making a Difference Relational Database" currently under development. Rhode Island Sea Grant staff will use this database to track and evaluate projects and provide program data and insight for external accountability reviews.

Outcome Mapping

Sea Grant programs are often multidimensional and complicated, with long-term results that depend on effective partnerships. The complex relationships among multiple programs make it difficult to evaluate the effect of any one program or project. Achieving the broad missions and goals stipulated in this strategic plan depends heavily upon the efforts and decisions of other academic and government institutions, as well as Rhode Island Sea Grant. Accordingly, Rhode Island Sea Grant has adopted an evaluative framework known as "outcome mapping" to design and implement a long-term approach to evaluating program outputs, outcomes, and impacts; foster adaptive learning; and provide a foundation for future strategic planning (Earl et al., 2001). As an evaluation model, outcome mapping emphasizes linking program activities to changes in the behavior of key partners or stakeholders and is consistent with the evaluation principles found in the national Sea Grant publication, *Fundamentals of a Sea Grant Extension Program* (Baker and Murray, 2000). The outcome mapping model provides detailed, sequenced methods that link strategic planning with program evaluation: develop vision and mission statements, identify "boundary partners," establish outcome challenges, identify progress markers, map strategic activities, and align organizational practices.

Part IV
New Initiatives

"Local ecological collapses can no longer be contained. Global rescue will require a new evolutionary step—a 'conscious cultural evolution' that allows us to overcome the limitations of individual perception and formulate a more responsive societal whole."
— Ehrlich and Ehrlich, 2004

Sea Grant International

The success of URI's Coastal Resources Center's (CRC) work during the 1970s and 1980s in designing and helping to implement coastal zone management in Rhode Island quickly became a foundation for similar work in other regions of the United States and then worldwide. In 1985, CRC was chosen to join a pioneering partnership with the U.S. Agency for International Development (USAID) to identify the aspects of the U.S. experience in coastal management that could be applied to developing nations. Early pilot programs conducted with in-country counterparts produced policies and plans that are being successfully implemented today. A second wave of progressive programs in developing nations began in 1993. True to CRC's core mission and strategies, all these programs built local constituencies to foster improved governance of coastal resources. They also strengthened the skills of local coastal management professionals and institutions. Since the first pilot programs in Ecuador, Sri Lanka, and Thailand, CRC's field programs have expanded to other sites in Asia, Africa, Latin America, and the Caribbean, as well as continuing work in Rhode Island and the United States.

CRC is well recognized globally as an effective international organization that:

- Serves as a global center of excellence for training and education to provide students, professionals, and policy-makers with the skills and the knowledge needed to advance sustainable forms of coastal development
- Sustains programs for place-based work in its four primary regions of focus: Latin America, Africa, Asia Pacific, and the United States
- Provides critical, short-term involvement that contributes substantially to improving coastal governance in a wide diversity of countries and regions
- Integrates effective coastal training programs with curricula of selected universities
- Fosters learning exchanges among practitioners worldwide
- Informs national, regional, and global debates on how more sustainable forms of coastal development can be achieved
- Codifies significant elements of good practices in coastal governance
- Continuously advances organizational effectiveness by improving planning processes, management practices, information systems, evaluation methods, and other capacity-building needs that allow CRC to be an efficient, adaptive, and learning organization

The Sea Grant model, which couples university-based, applied research integrated with the transfer of science-based knowledge to users, has proven to be adaptable to a number of international situations (Wilburn et al., 2004). In partnership with the CRC, Rhode Island Sea Grant is committed to developing international leadership in strategic programs that make a real difference in local coastal communities in developing countries.

In this strategic planning period, Rhode Island Sea Grant will facilitate new opportunities in the international realm to transfer lessons learned in sustainable coastal communities and ecosystems and sustainable fisheries. Specifically, we will:

- Work with CRC and its new USAID Leader with Associates Program
- Lead the national SGA International Committee to forge new opportunities with USAID, USDA, and National Association of State Universities and Land Grant Colleges, especially in the areas of fisheries, legal, ecological aquaculture, and sustainable coastal communities and ecosystems
- Become a portal to the National Sea Grant Network to help identify international interest, expertise, and commitment on particular themes and geographic locations where we may work to provide long-term technical assistance and mentoring to partner institutions in developing countries

Regional Sea Grant Initiatives

A study by the National Research Council (2000) makes the following points:

- *There is a need for a long-term commitment to regional marine research planning among federal agencies.*
- *The resolution of controversial and complex environmental problems requires regional approaches, cooperation and coordination in planning, and research activities directed toward management problems.*
- *Monitoring/observations provide a framework to discern environmental changes regionally.*
- *NOAA should provide the necessary leadership for regional programming.*

Both the President's U.S. Ocean Commission and the Pew Ocean Commission have articulated the need for new regional approaches. Regionalism is the cornerstone of a new generation of coastal stewardship. In the first generation of regional involvement, the federal government tackled specific problems of an industrial society. Second-generation problems are more broadly linked to transportation, regional demographics, education, economic development, and emerging coastal land use development practices

and trends. These second-generation problems are often regionally distinct. Thus their solutions will emerge regionally rather than in response to national dictates, and they will potentially powerfully affect how and where we live.

New England is a highly diverse region composed of distinct, autonomous subregions that consist of single small states, such as Rhode Island and Connecticut, or regions within a state such as the urbanizing southern coast of Maine and the still rural and economically depressed Downeast region of Maine. Its regional diversity is one reason New England is such an attractive place to live; this diversity also has hindered efforts by its leaders to come together in the interest of the entire region. There is still a paucity of broad discussion about how New England can function as a single entity in order to find prosperity in the global economy or to protect and enhance the unique environmental and cultural qualities that set New England apart from the rest of the United States. New England appears to be drifting into this new century without a broadly shared strategy on issues—economic, social, environmental, or global—that will critically influence its future.

Fortunately, there are indications that this is changing. In late 2003, 20 state and regional New England organizations came together to fund the first-ever national surveys (conducted by the Center for Survey Research and Analysis at the University of Connecticut) of people who live *outside* the region, asking their perceptions of New England as a place to live, work, and do business. Notably, New England is perceived as a slightly above-average location, but monolithic. Respondents saw little difference among the six states as business locations, tourist destinations, or as places to live. New England's highly educated, innovative workforce and superior environmental recreational amenities were rated as our greatest assets: Forty-two percent of the people in the survey agreed with a statement that "people and businesses in New England are more innovative than those in other parts of the country." While national businesses are put off by the high costs of New England, international firms, used to Europe's high-cost, regulated environments, were not. For them, the cost of doing business in New England is, by comparison, a bargain. Key issues for international executives were an educated workforce and access to institutions of higher education. Given this information, Rhode Island Sea Grant's strategy will be to help lead New England regional approaches that have strong international connections.

The SCCE Extension Program will actively participate in regional responses to the U.S. Commission on Ocean Policy's Final Report of 2004. In May 2004, SCCE Extension Program staff helped to facilitate a Northeast region discussion of the commission's preliminary findings at the Coastal Society Conference held in Newport, R.I. It became apparent from this discussion that the Gulf of Maine region has made significant progress in establishing regional governance frameworks, whereas the southern New England region running southwest from Cape Cod through New York Bight to Cape May, N.J., has made relatively little progress in establishing such a regional collaboration. The SCCE Extension Program, in conjunction with Rhode Island Sea Grant Program Management, will work to develop both research and governance frameworks for this coastal ocean region, including initiatives for a regional integrated ocean observing system (IOOS) that ultimately will be incorporated into the emerging national and international IOOS. Rhode Island Sea Grant will also work with the region's Sea Grant programs, national estuary programs, state coastal zone management programs, and national estuarine research reserves, as well as other offices in NOAA and EPA, to form a web-based learning network to promote regional governance and science frameworks. We intend to identify issues of common concerns that can only be solved at a regional scale, as recommended by the U.S. Ocean Commission. Specific issues that may require regional approaches include invasive species, public access, and habitat restoration.

In the thematic area of sustainable fisheries, the Northeast Sea Grant region serves as a model for regional collaboration with the fishing industry, NOAA Fisheries, environmental groups, the fisheries management councils, and the Atlantic States Marine Fisheries Commission. Led by Rhode Island Sea Grant's Sustainable Fisheries Extension Program, the Northeast regional fisheries network has forged partnerships with local, state, regional, and national agencies involved in Northeast fisheries issues. We are broadening the visibility of Sea Grant as a regional network, which has led to several collaborative projects.

Sustainable Fisheries Extension Program staff coordinate the Northeast Sea Grant Fisheries Extension Program, maintaining responsibility for organizing meetings in the region for Sea Grant, NOAA Fisheries, fishery management councils, and commissions as appropriate, providing education opportunities, and maintaining the Northeast Fisheries Extension website. As coordinator for the regional network, Rhode Island Sea Grant is a central link among the Sea Grant programs and the other regional stakeholders in fisheries. Future activities during this strategic planning period will include joint workshops and projects that further strengthen the regional network and work to achieve sustainable fisheries.

The United States and other western nations should encourage existing initiatives and participate as peers in supporting new initiatives grounded in thoughtful partnerships with emerging nations that advance solutions to issues of human diversity in education and society. The United States and other western nations should recognize the historical value and contributions to international society made by scientific endeavors currently underway in other countries.

— National Council for Science and the Environment, 2003

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Appendix

Rhode Island Sea Grant Strategic and Organizational Development Planning Timeline

December 2003
- Initial interviews with Rhode Island Sea Grant stakeholders regarding Rhode Island Sea Grant strategic and *organizational development*[1] planning

January 2004
- Rhode Island Sea Grant Strategic Planning Retreat, Avery Point, Conn., *including Leadership Team off-site retreat (first-quarter off-site)*
- Publish, distribute, and post on Web: Avery Point Retreat Proceedings, including first draft of "2006–2010 Strategic Planning Road Map and Timeline"
- *Publish, distribute, and post Leadership Team "Organizational Development Goals and Action Plans"*

March 2004
- Rhode Island Sea Grant Staff Strategic Planning Retreat, Hope Valley, R.I., *including Rhode Island Sea Grant Leadership Team second-quarter off-site*
- Publish, distribute and post Hope Valley Retreat proceedings including updated Strategic Planning Road Map and Timeline and updated *"Organizational Development Goals and Action Plans"*

May 2004
- Rhode Island Sea Grant Senior Advisory Council and University Advisory Committee day-long strategic planning meetings, Narragansett, R.I.
- Ocean Commission focus group: The Coastal Society's biannual international conference, Newport, R.I.

June 2004
- Publish, distribute, and post Senior Advisory Council and University Advisory Committee proceedings including updated strategic planning documents (timeline, events, deliverables, etc.)

July 2004
- *Rhode Island Sea Grant Leadership Team third-quarter off-site retreat, West Greenwich, R.I.*
- *Publish updated Organizational Development Action Plans including agreements regarding "Organizational Practices" and "Meeting Culture"*
- Complete first draft of 2006–2010 Strategic and Organizational Development Plan and vet internally to Rhode Island Sea Grant Leadership Team and staff

August 2004
- Legal Program focus group on institution building, Bristol, R.I.
- *Set remaining 2004 Leadership Team monthly strategic meetings and quarterly off-sites*

September 2004
- Leadership Team and staff responds to first draft of 2006–2010 Strategic and Organizational Development Plan
- Focus groups on Regional Ecosystems Governance as part of the RWU-Rhode Island Sea Grant Marine Law Symposium, Newport, R.I.

October 2004
- *Rhode Island Sea Grant Leadership Team fourth-quarter off-site retreat, West Greenwich, R.I.*
- Focus group on Marina Ecosystems, National Workshop on Marina Ecosystems, Graduate School of Oceanography, Narragansett, R.I.
- Complete second draft of 2006–2010 Strategic and Organizational Development Plan

November 2004
- Complete third draft of 2006–2010 Strategic and Organizational Development Plan and vet to Leadership Team
- Begin to assemble graphics and other collateral for layout and final production of plan
- *Publish updated Organizational Development Action Plans*

December 2004
- Complete and vet fourth draft of 2006–2010 Strategic and Organizational Development Plan to Rhode Island Sea Grant advisory groups
- Complete final draft of 2006–2010 plan and post on Web
- Begin final production of published 2006–2010 Strategic and Organizational Development Plan

January–February 2005
- Publish and roll out 2006–2010 Strategic and Organizational Development Plan

[1]Note: Organizational development planning activities are denoted by italics.

Sea Grant
Rhode Island

We envision a future where Rhode Island's coastal communities are recognized as stewards of the state's unique ecological, economic, and cultural assets. These coastal stewards enhance the Ocean State's priceless intellectual capital in ocean and marine activities, and nurture strategic partnerships that contribute to the state's marine economy, prosperity, and unique quality of coastal living.