

***University of Puerto Rico
Sea Grant College Program
Strategic Plan
2010-2014***

DRAFT

Introduction

The coastal zone of the Archipelago of Puerto Rico is our most critical natural resource. Its ecosystem provides us with a number of different goods and services. This includes tangible natural resources such as fisheries for commercial and recreational use and less tangible services such as fish and crustaceans recruitment in its marine habitats. Other less tangible services include the use of environmental amenities such as pristine beaches for recreational purposes and aquatic sports, tourism and residential development.

Puerto Rico's coastline includes, near shore reefs, near shore islands, mangroves, wetlands, estuaries, tidal flats, sand dunes and the coastal land margin. The biodiversity contained in these ecosystems is threatened by climate-related changes, seasonal to decadal climate processes and human population pressures. The increased incidence of storms, coral diseases, human-induced habitat degradation and intensive fishing are significantly responsible for observed declines in associated fishes and invertebrates. Our coastal zone is a finite resource and its capacity to withstand intensive use and development has reached a critical limit.

During the last centuries, Puerto Rico established its buildings, ports and harbors, roads, power lines and sewage systems, in hazard-prone areas within the coastal zone. Besides, sixty percent of the almost four million citizens in Puerto Rico live within the 43 municipalities bordering the Atlantic Ocean and the Caribbean Sea. This route of coastal development augments the potential vulnerabilities associated with sea level rise and shoreline erosion. Among these threats are coastal flooding, salt water intrusion, coral bleaching, inland migration of coastal ecosystems, changes to ocean chemistry and increased frequency or intensity of tropical storms. These increased rates of climate-related environmental changes have made the island's coastal communities vulnerable in ways never before imagined which are expected to have a series of socio-economic effects, including loss of land infrastructure and coastal resources, which implies a decline in economic, ecological, cultural and subsistence values associated with the coast. The long term sustainability of Puerto Rico and its people is dependent on coastal ecosystem's health. There is a need to develop strategies to use and preserve these resources, while assuring its economic and socio-cultural benefits.

Islands are uniquely vulnerable to many of the potential consequences of climate change. Preliminary findings of our strategic planning process demonstrated challenges and suggested adjustments that set our sight on the education of constituents to spur changes in behavior that would lead to conservation and sustainable development. As island communities, we need to become more resilient to a changing climate and consider implementing a number of adaptive strategies, including public awareness and education. We need to design creative solutions. The UPRSGCP is qualified to respond swiftly to the stringent challenges faced by our coastal and marine resources. Sea Grant's integrated national network will be a key player in addressing these emerging issues. Our program will maintain its focus on the goals and objectives set forth in this plan and will

consider the goals of the National Oceanographic and Atmospheric Administration (NOAA), the National Sea Grant College Program and those of the University of Puerto Rico.

University of Puerto Rico Sea Grant College Program Vision and Mission

The University of Puerto Rico Sea Grant College Program (UPRSGCP) envisions a future where people live along our coasts in harmony with the natural resources and attractions, taking advantage of the economic and recreational opportunities they offer, while preserving their quality and abundance for future generations.

This vision supports both the vision articulated in NOAA's 2006-2011 Strategic Plan and that of the National Sea Grant College Program (NSGCP): "... an informed society that uses a comprehensive understanding of the role of the oceans, coasts, and atmosphere in the global ecosystem to make the best social and economic decisions."

UPRSGCP mission is to provide integrated, applied research, outreach and education activities that increase citizens' understanding and responsible use of Puerto Rico's coastal and marine resources and to disseminate reliable information to support personal, policy and management decisions that promotes this vision.

UPRSGCP advances NOAA's and NSGCP's mission

"... to understand and predict changes in earth's environment and conserve and manage coastal and marine resources to meet our nation's economic, social, and environmental needs."

History and Overview

In the mid 1960s the founders of Sea Grant proposed a cooperative effort to promote the sustainable use of coastal resources through research, education and outreach activities. The central feature foreseen by these visionaries was to unite the academic power of the nation's universities with a wide range of public and private sector partners. This feature is still in place today and even more relevant than 42 years ago. Sea Grant moved from the National Science Foundation to NOAA in 1970. It incorporated government, universities, and citizens living and working in America's coastal and Great Lakes states to harness the best science, technology and human expertise to address marine and coastal resource issues of immediate public concern. By requiring to match every \$2 of federal funding with \$1 of non-federal funds, Sea Grant expands the reach and effectiveness of NOAA and other partners in planning for and managing the future of America's ocean, coastal and Great Lakes resources. This match has provided outstanding leverage to limited federal funds.

Sea Grant initiated its efforts in Puerto Rico with a Marine Advisory Project (SGMAP) established in the late 1970s at the University of Puerto Rico at Humacao. In 1980 the SGMAP was relocated as a comprehensive project to the University of Puerto Rico in Mayagüez and matured into a leading education and conservation institution in the Commonwealth. The project evolved from an effort to educate primarily fishermen and seafood consumers, into a diversified program that served mixed clientele groups of resource users, resource managers and policy makers. In 1981, in association with the University of the Virgin Islands, the UPRSGP developed a Marine Advisory Project at the United States Virgin Islands, as part of our effort to promote the sustainable development of coastal and marine resources in the Caribbean. In 1989, under the aegis of the Office of the President of the University of Puerto Rico, our program attained the status of Sea Grant College. With a wide range of public and private sector partners, our program has been able to provide integrated, applied research, outreach and education projects. Since its inception the UPRSGCP has been instrumental in solving problems and creating benefits and opportunities for coastal communities and marine resource users in the Caribbean region. Our program has responded to (local environmental challenges through the dissemination of science-based information as well as its non-regulatory presence in local communities. Sea Grant in Puerto Rico is considered an established ambassador, generating policy-relevant research and spreading scientific and technological discoveries among resource managers, decision makers and the general public.

The UPRSGCP Strategic Plan 2009-2013 incorporates the NOAA and NSGO priorities and aligns them with our goals, strategies, outcomes and performance measures. Our institutional culture and integrity, combined with a commitment to the Sea Grant core values, provide us the strength to achieve the goals set forth in this plan.

Planning Process and Strategic Approach

Cross-Cutting Goals

To manage Puerto Rico's and U.S. Virgin Islands coastal and ocean resources in ways that balance anthropogenic needs with environmental health the island must progress in three fundamental areas:

- We need better information about how tropical coastal and ocean ecosystems function and how anthropogenic activities affect tropical coastal and ocean living resources;
- We need citizens who understand the complexities of tropical coastal environments and the interactions between anthropogenic use and the health of coastal ecosystems;
- We need management and decision-making processes that are based on sound information and involve everyone who benefits from the beauty of Puerto Rico's limited coastal resources, and include mechanisms to evaluate the trade-offs between anthropogenic and environmental needs.

To facilitate progress in these areas and to help Puerto Rico understand, manage, and use its coastal and ocean resources wisely, Sea Grant has identified three cross-cutting goals, central to all that Sea Grant does. The three goals reflect the value of Sea Grant's integrated approach to research, extension, and education. They provide the foundation of the University of Puerto Rico

Sea Grant's work and are integral to the success of this five-year plan.

Cross-Cutting Goals

Goal

Sound scientific information to advance understanding of the nature and value of the coastal and ocean resources of the archipelago of Puerto Rico and the U.S. Virgin Islands; to identify new ways to conserve and use these resources, and to support evaluation of the environmental impacts and socio-economic trade-offs involved in coastal decision-making.

Short-term economics often influence coastal decision-makers to make their choices without understanding the long-term social, environmental, and economic consequences of their decisions. Ecosystem lifestyle and values, emerging economic opportunities, and the social and economic costs and benefits of various human activities, need to be translated into factors understood by the general public for sustainable uses of coastal environments to become a reality. UPR Sea Grant has a long history of generating cutting-edge research and supporting technological innovations related to informed conservation and use of coastal, ocean and Caribbean resources.

Strategies

- Support research to generate the scientific, technical and legal information needed to increase understanding of coastal and ocean processes in the Caribbean; support the development of new businesses, products, tools and technologies; and answer the most pressing questions related to coastal, ocean and Caribbean resource conservation, use and management at the territorial and regional levels.
- Play a leadership role in the Caribbean region, increasing the amount and quality of the socioeconomic research needed to help decision-makers evaluate socio-economic trade-offs and assess risks to the future health and productivity of coastal and ocean resources in the Caribbean.
- Integrate, translate and disseminate findings and technological discoveries to the citizens, industries and leaders who need to capitalize on opportunities and make wise management decisions.

Cross-Cutting Goals

Goal

An informed public that understands the value and vulnerability of coastal and ocean resources and demands informed science-based decisions about the conservation, use, and management of these resources and a well-trained workforce that will make this a reality.

The 2004 U.S. Commission on Ocean Policy Report emphasized that restoring and sustaining our coastal and ocean environments requires an informed citizenry that understands the value and vulnerability of these resources. We also need scientists, planners, developers, engineers, and people involved in all water-related enterprises who understand the interactions between human activities and ecosystem health. NOAA has made ocean and aquatic literacy a strategic priority. UPR Sea Grant has been a leader in the region in K-12, undergraduate, graduate, professional, and technical education in coastal and ocean related areas for decades. UPR Sea Grant is committed to playing a leadership role in partnership with other NOAA programs at the national, regional (Southeast and the Caribbean) and local levels to advance coastal and ocean literacy. This can be done by capitalizing on UPR Sea Grant's strong partnerships with NGOs, government agencies, and resource users and managers, and by using its education and extension capacities to develop educational programs for schools, professional education, and workforce training.

Strategies

- Work with partners from different universities, Commonwealth and Federal agencies to develop and sustain information and technology transfer activities, capacity building programs, databases, models and pilot projects on stewardship that support ecosystem based planning and management approaches, while also sharing them with a wide variety of constituencies in PR/USVI and the Caribbean.
- Support the development of regional, coastal observation systems, and other collaborative efforts, that advance our capability to predict the effects of human activities and environmental changes on coastal resources in order to take steps to mitigate their effects.
- Provide life-long learning programs for people of all ages that enhance understanding of coastal and ocean environments, and promote stewardship for healthy ecosystems in PR/USVI.

Cross-Cutting Goals

Goal

Decision-making process that involve the full-range of coastal interests and integrates efforts of public and private partners at the federal, regional, state, and local levels, and provides mechanisms for establishing common understandings and generating outcomes that balance multiple interests.

The continued, sustained and haphazard development of our coastal areas increases the complexity of coastal decision making, which remains fragmented and narrowly focused. UPR Sea Grant's long-standing relationships with a wide variety of stakeholders in coastal communities as well as its reputation as a source of unbiased information enable our program to play a leadership role in promoting effective information sharing, consensus building, and integration of efforts in the coastal arena. UPR Sea Grant can enhance its effectiveness by working closely with other NOAA coastal programs, local and federal agencies, decision-makers and users through local and regional research, education and outreach alliances and by employing international, national and regional ocean observation systems.

Strategies

- Use UPR Sea Grant's research, extension, and education capabilities to encourage and support the creation of public decision-making processes that minimize overlap, maximize effectiveness, and provide an integrated response to coastal problems and opportunities.
- Build consensus on complex issues such as coastal land use, energy development, public access, invasive species control, and climate change impacts by supporting cutting-edge research, building broader understanding among various constituency groups, and convening diverse groups of stakeholders to work together to find common solutions.
- Strengthen partnerships among federal and territorial programs to promote national, regional, and issue-related collaboration to support more effective and integrated coastal decision-making.
- Support research to improve the effectiveness of ecosystem restoration and identify promising new restoration approaches and technologies.

Focus Areas

Over the next five years, UPR Sea Grant will concentrate effort in four areas: **healthy coastal ecosystems; sustainable coastal development; and hazard resilience in coastal communities.** These three interrelated focus areas emerged from the strategic planning process as areas of critical importance to the health and vitality of the Caribbean region's coastal resources and communities. They respond to issues of major importance to NOAA, the National Sea Grant College Program, local decision-makers and resource users, and are topical areas in which UPR Sea Grant has made substantial contributions in the past and is positioned to make significant contributions in the future.

In each of the three focus areas, Sea Grant has identified goals to pursue strategies designed to take advantage of its strengths in integrated research, outreach and education, and its established presence in coastal communities of the region. Understanding relationships and synergies across focus areas is vital to achieving the focus area goals. UP Sea Grant is one of many partners working to address these complex and interrelated issues. Understanding how activities in one area can support and complement other activities, and using partnerships to accomplish shared goals, are strategies inherent to Sea Grant, and will be central to achieving the goals outlined in this plan.

Focus Areas

Healthy Coastal Ecosystems

Puerto Rico and the United States Virgin Islands share common problems related to the sustainable development of their natural resources and attractions. Some of the typical problems of this archipelago include: resource degradation by natural hazards (hurricanes, earthquakes, tsunamis, landslides, and flooding) and by human induced factors (deforestation, habitat destruction, over-fishing, extinction of species, modification of the maritime zone, coastal water quality degradation). Several socio-economic, biological, physical, and geographic factors also limit the sustainable development of the natural resources of these island countries.

Puerto Rico's sea and its 700 miles of coastline, constitute a vital environment in which a broad and complex variety of urban dwellers, resource users, and tourists all compete for its recreational and economic resources. Sixty percent of the Commonwealth's, nearly four-million population live within the 43 municipalities bordering the Atlantic Ocean and the Caribbean Sea. The present and future growth of both, the real estate business and the construction industry, lies in the coastal plains. Following a national demographic trend, more and more of the Puerto Rican population is moving into the coastal areas each year, creating a demand for housing and development that causes erosion, reduces water quality, and destroys mangrove and wetland habitats. These growing social, economic, and environmental pressures will increase the demands placed on our coastal resources and threaten the health of these coastal ecosystems which are the foundation for life along the coast. The UPRSGCP's aims to improve and enhance abilities, economic strategies, and planning efforts of coastal communities, insular and federal government agencies, industry, university, and small entrepreneurs, in their interaction with marine resources. Sea Grant's regional consortia, nationwide networks, and international contacts are particularly well suited to helping the nation to address ecosystem health at the appropriate local, state, regional, national and global levels.

Focus Areas

Healthy Coastal Ecosystems

Sound scientific information to support ecosystem-based approaches to managing the coastal environment of the archipelago of Puerto Rico and the U.S. Virgin Islands.

To realize the full potential of ecosystem-based management approaches, we need research that will lead to better understanding of present day conditions, basic ecosystem processes, the impacts of coastal and upland land uses on the health of the Caribbean coastal and ocean environments, and the importance of healthy ecosystems to healthy fisheries. We also need to know more about how to transform our new knowledge into sound management principles and practices. UPR Sea Grant will continue to build the scientific foundation needed by supporting research that provides accurate information related to ecosystem health and by accelerating the transfer of this information to coastal residents, resource managers, businesses and industries.

Strategies

- Conduct research on tropical-insular ecosystem processes, the relationships between anthropogenic activities and coastal stressors-water quality degradation, contaminants, coastal erosion, habitat loss- and long-term human ecosystem health, and to communicate this information to public and private planners, decision-makers and managers.
- Contribute to the development of baseline data, models, conservation strategies, and indicators to support ecosystem-based approaches to land use planning, coastal development and management, sustainable practices in fisheries and marine resource use, and the assessment of risks, working with programs such as the Caribbean Fishery Management Council, NOAA's NERRS, Caribbean Regional Association for IOOS, and Coastal Zone Management Program, among others.
- Develop methodologies for testing ecosystem-based management approaches to assess their effectiveness, and to guide future management efforts, working with NOAA Fisheries, the Caribbean Fisheries Management Council, the DNER Fisheries Research Laboratory, and other local and regional partners.
- Develop and implement, in collaboration with management agencies and stakeholders, pilot projects and programs to test public stewardship and adaptive management strategies in relation to the ecosystem-based management approaches.

Short / Mid Term Outcomes:

- ❖ Managers draw on both scientific information and the public to prioritize which ecosystems to protect and restore and to set realistic goals, through research and other activities.

Long Term Outcomes:

- ❖ Coastal residents, resource managers, businesses, and industries have access to sound scientific information to support ecosystem-based approaches to managing the coastal environment and restoration of degraded ecosystems.

UPRSGCP Measurable Objectives:

- ✓ From 2010 to 2014, one (1) of every four (4) of our proposals will tackle key issues related to restoration, and more specifically, the development of innovative restoration and conservation techniques.
- ✓ By 2013, 100 constituents (organizations and individuals) had access and applied the scientific information developed by Sea Grant and its partners, in a number of activities related to the protection and restoration of coastal and marine ecosystems.

Healthy Coastal Ecosystems

Goal

Widespread use of ecosystem-based approaches to managing land, water and living resources in coastal areas.

Achieving widespread use of ecosystem-based management approaches will require extensive efforts to communicate the effects of ecosystem degradation on natural resources, local economies, and human health to a wide range of audiences in ways that motivate them to respond. Sea Grant's strong research and extension capabilities provide scientific information and technical assistance on ecosystem-based management approaches. At the same time, the organization's outreach and education capabilities engage citizens in stewardship activities that promote healthy ecosystems. All these programs can result in regional and other collaborative approaches to address problems that extend beyond traditional geographic or governmental boundaries.

Strategies

- Work with partners from different universities and Commonwealth and Federal agencies to develop and sustain information and technology transfer activities, capacity building programs, databases, models and pilot projects on stewardship that support ecosystem based planning and management approaches, and share these with a wide variety of constituencies in PR/USVI and the Caribbean.
- Support the development of regional coastal observation systems and other collaborative efforts that advance our capability to predict the effects of human activities and environmental changes on coastal resources in order to take steps to mitigate their effects.
- Provide life-long learning programs for people of all ages that enhance understanding of coastal and ocean environments, and promote stewardship for healthy ecosystems in PR/USVI.

Short / Mid Term Outcomes:

- ❖ Peoples of all ages understand coastal and ocean environments of the Caribbean, and the need for stewardship of healthy ecosystems.
- ❖ Managers draw on both scientific information and the public to prioritize which ecosystems to protect and restore and to set realistic goals.

Long Term Outcomes:

- ❖ Coastal residents, resource managers, businesses, and industries have access to sound scientific information to support ecosystem-based approaches to managing the coastal environment and restoration of degraded ecosystems.
- ❖ Coastal residents, resource managers, businesses, and industries balance social, natural, physical science in managing resources, and work with all sectors in making decisions.

UPRSGCP Measurable Objectives:

- ✓ By 2013 four MPA have integrated 4 groups or organizations of stakeholders in the stewardship and management of the protected areas, jointly with conservation agencies, contributing to the support of conservation activities.
- ✓ By 2014 there will be 20 municipalities with their pertinent staff trained in conservation and restoration methodologies and regulations. Ten (10) of those municipalities have the conservation methodologies incorporated in their action plans, and 5 are engaged in the process.
- ✓ By 2014 with the collaboration of the UPRSGCP the Caribbean Regional Association (CaRA) and the Caribbean Integrated Coastal Ocean Observing System (CARICOOS) will make accessible data, forecasts and visualization products for winds, waves, currents, water quality and coastal inundation in real time and in user friendly formats that will be used by 500 recreational fishermen, 50 commercial fishermen, 20 municipalities and 500 marine recreationists.

Focus Areas

Healthy Coastal Ecosystems

Restored function and productivity of degraded ecosystems

Past activities and events have led to deterioration of nursery areas for wild fish populations, loss of wetlands, closure of beaches, and proliferation of invasive species. UP Sea Grant will help reverse these trends by identifying and assessing impaired ecosystems and supporting the development of new policies, technologies, and processes that promote restoration of ocean and coastal ecosystems in ways that balance the needs of the natural systems with the needs of the humans who inhabit them. UPR Sea Grant will use its nationwide network of extension, education and communication specialists to provide the technical assistance needed, and to share new information and technologies with local, state, regional, national, and international partners.

Strategies

- Support research to improve the effectiveness of ecosystem restoration, and identify promising new restoration approaches and technologies.
- Invest in the development and dissemination of new information, policies, technologies and methods to address water quality degradation and watershed conservation.
- Develop and provide technical support for citizens, NGO's, municipalities, resource managers, and businesses in stewardship projects that need help with specific mitigation/restoration problem.
- Identify and support innovative research areas in the analysis of the ecological footprint, and the minimization of its impact that contribute to the development of policies, programs and appropriate conservation and sustainable practices.

Short / Mid Term Outcomes:

- ❖ Baseline data, standards and indicators developed by Sea Grant and partners are used to support ecosystem-based approaches.
- ❖ Methodologies are developed and used to evaluate ecosystem-based management approaches and guide future management efforts.

Long Term Outcomes:

- ❖ Managers, communities and NGOs have the resources and capacity to undertake conservation and restoration projects, do so, and evaluate and adapt as needed.

UPRSGCP Measurable Objectives:

- ✓ From 2010 to 2014, one (1) of every four (4) of our proposals will tackle key issues related to restoration, and more specifically, the development of innovative restoration and conservation techniques.
- ✓ By 2012 our program will train 100 scientists and managers in conservation and restoration methodologies. Twenty-five (25) of them will integrate the methodologies in their working plans. It is expected that 5 habitats will benefit from this effort.
- ✓ By 2013 there will be 20 municipalities with their pertinent staff trained in conservation and restoration methodologies and regulations. Ten (10) of those municipalities have the conservation methodologies incorporated in their action plans, and 5 are engaged in the process.
- ✓ By 2014 Sea Grant will be associated in 5 partnerships with municipalities, NGO and / or communities, for the development of sustainable projects and conservation of coastal ecosystems; incorporating more than a 100 volunteers stimulating the investment of private and public funds in excess of \$2,000,000.

Sustainable Coastal Development

Coastal communities, ecosystems, resources and natural attractions in Puerto Rico and the USVI, provide vital economic, social, and recreational opportunities for millions of Puerto Ricans, but decades of population migration have transformed our coastal landscapes and intensified demand on finite coastal resources. The increase in population has resulted in new housing developments and recreation facilities, as well as a new generation of energy development activities, port expansions, and other business activities. These changes are placing tremendous pressure on coastal lands, water supplies, and traditional ways of life. To accommodate more people and activity, and to balance growing demands on coastal resources, we must develop new policies, institutional capacities, and management approaches to guide the preservation and use of coastal and ocean resources. UPR Sea Grant will engage a diverse and growing coastal population in applying the best available scientific knowledge, and use its extension and education capabilities to support the development of healthy coastal communities that are economically and socially inclusive are supported by diverse and vibrant economies, and function within the carrying capacity of their ecosystems.

Focus Areas

Sustainable Coastal Development

Goal

Healthy coastal economies that tap into potential and innovative activities in commerce, recreation, alternate energy sources, sustainable tourism opportunities, and coastal access for all citizens.

Marine resources and coastal amenities sustain local and national economies through fisheries and aquaculture, seafood processing, trade, energy production, tourism, and recreation enterprises. Urban ports and waterways continue to accommodate expanding international trade, staging areas for offshore industries, growth in tourism and recreational boating, and changes in fishing fleets. At the same time, changing development patterns along the coast are threatening to displace traditional water dependent industries and cut off water and beach access for coastal residents. Vacant industrial buildings and obsolete infrastructure facilities can be recaptured for new marine enterprises, public access, and planned mixed use developments that bring enjoyment to residents and visitors alike. UPR Sea Grant's long standing relationships with coastal communities and industries make it ideally suited to provide information, tools, and techniques to support working waterfronts, responsible energy development, the development of accessible recreation and tourism activities, and the adoption of sustainable development practices.

Strategies

- Support research and outreach activities that provide local communities, NGOs, municipalities and government agencies with information, programs and techniques to help them enhance and add value to coastal related economic activities such as fishing, boating, aquaculture, sustainable tourism, outdoor recreation, and energy development, while preserving the quality and health of ecosystems and resources for future generations.
- Support regional (Caribbean) and local (PR/USVI), efforts to increase public access to the beaches and waterfronts through assessment of access needs, analysis of legal and policy issues, and technical assistance to local (municipal) governments, NGOs, resource managers, community based organizations, and territorial governments.
- Use UPR Sea Grant extension and education capabilities to engage government agencies, NGOs, university programs, and coastal communities in a planning and implementation process that support efforts to incorporate stakeholders in the identification and pursuit of sustainable economic development policies, programs and projects.

- Provide critical learning and capacity building opportunities for the general public on stewardship and sustainable coastal development, through innovative communication products and publications, for PR/USVI and the Caribbean.

Short / Mid Term Outcomes:

- ❖ Local communities have the information and techniques to enhance waterfront-related economic activities and protect the health of the natural coastal environment.
- ❖ Coastal communities engage in visioning, resource inventories, analysis of development policies and education of community leaders and citizens.

Long Term Outcomes:

- ❖ Coastal communities make efficient use of land, energy and water resources and protect the resources needed to sustain coastal ecosystems and quality of life.
- ❖ Coastal communities and industries have healthy economies that include working waterfronts, an abundance of recreation and tourism opportunities, and coastal access for all citizens.

UPRSGCP Measurable Objectives:

- ✓ By 2013 our program will develop a master plan for the sustainable development of coastal communities in Puerto Rico. The document and the process will be developed with the participation of 10 coastal communities groups, 5 commonwealth agencies and 3 federal government agencies.
- ✓ By 2014 the Commonwealth of Puerto Rico will incorporate the master plan, and the activities laid out in the plan will form part of the 8 agencies work plan, as well as UPR Sea Grant future proposals.
- ✓ By 2014 more than 10,000 stakeholders, residents and resource users have had access to the plan through printed materials, workshops, radio and television programs and the Internet. By 2015 we expect to have more than 50 volunteers involved with the ongoing efforts to implement the plan.

Focus Areas

Sustainable Coastal Development

Goal

Coastal communities that make efficient use of land, energy and water resources and protect the resources needed to sustain coastal ecosystems and quality of life.

The biggest challenge facing many coastal cities, municipalities and estates (USVI) today is how to manage growth in ways that do not diminish the health of the ecosystems these communities depend on. One way this is reflected nationally and internationally is in the high level of concern about climate change and its associated effects. To respond to the challenges of growth at a local and regional level, communities are looking at ways to use land and water, generate energy, and dispose of waste that will preserve environmental health and economic vitality. Determining the amount of land, water, and other natural resources needed to sustain healthy communities is an essential first step in establishing sustainable policies and growth practices. Only when the dimensions of this environmental footprint are identified can coastal communities understand what their carrying capacity is and what will be needed for generations to come. UPR Sea Grant and its partners are in a unique position to conduct research and develop models and forecasts that will help communities with this process.

Strategies

- Strengthen UPR Sea Grant's research activities and extension capacity to help coastal communities determine the sustainable carrying capacity of their land, water, and other resources through resource assessments, scenario building, modeling, and other techniques.
- Support innovative research on land use practices and building designs that promote energy and water conservation, coastal-ocean related renewable energy technologies, and the creation of other tools to help communities grow in sustainable ways.
- Work with Commonwealth and Federal agencies and research programs (most prominently, NOAA's CZMP, NERRS, NOS, Fisheries, and others) and other partners and universities to help municipalities, companies and communities to evaluate their ecological footprints and grow in environmentally sustainable ways.

Short / Mid Term Outcomes:

- ❖ Coastal communities adopt best management practices, and improved site designs (low impact development, green building design, natural area planning, wild habitat corridors, bio retention areas, vegetative swales) in local policies and ordinances.

Long Term Outcomes:

- ❖ Coastal communities make efficient use of land, energy and water resources and safeguard the resources needed to sustain coastal ecosystems and quality of life.

UPRSGCP Measurable Objectives:

- ✓ By 2012 Sea Grant develops a set of guidelines for sustainable practices for conservation and business development in coastal communities, in partnership with other university programs, municipalities and NGOs.
- ✓ By 2014, 30 coastal communities' representatives and NGOs adopt sustainable practices for conservation and business development, which includes waste reduction and energy conservation practices, as well as the substitution of non- renewable for renewable sources of energy.
- ✓ By 2014 the UPRSGCP will collaborate in the development of a National Strategy for Environmental Education for Puerto Rico with the collaboration of 10 government agencies, 5 NGO's and representatives of the private sector to promote the development of a sustainable society that guarantees the conservation of ecological systems essential for the perpetuity of all species and the quality of life of the population.

Focus Areas

Sustainable Coastal Development

Goal

Coastal citizens, NGOs, government agencies, trade organizations, and industries that recognize the complex inter relationships between social, economic and environmental values in coastal areas and work together to balance multiple uses and optimize environmental sustainability.

All the residents of Puerto Rico and the USVI are considered coastal residents since they live less than fifty miles from the coast. New developments and critical infrastructure for tourism, industries and commerce, are established in the coastal zone, which are the most rapidly growing areas in the territories. Citizens and decision-makers have an urgent need for tools that will help them evaluate the implications of land-use changes, coastal development pressures, and increased resource use in approaching the policy and management decisions they face. Regional cooperation and coordinated land-use and watershed planning are essential. UPR Sea Grant's well-established role as a trusted broker among a wide range of interests, makes it a key player in providing sound information for decision-makers—convening stakeholders to seek common ground, and facilitating the development and implementation of new coastal policies, plans, management approaches, and consensus-building strategies.

Strategies

- Work, liaise and join efforts with Commonwealth and Federal agencies in the territories, university programs, as well as with NGOs, community based organizations and private groups to identify needs and transfer the appropriate assessment tools, model plans and ordinances, best management practices, alternative development approaches, and other technique that will enable the citizens of our coastal zone to develop their coastal economies in environmentally sound, and participatory ways.
- Build the research capabilities to assess the economic and social value of the coast in the accounting of the Territorial Gross Product through the modeling of ecosystem services, job and income generation, multiplier effects, subsistence practices, adaptive strategies to cope with economic crisis, and the formation of coastal economic resilience.
- Foster regional cooperation and partnerships among local government officials, community stakeholders, and regional planning organizations to promote sustainable growth plans and strategies that protect local and regional natural resources that will ensure an abundance of these resources is available to serve future generations.

- Strengthen the capabilities of research and conservation programs that work in tandem with NOAA and local agencies goals, and in partnership with Puerto Rico Sea Grant (Interdisciplinary Center for Coastal Studies, CIEL; the Center for Applied Social Research and CISA, in programs that assess social and economic development, socioeconomic monitoring of MPAs, vulnerability, and resilience of coastal communities to identify and propose sustainable planning, the implementation of innovative conservation programs and the citizen's stewardship of coastal and marine resources.

Short / Mid Term Outcomes:

- ❖ Local communities have the information and techniques to enhance waterfront-related economic activities and protect the health of the natural coastal environment.
- ❖ Coastal communities engage in visioning, resource inventories, analysis of development policies and education of community leaders and citizens.

Long Term Outcomes:

- ❖ Coastal communities make efficient use of land, energy and water resources and protect the resources needed to sustain coastal ecosystems and quality of life.
- ❖ Coastal communities and industries have healthy economies that include working waterfronts, an abundance of recreation and tourism opportunities, and coastal access for all citizens.

UPRSGCP Measurable Objectives:

- ✓ By 2014 four MPA have integrated 5 groups / organizations of stakeholders in the stewardship and management of the protected areas, contributing to the support of conservation activities.
- ✓ By 2014 there will be 20 municipalities with their pertinent staff trained in conservation and restoration methodologies and regulation. Ten (10) of those municipalities have the conservation methodologies incorporated in their action plans, and 5 are engaged in the process.

Focus Areas

Safe and Sustainable Seafood Supply

Goal

A sustainable supply of safe seafood that meets public demand at affordable prices.

The U.S. has witnessed the decline of many of its major fisheries while seafood consumption is on the rise. This has resulted in a seafood trade deficit of \$8 billion per year, according to U.S. Department of Agriculture Foreign Agricultural Service statistics. At the same time, Sea Grant, through its research, extension, education activities, and work partners, has produced important discoveries that have aided the stabilization and recovery of many endangered fisheries. According to the NOAA Aquaculture Program, aquaculture is in its infancy in the U.S., amounting to just over \$1 billion of a \$70 billion worldwide industry. Aquaculture creates important new opportunities to meet the increased demand for seafood, but a number of questions need to be addressed for its full potential to be realized. Seafood safety is a growing concern as international trade increases and fish diseases and contamination become bigger problems. Sea Grant has key roles to play in advancing public understanding of the nature of these problems and opportunities. Through the use of its research, extension and education capacities, Sea Grant will support the kind of informed public and private decision making that will lead to a sustainable supply of safe seafood long into the future.

Strategies

- Use Sea Grant's research, extension, education, and communication capabilities to develop and disseminate essential knowledge about natural and human threats to the long term viability of wild fish populations, to identify ways to minimize these threats, and to use ecosystem based fisheries management and other innovative approaches to accomplish this.
- Conduct integrated research, education, and outreach activities to support and promote a viable local mariculture sector with minimal environmental impacts, in ways that are consistent with the territorial and national objectives, building on the leadership role Sea Grant plays in this area.
- Work with stakeholders (fishers, NGOs), NOAA's National Marine Fisheries Service Program, other Federal and State partners (Planning Board, DNER, CFMC, Environmental Quality Board, Fisheries Research Laboratory, SEAMAP, CaRA), and other Caribbean regional and international programs to enhance the management and conservation of wild fisheries through sustainable fishing practices, and the support of MPAs and other management strategies.

- Work with NOAA’s National Marine Fisheries Program, the Caribbean Fisheries Management Council, other Federal agencies (EPA, USACOE, USFWS) and the PR/USVI departments of planning, agriculture, environmental quality, and natural resources, and local entrepreneurs in the seafood sector to develop pilot projects in sustainable and environmentally safe mariculture ventures.

Short / Mid Term Outcomes:

- ❖ Fishermen are knowledgeable and employ sustainable fishing practices that protect wild caught species.
- ❖ Scientific and Traditional / Local Ecological forms of knowledge are integrated into the current system of fisheries management.
- ❖ An information portal is available on sustainable fisheries, conservation practices and sustainably harvested seafood.

Long Term Outcomes:

- ❖ Contribute to a sustainable seafood supply.
- ❖ Consumers make choices in seafood purchases that support safe, valuable and sustainable seafood cottage industries.

UPRSGCP Measurable Objectives:

- ✓ By 2012, 50 artisanal fishers and 500 consumers with access to Internet will have information available on sustainable conservation practices, fishing effort, and safe and sustainably caught wild species.
- ✓ By 2013 the Commonwealth of Puerto Rico and the Puerto Rico Fishermen Federation FEPDEMAR have tested a pilot program for the incorporation of the fishermen in the process of management and stewardship of the local fisheries.
- ✓ By 2014, one hundred an eighty (180) of the fishers from Puerto Rico will have a working knowledge of conservation practices, and the need for sustainable measures to protect wild caught species. This outcome requires an improved communication flow between fishers and management agencies, and an improved compliance with regulations.
- ✓ By 2014 Sea Grant and the concerned agencies (NMFS, CFMC, DNER, DA) develop a plan (economic and technical feasibility) for the sustainable exploitation, and increase in the harvest of wild species, mainly by targeting pelagic and “highly migratory species” in the waters of the EEZ.

Hazard Resilience in Coastal Communities

Sea level rise, the increased number and intensity of coastal storms, and other natural and human hazards are putting more people and property at risk along the nation's coasts, with major implications for human safety and the economic and environmental health of coastal areas. It is essential that residents of coastal communities understand these risks and learn what they can do to reduce their vulnerability and respond quickly and effectively when events occur. UPR Sea Grant will use its integrated research, training, and technical assistance capabilities, and its presence in coastal communities to play a major role in helping local citizens, decision-makers, and industries plan for hazardous events and optimize the ability of their communities to respond and rebuild.

Focus Areas

Hazard Resilience in Coastal Communities

Goal

Widespread understanding of the risks associated with living, working, and doing business along the nation's coasts.

Communities and businesses are increasingly vulnerable to hazardous events brought on by climate-related changes, land-use changes, and increased economic activity in coastal and ocean waters. There is a great need for information and tools to help communities assess the risks they face and identify the options available to them to minimize those risks. UPR Sea Grant will support the work of NOAA programs in the development and implementation of climate impact and adaptation related activities. UPR Sea Grant will work with NOAA and other federal, territorial and (Caribbean) partners and organizations, the banking and insurance industries, and others to develop forecasting and risk assessment tools, economic and environmental impact models, and other mechanisms that will help families, businesses, communities, and regions to understand their risks and take them into account in making personal, business, and community-related decisions.

Strategies

- Conduct research to assess hazard-related risks and increase the availability and usefulness of hazard-related information and forecasting for citizens, industries, and decision-makers in coastal communities.
- Work with the NOAA local National Weather Service program, the Seismic Network, UPR Coastal Hazards Center, and other public and private sector partners to develop comprehensive education/literacy programs on the immediate and long-term effects of climate-related changes, and other hazardous events, on human safety and property along the coast, and how to prepare for and survive them.
- Collaborate with NGOs, universities, research programs and communities to develop and implement policies conducive to the protection of coastal communities threatened by climate related changes and hazardous events.

Focus Areas

Hazard Resilience in Coastal Communities

Goal

Community capacity to prepare for and respond to hazardous events

It is not enough for communities and businesses to understand their vulnerabilities, they must act on this knowledge and become more resilient or the human and economic losses will continue to mount. Individuals, businesses, and communities need to develop comprehensive emergency preparedness and response plans that increase their resiliency and enable them to respond effectively. Sea Grant will contribute to this by building a sound knowledge base to improve forecasting capabilities, by identifying development and best management practices that reduce the vulnerability of people, buildings and businesses to coastal hazards, and by advancing ways communities can manage and recover from these events when they occur.

Strategies

- Help public and private decision-makers create and adopt policies, plans, and ordinances to reduce risks, manage catastrophic events and speed recovery.
- Create and disseminate, in partnership with NOAA National Weather Service, the IOOS Caribbean Regional Association, the scientific community, NGOs, municipalities and local governments on-line tools to assess vulnerability for the reduction of the impact of hazardous events, support hazard-related planning activities, and facilitate disaster relief efforts.
- Make Sea Grant's local knowledge, staff and contacts available to work with federal, state, regional, and local agencies, non-governmental organizations, and international partners that have hazardous event responsibilities, to facilitate the speed and quality of response to these crises.

Short / Mid Term Outcomes:

- ❖ Coastal decision-makers have the knowledge and skills to assess local risk vulnerability and respond with appropriate policies and regulations.
- ❖ Coastal opinion leaders and decision-makers take proactive measures to ensure that hazards, risks, and vulnerabilities are communicated to property owners and perspective purchasers.

Long Term Outcomes:

- ❖ Coastal residents and decision makers are aware of and understand the physical processes that produce hazards and climate change and the implications of those events for their communities.
- ❖ Coastal decision makers are knowledgeable of the tools and practices to mitigate the impacts of hazards and climate change and the implications, and implement strategies for their mitigation.

UPRSGCP Measurable Objectives:

- ✓ By 2012 UPRSG will be the clearinghouse for scientific and socioeconomic information of hazard related risks, and the strategies to cope with hazards and climate change.
- ✓ By 2013, the relevant staff of all coastal municipalities (48) will be trained in hazard mitigation and improved resilience.
- ✓ By 2014, one third (15) of the municipalities have incorporated mitigation and resilience programs in their planning and implementation plans.
- ✓ By 2014 twenty (20) municipalities will be making use of CARICOOS and CaRA services and products related to winds, waves, currents and coastal inundation.