PIER 2014 Annual Report

Puerto Rico Sea Grant

Official Level of Effort - Only Approved Funding

Report Generated by YULISSA GARCIA on 12/13/2021

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2014 Level of Effort

National Focus Area Name	SG Federal	Match	Pass Thru	Federal + Match + Pass Thru	LOE without Leverage (%)	Leveraged (Managed)	LOE with Leverage (%)
Healthy Coastal Ecosystems	$590,040	$356,254	$71,500	$1,017,794	50 %	$39,874	49 %
Sustainable Fisheries and Aquaculture	$0	$0	$0	$0	0 %	$0	0 %
Resilient Communities and Economies	$418,987	$236,213	$0	$655,200	32 %	$69,506	34 %
Environmental Literacy and Workforce Development	$207,475	$138,156	$0	$345,631	17 %	$8,861	17 %
TOTAL ALL FOCUS AREAS:	$1,216,502	$730,623	$71,500	$2,018,625	100 %	$118,241	100 %

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2014 Impacts & Accomplishments

Potential Future Land Loss of Small Islands of Puerto Rico and the United States Virgin Islands

NATIONAL FOCUS AREAS: Healthy Coastal Ecosystems

- Impact
- PO Review Complete

RECAP: Puerto Rico Sea Grant researchers developed a relatively rapid, easy and cost-effective method of assessing the vulnerability of sea level rise to different shoreline types. Land loss of small islands can be quantified and utilized as a management tool. Several small islands associated with Puerto Rico and the U. S. Virgin Islands can now be evaluated very quickly and easily. The evaluation of other islands will be a simple operation with the new method of assessing the vulnerability of different shoreline types to sea level rise developed on this project. Recommendations for resource managers were included.

PROGRAM FOCUS AREAS: HEALTHY COASTAL ECOSYSTEMS

Small islands typically do not have the baseline data available needed for sound coastal management and planning. Understanding how shorelines respond to rising sea level is critical for developing sound coastal management and land use planning guidelines, and is even more important when considering the effect on small islands.

New techniques of gathering and analyzing pertinent geomorphic data were developed and refined for application to small islands. Coastal vulnerability and forecasts of shoreline changes and land loss was evaluated for twenty small islands. The Coastal Vulnerability Index (CVI) was modified for the Caribbean setting, to better predict potential changes and develop a potential response to sea-level rise.

Twenty (20) islands were evaluated for coastal vulnerability and shoreline migration related to anticipated sea-level rise. Methodologies developed during the recent project include enhancement of a new coastal vulnerability analysis tool named AMBUR-HVA (Analyzing Moving Boundaries Using R - Hazard Vulnerability Assessment) that contains analysis functions customized for small islands and Caribbean coasts. Instrumentation used in the newly developed protocol includes LIDAR and kinematic GPS. Maps are available for each of the 20 small islands. A CVI applicable throughout the Caribbean and to any islands with similar climate, hydrography, and geologically complex

coasts was developed. Further, the AMBUR-HVA program was modified to better handle coastal features found in the Caribbean such as cays or smaller islands with diverse geological and biological frameworks. The U.S. Fish and Wildlife Service (USFWS) will utilize the protocols developed by Puerto Rico Sea Grant researchers and the consulting firm HJR Reefscaping will extend the project methods and utilize AMBUR to evaluate potential near future changes in wildlife reserve boundaries due to expected sea level rise.

Partners: University Of West Georgia;

Associated Project(s):
POTENTIAL FUTURE LAND LOSS OF SMALL ISLANDS OF PUERTO RICO AND THE UNITED STATED VIRGIN ISLANDS (2010 - 2013)

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Coastal Nature Reserve: "Caño Boquilla"

National Focus Areas: Healthy Coastal Ecosystems

- Impact
- PO Review Complete

Recap: Puerto Rico Sea Grant continued outreach efforts in the RNCB through publications prepared and posted on the "Reserva Natural Caño Boquilla" blog, at www.granreservaboquilla.wordpress.com, and www.mayaguezsabeamango.com.

Program Focus Areas: Healthy Ecosystems and Habitats

The "Caño Boquilla" (RNCB) is a Coastal Nature Reserve (120 acres of maritime zone, wetlands, estuary and mangroves) located in the Mayaguez-Añasco Bay. The reserve estuary discharges into one of the most important western sand beaches where two species of marine turtles nest, and is habitat for more than 80 bird and 50 fish species.

Puerto Rico Sea Grant and the NGO Mayaguezanos Por la Salud y el Ambiente (MSA) implemented an educational initiative in the RNCB consisting of restoration and labeling of ten (10) coastal waterways (834 meters) in the reserve's maritime zone, designing a waterway map, developing an educative campaign about coastal cleaning, solid waste removal and reserve flora and fauna; and the creation of three (3) murals with messages that motivated the reserve protection. During this outreach initiative, seven (7) volunteers were capacitated in coastal ecology and ecosystems and served as trainers to more than 150 residents that live near the reserve. More than 100 citizens visited the RNCB during this year.

As a result of UPRSG outreach efforts, the Senate of Puerto Rico approved the resolution, RC del S 116, to assigned $300,000 to the Department of Natural and Environmental Resources for the development of sustainable infrastructure inside the RNCB. During this year, three (3) acres of wetlands were added to the RNCB land extension, increasing the number of an endangered wetland tree, Pterocarpus officinalis, and wetland habitat that will contribute to the protection of the Río Grande de Añasco Watershed, where the reserve is located.

Partners: Mayaguezanos Por la Salud y el Ambiente;

Associated Project(s):
Marine Outreach Program (2014 - 2017)

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Long-term Passive Acoustic Tracking of Juvenile Black-tip and Lemon Sharks: an Investigation Into the Spatiotemporal Dynamics and Connectivity of Shark Nursery Habitat in St. John, USVI

National Focus Areas: Healthy Coastal Ecosystems

- Impact
- PO Review Complete

Recap: Coral and Fish Bays represent essential nursery habitat for blacktip and lemon sharks in the USVI. There are indications that these areas are threatened by anthropogenic stresses and with natural mortality estimates as high as 90%, additional mortality will impact population growth. Given the importance of this habitat, fisheries managers should implement measures to protect these areas from anthropogenic impacts.

Program Focus Areas: HEALTHY COASTAL ECOSYSTEMS

Sharks are typically slow growing species with low intrinsic rates of reproduction and represent an important component of the Caribbean marine ecosystem as top predators and keystone indicators of coral reef productivity and health. Shark nursery habitat in St. Thomas and St. John, USVI is limited to a handful of relatively small bays, estuaries, and reef lagoons susceptible to a number of human activities including overexploitation, sedimentation, pollution, marinas, and commercial and industrial development.

Sea Grant researchers examined shark spatial and temporal dynamics of habitat use, specifically, information on movements, site fidelity, immigration and emigration between and within habitats, and associations with National Park boundaries, crucial information for coast-wide habitat protection and management. Additionally, they studied the extent to which these "pockets" of productivity are interconnected. Shark movements were monitored using passive acoustic receivers.

Evidence that juvenile blacktip and lemon sharks utilize this habitat for protection during the first several months of their lives, when they are most vulnerable to predation as well as was information for local fisheries managers to establish effective conservation measures such as fishing closures, habitat protection, additional marine protected areas, and limits on coastal development was provided. Coastal resource management agencies used Puerto Rico Sea Grant findings to decline development requests to build submerged docks and piers within one of these shark nurseries (Coral Bay). In another instance, a local community group, The Coral Bay Community Council, used project findings to demonstrate the ecological value of Coral Bay in St. John, USVI as important shark nursery habitat. Public awareness was raised and the importance of coastal sharks to a healthy coral reef marine community emphasized.

Partners: University Of Massachusetts At Amherst (Umass);

Associated Project(s):
LONG-TERM PASSIVE ACOUSTIC TRACKING OF JUVENILE BLACKTIP AND LEMON SHARKS: AN INVESTIGATION INTO THE SPATIOTEMPORAL DYNAMICS AND CONNECTIVITY OF SHARK NURSERY HABITAT IN ST. JOHN, USVI (2010 - 2012)

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Application of the soil and water assessment tool (SWAT) to estimate discharge and sediment yields from the Río Grande de Añasco watershed, Puerto Rico

National Focus Areas: Healthy Coastal Ecosystems

- Impact
- PO Review Complete

Recap: Results presented can provide essential input to fulfill the National Water Quality Initiative of the NRCS for the RGA watershed, as well as to help achieve the local and federal government's public policy water resources goals for PR.

Program Focus Areas: HEALTHY COASTAL ECOSYSTEMS

Localized increases in anthropogenic stresses are considered as an important cause of the decline in living coral cover observed throughout the Caribbean (Gardner et al., 2003; Mora, 2007). Coral reefs in the Commonwealth of Puerto Rico (PR) are among the most highly threatened of the entire Caribbean Region (Burke and Maidens, 2004), and pollution from land sources of contamination ranks high as a priority threat together with increased surface seawater temperatures, a higher incidence of disease, and overfishing (Ballantine et al. 2008; Hernández et al., 2012). Excess delivery of land-based sediments exerts an important control on the condition of coral reefs. High sediment concentration in the water column reduces the amount of light needed for photosynthesis by symbiotic algae, while settling of sediment can smother existing coral or reduce the surface area suitable for new growth (Hubbard, 1986; Rogers, 1990; Fabricius, 2005; Erftemeijer et al., 2012).

The SWAT model was applied to estimate runoff and sediment yields from the Río Grande de Añasco (RGA) watershed between 1998 and 2012. A high resolution land cover map based on 2010 imagery was completed and a SWAT database was developed and applied to the RGA watershed. Erosion hotspots and land cover types contributing large quantities of sediment were identified. MERIS images of sediment plumes coming into the Añasco-Mayaguez Bay were obtained and processed for TSS. Frequency distribution analyses of RGA discharge data; Development of a basic understanding of RGA discharge control on sediment plume size and TSS magnitude.

A key finding of this study is the identification of a preferred northwest trend of the sediment plume originating from the Río Grande de Añasco watershed. Hence, the study highlights the degree of connectivity among coffee farms, other agricultural practices, and urbanization with all marine resources located along the coast from Añasco through the municipality of Rincón. This has very important implications on the management of Acropora palmatta coral reef resources of this area, including the Reserva Natural Tres Palmas.The NGO Amigos de Tres Palmas will coordinate a meeting with the Puerto Rico Department of Agriculture, NOAA Fisheries, NRCS and the Puerto Rico Department of Natural and Environmental Resources to start an effort to control sediments from the AWS that could affect the health of the Tres Palmas Marine Reserve.

Partners: Island Resources Foundation; Texas A&M University;

Associated Project(s):
APPLICATION OF THE SOIL AND WATER ASSESSMENT TOOL MODEL (SWAT) TO ESTIMATE DISCHARGE AND SEDIMENT YIELDS FROM THE RIO GRANDE DE AÑASCO WATERSHED, PUERTO RICO (2010 - 2013)

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Deciphering Phosphorescent Bay: New Approaches towards the Understanding of this Unique Ecosystem

National Focus Areas: Healthy Coastal Ecosystems

- Impact
- PO Review Complete

Recap: Sea Grant research confirms the importance of seasonality in determining the P. bahamanese and C. furca cell densities. Seasonal meteorological conditions result in shifts of dinoflagellate community and bioluminescence levels.

Program Focus Areas: HEALTHY COASTAL ECOSYSTEMS

Bioluminescent Bays (BB) are rare worldwide. These are especially sensitive ecosystems, for which the factors associated to their dynamic nature, are poorly understood. A detailed examination of biological and environmental factors defining these systems, should be a priority to local agencies and resource managers, in order to safeguard the ecosystems services they provide as habitat and nursery for protected and economically important species and to the tourism and recreation local industries.

The daily, spatial and seasonal variability of P. bahamense and C. furca was determined and the environmental factors that may drive the spatial and temporal fluctuations of species at Phosphorescent Bay were identified including the nutrient analysis, phytoplankton counting and the statistical analysis. All temperature and current data from the ADCPs for both deployments was processed and analyzed, both in time and frequency space.

Results: Results confirm the researchers previous observations (Soler-Figueroa and Otero, 2014) regarding the importance of seasonality in determining the P. bahamanese and C. furca cell densities. Precipitation is one of the principal factors that triggers the high cell densities of P. bahamense during the wet season, probably due the entrance of land-derived and watershed runoff bringing nutritional elements that are essential for the growth of this dinoflagellate. This research project has positioned Puerto Rico Sea Grant and the UPR Department of Marine Sciences as the leaders in the study of bioluminescent bays. The Puerto Rico Department of Natural and Environmental Resources has already consulted our researches in matters related to the management and conservation of these natural attractions.

Partners: None listed in Database

Associated Project(s):
Deciphering Phosphorescent Bay: New Approaches Towards the Understanding of this Unique Ecosystem (2012 - 2013)

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Development of the Puerto Rico Beach and Surfzone Currents Warning System

National Focus Areas: Hazard Resilient Coastal Communities

- Impact
- PO Review Complete

Recap: Sea Grant Research generated two online tools: the CariCOOS Nearshore Wave Model: http://caricoos.org/drupal/swan_multigrid and the CariCOOS-Sea Grant Nearshore Breaker Model: http://www.caricoos.org/drupal/nearshore_breaker

Program Focus Areas: HAZARD RESILIENCE IN COASTAL COMMUNITIES

One of the gravest dangers beachgoers have to deal with, are intense surf-zone currents, which represent a serious hazard. A total of 30 persons, drown every year at the beaches of the Archipelago of Puerto Rico, which results in a drowning every twelve (12) days, for a total of four hundred and twenty (420) persons in the course of the last 14 years.

Sea Grant efforts were focused on developing a beach hazard warning system for predicting potentially hazardous surfzone currents. The Puerto Rico Beach and Surfzone Currents Warning System was developed in an effort to provide the public with potentially life- saving information on hazardous beach conditions. A customized webpage was designed to provide beach-specific estimates of the hazard posed by dangerous currents on any given day. The website is based on a beach hazard matrix developed for each of the four major coasts of Puerto Rico, taking into account local wave climate, wave sheltering, coupled wave and wind effects and local bathymetric effects for each major beach.

Results: A very high resolution nearshore wave model capable of predicting nearshore breaker heights was successfully completed, and the model is fully operational. The development of a Beach Hazards Warning System was changed to a Nearshore Breaker Height Prediction System and completed, as a result of conversations with the National Weather Service (NWS), who sustained that the NWS should be the official agency to emit hazardous currents warning levels. Negotiations between the PI's, NWS and Puerto Rico Sea Grant led to the agreement that the NWS is utilizing the high-resolution wave models and the nearshore breaker prediction system developed as part of the present project in order to emit their warnings, given the unique numerical and computational advantages of the system developed by the PI's. The culmination of this collaboration occurred on October 30, 2014, when the NWS San Juan issued a press release describing the NWS-CariCOOS-Sea Grant collaboration on this issue. Development of a customized hazardous currents warning signs for several beaches was also successfully completed.The development of the Sea Grant /CariCOOS surf hazard prediction system for Puerto Rico/USVI has led to an unprecedented agreement with the National Weather Service Forecast Office in San Juan which in order to achieve its mission of saving lives, will start issuing the Surf Zone Forecast for beaches in Puerto Rico and U.S. Virgin Islands. Other stakeholders including the Surfrider Foundation are actively using wave height predictions from the operational model.

Partners: National Weather Service, Forecast Office, San Juan, PR;

Associated Project(s):
Development of the Puerto Rico Beach and Surfzone Currents Warning System (2012 - 2013)

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The Coast's Bailout: Coastal resource use, quality of life and resilience in Puerto Rico.

National Focus Areas: Sustainable Coastal Development

- Impact
- PO Review Complete

Recap: The quality of life and well being of a large proportion of SE PR coastal residents of all walks of life is inextricably linked to the use of -and access to- the coast and its resources. It also provides a methodological blueprint to engage mixed qualitative and quantitative methods to provide policy makers with critical information for fulfilling the true objective of public policy: to enhance people's total quality of life and well being. These methods can be applied in other locales on the coast of Puerto Rico and beyond.

Program Focus Areas: SUSTAINABLE COASTAL DEVELOPMENT

The relationships between the use of coastal resources (small-scale harvesting, processing, and exchange of coastal resources like commercial small-scale fishing, subsistence fishing, commercial and subsistence land crabbing, mangrove oyster and clam harvesting, and non-timber coastal forest resource uses such as picking coconuts) and the well-being and quality of life of people living along the coast of Southeastern Puerto Rico has not been taken into consideration by policy makers in the evaluation of alternative uses of coastal environments.

The contribution of the coast (productive coastal communities and the physical environment they depend on) to the quality of life and well being of the people living along the southeastern coast of Puerto Rico was scientifically documented and the information will be disseminated among policy makers coastal social science researchers, and others (most importantly local communities and community organizations themselves) with an interest in understanding human reliance on CRs and associated phenomena, to make better policy decisions.

Links between the coast and quality of life and well being are evident in practically all realms of SE PR residents' lives: in commercial and household economies, risk reduction and resilience strategies, food security, family and community relationships, social problem (poverty and crime) avoidance, life and job satisfaction, and aesthetic enjoyment. Many of these links (including those related to production and exchange of coastal products) are manifested outside of formally-reported economic activity: assessments of policy trade-offs that only take into account formally reported economic exchanges will undoubtedly underestimate most benefits of CR use and engagement and thus risk policy failure. Collaborative relationships and services enable coastal communities to challenge coastal development projects, which appear to threaten established livelihoods and community health. Plans for urban development have been stopped in areas where these plans threaten or destroy traditional coastal resources and the increased wellbeing they provide to local communities, such plans need to consider these influences. In one case, a local community's dependence on the natural resources from local wetlands and estuaries was used as part of a successful legal recourse, by community leaders, to challenge a large tourism/luxury residential complex at the Punta Arenas estuary, Salinas PR.

Partners: University of Rhode Island (URI);

Associated Project(s): None listed in the database

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Puerto Rico Sea Grant develops crucial component for marine education

National Focus Areas: Environmental Literacy and Workforce Development; Resilient Communities and Economies

- Impact
- Approved

Recap: Puerto Rico Sea Grant developed educational guides on the topics of mangroves, sea grass beds, and coral reefs.

Program Focus Areas: Education and Workforce Development ; Resilient Communities and Economies

RELEVANCE- Schoolteachers are in great need for resources to educate their students about topics relevant to marine and coastal ecosystems, its conservation and sustainable use. Any educational process has to start with the development of a curriculum that contributes to the advancement of the capacities of specialists, practitioners and decision makers in the design, management and implementation of the quality of curriculum making process.

RESPONSE-The curriculum is a crucial component of any education process and taking advantage of this opportunity Puerto Rico Sea Grant got involved in the design and development of three educational guides of essential coastal and marine habitats: mangroves, sea grass beds, and coral reefs. Each guide contains background information about the ecosystem, pre and post-tests, plans, educational activities and exercises, complementary and supplementary materials, pictures, illustrations, stories, and music, all aligned with the standards of the Department of Education of Puerto Rico.

RESULTS- Guides have been approved by the Department of Education and have been implemented in 30 schools, together with the hands on workshops to educate teachers about these three marine and coastal habitats and how to use the guides in their education efforts.

Partners: Puerto Rico Department of Education;

Associated Project(s):
Marine Education (2014 - 2017)

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Acoustic telemetry helps determine essential bonefish habitat and catch release survival for a recreational fishery around Culebra Island Puerto Rico

National Focus Areas: Healthy Coastal Ecosystems

- Accomplishment
- PO Review Complete

Recap: Acoustic telemetry used to track bonefish off the island of Culebra, Puerto Rico indicates that high survival rates can be expected from a catch and release sport fishery. This sport can provide important inputs to the local economy. Bonefish exhibit high reef flat site fidelity indicating that sustainable resource management needs to include tight controls on reef flat netting of fish and disturbances to reef flat habitat. The development of best management practices for bonefish sport fishery in the Caribbean was initiated with this research.

Program Focus Areas: HEALTHY COASTAL ECOSYSTEMS

Little is known about recreational capture and release of bonefish outside of the Bahamas. A study assessing sustainable recreational bonefish catch and release contributes to a greater understanding of this activity in the Caribbean and to tourism and coastal community resilience for Culebra PR. A small sister island east of Puerto, it relies heavily on tourism and recreation for the wellbeing of its local community.

An underwater bottom mounted array of acoustic telemetry receivers was setup with GPS position and covering diverse habitats around known bonefish fishing areas. A number of bonefish of varying size were rod and reel captured and tagged with a unique number by placing a small acoustic transmitter in the body cavity of each fish after making a small incision and closing with a surgical glue. The bottom mounted receivers were allowed to detect tagged fish for several months before divers retrieved digital recorders at each receiver, downloaded the data and replaced the recorders.

Results: Over four million detections were made during the study. Early detections made during the first days were used to evaluate recovery success after catch and release. Later detections demonstrate connectivity with other habitats. Bonefish tend to stay around the reef flats where they were caught and released. Little movement among flats was observed. Effective conservation and management will need to limit net fishing on reef flats. Bonefish on small reef flats will be susceptible to depletion and require a long time for re-colonization. They will also be highly susceptible to habitat disturbances. The development of best management practice for this sport fishery is highly recommended.

Partners: None listed in Database

Associated Project(s):
Movement Patterns of Bonefish (Albula spp.) Inhabiting Reef Flats in Culebra, Puerto Rico: From Ecological Connectivity to Sustainable Use of a Recreational Fishery (2012 - 2013)

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An interdisciplinary evaluation of the fishery for Cittarium pica

National Focus Areas: Healthy Coastal Ecosystems

- Accomplishment
- PO Review Complete

Recap: Currently, fishers are secretive about good collecting sites and target C. pica sporadically to supplement their income. Commercial C. pica fishers are knowledgeable about the fishery, fishing regulations, and generally concerned with the future of the fishery. Recreational/subsistence fishers, in contrast, are generally unaware of, and sometimes violate, regulations.

Program Focus Areas: HEALTHY COASTAL ECOSYSTEMS

Cittarium pica or burgao, is an important component of small scale fisheries throughout the Caribbean, harvested widely and intensively for sale and for personal consumption, but has received little attention from scientists. Its population status around the Caribbean and how they are affected by fishing is not well documented. A better understanding of its biology and its role in the lives of the many people that depend on it as a source of food and income is necessary for its appropriate management. Incorporating this knowledge into management actions may help establish regulations that are better supported by local communities.

An integrated assessment of the fishery for Cittarium pica in two culturally distinct Caribbean islands was conducted in order to evaluate alternate management actions for small-scale fisheries. The impact of fishing on whelks was assessed by examining changes in abundance over time and correlating these changes with levels of harvesting reported by fishers. Using an interdisciplinary approach, social and biological data were combined to evaluate alternate management actions (size-limits, catch limits, seasonal closures and reserves). A tag-recapture study allowed the researchers to assess the biological and social effectiveness of different management actions and strategies. Interviews to resource users to understand patterns of whelk harvesting and its role in sustaining the community and receptiveness to alternate management actions was also evaluated.

Results: C. pica populations subject to chronic harvesting have a much smaller fraction of adult-sized and legal-sized whelks. Recruitment occurs year round, so seasonal closures should not affect reproduction. Despite rapid growth rates, many populations are dominated by immature whelks, so size-limits are not having the effect of protecting reproductive adults.

Partners: None listed in Database

Associated Project(s):
An Interdisciplinary Evaluation of the Fishery for Cittarium pica (2012 - 2013)

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A Sedimentary Record of Marine Flooding Events from Coastal Salt Ponds, Southwest Puerto Rico

National Focus Areas: Healthy Coastal Ecosystems

- Accomplishment
- PO Review Complete

Recap: PR Sea Grant research demonstrates that major environmental changes are detectable using existing sampling and radiometric methods, while thin storm layers in younger sediment has not led to the originally anticipated results.

Program Focus Areas: HEALTHY COASTAL ECOSYSTEMS

Tropical cyclones and tsunami represent the preeminent coastal hazards in Puerto Rico. Both can generate devastating coastal marine flooding events that inundate low lying coastal areas with seawater causing widespread property damage and potentially loss of life. It is important to identify proxy records of past storms or tsunami activity in order to establish patterns in their occurrence, frequency and magnitude. This will provide important information of past events in the region and help in assessing the vulnerability of the area to hurricane or tsunami activity.

Sediment characteristics, radiometric dates were described for a number of cores taken from the southwest coast of Puerto Rico.

Results: The identification of frequent storm layers intercalated in hyper-saline muds has not been observed as originally anticipated. Instead, a major change from open marine type sediments to salt pond muds occurs at a depth of about 50cm in the recovered cores. Dates from woody material at this level range from 600-1300 before present. The major change in sediment type represents a rapid change in habitat with a number of possible explanations. Although some thin layers of carbonate sand are present in the upper levels of the cores they are young skeletal sand falling outside the precision of radiocarbon dating.

Partners: None listed in Database

Associated Project(s):
A SEDIMENTARY RECORD OF MARINE FLOODING EVENTS FROM COASTAL SALT PONDS, SOUTHWEST PUERTO RICO (2010 - 2012)

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Puerto Rico Sea Grant's Marine Outreach Program Fisheries Electronic Portal

National Focus Areas: Healthy Coastal Ecosystems

- Accomplishment
- PO Review Complete

Recap: The MOP-fisheries electronic portal is available for public use. More than 7,497 visitor "hits" from twenty four (24) different countries have been received at the electronic portal.

Program Focus Areas: Healthy Ecosystems and Habitats

Effective fisheries management begins with accurate scientific information about fish and fisheries. Marine users from public and private sectors have a need for direct support and advice on the need of maintaining sustainable fisheries practices, in order to guarantee the future of our domestic fisheries in a collaborative manner. Science information needs to be available as an outreach product within the Web, promoting the wise utilization of coastal natural assets while increasing public awareness of the need to protect our local resources.

An electronic "blog" site managed by MOP-fisheries was created and opened to the public access: http://prsgfisheriesoutreach.wordpress.com/. Relevant information related to fisheries and aquaculture outreach and investigations conducted by MOP has been summarized and posted for public information and forum discussions. A section in the portal includes an open archive for SEAMAP-C data downloading, and access to program publications. Other sections include applied fisheries studies and mariculture outreach projects.

The web-portal provides detailed information of the work conducted by Puerto Rico Sea Grant, access to fisheries studies, their results and reports, including fishery independent studies, and relevant marine advisories. The site also promotes the aquaculture/mariculture development in Puerto Rico. All educational materials are oriented to increase the public's awareness on maintaining a sustainable fishery and to ensure responsible and productive use of the resources.

Partners: Caribbean Fishery Management Council (CFMC); Federación de Pescadores de Puerto Rico y Defensores Del Mar, Inc. (FEPDEMAR); Puerto Rico Department of Agriculture; Puerto Rico Department of Natural and Environmental Resources;

Associated Project(s):
Marine Outreach Program (2014 - 2017)

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Commercial and Recreational Fish Users Education

National Focus Areas: Healthy Coastal Ecosystems

- Accomplishment
- PO Review Complete

Recap: Puerto Rico Sea Grant has collaborated in the establishment of FEPDEMAR (Federación de Pescadores de P.R. y Defensores Del Mar, Inc.) as the main organization representing fishery workers of Puerto Rico, by relying on their traditional knowledge, while asserting their social standing, their political status, and preserving their role in the natural environment.

Program Focus Areas: Healthy Ecosystems and Habitats

Puerto Rico's coastal and marine resources are under increasing anthropogenic and industrial pressure. The constant decline of these resources is due to poorly coordinated and unplanned exploitation. Renewable resources like fish stocks can be exploited forever, provided that their capability for self-renewal is not destroyed. This requires resource management, where somebody has the right and the means to control access to it. Traditionally, fish stocks have been common property but it is important to ensure effective management of resources to achieve ecological and economic sustainability. Consequently, the challenge is in developing educated and responsible fishers that respect fishing laws and agreements and a cadre of well trained and well equipped practitioners and professionals in sustainable fisheries management.

Puerto Rico Sea Grant serves as a long- term facilitator and non-advocate advisor for a diverse group of local fishers of Puerto Rico representing commercial, recreational, skin-diver and kayak recreational sport- fishers, and wild ornamental fishers.

Advisory services have been oriented to help commercial fishers to set priorities and develop long-range plans that include alternatives for product diversification. The specialized advisories from the Program's Marine Outreach Program have been extended to include recommendations to resource managers, particularly to the PR-Department of Natural and Environmental Resources, and the PR Department of Agriculture, on matters related to marine resources regulations, government incentive programs, and other critical fishers' needs. These include technical support to maintain commercial and recreational fishers informed about fishing regulations, biological aspects of regulated species, and issues dealing with environmental conservation.

Partners: Caribbean Fishery Management Council (CFMC); Federación de Pescadores de Puerto Rico y Defensores Del Mar, Inc. (FEPDEMAR); National Marine Fisheries Service (US DOC, NOAA, NMFS); Puerto Rico Department of Agriculture; Puerto Rico Department of Natural and Environmental Resources;

Associated Project(s):
Marine Outreach Program (2014 - 2017)

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Coordination of Caribbean NMFS Cooperative SEAMAP Program

National Focus Areas: Healthy Coastal Ecosystems

- Accomplishment
- PO Review Complete

Recap: The fisheries independent data obtained from SEAMAP-C is being used by students, scientists, and state and federal managers to describe population trends; to explain responses to environmental factors; to estimate stock abundance; and to track reproduction, recruitment, and yields. This information is essential for establishing regulatory programs for sustainable fisheries in PR and the USVI.

PROGRAM FOCUS AREAS: Healthy Ecosystems and Habitats

The SEAMAP-C program, contribute to the development of fisheries independent baseline data, standards, and indicators to support ecosystem-based approaches to land use, water, fisheries, and other resource management. The information obtained, is shared with a wide variety of constituencies in PR/USVI and the Caribbean.

This program established a common forum plan and a coordinated evaluation methodology for fishery data collection, which is essential for management activities. Collected information include: bottom and marine habitat mapping, independent data from reef fish, conch (Lobatus gigas) distribution, lobster (Panulirus argus) pueruli settlement and juvenile abundance, and the West Indian top shell (Cittarium pica) recruitment and abundance.

MOP fisheries liaison activities include effective and efficient data collection during surveys, management and dissemination of fishery-independent data. As an example, CFMC and PR-DNER Management Plans for conch and reef fish have been based on population data obtained by SEAMAP-C. MOP supervision, directed by the coordinator, has improved precision and accuracy of the long-term reef-fish data collected through quality control evaluation.

PARTNERS: None listed in Database

ASSOCIATED PROJECT(S): None listed in the database

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Ordinance 16 Series 2014-2015 to ban plastic bags in the municipality of Cabo Rojo.

NATIONAL FOCUS AREAS: Environmental Literacy and Workforce Development; Healthy Coastal Ecosystems; Resilient Communities and Economies

- Accomplishment
- PO Review Complete

RECAP: Puerto Rico Sea Grant advised the municipality of Cabo Rojo in its efforts to adopt and implement a local ordinance to ban the use of plastic disposable bags in over 3,000 local businesses and to educate its population regarding the economic and environmental benefits offered by the permanent switch to environmentally friendly and cost effective reusable bags.

PROGRAM FOCUS AREAS: Education and Workforce Development ; Healthy Ecosystems and Habitats ; Resilient Communities and Economies

The EPA states that between 500 billion and a trillion plastic disposable bags are consumed worldwide each year. Even though these bags are used for an average of 12 minutes, they remain in our landfills, oceans, parks and beaches for many of years, are costly, environmentally damaging, and completely unnecessary.

In an effort to protect Cabo Rojo's coastal and marine environment Puerto Rico Sea Grant advised the municipality to approve legislation to ban disposable bags, and through a combination of legislation and education make a permanent switch to environmentally friendly and cost effective reusable bags.

Results: The municipality of Cabo Rojo approved disposable bag legislation and is working with residents and businesses to reduce disposable bag use and switch permanently to reusable bags as an alternative.

PARTNERS: None listed in Database

ASSOCIATED PROJECT(S):
CLIMATE EXTENSION (2014 - 2017)

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Protection of Natural Valuable Ecosystems by Community and Schoolchildren

NATIONAL FOCUS AREAS: Healthy Coastal Ecosystems

- Accomplishment
- PO Review Complete

RECAP: UPRSGP supported schools staff in the preparation of an Annual Environmental Laboratory Plan integrating conservation strategies, natural laboratory experiences, watershed knowledge and enjoyment of the natural walking trails as recreational and educational areas for the community and the students through the initiative "Forest-School". This outreach effort has been reinforced by sharing information through the www.naturalezasintoxicos.wordpress.com blog.

PROGRAM FOCUS AREAS: Healthy Ecosystems and Habitats

The environmental community project "Estampas Agroecoturísticas de Puerto Rico" (EAET), located in the Municipality of Mayagüez, inside the Río Guanajibo Watershed, is an effort to preserve and protect the last community urban forest (70 acres) of the city.

UPRSGP promoted the establishment of the First Community Aquaculture Project in EAET. More than one hundred (100) citizens visited the project and learned about aquaculture techniques and the feasibility of this project-type for assuring food security in the community, while an economic input was obtained. One kilometer (1 km) of natural walking trails were created in the forest, and more than 100 visitors walked along the trails and learned about flora and wildlife. This educational and recreational activity added an economic component to the project. A legislative bill (P. de la C. 1701) and a Community Proposal were prepared to advance forest land acquisition by the Municipality of Mayaguez.

Throughout the advice of UPRSGP, an environmental proposal for the establishment of a scientific station inside the urban community forest was prepared, submitted and granted by Ford Foundation. The NGO received $3,900 to create a research facility in the "Forest-School" initiative to promote scientific education and ecological activities inside the community forest.

Partners: Proyecto Comunitario Agro Eco Turistico del Barrio Rio Hondo;

Associated Project(s):
Marine Outreach Program (2014 - 2017)

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Community in Harmony with the Environment

National Focus Areas: Healthy Coastal Ecosystems

- Accomplishment
- PO Review Complete

Recap: UPRSGP is advising three (3) new NGO's (CQA, ADCM and CTH) in their environmental projects helping the volunteers to potentiate their skills, abilities, leadership and teamwork. The new alliances increased the number of stakeholders (10 citizens) that are promoting sustainable communities development in Puerto Rico. This effort was enhanced by sharing information through the community blog at www.bibliotecalegalambiental.wordpress.com.

Program Focus Areas: Healthy Ecosystems and Habitats

An integrated ecological management plan with natural resources protection are key elements for the future economic development of the island. The lack of well-planned activities in our land and coastal territories requires a strong educational campaign towards sustainability and revision of the actual laws, regulations and public policies.

UPRSGP, the NGO MSA and Dewey University organized the "Great Parade of the Nature Coastal Reserve Caño Boquilla" to alert the community about the illegal garbage and biomedical wastes disposal in the Reserve and the Río Grande de Añasco Watershed. More than 350 citizens learned about estuaries, exotic animals, mangroves and environmental protection, resulting in their commitment to minimize solid wastes disposal in the reserve.

Ten (10) UPRSGP community volunteers organized a schoolchildren drawing contest promoting the importance of the coastal nature reserves. Two-hundred (200) students participated in the contest and learned about nature reserves, marine turtles, mangroves, wetlands, marine birds and estuaries. Five (5) UPRSGP community volunteers participated in the 2014 Manatee's Week (surveying manatee knowledge and sightings in the Sabanetas-Maní Coast) and in the Annual Birds Census, identifying resident and migratory birds that arrives to La Boquilla Nature Reserve, resulting in the international publication of these data.

Partners: Comite Tres Hermanos de Añasco; Comunidad Quebrada del Agua de Cabo Rojo; Dewey University; Mayaguezanos Por la Salud y el Ambiente;

Associated Project(s):
Marine Outreach Program (2014 - 2017)

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Coastal Nature Reserve: "Caño Madre Vieja"

National Focus Areas: Healthy Coastal Ecosystems

- Accomplishment
- PO Review Complete

Recap: Puerto Rico Sea Grant continued outreach efforts for the CMV designation as a Coastal Nature Reserve and the implementation of the best management practices in the CMV ecosystem through publications posted in the blog: "Reserva Natural Caño Madre Vieja", www.reservanaturalcanomadrevieja.wordpress.com.

Program Focus Areas: Healthy Ecosystems and Habitats

The "Caño Madre Vieja" (CMV) is part of a 66 acres of an estuary-wetland-coastal zone in the Municipality of Aguada, composed primarily of mangrove, freshwater wetlands and a coastal barrier zone designated by the federal government. The area is habitat for several estuarine fishes and crustaceans, and also serves as nesting site for resident and migratory birds. It also provides coastal protection, flood mitigation, and pollutant filtration and erosion control for a small part of the north-west coast of Puerto Rico.

UPRSGP and the NGO CAPCA organized working group meetings, field trips and talks about the importance of the CMV designation as a nature coastal reserve, their connection with the Río Culebrinas Watershed and recreational activities that could be designed in the reserve to promote local government and citizen's involvement in knowing the ecosystem and motivating its protection and conservation.

As a result of these outreach efforts, the Senate of Puerto Rico submitted the bill, P. del S. 606, for the designation of the CMV as the First Coastal Nature Reserve in the Municipality of Aguada. During the legislative process UPRSGP advised and provided scientific information about the ecosystem. The principal environmental agencies of Puerto Rico supported the reserve designation and the Senate is coordinating a site visit to the CMV during this year.

Partners: None listed in Database

Associated Project(s):
Marine Outreach Program (2014 - 2017)

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Climate Education for Virgin Islands High School Students

National Focus Areas: Healthy Coastal Ecosystems; Resilient Communities and Economies

- Accomplishment
- PO Review Complete

Recap: Puerto Rico Sea Grant's Virgin Islands Marine Advisory Service (VIMAS) has started to provide high school students with the necessary information to understand global climate change and how they can work to mitigate it.

Program Focus Areas: Healthy Ecosystems and Habitats ; Resilient Communities and Economies

Island communities are particularly vulnerable to the impacts of climate change. Small islands like St Croix and St. Thomas have a major portion of its population located in coastal areas threatened by increased sea level rise. The Virgin Islands (VI) have already lost a significant portion of their coral reefs through the direct and indirect impacts of increased sea water temperatures over the last decade. Impacts from sea level rise, increasing sea water temperatures and increases in the intensity of hurricanes as well as other effects of climate change will continue and intensify in coming years and will have major repercussions in the Virgin Islands. Despite its vulnerability, the local population has little knowledge or understanding of climate change science. Among local students, the lack of knowledge seems particularly apparent in the public schools where climate change is not a part of the curriculum. In addition, few if any outreach programs exist on climate change in the VI. This project provides climate change education to high school students so that they are better equipped to adapt to the changing climate and its local impacts as they continue their education and enter the workforce. Increased awareness of the problem will assist with better resource management and planning and better mitigation of climate change impacts, and the reduction of individual carbon footprints through changes in behaviour. VIMAS provided climate change education to high school students by providing six climate change presentations to three environmental science classes on St. Croix. VIMAS did a presentation to 30 teachers as part of the Department of Education's annual professional development day. In addition, planning was started for a series of climate change presentations starting in Feb. 2015. The St. Croix VIMAS Advisor became the first Certified Climate Steward for the VI.

Partners: University of Virgin Islands;

Associated Project(s):
Virgin Islands Marine Advisory Service (2014 - 2017)

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Puerto Rico Sea Grant promotes fishing and consumption of lionfish

National Focus Areas: Environmental Literacy and Workforce Development; Healthy Coastal Ecosystems; Resilient Communities and Economies

- Accomplishment
- PO Review Complete

Recap: Through Puerto Rico Sea Grant efforts, people have become aware of the lionfish as an invasive species, how it is affecting our fisheries, how to control its population and economic opportunities.

Program Focus Areas: Education and Workforce Development ; Healthy Ecosystems and Habitats ; Resilient Communities and Economies

Lionfish are non-selective feeders and voracious predators that virtually have no natural enemies in the Caribbean. These invasive species are out-competing native predators for their food sources, as well as reducing fish populations through direct predation. Lionfishes are well

established in Puerto Rico and occupy an extensive geographic range, surviving in different habitats and depths.

For the period reported, Puerto Rico Sea Grant participated in over 15 chats, workshops, exhibitions, fairs, and visits to restaurant and fishing villages in which PRSG oriented fishers and the general public in topics related to lionfish and how to control its population through consumption. Our program has been a regular in radio programs promoting the consumption of lionfish.

Over 2,500 persons learned about the lionfish consumption efforts, how to handle it, and learned that it is edible and not poisonous when handled correctly. Information regarding the different ways to catch and consume the lionfish was also disseminated. Also, we have been developing another educational effort with 6 new restaurants that have been serving lionfish, and new restaurants are incorporating lionfish as a regular fixture in their menus. Also, more fishermen are seeing lionfish as a way of improving their incomes when their fisheries are in closed seasons.

Partners: None listed in Database

Associated Project(s):
Marine Outreach Program (2014 - 2017)

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Reef Responsible - A Market driven approach to a sustainable commercial fishing industry in the VI.

National Focus Areas: Safe and Sustainable Seafood Supply

- Accomplishment
- PO Review Complete

Recap: Puerto Rico Sea Grant's Virgin Islands Marine Advisory Service (VIMAS) has been working with local restaurants to certify new and update original restaurants in the Reef Responsible program.

Program Focus Areas: SAFE AND SUSTAINABLE SEAFOOD SUPPLY

The demand for seafood is increasing yet many populations of fish are being overfished, especially around the island of St. Croix. This project promotes the purchasing and consuming of fish caught or farmed using environmentally friendly practices. It educates restaurants on purchasing fish that are legally caught using sustainable methods. VIMAS has joined with staff from local agencies and organizations to develop an education and outreach program that promotes a sustainable fishing industry. VIMAS has been working with partners to create the Reef Responsible program and supporting educational materials. 3 workshops were held and 15 restaurants were certified as Reef Responsible. In addition, an exhibit on the program was done at "The Taste of St. Croix", a local annual event which attracts hundreds of St. Croix residents.

Partners: The Nature Conservancy; University of Virgin Islands;

Associated Project(s):
Virgin Islands Marine Advisory Service (2014 - 2017)

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Puerto Rico Sea Grant advances ocean literacy through the Sandwatch Project

National Focus Areas: Environmental Literacy and Workforce Development; Resilient Communities and Economies

- Accomplishment
- PO Review Complete

Recap: Puerto Rico Sea Grant, through the Sandwatch Project, increases ocean literacy and develops scientific and data gathering skills among leaders and volunteers and the use of the scientific method.

Program Focus Areas: Education and Workforce Development ; Resilient Communities and Economies

RELEVANCE- Puerto Rico is a need for environmental education in schools and communities as well as opportunities to learn about marine and coastal resources through the development of scientific and data gathering activities. Coastal communities and young adults need to be informed about the fragility of marine and coastal resources and the importance of conservation and sustainable use of those resources.

RESPONSE- On 2014, Puerto Rico Sea Grant conducted a workshop to prepare leaders and volunteers to do the different scientific activities included in the Sandwatch project, a collaboration with UNESCO.

RESULTS- Twenty groups of volunteers have enrolled in Sandwatch. Leaders and groups learned to take measurements of the maritime zone and water quality. Most of them are mastering the different activities and submitting data. While they are taking data, they are applying scientific and mathematical knowledge, writing skills, technical skills and creative abilities. Data is posted in the blog. Volunteers dedicated 5,040 hours to the project.

Partners: UNESCO;

Associated Project(s):
Communications and Publications (2014 - 2017)

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Center for the Education on Environmental Climate Change (CENECCA)

National Focus Areas: Resilient Communities and Economies

- Accomplishment
- PO Review Complete

Recap: Puerto Rico Sea Grant in collaboration with the Autonomous Municipality of Cabo Rojo and the University of Puerto Rico, established the Center for Education on Environmental Climate Change (CENECCA) and is advising coastal communities by addressing the needs for scientific information related to climate change and adaptation, coastal hazards and vulnerability, and the development of local strategies and tools to tend these needs.

Program Focus Areas: Resilient Communities and Economies

Puerto Rico's coastal municipalities and communities are in great need of a process to plan and adapt for the impacts of climate change in order to minimize potentially adverse social and environmental impacts.

Sea Grant provides expertise for the development of mitigation strategies regarding coastal hazards, vulnerabilities and climate change impacts in the coastal communities of Puerto Rico.

Results: An MOU between Puerto Rico Sea Grant , the University of Puerto Rico and the Autonomous Municipality of Cabo Rojo was signed to set up the facilities of the CENECCA at the historical facilities of Los Morrillos Lighthouse and begun to develop efforts for steady, responsible insular action to slow and address the effects of climate change among the island of Puerto Rico, US Virgin Islands and the Caribbean.

Partners: None listed in Database

Associated Project(s):
Climate Extension (2014 - 2017)

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Puerto Rico Sea Grant and CENECCA develop an initiative to address water management and drought at the municipality of Cabo Rojo farmlands through climate change adaptation strategies

National Focus Areas: Resilient Communities and Economies

- Accomplishment
- PO Review Complete

Recap: Puerto Rico Sea Grant coordinated a roundtable at the municipality of Cabo Rojo to assess the impact of the severe drought season that is affecting farmers, ranchers, small businesses, and communities, to tend their needs by establishing a collaboration with local and federal agencies to facilitate a process to identify financing opportunities and benefits and develop a strategies for water management and conservation practices.

Program Focus Areas: Resilient Communities and Economies

Communities across the Western coast of Puerto Rico are struggling with a severe to exceptional worst drought. Drought threatens multiple sectors of the economy and leads to increased risks to communities including food security, wildfires, job losses, particularly in the agricultural sector.

CENECCA coordinated a roundtable with farmers and representatives from the Academia, NRCS and Puerto Rico Department of Agriculture to support the farmers, ranchers, small businesses, and communities facing drought severe impacts by identifying the tools and actions needed to enhance community drought planning and water resource management and by introducing them to federal support to state and local efforts.

Specific needs from each farmer were identified at the roundtable and several alternatives and adaptation strategies were presented from representatives of the local and federal agencies. A fieldtrip to evaluate crops and determine the water requirements for optimal operations were conducted. NRCS and the Department of Agriculture will identify financing opportunities and benefits to develop a strategies and implementation of conservation practices to tend the needs of the farmers.

Partners: US Natural Resources Conservation Service (USDA, NRCS); Puerto Rico Department of Agriculture;

Associated Project(s):
Climate Extension (2014 - 2017)

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Storm Surge Modeling Maps: Climate change education and adaptation for coastal communities

National Focus Areas: Environmental Literacy and Workforce Development; Resilient Communities and Economies

- Accomplishment
- PO Review Complete

Recap: As a collaborative effort with the Caribbean Integrated Coastal and Ocean Observing System (CarICOOS), the United States Weather Service (USWS), and NOAAs' Puerto Rico Coastal Zone Management Program (PRCZM), Puerto Rico Sea Grant through its CENECCA project coordinated capacity building activities and educational materials to increase decision makers and coastal communities understanding of coastal hazards and vulnerabilities employing the new storm surge models and products.

Program Focus Areas: Education and Workforce Development ; Resilient Communities and Economies

Storm surge is an abnormal rise in water level, over and above the regular astronomical tide, caused by forces generated from a severe storm's wind, waves, and low atmospheric pressure. FEMA's Flood Insurance Rate Maps underestimate storm surge coastal flooding for intense hurricanes and make it extremely difficult for emergency managers to know what to expect. The Caribbean Integrated Coastal and Ocean Observing System (CarICOOS), and NOAAs' Puerto Rico Coastal Zone Management Program (PRCZM), developed numerical computations of storm surge for all hurricane intensities and various statistically probable tracks and merged them to estimate Maximum of Maximums Storm Surge elevations and developed the new Storm Surge Maps for Puerto Rico and the US Virgin Islands.

PR Sea Grant and CENECCA in collaboration with CariCOOS and the USWS developed a capacity building effort to familiarize emergency officials, decision makers and resource managers from the 44 coastal municipalities of Puerto Rico regarding the use of Storm Surge Maps and Models for estimation of the three storm surge drivers: wind, pressure, and wave setups.

Results: Over 80 officials from PREMA representing the 44 coastal municipalities of Puerto Rico were trained in the use of the Storm Surge Maps and Models. They also improved their management skills for better decision making process based on the hurricane category and direction.

Partners: National Weather Service;

Associated Project(s):
Climate Extension (2014 - 2017)

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First Mariculture Phase Title: "Sea Grant Aquaculture Extension 2010: Outreach Mariculture Project as a Fisheries Alternative for Puerto Rico; Growout of Yellowtail and Lane Snappers (Ocyurus chrysurus, Lutjanus synagris) in Recirculation Systems Managed by a Fishery Association"

National Focus Areas: Hazard Resilient Coastal Communities

- Accomplishment
- PO Review Complete

Recap: More than 600 persons showed interest in the project while visiting the fishing villa or during "Open- house" activities. Twelve (12) commercial fishers received various levels of training, related to distinct phases of the growout project, while more than 17 students from the Corozo's community received direct specialized training on marine fish growout techniques.

Program Focus Areas: HAZARD RESILIENCE IN COASTAL COMMUNITIES

Evidence strongly suggests that a combination of heavy exploitation of spawning and over-wintering aggregations, poor management and overfishing pressure were major factors in stock declines, with contributions from pollution, habitat degradation and marine ecosystem shift.

A closed recirculation marine aquaculture facility project was constructed at the Corozo Association of United Fishers (CAUF) Fishery Villa in Combate, Cabo Rojo, as part of an overall plan to promote the culture of marine fish to ameliorate fishing pressure on fragile tropical marine ecosystems. The project primarily served as a demonstration project for hands-on activities and workshops for Puerto Rico fishers. The facility has been continually fine- tuning to optimize the culture techniques, to train fishers at the CAUF villa, and to offer "Open House" demonstrations oriented toward the general public, students, and especially to fishers from other fishery villas.

Results: The project has been successful in achieving technological outreach and education on water quality management, harvesting of wild fish, control of nutritional aspects while adapting wild caught fish to artificial diets, system engineering and maintenance, and developing clear-cut, relatively simple, growout aquaculture management procedures for fishers to utilize in the future.

PARTNERS: US Fish and Wildlife Service (US DOI, FWS); Caborrojeños Pro-Salud y Ambiente, Inc; Corozo Association of United Fishers (CAUF); Puerto Rico Department of Agriculture; Puerto Rico Tourism Company;

ASSOCIATED PROJECT(S): None listed in the database

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Landscape Transformations and Vulnerability to Coastal Hazards in Puerto Rico: Understanding it better

NATIONAL FOCUS AREAS: Hazard Resilient Coastal Communities

- Accomplishment
- PO Review Complete

RECAP: Puerto Rico Sea Grant identified the relationship between landscape transformation, urban/built-up expansion, and exposure to coastal hazards and quantified resident's knowledge and understanding about landscape transformation and exposure to coastal hazards. In terms of practical strategies, the results from this study indicate that there is a need to: 1) increase and improve knowledge and understanding of community residents about the relationships between landscape transformations, past land cover and current urban/built-up occurrence and hazard exposure, particularly those associated to geologically-induced hazards; 2) clarify the difference between processes and potential outcomes of climate change (regarding, for instance, sea level rise, hurricanes, storms) and processes and potential outcomes of geologically-induced hazards such as earthquake (and associated liquefaction effects) and tsunami; 3) provide information about different coastal hazards, particularly those less known and understood (earthquake, tsunami); 4) work with exposed community members to discuss and identify strategies that can increase their preparedness and capacity to face the occurrence of different coastal hazards; 5) discuss the feasibility or limitations to implement identified management strategies; 6) take into account everyday life problems and concerns community residents experience and mainstream hazard management within the context of such problems.

PROGRAM FOCUS AREAS: HAZARD RESILIENCE IN COASTAL COMMUNITIES

Puerto Rico's coastal areas have been subject to high development pressures, including rapid urban/built-up expansion. Population densities in coastal areas are high and settlements have oftentimes been established on areas exposed to different coastal hazards (e.g., flood zones, tsunami) or in conditions that can amplify hazard effects in the event of disaster occurrence (e.g., on unconsolidated soils that are subject to liquefaction effects).

Puerto Rico Sea Grant researchers integrated aerial photograph interpretation and Geographic Information Systems techniques to document landscape change-with special interest in urban/built-up expansion-in two coastal municipalities of Puerto Rico between 1930 and 2010, and to analyze the distribution of urban/built-up areas in relation to areas that are exposed to coastal hazards occurrence, specifically floods, tsunamis, and liquefaction effects. Semi-structured interviews and questionnaires were conducted with community members and government officials to explore their understanding about landscape transformation, urban expansion and coastal hazards exposure and associated vulnerabilities

RESULTS: Analysis of aerial photograph indicated that the study area's landscape changed from one being mostly composed of pasture and agriculture (mostly sugar cane) in 1930 to one dominated by urban and built-up areas in 2010. There was a six-fold increase of urban/built-up areas during the 80-year period of study. In terms of hazard exposure, approximately 56 % of the study area is classified as prone to floods and 40% to tsunami, whereas about 60% of the area has geologic conditions with medium-to-high potential to liquefaction effects. Resident's perception to costal hazards and associated risks is higher to those risks associated to earthquake and tsunamis, and lower to hurricane and floods. Moreover, residents stated that they do not feel prepared to face the occurrence of an earthquake or a tsunami, would not know what to do, other than pray or stay still (in the case of earthquake) or move to a higher place if possible (in the case of tsunami). These elements also influence higher risk perception, increases vulnerability and limits the capacity to prepare better to manage such hazards.

PARTNERS: Rutgers University;

ASSOCIATED PROJECT(S):
UNDERSTANDING IT BETTER: LANDSCAPE TRANSFORMATION AND VULNERABILITY TO COASTAL HAZARDS IN PUERTO RICO (2012)

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Promoting Aquatic Safety in Puerto Rico through the implementation of a Lifeguard Pilot Project in Condado Beach, San Juan, Puerto Rico.

NATIONAL FOCUS AREAS: Hazard Resilient Coastal Communities

- Accomplishment
- PO Review Complete

RECAP: The first public-private partnership (PPP) preventive lifeguard pilot project in Puerto Rico, is expected to be instituted at the Condado beach by the summer of 2016. This project will set an example regarding how the implementation of aquatic safety strategies can not only save lives, but also contribute to tourism and recreation industries, and as a result improve the local economy.

PROGRAM FOCUS AREAS: HAZARD RESILIENCE IN COASTAL COMMUNITIES

During the past 14 years, 420 persons have drowned at Puerto Rican beaches. In other words every 12 days a person drowns at the beaches of Puerto Rico. Puerto Rico Sea Grant has been the leader for the last 20 years developing different efforts to reduce the drowning incidents through collaborations with the United States Lifesaving Association (USLA), NOAAs' Coastal Zone Management Program, the tourism industry private sector and the insular government by gathering drowning statistics, coordinating lifeguard workshops and training, promoting beach safety (rip currents information) and highlighting the need to establish lifeguard services at the beaches of Puerto Rico.

Under the leadership of Puerto Rico Sea Grant and in collaboration with the United States Lifesaving Association (USLA) and the Puerto Rico State Agency for the Management of Emergencies and Administration of Disasters (AMEAD), a proposal to implement a pilot lifeguard program at Condado beach in San Juan was presented to the International Hospitality Enterprises (IHE) managers of two hotels at this beach. The concept proposed is consistent with that of successful lifeguard agencies in the US operating in accordance with USLA national standards, which is actually a continuum of prevention, rather than what might typically be viewed as lifeguards waiting to make rescues. This includes education of hotel guests and beach visitors upon arrival (e.g. in room safe beach use brochures and appropriate signage at the beach), management of beach visitors upon arrival through individual contact and encouragement to swim in the safer areas, appropriate marking of "no go" areas, personal contact with people nearing unsafe areas, and of course rescue of those in distress. This project aims to demonstrate that with the establishment of a pilot open water lifeguard service, certified under USLA standards, drowning incidents will be erradicated from this beach where four drowning incidents occur every year. The primary goal of this effort is prevention of drowning incidents.

Results: Thanks to this effort, the IHE made a commitment to match the funding provided by the government of Puerto Rico to provide lifeguard services to beach users at the Condado beach.

Partners: None listed in Database

Associated Project(s):
Marine Advisory Service (2012 - 2013)

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Moving forward from vulnerability to adaptation

National Focus Areas: Hazard Resilient Coastal Communities

- Accomplishment
- PO Review Complete

Recap: Puerto Rico Sea Grant sponsored research provides valuable and life-saving information, pertaining to hazards in the surf zone, to beachfront communities, including the general public and providers of beachfront safety services, such as lifeguards and emergency managers.

Program Focus Areas: HAZARD RESILIENCE IN COASTAL COMMUNITIES

More than 70% of Puerto Rico's population lacks the needed water skills to survive on rough waters or simply do not know how to swim. Besides, lifeguard services are non-existent in the majority of Puerto Rico's beaches. In addition, Puerto Rico has a strong seasonal cycle in wave heights and marine conditions that can change very quickly as intense swell events arrive, creating intense surf-zone currents.

In an effort to save lives and educate the public as well as local authorities about the possibility of hazardous surfzone conditions, Puerto Rico Sea Grant invested in a project that led to the development of two online tools to reduce drowning incidents at the beaches of Puerto Rico: the CariCOOS Nearshore Wave Model (www.caricoos.org/drupal/swan_multigrid) and CariCOOS-SeaGrant Nearshore Breaker Model (www.caricoos.org/drupal/nearshore_breaker).

An interesting partnership was developed among (CariCOOS) and the National Weather Service Forecast Office in San Juan, which in order to achieve its mission of saving lives, issues the Surf Zone Forecast for 85 beaches in Puerto Rico and U.S. Virgin Islands based on information provided by CariCOOS under a Puerto Rico Sea Grant sponsored research. The SRF product includes the following information for selected beaches in Puerto Rico and U.S. Virgin Islands: location, breaking wave height, rip current risk and forecast of wind, weather and temperature. Rip current risk in the SRF will use the following 3-tiered text qualifiers: low risk, moderate risk and high risk.

Partners: National Weather Service, Forecast Office, San Juan, PR;

Associated Project(s):
Marine Advisory Service (2012 - 2013)

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Educational challenges of a no take marine protected area

National Focus Areas: Environmental Literacy and Workforce Development

- Accomplishment

- PO Review Complete

Recap: In collaboration with Amigos de Tres Palmas and DNER, Puerto Rico Sea Grant is developing an effort to protect the Tres Palmas Marine Reserve, home of the endangered Acropora palmata corals and the biggest surf break in the Caribbean and a big contributor to the economy of the municipality of Rincón.

Program Focus Areas: Education and Workforce Development

Healthy Elkhorn coral (Acropora palmata) can help protect the coastline from erosion and provide important nearshore habitat for many species but has decreased up to 90% throughout the Caribbean. The Tres Palmas Marine Reserve (TPMR) is home to one of the thickest stands of the endangered Elkhorn coral (Acropora palmata) in Puerto Rico and the biggest surf break in the Caribbean (up to 40 feet waves). This marine reserve is under constant threat by coastal development activities including erosion, sedimentation, fishing activities, contamination, insufficient funding and lack of management.

With the collaboration of the DNER, Puerto Rico Sea Grant and Amigos de Tres Palmas developed an educational effort to compensate the lack of enforcement and management at the TPMR. This educational effort included the installation of education and interpretation signs and the training of volunteers to collaborate with the education of users of the resource. Educational materials were developed including a poster of the TPMR and the benefits of having this no-take marine reserve, a fish identification cards bracelet with 44 of the most common species that can be observed at the reserve and a three minute video about the importance of conserving the reserve and the recreational and economic opportunities offered by this natural attraction.

Local dive shops, hotels and surf shops are collaborating in the educational effort and in the marketing of the products (posters, fish cards, video). The three minute video produced by Puerto Rico Sea Grant is currently exhibited at dive shops, souvenir stores, hotels and the US Postal Service Office in solidarity with our educational efforts and in recognition of the TPMR ecological and economical opportunities that it represents to the municipality of Rincón. More than 120 students have benefited from the field activities and talks coordinated including the first snorkeling experience for a group of Down Syndrome kids from Rincón. Puerto Rico Sea Grant advice to Amigos de Tres Palmas, was instrumental for their designation by the Internal Revenue Service as a non-profit organization under Section 501 c3 and in the development of a co-management agreement with the DNER.

Partners: Puerto Rico Department of Natural and Environmental Resources;

Associated Project(s): None listed in the database

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Marine Debris Education and Community Engagement

National Focus Areas: Environmental Literacy and Workforce Development

- Accomplishment
- PO Review Complete

Recap: Puerto Rico Sea Grant's Virgin Islands Marine Advisory Service (VIMAS) increased awareness of marine debris and engaged over 1100 people in reducing marine debris in the Virgin Islands.

Program Focus Areas: Education and Workforce Development

Marine debris is a problem throughout the VI as well as in many Caribbean islands. It is a deterrent to tourism, a human health hazard, degrades marine habitats and can impact marine plants and animals. Past studies have shown that about 80% of VI marine debris is from recreational use of the beaches and surrounding areas. If we are to mitigate this problem we must increase community awareness and engage the community in actions that will result in behaviour change. Coastweeks is an annual event in the VI (promoted internationally by The Ocean Conservancy) where hundreds of volunteers are engaged in coastal and underwater clean-ups. This event is coordinated locally by VIMAS agents who make classroom presentations and coordinate beach and underwater clean-ups. Participating in coastal clean-ups allow participants to engage in an activity which helps our marine environment and develops a sense of stewardship, promoting positive behaviour change.VIMAS increased awareness about the problem of marine debris and engaged the community in activities to address the issue. VIMAS coordinated the annual coastal cleanup event in Sept. and Oct. In addition classroom presentations were made to local schools on the issue. During this reporting period VIMAS coordinated 28 coastal clean-ups engaging over 1100 volunteers. All data was transmitted to TOC. VIMAS made classroom presentations to 9 classes on marine debris.

Partners: University of Virgin Islands;

Associated Project(s):
Virgin Islands Marine Advisory Service (2014 - 2017)

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Puerto Rico Sea Grant collaborates with the Interdisciplinary Center for Coastal Studies

National Focus Areas: Environmental Literacy and Workforce Development

- Accomplishment
- PO Review Complete

RECAP: Puerto Rico Sea Grant collaborates with the Interdisciplinary Center for Coastal Studies in the development of lectures and workshops to augment research interest among university students and develop their communication and literacy skills.

PROGRAM FOCUS AREAS: Education and Workforce Development

Augmenting research interest among university students and their communication and literacy skills is a high priority for the UPR, Mayagüez Campus.

For the academic year 2014-2015, the Interdisciplinary Center for Costal Studies started a series of lectures and workshops devoted to: share research findings on topics related to the coast, increase ocean literary and develop research and documentation skills among university students. Puerto Rico Sea Grant produced posters to announce the activities, promoted them through social networks and mailing lists, and provided the Marine Education and Information Resources Center and materials to develop the activities.

Over 50 persons have been participating of the lectures and workshops.

PARTNERS: None listed in Database

ASSOCIATED PROJECT(S):
COMMUNICATIONS AND PUBLICATIONS (2014 - 2017)

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Puerto Rico Sea Grant celebrated the Fifth Marine and Coastal Applied Research Symposium

NATIONAL FOCUS AREAS: Environmental Literacy and Workforce Development

- Accomplishment
- PO Review Complete

RECAP: Puerto Rico Sea Grant celebrated the Fifth Marine and Coastal Applied Research Symposium to disseminate research findings and promote the wise use of coastal and marine resources.

PROGRAM FOCUS AREAS: Education and Workforce Development

Scientific community needs a forum to share findings and results and obtain feedback from other colleagues, resources users, resources managers, students and other stakeholders.

Puerto Rico Sea Grant celebrated the Fifth Marine and Coastal Applied Research Symposium in which researchers of PRSG 2010-2012 and 2012-2014 proposal periods were able to present their projects results.

Researchers were able to share findings and results and answer questions and comments of the public. Over 120 persons-including scientists, students, representatives of governmental agencies, members of different organizations, teachers, and professors-attended the symposium.

PARTNERS: None listed in Database

ASSOCIATED PROJECT(S):
COMMUNICATIONS AND PUBLICATIONS (2014 - 2017)

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Puerto Rico Sea Grant collaborates with the Center for Spanish Writing of the UPRM

NATIONAL FOCUS AREAS: Environmental Literacy and Workforce Development

- Accomplishment
- PO Review Complete

RECAP: Thirteen undergraduate and graduate students participated in a series of journalistic writing workshops, coordinated by Puerto Rico Sea Grant and the Center for Spanish Writing of the University of Puerto Rico at Mayaguez.

PROGRAM FOCUS AREAS: Education and Workforce Development

Relevance:Improving communication skills, developing young leaders and disseminating information about coastal and marine resources is extremely relevant to accomplish conservation, sustainable use and environmental education efforts.

Response: In alliance with the Center for Spanish Writing of the UPRM, Puerto Rico Sea Grant offered a series of journalistic writing workshops in which 13 undergraduate and graduate students had the opportunity to benefit from the participation. Participants were able to

learn basic concepts about marine and coastal resources, get to know writing, interviewing and documentation techniques, meet with politicians and managers of the resources and visit ecosystems thorugh a field trip coordinated by Puerto Rico Sea Grant.

Results: Participants wrote articles for Marejada, Puerto Rico Sea Grant's offcial magazine, that will be published in the first issue of 2015. Also, Puerto Rico Sea Grant has trained a group of talented students that will be able to write for upcoming issues of the magazine or for the blog, as well.

Partners: None listed in Database

Associated Project(s):
Communications and Publications (2014 - 2017)

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Puerto Rico Sea Grant increases capacity building among school teachers

National Focus Areas: Environmental Literacy and Workforce Development

- Accomplishment
- PO Review Complete

Recap: Puerto Rico Sea Grant has been working closely with teachers in order to increase their knowledge in the areas of coastal ecosystems, conservation, sustainability, resiliency and climate change.

Program Focus Areas: Education and Workforce Development

In order to promote conservation and sustainable use and increase ocean literacy and resiliency among communities, it is essential to provide schoolteachers the resources and tools to integrate these topics in their educational efforts.

Puerto Rico Sea Grant, in collaboration with the Caribbean Coastal and Oceanic Integrated Observation System (CariCOOS) and Center for Education on Environmental Climate Change, coordinated and developed a three-day workshop for schoolteachers about the impacts of climate change on coastal ecosystems.

A group of 19 teachers was able to visit coastal ecosystems during a field trip, increase their knowledge about climate change through conferences and hands-on activities and practice how to apply this knowledge with their students. Learning gain of the participants was 73%.

Partners: None listed in Database

Associated Project(s):
Communications and Publications (2014 - 2017)

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Puerto Rico Sea Grant increases its visibility through social networks

National Focus Areas: Environmental Literacy and Workforce Development

- Accomplishment
- PO Review Complete

Recap: Social networks have evolved into an excellent tool for Puerto Rico Sea Grant's dissemination efforts.

Program Focus Areas: Education and Workforce Development

Social networks improve communication skills, enhance participation as well as social commitment, reinforce peer support, and ensure realization of education based on collaboration strategies. Furthermore, social networking sites can be easily and inexpensively used without substantial support from major sponsors. They can also be successfully integrated into educational processes. It appears that this type of use rapidly becomes widespread all around the world (Gulbahar et al., 2010, p.2).

Since 2009, Puerto Rico Sea Grant has been using Facebook , Twitter, and Flicker pages to share the information that Sea Grant produces and to promote events and activities. For the period reported, Puerto Rico Sea Grant reached over 3,315 likes in Facebook and 1,200 followers in Twitter. Through social networks, we share the information and pictures about PRSG activities and communicate with our stakeholders via messages. In the PRSG Facebook page people, are free to comment and share information about conservation and sustainable use of marine and coastal resources, request information and communicate their concerns.

Through social media pages, Puerto Rico Sea Grant promotes conservation and sustainable use of marine and coastal resources, and simultaneously, facilitates the process of sharing and searching information. Also, other blogs, Facebook and Twitter pages from diverse entities, governmental agencies, and media organizations, such as newspapers and environmental electronic magazines and blogs, share the information that Puerto Rico Sea Grant posts in Facebook and Twitter. National Sea Grant reposts our information, too.

Partners: None listed in Database

Associated Project(s):
Communications and Publications (2014 - 2017)

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Puerto Rico Sea Grant published two issues of Fuete y Verguilla magazine

National Focus Areas: Environmental Literacy and Workforce Development

- Accomplishment
- PO Review Complete

Recap: PRSG continues publishing Fuete y Verguilla keeping commercial fishers informed about regulations, management, social and cultural aspects of fishing, sustainable use, and conservation of marine and coastal resources.

Program Focus Areas: Education and Workforce Development

Commercial fishers have a need of relevant information related to the topics of regulations, management, social and cultural aspects of fishing, sustainable use, and conservation of marine and coastal resources, particularly, sustainability of fish stocks.

PRSG continues publishing Fuete y Verguilla, a magazine for fishers that exposes topics about regulations, management, sustainable use, and conservation of marine and coastal resources in a simple format. On 2014, PRSG published two issues of Fuete y Verguilla. The first one was dedicated to the topic of "La Ruta del Pescado", an interagency effort that promotes local and sustainable fish consumption. The second one was dedicated to the topic of "Fishing as a Lifestyle in St. Croix and exposes the lives of the fishers in this Caribbean Island and the history behind this important economic activity. This issue was developed in partnership with the Caribbean Fisheries Management Council and the project Don't Stop Talking Fish.

Both issues were widely distributed among fishing villages and communities, managers, agencies, non-governmental organizations, and libraries. Also, are available through PRSG webpage: http://seagrantpr.org/v2/communications-and-publications/fuete-y-verguilla/.

Partners: None listed in Database

Associated Project(s):
Communications and Publications (2014 - 2017)

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Puerto Rico Sea Grant published two issues of Marejada and four videos on marine reserves

National Focus Areas: Environmental Literacy and Workforce Development

- Accomplishment
- PO Review Complete

Recap: In response to a lack of educational resources about marine reserves in Puerto Rico, PRSG published two issues of Marejada, and four videos dedicated to the topic of marine reserves.

Program Focus Areas: Education and Workforce Development

Marine reserves in Puerto Rico have an ecological, social, cultural and economic relevance. Marine reserves are a habitat for commercial fishes and provide recreational services and serve as green infrastructure, which provide economic benefits and contribute to resiliency of coastal communities. On the other hand, marine reserves are the scenario of diverse uses and conflicts and management challenges. There was a lack of information products related to the marine reserves and also there was a need to communicate the importance of these reserves in terms of conservation and sustainable uses.

PRSG published two issues of Marejada and four videos on the topic of marine reserves. These issues addressed the need for information about marine reserves and contributed to an increase in environmental education and ocean literacy. The four (4) videos highlight the importance of marine reserves as effective tools for supporting natural and cultural heritage conservation objectives. Reserves highlighted include: Desecheo, La Parguera, Canal Luis Peña, and Tres Palmas.

The magazine was printed, distributed among managers, scientists, public policy makers, decision makers, agencies, marinas, private entities, non governmental organizations, and libraries and is also available in its electronic for through our webpage: http://seagrantpr.org/v2/communications-and-publications/marejada-magazine/. The videos altogether have more than 3,800 views.

Partners: None listed in Database

Associated Project(s):
Communications and Publications (2014 - 2017)

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Puerto Rico Sea Grant advances teachers professional development by providing up-to-date and accurate marine science materials, the latest marine research information and the skills to teach students and help them become "ocean literate."

National Focus Areas: Environmental Literacy and Workforce Development

- Accomplishment
- PO Review Complete

Recap: Nearly one hundred teachers participated in the professional development programs coordinated by the Puerto Rico Sea Grant. Close to 7,689 K-12 students were reached through educators who completed the programs.

Program Focus Areas: Education and Workforce Development

Most Puerto Rican teachers lack formal or informal studies on issues related to marine sciences. To accomplish an ocean literate society, marine sciences must be integrated into educational practice, curricula and textbooks. Workshops for teachers and hands-on field activities for students are effective ways to disseminate new and relevant marine science materials, research information, ocean literacy principles and positive attitudes toward the marine environment.

The Puerto Rico Sea Grant Education Component (PRSGEC) developed seven (7) professional development programs related to specific topics, including climate change, coral reefs ecosystems, plankton communities, mangroves and sea grasses.

Ninety-two (92) teachers participated in the programs designed to provide formal educators and curriculum developers with step-by-step information that helps them build coherent and conceptual sound learning experiences on what is essential for students to understand about coastal and marine resources. Pre and post-test assessment indicated a significant improvement in student content with a participant knowledge gain of 79.0%.

Partners: G Works; Puerto Rico Department of Education; Puerto Rico Department of Natural and Environmental Resources;

Associated Project(s):
Marine Education (2014 - 2017)

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Marine Science Adventure Program (k-12)

National Focus Areas: Environmental Literacy and Workforce Development

- Accomplishment
- PO Review Complete

Recap: Personal connections to the coastal and marine environments were developed as well as motivations to become ocean literate and to act on behalf of the ocean.

Program Focus Areas: Education and Workforce Development

According to the NOAA Ocean Literacy Guide "ocean literacy is an understanding of the ocean's influence on you and your influence on the ocean". To accomplish an ocean literate society in Puerto Rico, marine sciences must be integrated into educational practice, curricula and textbooks.

In February 2014 to January 2015, the PRSGEC coordinated the Marine Science Adventure Program, which consisted of high-quality learning activities and experiences with corresponding support services for k-12 students and teachers. The program was designed as an introduction to the marine environment through exhibitions, laboratories and field activities at different coastal nature reserves in Puerto Rico.

Thirty-five (35) educational Marine Science Adventures were coordinated where 2,186 K-12 levels students and 121 teachers (school programs) benefitted from this effort. A seventy-five percent (75%) knowledge gain was registered among students.

Partners: Vieques Refuge Service; G Works; Puerto Rico Department of Education;

Associated Project(s):
Marine Education (2014 - 2017)

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Puerto Rico Sea Grant uses best practices in sea turtles science and conservation to build knowledge and protection at the east and southeast coasts of Puerto Rico

National Focus Areas: Environmental Literacy and Workforce Development; Healthy Coastal Ecosystems

- Accomplishment
- PO Review Complete

Recap: PRSG trained volunteers to protect sea turtle nesting beaches and help local and state decision makers develop resource management policy. With the participation and support of the community, Puerto Rico Sea Grant developed an exemplary volunteer monitoring program for marine turtles in three municipalities. The Program prevented poaching, helped hatch and raise the hatchlings, and educated the local communities with regard to the importance of conservation of these endangered marine turtle species.

Program Focus Areas: Education and Workforce Development ; Healthy Ecosystems and Habitats

Nesting surveys and nest protection measures in Puerto Rico are administered by a variety of public agencies including the U.S. Fish and Wildlife Service, the Department of Natural and Environmental Resource, the U.S. Army Corps of Engineers and the National Park Trust. Managers and biologists from these public agencies depend on the support of citizen volunteers to collect nesting data and vigilance for the protection of sea turtles and their habitats. Several private organizations and various volunteers are also actively involved with sea turtle protection work, including some very robust volunteer efforts along the east and southeast coasts of Puerto Rico as a result of the lack of agency staff due to budget restrictions. This integration provides citizens the opportunity to gain a greater understanding of the natural world. The challenge lies in organizing projects that yield quality outcomes both scientifically and educationally.

In 2014, PRSG developed two (2) sea turtle training workshops to educate volunteers, students and coastal residents about sea turtle species identification, foot and ATV patrol techniques and patroller safety, on beach signs of nesting activity, prevention of project related impact to nesters, nests and eggs hatchlings, stranded sea turtle response and reporting requirements, beach ecology, daily monitoring log requirements, nest marking and nest relocation.

Two sea turtles monitoring workshops that included in-class lectures and on beach practical training were conducted for forty (40) university students and coastal residents participated in this active learning experience. The volunteers program is progressing beyond a tool for data collection. These training efforts raise awareness, affect policy and build support for the conservation of biodiversity, at the same time that saves money to the government in management and protection. The volunteers worked 912 hours in the year, helped to collect quality sea turtle nesting data and identify and reduce sea turtle threats.

Partners: Puerto Rico Department of Natural and Environmental Resources;

Associated Project(s):
Marine Education (2014 - 2017)

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Marine Nature and Conservation Newspaper Column

National Focus Areas: Environmental Literacy and Workforce Development

- Accomplishment
- PO Review Complete

Recap: Puerto Rico Sea Grant's Virgin Islands Marine Advisory Service (VIMAS) is increasing marine education by regular newspaper submissions.

Program Focus Areas: Education and Workforce Development

If the community is to protect and conserve marine resources they need to have an understanding of them. This can be done in a variety of ways such as publications, public and school presentations, field activities, as well as through the media. This project would involve writing articles on marine nature and conservation as well as promoting the VIMAS program and website. The local newspapers are widely read on a daily basis in the VI. VIMAS will increase this type of education by regularly writing a publishing in the newspaper and other media. VIMAS has started to make more regular submissions to the local media in order to increase awareness of marine issues. Media articles on marine issues and VIMAS events were published in Dec. 2014 (Seagrass Halophila invasion), Feb. 2014 (Global Climate Change impacts), May 2014 (BioBay St. Croix), Sept. 2014 (Coastal clean-ups).

Partners: None listed in Database

Associated Project(s):
Virgin Islands Marine Advisory Service (2014 - 2017)

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Community Engagement

National Focus Areas: Environmental Literacy and Workforce Development

- Accomplishment
- PO Review Complete

Recap: Puerto Rico Sea Grant's Virgin Islands Marine Advisory Service (VIMAS) has been working to promote its programs, services, and products within the USVI community.

Program Focus Areas: Education and Workforce Development

In order for the Puerto Rico Sea Grant's Virgin Islands Marine Advisory Service (VIMAS)to be effective, people must be aware of the program and the services it offers. To increase public awareness of VIMAS and Sea Grant, and promote the program's goals, VIMAS agents participate in several community activities and boards. Objectives will be carried out through events such as community affairs and public presentations. In addition, VIMAS agents will provide technical assistance to governmental agencies and boards about marine resources such as the VI Fisheries Advisory Committee, the East End Marine Park (EEMP) Committee, the St. Thomas East End Reserve (STEER) Committee, Blue Flag Committee as well as the VI Nonpoint Source Pollution (NPS) Committee.VIMAS is working to increase awareness of marine issues, scientific research, career opportunities and Sea Grant activities through participation in community affairs, public presentations and media. During this reporting period, VIMAS participated in the St. Croix and St. Thomas Agriculture Fairs to promote Sea Grant and VIMAS activities. VIMAS also participated in the annual Earth Day Eco Fair (STX), coordinated Reef Fest (STT) and Afternoon on the Green (STT) to promote Sea Grant and the wise use of natural resources. During this period VIMAS also led 41 field activities and did 42 classroom presentations. VIMAS agents serve on government and local environmental committees such as the Fisheries Advisory Board (STX) and the Nonpoint Source Pollution Committee (STX) and the St. Thomas East End Reserve Committee.

Partners: University of Virgin Islands; The Nature Conservancy;

Associated Project(s):
Virgin Islands Marine Advisory Service (2014 - 2017)

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2014 Leveraged Funding

Project Level

Source	Project	Title	Amount	Type
National Marine Fisheries Service (US DOC, NOAA, NMFS)	9919 - Marine Outreach Program (A/151-1-14)	SEAMAP-C	$88,608.00	Managed
US Forest Service (USDA, USFS)	9921 - Coastal Communities Development (A/151-3-14)	Agroforestry and conservation practices applicable to land farms in PR and USVI	$25,000.00	Managed
US Fish and Wildlife Service (US DOI, FWS)	9921 - Coastal Communities Development (A/151-3-14)	Laguna Cartagena: Interpretive Panels & Education Sheet	$4,632.00	Managed
Puerto Rico Department of Natural and Environmental Resources	9919 - Marine Outreach Program (A/151-1-14)	Development of sustainable infrastructure inside the RNCB	$150,000.00	Influenced
		TOTAL:	$268,240	

Program Level

No Program Level Leveraged Funding for this year

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Performance Measures

2014 Communities implementing hazard resiliency practices

County of the Coastal Community	Name of Coastal Community	Number of Resiliency Training/Tech Assistance provided	Community hazard resiliency improved
	44 coastal municipalities of Puerto Rico	1	Yes

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2014 Sea Grant Products - (tools, technologies, info services)

Description	Developed	Used
Online tool to reduce drowning incidents at the beaches of Puerto Rico: the CariCOOS Near-shore Wave Model. www.caricoos.org/drupal/swan_multigrid	Yes	Yes
Online tool to reduce drowning incidents at the beaches of Puerto Rico: the CariCOOS-Sea Grant Near-shore Breaker Model www.caricoos.org/drupal/nearshore_breaker	Yes	Yes

Interdisciplinary teachers' educational guide: The Marine Grass Beds	Yes	Yes
Interdisciplinary teachers' educational guide: The Mangroves	Yes	Yes

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2014 Economic (market and nonmarket) impacts

(No Data)

2014 National Performance Measures - General

Performance Measure	Annual Target	Reported	Program Comment
Number of fishermen, seafood processors and aquaculture industry personnel who modify their practices using knowledge gained in fisheries sustainability and seafood safety as a result of Sea Grant activities.	4,196	47	
Number of communities that implemented sustainable economic and environmental development practices and policies (e.g., land-use planning, working waterfronts, energy efficiency, climate change planning, smart growth measures, green infrastructure) as a result of Sea Grant activities.	223	7	6 in Municipality of Cabo Rojo, Culebra
Number of acres of coastal habitat protected, enhanced or restored as a result of Sea Grant activities.	331,630	460	
Number of resource managers who use ecosystem-based approaches in the management of land, water, and living resources as a result of Sea Grant activities.		6	Six mayors from coastal municipalities in PR have implemented best management practices as a result Sea Grant advisory services.
Number of people engaged in Sea Grant supported informal education programs.	773,973	93	
Number of Sea Grant-supported graduates who become employed in a career related to their degree within two years of graduation.	118	7	

2014 Program Performance Measures

(No Data)

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2014 Metrics

Staffing Numbers	Individuals	SG FTEs	non-SG FTEs
Administrative	5.00	2.92	1.58
Communications	12.00	1.73	6.65
Education	1.00	1.00	
Extension	10.00	4.90	2.02
Research	60.00	2.66	5.40

Core Funding	Proposals	Institutions Involved	From Home Institution
Pre-Proposals	7	4	4
Full Proposals	6	3	4
Proposals Funded	3	1	3

Student Support	Number of New Students	Number of Continuing Students	Number of Degrees Awarded
Sea Grant Supported Undergraduate Students	15	4	
Sea Grant Supported MS/MA Graduate Students	3	6	
Sea Grant Supported PhD Graduate Students		5	2
Other Sea Grant Supported Professional Degree Graduate Students	1		

Other Metrics	Amount
VolunteerHours	6734
Number of P-12 Students Reached Through Sea Grant-Trained Educators or Directly through Sea Grant Education Programs	9875
Number of P-12 Educators who participated in Sea Grant education programs	301
SG-Sponsored/Organized Meetings/Workshops	135

Attendees in SG Meetings/Workshops	2820
Public or Professional Presentations	88
Attendees at Public or Professional Presentations	9825
Clean Marina Program -- Certifications	
HACCP -- Number of people with new certifications	