COASTAL AND MARINE CONSERVATION DRAFT

PHASE ONE REPORT

2012

Commonwealth of Puerto Rico

Department of Natural and Environmental Resources

COASTAL AND MARINE CONSERVATION DRAFT

PHASE ONE REPORT

Commonwealth of Puerto Rico
Department of Natural and Environmental Resources

Honorable Daniel J. Kercadó
Secretary

Damaris Delgado
Director
Bureau of Coastal, Wildlife Refuges,
And Natural Reserves

Ernesto Díaz
Director
Coastal Zone Division

2012

Prepared by: Evelio Valeiras Mini
Environmental Planner
Coastal Zone Division

Funding for this document was provided by the U.S. Department of Commerce, Office of Ocean and Coastal Resource Management, under the Coastal Zone Management Act (CZMA) of 1972, as amended. NOAA GRANT: NA10NO54190216

Table of Contents

Acknowledgements

On February 5th, 2010, a letter addressed to President Barrack Obama commending his initiative and leadership in formulating America first National Ocean Policy was signed by a group of marine scientist offering support in realizing our shared vision for healthy and secure oceans. This report is a small contribution to this initiative; it would not have been possible without the collaboration of various participants. Special thanks for their contributions and for the opportunity of working with them. Ernesto Diaz, Program Manager, deserves special thanks for his continuous support.

List of Maps:

List of Tables:

List of Figures:

USE AND MANAGEMENT OF COASTAL RESOURCES

1.1 Overview

Marine Spatial Planning is a process of analyzing and allocating parts of a three dimensional marine space for specific uses, to achieve ecological, economic, and social objectives that are usually specified through political process. Ocean Zoning Is an element of marine Spatial Planning consisting of zoning maps and regulations to some or all areas of a marine region.

The principal output is a comprehensive spatial management plan for a marine area or ecosystem. This plan sets out priorities for the area and defines what these priorities mean in time and space. In Puerto Rico an extensive array of existing laws and planning regulations are used as guidelines for considering appropriate siting or making decisions on suitable ocean uses

The integration of coastal zone management to marine spatial planning has initiated a new approach in managing natural resources. In In many ways coastal zone management is similar to marine spatial planning. Both are integrated, strategic, and both aim to maximize compatibilities and reduce conflicts among human uses and between human uses and nature.

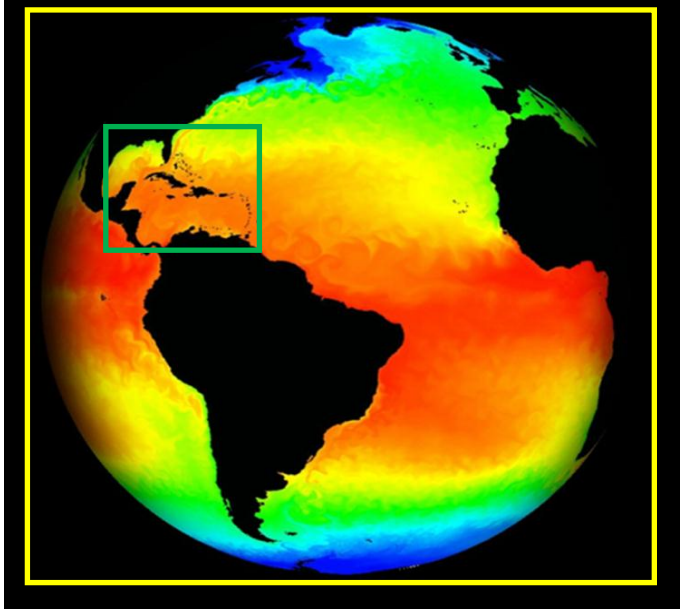
In practical terms through CMSP a country a region, or a local jurisdiction identifies areas most suitable for various type or classes of activities in order to reduce conflicts among uses, reduce environmental impacts, facilitate compatible uses, and preserve critical ecosystem services to meet economic, environmental security and social objectives for future generations.

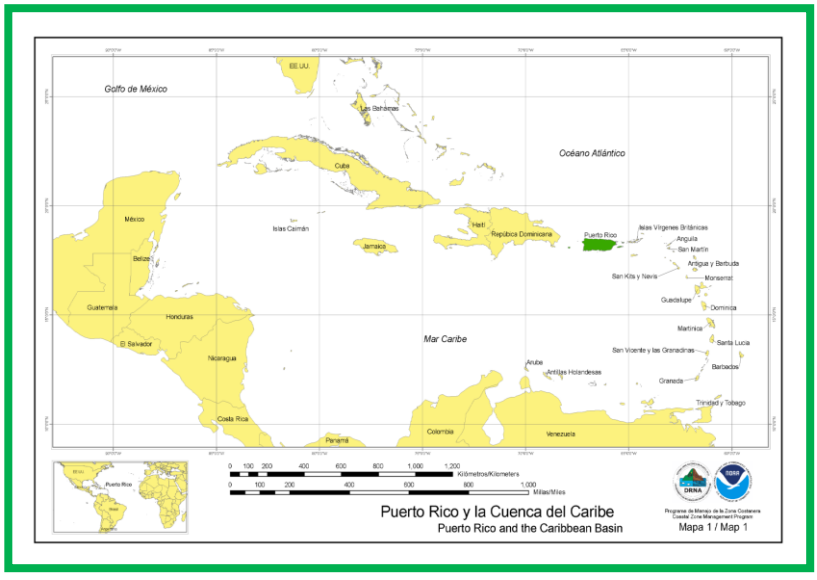
The Puerto Rico Coastal Management Program will be implementing the principles of coastal and marine spatial planning (CMSP). During this process public policies would be developed adding a regional approach to allow for the variability of the economic, environmental and social aspect among different areas of the US and the Caribbean

The geographic scope of the planning area of the CMSP in the US includes the territorial sea including bays and estuaries, EEZ and the continental shelf, extending landward to the mean high water line. In the case of Puerto Rico this new approach implies modifying the traditional scale of the coastal zone jurisdiction.

.

Geographical Location





1.2 Coastal and Marine Protection

DNER is the lead agency for the conservation, management, and administration of submerged lands beneath Puerto Rico's territorial waters. The Planning Board of Puerto Rico (PRPB) develops and implements public policy on planning, land use, economic and social development, as well as counseling the Governor and the Legislature in all related matters. Reviews and adjudicates cases of proposed residential, commercial, industrial and institutional developments on a daily basis, as well as reviewing certificates of consistency with the PR Coastal Management Program.

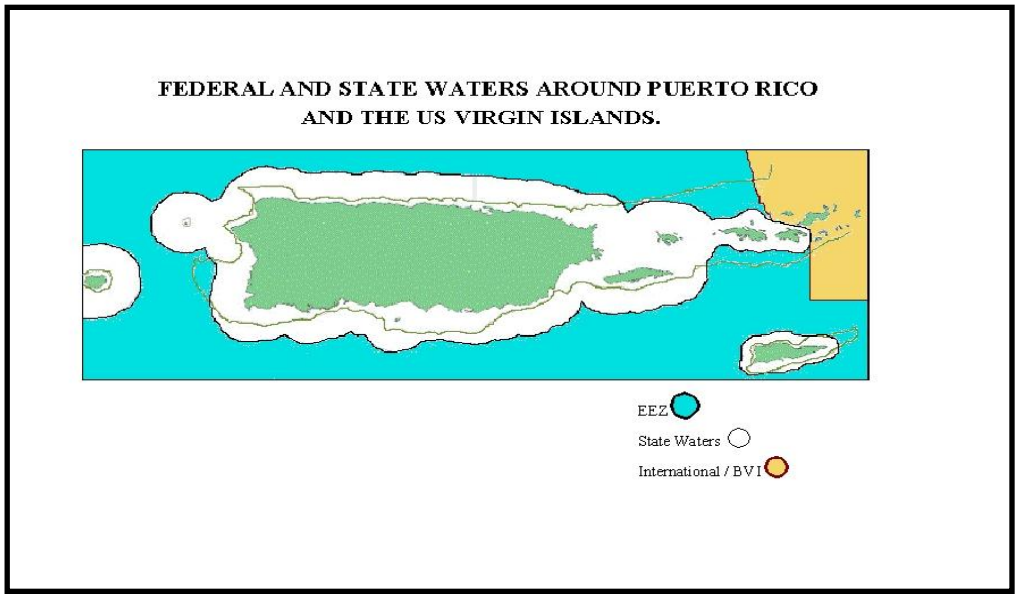
PRPB land use policies guide energy and government facility siting as well as other land use and development activities. The PRPB led the effort that resulted in the adoption of the 2009 Permits Law, the establishment of the Integrated Permit System and the Joint Permit Regulations for guiding future permitting and coastal development. Two new agencies were created by Law 161 to replace the former ARPe (Regulations and Permits Administration): OGPe (Permits Management Agency) and OIGPe (Permits Comptroller Agency).

The Department of Natural and Environmental Resources in coordination with the Energy Affairs Administration and the Solid Waste Authority have initiated efforts to increase environmental compliance, natural resources conservation, recycling, reuse of solid wastes and energy efficiency at government facilities, and will continue serving in an advisory role to agencies with regulatory power.

The U.S. Army Corps of Engineers, Fish and Wildlife Service, National Marine Fisheries Service and DNER are the key decision-making agencies affecting marine resources use and protection. Although existing policies and regulations provide protection to ocean resources, permitting actions have resulted in development-related impacts to coastal and marine resources. Going forward, climate variability and change may pose a growing threat to these resources.

The Environmental Quality Board protects the environment implementing practical measures to control the contamination of air, water, soil, and noise pollution.Conditions in which man and nature can co-exist harmoniously are maintained through prevention activities to preserve the quality of life of all Puerto Ricans, as well as for future generations.

U.S. Caribbean Areas of Jurisdiction
Puerto Rico State Waters 9nm (10.35 mi), USVI State Waters 3nm (3.45mi)



Coastal And Marine Spatial data

Coastal Attributes :	Puerto Rico	Caribbean
Length of coastline	1,094 Km	73,703 Km
Population within 100 km of the coast	100%	
Area of continental shelf (200 feet depth)	4,073(Km2)	806,613 (Km2)
Territorial sea (12 nautical miles)	17,526 (Km2)	1,049,953 (km2)
Claimed Exclusive Economic Zone	187,935 (Km2)	6,488,961 (Km2)
Annual fisheries production	4487 metric tons	2,118,946 metric tons
Annual aquaculture production	154 metric tons	146,360 metric tons
People employed in production	1758	446,390

Reference: © EarthTrends 2003, at http://earthtrends.wri.org

The Caribbean Fisheries Management Council is a U.S. government unit responsible for creating management plans for fishery resources (FMPs) in waters off Puerto Rico and the U.S. Virgin Islands.

CFMC MANAGED AREAS AND SHARED JURISDICTIONS:

Name of Area and location	Jurisdiction	Area (nm2)	Changes in management	Species Protected	Season	Management	FMP
Hind Bank, St. Thomas	Federal	16	1990	Red hind/all species	Dec-Feb	No fishing	RF A1
	Federal	16	1999	Coral/ all fish species/lobster /conch	Year round	No Take	Coral A1
Tourmaline Bank, West coast PR	Federal /State	15	1993	Red hind/all species	Dec-Feb	No fishing	RF A2
	Federal /State	9/(5.2 Federal)	1996	Red hind/all species	Dec-Feb	No fishing	RF Reg A2 /Administrative Order 96-09 DNER
	Federal /State	9/(5.2 Federal)	2005/2007	All species/Corals	Year round	No bottom tending gear	SFA RF A3 /Regulation Num. 7326
Lang Bank, St. Croix	Federal	~3	1993	Red hind/all species	Dec-Feb	No fishing	RF A2
	Federal	~3	2005	All species/Corals	Year round	No bottom tending gear	SFA /RF A3
Mutton snapper Area	Federal/State	~2/(<1 Federal)	1993/1994/1996	Mutton snapper	Mar-Jun	No fishing	RFA2 /USVI code/RF Reg A1
	Federal	~2/(<1 Federal)	2005	All species/Corals	Year round	No bottom tending gear	SFA /RF A3
Bajo de Cico, West coast PR	Federal /State	9/(7.4 Federal)	1996	Red hind/all species	Dec-Feb	No fishing	RF Reg A2 /Administrative Order 96-09 DNER
	Federal/State	9/(7.4 Federal)	2005	All species/Corals	Year round	No bottom tending gear	SFA RF A3 /Regulation Num. 7326
Abrir La Sierra, West Coast PR	Federal	9	1996	Red hind/all species	Dec-Feb	No fishing	RF Reg A2
	Federal	9	2005	All species/Corals	Year round	No bottom tending gear	SFA /RF A3
Grammanik Bank, St. Thomas	Federal	6.88	2005	Yellowfin grouper/all species	Feb-April	No Fishing	RF Interim Rule

Fisheries regulations were amended in 2010. Amendments include revised penalties and clarification of permanent or seasonal closures for the harvesting of marine species. No CZMP

changes have resulted. While it is too soon to evaluate outcomes and effectiveness, the revisions are significant and are likely to strengthen the role of DNER in marine and ocean resources management.

NOAA plays an important role in the research, exploration, and conservation of deep-sea coral ecosystems. As the federal agency responsible for managing the Nation's marine living resources, NOAA is well-positioned to locate, characterize, and conduct targeted exploration and research to improve the understanding of deep-sea coral and sponge ecosystems. Sound management of these ecosystems requires scientifically based information on their condition, the causes and consequences of their condition, and the costs and benefits of possible management actions to maintain or improve their condition. To this end, NOAA has increased activities in recent years to locate, study, and protect deep-sea corals. The following issues have been identified as information needs to better understand and improve management of these ecosystems:

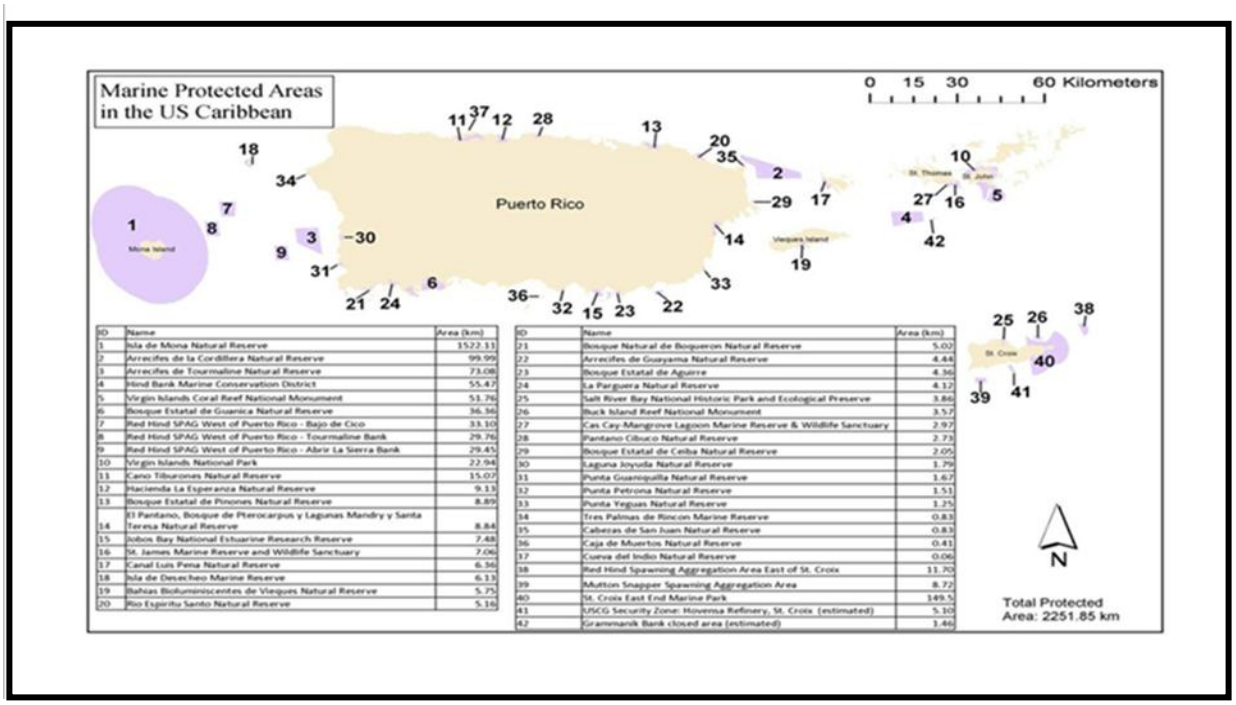
- Locating, mapping, and characterizing deep-sea coral habitats
- Understanding the taxonomy, biology, life histories, and ecology of deep-sea coral species
- Understanding the biodiversity and ecology of deep-sea coral communities
- Understanding impacts caused by fishing and other human activities
- Understanding the potential role of deep-sea corals to assess past ocean and climate conditions

In order to ensure the protection of natural resources, a series of maps based on the presence of sensitive areas or natural hazard risks have been created to implement development regulations.

Matrix: Coastal Zone Designated Uses

Map	Regulated activity	Land domain	Marine domain
Coastal Barriers	**Property Insurance**	**X**	**X**
Floodable areas	**Development**	**X**	**X**
Tsunamis	**Hazard Risk**	**X**	
No take zone	**Fisheries**		**X**
Topographic	**Political boundaries**	**X**	
Nautical charts	**Navigational aids**		**X**
Natural Reserves	**Conservation**	**X**	**X**
Public beaches	**Recreation**	**X**	**X**
POTS	**Municipal Land Use**	**X**	

In 1978 PRCMP identified 26 candidate areas for designation as natural reserves. As of 2010, DNER had submitted 35 recommendations for natural reserve designation of which 34 have been approved by the Puerto Rico Planning Board (PRPB). The Puerto Rico Legislature has also adopted, via special statutes, eight natural reserves; although not all are coastal or marine reserves



ID	Name	Area (km)
1	Isla de Mona Natural Reserve	1522.11
2	Arrecifes de la Cordillera Natural Reserve	99.99
3	Arrecifes de Tourmaline Natural Reserve	73.08
4	Hind Bank Marine Conservation District	55.47
5	Virgin Islands Coral Reef National Monument	53.76
6	Bosque Estatal de Guanica Natural Reserve	36.36
7	Red Hind SPAG West of Puerto Rico - Bajo de Cico	33.10
8	Red Hind SPAG West of Puerto Rico - Tourmaline Bank	29.76
9	Red Hind SPAG West of Puerto Rico - Abrir La Sierra Bank	29.45
10	Virgin Islands National Park	22.94
11	Cano Tiburones Natural Reserve	15.07
12	Hacienda La Esperanza Natural Reserve	9.13
13	Bosque Estatal de Pinones Natural Reserve	8.89
14	El Pantano, Bosque de Pterocarpus y Lagunas Mandry y Santa Teresa Natural Reserve	8.84
15	Jobos Bay National Estuarine Research Reserve	7.48
16	St. James Marine Reserve and Wildlife Sanctuary	7.06
17	Canal Luis Pena Natural Reserve	6.36
18	Isla de Desecheo Marine Reserve	6.13
19	Bahias Bioluminiscentes de Vieques Natural Reserve	5.75
20	Rio Espiritu Santo Natural Reserve	5.16

ID	Name	Area (km)
21	Bosque Natural de Boqueron Natural Reserve	5.02
22	Arrecifes de Guayama Natural Reserve	4.44
23	Bosque Estatal de Aguirre	4.36
24	La Parguera Natural Reserve	4.12
25	Salt River Bay National Historic Park and Ecological Preserve	3.86
26	Buck Island Reef National Monument	3.57
27	Cas Cay-Mangrove Lagoon Marine Reserve & Wildlife Sanctuary	2.97
28	Pantano Cibuco Natural Reserve	2.73
29	Bosque Estatal de Ceiba Natural Reserve	2.05
30	Laguna Joyuda Natural Reserve	1.79
31	Punta Guaniquilla Natural Reserve	1.67
32	Punta Petrona Natural Reserve	1.51
33	Punta Yeguas Natural Reserve	1.25
34	Tres Palmas de Rincon Marine Reserve	0.83
35	Cabezas de San Juan Natural Reserve	0.83
36	Caja de Muertos Natural Reserve	0.41
37	Cueva del Indio Natural Reserve	0.06
38	Red Hind Spawning Aggregation Area East of St. Croix	11.70
39	Mutton Snapper Spawning Aggregation Area	8.72
40	St. Croix East End Marine Park	149.5
41	USCG Security Zone: Hovensa Refinery, St. Croix (estimated)	5.10
42	Grammanik Bank closed area (estimated)	1.46

Special Planning areas: Natural Reserves

Total wetlands acreage from the inventory maps is 217,118.00 acres. Relevant information on the extent of protected wetlands in Puerto Rico before 2006 is included. Actually, a total of 61,233.98 acres of wetlands are protected by federal and local government designations. The remaining **152,933.96** wetlands acreage is distributed along private properties, altered wetlands, or wetlands remaining in their natural condition. In fulfillment of a legislative mandate (Law 314), a wetlands inventory identifying candidate areas for natural reserve designation was completed. In order to make informed policy recommendations for other coastal regions, comprehensive data for specific coastal sub regions is needed.

Coastal habitats protected by federal and local government

Designation	Estuarine (acres)	Lacustrine (acres)	Marine (acres)	Palustrine (acres)	Riverine (acres)
State Forest	7474.57	0	413.67	447.86	0
State Forest-Buffer zone	15.60	0	.33	0	0
Marine Reserve	49.01	0	96.16	447.83	0
National Estuarine Research Reserve	1244.29	0	9.26	161.59	0 0
Natural Reserve	769.09	0	26.19	1169.61	7.22
Natural Reserve-Buffer zone	0	0	0	0	0
Natural Reserve-Marine extension	2437.50	0	1718.67	0	0
Wild Life Refugee	578.59	31	0	1.11	0
Conservation Trust of Puerto Rico	3363.25	0	17215.31	862.95	11.65
US Fish and Wildlife Service	2545,56	0	317.51	.03	0
*DNER acquired properties (2)	2138.50	0	40.83	291.10	0
TOTAL	**25,496.01**	**31**	**35,306.03**	**3,382.13**	**18.87**

The Puerto Rico Coastal Management Program (PRCZMP) is a partnership led by the Puerto Rico Department of Natural and Environmental Resources to promote the protection, conservation, sustainable use and socioeconomic development of Puerto Rico's coastal zone and natural resources.

The PRCZMP is the coastal element of the Puerto Rico Island-wide land use plan. The Coastal Zone Management Program follows the principles used in the Island Wide Land use Plan (IWLUP) and the Coastal Zoning Districts defined in the Joint Regulation Plan, section 32 of the Puerto Rico Planning Board.

The IWLUP land use policies guide the energy and government facility sitting as well as other land use and development activities; it does not integrate coastal zoning districts. In Puerto Rico the Joint Regulation (32) was established to protect the Coastal Zone and Access to Beaches and Coasts of Puerto Rico. Is a planning tool that was designed as a guide to control the use and development of the Coastal Zone. By means of this regulation the zoning district's established by the Planning Board can be used to control development of land, the ocean floor, maritime waters, reefs, islets and adjacent islands within a distance of nine nautical miles in offshore water, and up to one kilometer inland including the required additional distance of important natural systems. Coastal zoning can be used to designate restrictions and multiuse objective conditions in the marine domain.

Zoning districts established by the Planning Board of Puerto Rico :
CR= Resource conservation, CRR= Conservation and restoration , PP = Public beaches, PM = Fisheries, PR= Resource preservation, AD = Developed areas

CR	CRR	B-2	PM	PR	PP	AD	Potential use of marine spaces:
R	R	R	A	R	R	A	Commercial fisheries
A	A	A	R	A	R	R	Aggregation sites
A	R	A	A	R	R	R	Breeding/mariculture
A	A	A	A	A	A	A	Scientific Studies
A	A	A	A	A	A	A	Resource protection
A	R	R	A	R	R	A	Port, harbor and marinas development
A	A	R	A	R	R	A	Vessel traffic
A	A	R	R	R	R	A	Pipe lines, cables and outfall sitting
A	A	A	A	A	R	A	Artificial reefs
A	A	A	A	A	A	A	Recreation

Zoning regulations: A= Allowed R= Restricted

The Joint Regulation (32) contains six main multiuse zoning districts:

1. **Resource Preservation (PR)**

Established to classify specific areas of the coastal zone constituting natural resources to be protected for scientific studies and contemplation

2. **Conservation of Resources CR**

Established to classify areas of the coastal zone such as mangroves, bioluminescent bays, forest, dunes, lakes, geological formations, coral reefs, wildlife refuges, reservations, falls, springs, caves and sinks, natural habitats for endangered species, and other areas of special interest that should be protected for observation, scientific studies and the limited and controlled use of recreational facilities.

3. **Conservation and Restoration of Resources (CRR)**

Established to classify land or properties or portions thereof in the coastal zone of Puerto Rico, that constitutes part of the architectural, cultural and historic patrimony of PR.

4. **Mangrove Forests (B-2)**

Established to classify the different types of mangroves forest in Puerto Rico and to protect them from irreparable damages caused by improper use and lack of foresight in considering the negative impact that other activities have over them.

5. **Public Beaches (PP)**

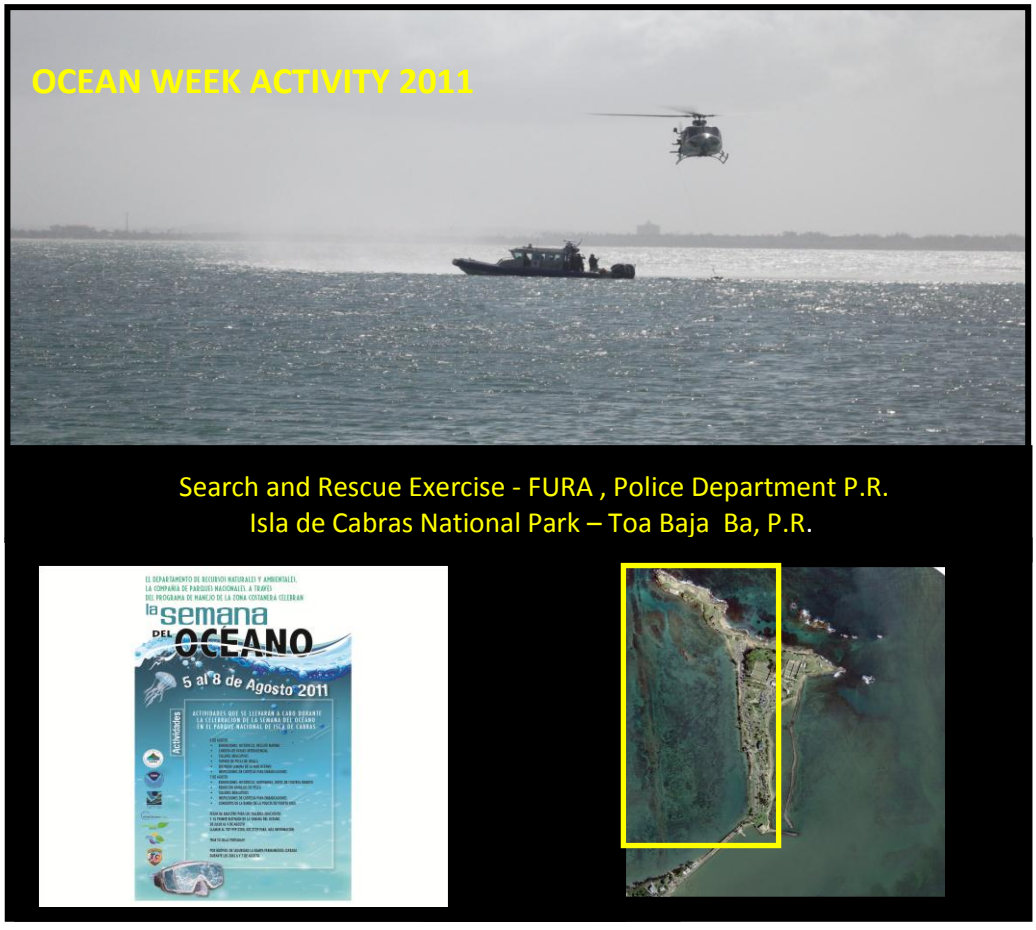
Established to classify beach sectors in Puerto Rico that due to its scenic, historic, or recreational characteristics have an optimum potential for future development or present use, as coastal tourist and recreational centers; as well as terrain within the terrestrial maritime zone.

6. **Fishing and Aquaculture (PM)**

Establish to classify those coastal sectors which are been utilized or can be used because of its great potential, to develop a fishing industry and/or aquaculture, or cultivate marine species. Includes sections of land and water whose principal use is or could be the commercial production of sea food.

PRCMP-CMO has completed the development of the marine and intertidal wetlands draft zoning documents. Zoning districts have not been adopted by the PRPB. However, CMO will use these results as the basis for the proposed Coastal and Marine Spatial process initiated by President Obama through the Executive Order 13547 adopting the Task Force's report, defining a National Ocean Policy that prioritizes the protection, maintenance and restoration of ecosystem health and sustainable economic development of our coastal and ocean economies. Coastal and Marine Spatial Planning (CMSP) is the planning process established to achieve these goals and the National Ocean Council and associated committees and regional planning bodies comprise the governance structure created to ensure implementation

This initiative was a great opportunity for integrating the DNER in its first time celebration of the Oceans Week, joining efforts with the Department of the Interior and the National Ocean Council in promoting educational, scientific, and cultural activities, to motivate society awareness in our ocean and the conservation of marine resources.



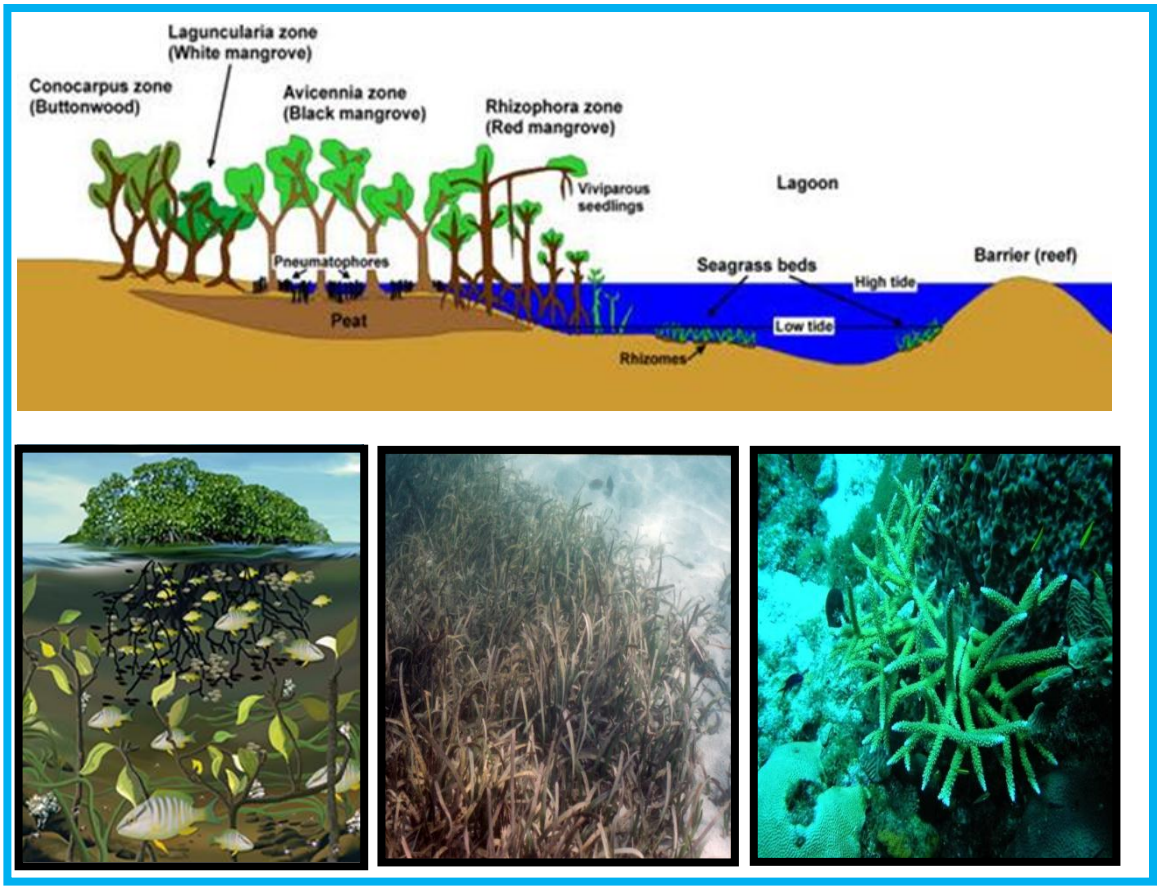
The Oceans Week proclamation was coordinated through the State Department and signed by the Governor of Puerto Rico. It was read in the official opening of the Ocean Week's activities during The 2nd Cycle of Marine Spatial Planning Conferences given on August 5, 2011. As part of the celebration two days of activities were planned in Isla de Cabras National Park. According to their records, 1200 participants visited the Park during the Celebration days.

Activities included a fishing tournament sponsored by Club De Pesca de Isla de Cobras, historical representations by Regimiento Fijo de Puerto Rico , nautical events sponsored by the Puerto Rico Offshore and Inshore Boat Associations, Automeca, the Police Department of Puerto Rico and the DNER Marine Rangers.

1.3 Ocean zoning

Comprehensive ocean zoning differs from land –use zoning in terms of the scale on which it is planned, and in the way it is implemented along the seascape. Zoning districts cannot be considered isolated units they are surrounded and strongly bounded by ecological, economic, political and cultural factors that have to be taken into consideration during a designation analysis, like the size of the areas, their interconnection and related impacts threats.

Marine Habitats



<u>General guidelines criteria for ocean zoning</u>

1-Identify the mapping unit by type of polygons: Polygons clearly define the cartographic boundaries, are biologically meaningful and can be easily identified for protection and enforcement using GPS technology:

a- Single polygons : (R), (M), (SV) : These polygons are not isolated units; they can be associated sometimes to others by ecological, economic, political and cultural reasons

• (R) Coral reefs
Typically occurring in waters at the interface between coastal and oceanic habitats, used by small coastal pelagic fishes and migratory species. Numerous small bodied organisms with highly specialized habitat requirements live within holes and crevices inside the reef (crustaceans, mollusk, fish, and echinoderms) known as crypto fauna.

• (M) Mangroves
Most commonly found as thin fringes along bays, rivers, cays, salt ponds and low lying forests in estuarine lagoons. Complex roots structures offer shelters and nursery areas from commercially and recreationally important species.

• (SV) Sub aquatic vegetation:
Large estuarine, riverine, coastal lagoons and bays that contain extensive sea grass and algal plains areas that serves as nurseries for many species of fishes and invertebrates.

b-Mixed polygons : (SVR)) (SVM),(MR) : Frequently conservation areas are found adjacent or inside other ecosystems, in this way spatial arrangements as the ones described below area formed:

• (SVR) Sub aquatic vegetation & Coral reefs
Important foraging grounds for keynote species such as endangered sea turtles and manatee populations.

• (SVM) Sub aquatic vegetation & mangroves
Dense mangrove canopy layers provide roosting and nesting habitat for resident and migratory birds, including endangered species.

• (MR) Mangroves & coral reefs
Complex well developed areas provide excellent habitat for crypto fauna.

C-Swat polygons -Mangrove & sub aquatic vegetation & coral reefs: This highly productive ecosystem encompasses terrestrial and marine habitats such as coastal wetlands, sea grass, coral reefs, and open oceanic habitats. The presence of different habitat's in close association to one another's is considered especially valuable since they provide a natural energy flow between systems.

***2*-Size of the special conservation areas**

(A) Large areas (> 1000 square meters) may sustain a greater density of organisms. May require some form of human involvement to maintain their ecological functions and quality under current pressures and management regimes.

(B) Smaller isolated areas (< 1000 square meters) sustaining lower density of organisms. May require only a reduction of current pressures to preserve the quality of the habitat.

• *Choose A or B go to number (3) –*

3– Interconnection to designated areas.

Single or mixed polygons that intersect the official limits of a protected marine reserve or a military ordinance section, contributing to their possible stabilization due to their connectivity to adjacent natural special areas.

• *(Yes) go to number (11)* • *(No) go to number (4)*

4- Impact threats*:*

(C) Marine habitats along the inner and outer shelf are exposed to low human pressures and habitat degradation, but highly susceptible to large scale disturbances (Global warming, storms, tsunamis, sedimentation). Proximity between nearby habitats contribute to their ability to adapt to change.

(D) Coastal near shore environments are slightly degraded due to nutrients and pollution from coastal development, port activities, agricultural and industrial runoff. Capacity to adjust and recover from future disturbances will require some human intervention to maintain ecosystem integrity and functioning.

• *Choose C or D go to number (5).*

5- Fishing and Aquaculture (PM**)**

Establish to classify those coastal sectors which are been utilized or can be used because of its great potential, to develop a fishing industry and/or aquaculture, or cultivate marine species. Includes sections of land and water whose principal use is or could be the commercial production of sea food.

• *(Yes) identify polygon as **PM*** • *(No) go to number (6)*

6- **Mangrove Forests (B-2)**

Established to classify the different types of mangroves forest in Puerto Rico and to protect them from irreparable damages caused by improper use and lack of foresight in considering the negative impact that other activities have over them.

• *(Yes) identify polygon as* ***B-2*** • *(No) go to number (*7)

7- Conservation and Restoration of Resources (CRR)

Established to classify land or properties or portions thereof in the coastal zone of Puerto Rico, which constitutes part of the architectural, cultural and historic patrimony of PR

• *(YES) identify polygon as* ***CRR*** • *(No) go to number (8*)

8 – Public Beaches (PB)

Established to classify beach sectors in Puerto Rico that due to its scenic, historic, or recreational characteristics have an optimum potential for future development or present use, as coastal tourist and recreational centers; as well as terrain within the terrestrial maritime zone.

• *(Yes) identify polygon as* ***PB*** • *(No) go to number (9)*

9 – (a) **Developed areas (AD)**

Non Urban areas that have been developed into rural communities, townships, isolated urbanizations, industrial development and other similar uses.

(b) **Marine developed areas (AD- M)**

Underwater pipelines, cables, wrecks, marinas, ports, dredged, spoiled areas and other similar uses.

• *(Yes) identify polygon as* ***AD*** *or* ***AD-M*** • *(NO) go to number (10)*

10 -Data availability – • *No relevant data is available at the time :*

If impact threats are < for (AC) or (BC) then go to number (11)
If impact threats are > for (AD) or (BD) then go to (12)

11- Resource Preservation (PR)

Marine or Coastal polygons single or mixed that can be used only to preserve existing natural conditions of ecosystems, migratory patterns of wildlife, and to enhance the continuity of evolutionary processes and genetic flow patterns. Established to classify specific areas of the coastal zone constituting natural resources to be protected for scientific studies and contemplation

12 - (a) Conservation of Resources (CR)

Established to classify areas of the coastal zone such as mangroves, bioluminescent bays, forest, dunes, lakes, geological formations, coral reefs, wildlife refuges, reservations, falls, springs, caves and sinks, natural habitats for endangered species, and other areas of special interest that should be protected for observation, scientific studies and the limited and controlled use of recreational facilities.

(b) Conservation of Marine Resources (CR-M)

Established to identify and classify pristine marine ecosystems such as coral reefs, sub aquatic vegetation, and other areas of special interest that should be protected for observation, scientific studies and the limited and controlled use of recreational facilities. Anchoring is not allowed, and fishing activities must follow established regulations.

3. STRATEGIC CONSIDERATIONS

2.1 Participatory mapping

Protecting coastal resources from destruction and deterioration due to improper use or lack of foresight in preventing the adverse impact that other activities have over them entails comprehensive planning, research and monitoring. Participatory mapping is commonly used to create maps that represent, resources, hazards, community values, usage, perceptions or alternative scenarios. Is a powerful tool that can simultaneously serve to create opportunities for stakeholder participation, capture important new information, and help participants make better coastal management decisions

To this effect a representative group of interdisciplinary professional staff was formed to develop a mapping exercise of multiuse zoning for the south coast of Puerto Rico. Conferences and outreach activities were planned for engaging individually stakeholders in providing local objective information on coastal resources exploring the responses as a group. The evaluation consisted of the (4) following steps:

- Planning the acquisition and synthesis of the appropriate data that was required to evaluate the diverse array of ecosystems distributed along the submerged lands.

Relevant data from different layers of existing GIS data sets, marine protected areas, satellite images and coral reef baseline data from wetlands and benthic maps made by the U.S. Fish and Wildlife Service, NOAA and DRNA were selected to initiate the evaluation of different use zones for marine ecosystems. Improving knowledge about ocean resources through mapping and monitoring activities is critical to developing baseline data and information to support ecosystem management.

- Classifying information about the real use of marine spatial areas, identifying local threats of stakeholder's activities processed at DNER permit divisions, reviewed by professional staff. Develop marine zoning guidelines.

According to joint permit application records, port and marina maintenance, dredging, ship groundings, laying of submarine fiber optic cables, increased demand of boating activities, poor anchoring practices and commercial and recreational fisheries activities, pose growing threats to marine ecosystems. Today they represent only a few of existing multiple ocean uses.

The guidelines provide a scientific and methodological basis for the comprehensive zoning of submerged lands; zoning districts can be delineated and mapped in order to minimize use conflicts among stakeholders, user groups, the public, and to maximize the sustainability of marine space

- Comprehensive analysis and adaptation of existing zoning regulations and criteria identified for zoning marine resources.

To initiate the classification of zoning districts the island shelf was divided into sub-regions containing regional scale baseline data and similar polygons with complex habitat assemblages stratified as mangroves, coral reefs, and sub aquatic vegetation. Using GIS, the layers of information were overlaid in an easy to use format to produce several large baseline maps (3 by 3 feet). Marine zoning guidelines were provided as a reference tool for technical staff participants.

Using their own professional expertise they evaluated and assigned five types of multiuse zoning districts (PR-Resource Preservation; PM-Fishing and Aquaculture; CR- Resource Conservation; B-2 Mangrove Forests; CRR- Resource Conservation and Restoration) to baseline maps. The cartographic unit's representativeness was finally evaluated using a group of interagency professionals. The corrections for relevant zoning issues were reprocessed using GIS, and integrated to final maps. Finally a permanent exhibit of marine zoning maps were exposed to the public for general use at DNER natural reserves offices, located around the island at Arecibo Cabo Rojo, Guayama, Fajardo, and San Juan.

The main objective of implementing multiuse zoning maps is to protect natural and environmental resources from their destruction and deterioration due to improper use or lack of foresight in preventing the adverse impact that other activities may have over them.

Multiuse objective mapping resulted in the delineation of 188 zoning districts on the south coast with the following proposed classifications: 88 districts were evaluated, classified and proposed for preservation (PR); 48 districts proposed for conservation (CR) and 52 districts proposed for mangrove protection (B-2

- Validation of the proposed zoning districts

The proposed coastal zoning maps were distributed in the coastal municipios that integrated the landward domain (a total of 14) of the 6 southern marine sub-areas. After review, local planning offices concluded that it was relevant to initiate planning efforts to coordinate the

potential timetable and procedures to integrate the adoption of ocean zoning districts as part of the Island wide Land Use Plan with the Planning Board.

Throughout the islands of the Caribbean all communities may be regarded as being coastal dependent. Puerto Rico's coastal communities are highly dependent upon the ocean and its resources to support dynamic ecosystems, working waterfronts, maritime commerce, tourism, recreation, energy, and healthy, disaster-resilient communities. The zoning proposed for the submerged lands represents an opportunity to develop a planning framework for integrating coastal, marine and socioeconomic systems to generate management recommendations for guiding public and private development of our marine spatial places.

The effectiveness of the zoning district proposals in affecting governmental decision-making remains to be determined. It is notable that the decision to pursue a program of zoning submerged lands is consistent with new federal initiatives related to Ocean and Marine Spatial Planning and with the Presidential executive order 12345 of July 19, 2010.

- Managing strategic information on an ongoing basis to meet planning needs.

To raise general awareness on CMSP, conferences and outreach activities were coordinated during years 2010-11 integrating stakeholders, academia and intergovernmental agencies participation. A total of 435 participants and 40 presentations with relevant scientific information were obtained. Preferred spatial use scenarios were identified and classified to initiate the marine spatial planning process. A web page for monitoring coastal and marine resources is being developed for stakeholders.

MANAGEMENT GOALS

- **Goal (1) Identification of areas for conservation and biodiversity protection.**
- **Goal (2) Facilitate the decisional process and inter-relations between government and society.**
- **Goal (3) Obtain equilibrium between productive activities an natural resource protection.**
- **Goal (4) Offer investment opportunities for private and public sectors (Industrial, Mari culture, Tourism)**
- **Goal (5) Stimulate the sustainable use of marine spaces and the effectiveness of public policies**
- **Goal (6) Promotion of productive activities with no adverse impacts in suitable areas.**

2.2 Preferred Spatial Use Scenarios

Stakeholder participation is vital to many steps in MSP process, including the development of social, economic, and ecological goals and objectives; mapping current and future uses of marine ecosystems; and selecting preferred spatial use scenarios and zoning plans.

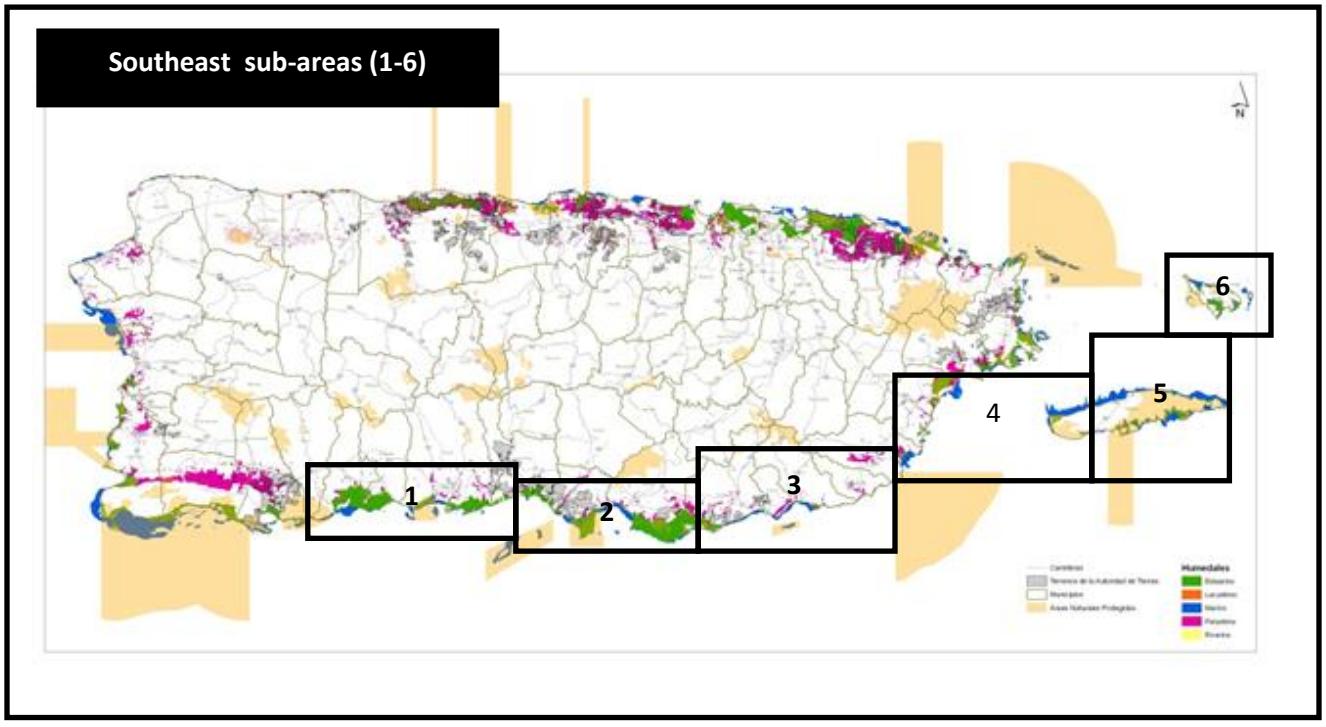
Transparency is a key element of participatory mapping. Stakeholder's preferred spatial use scenarios associated to main goals were obtained after review of some presentations and workshops given at Marine Spatial Planning conferences. Information about marine spatial places was widely available to the public, particularly information facilitating greater understanding of decision-making.

US NAVY MILITARY RANGE- VIEQUES PUERTO RICO

<u>Targeted management goal (1):</u> Identification of Areas for Conservation and Biodiversity Protection.

a- Southeast coastal sub -areas (1-6)

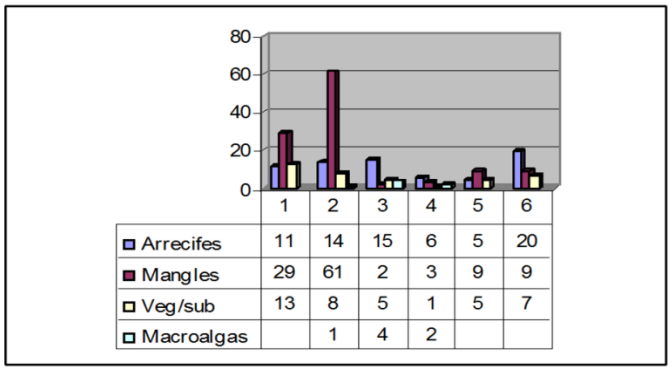
PRCMP funded marine spatial planning efforts through 309 coastal habitat and wetlands task activities addressing characterization and zoning needs for terrestrial and marine habitats such as coastal wetlands, sea grass, coral reefs, and open oceanic habitats. These natural resources encompass highly productive ecosystems. The presence of different habitat's in close association to one another's is considered especially valuable since they provide a natural energy flow between systems.



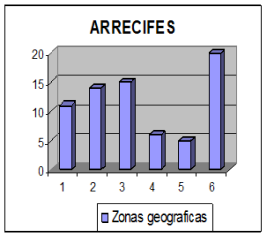
Marine life and habitats of the southern region of Puerto Rico were selected for developing coastal zoning maps as a planning tool that can be used in following principles and practices of MSP. Conservation of Resources is represented with red polygons, Preservation of Resources with light green and Mangroves with dark green.

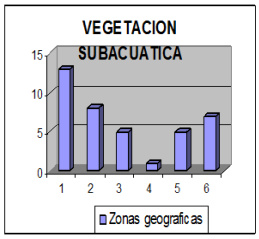
Southeast sub- areas (1-6)

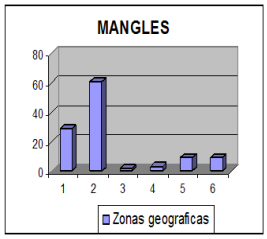
Geographical distribution of Coastal and Marine Habitats:



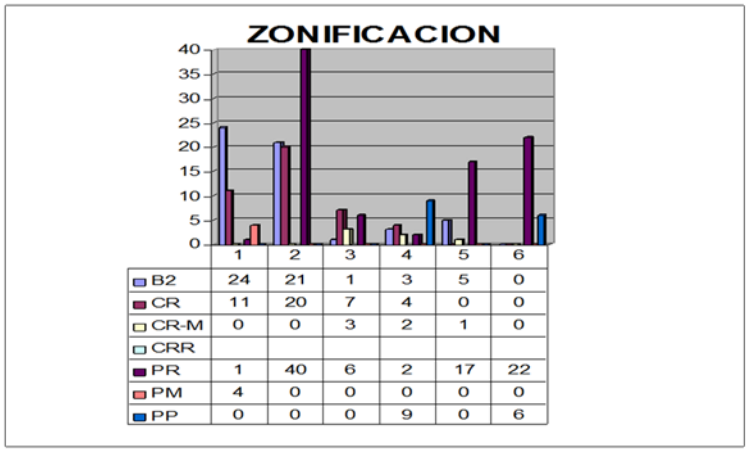
	1	2	3	4	5	6
Arrecifes	11	14	15	6	5	20
Mangles	29	61	2	3	9	9
Veg/sub	13	8	5	1	5	7
Macroalgas		1	4	2		







Spatial distribution of coastal zoning districts.

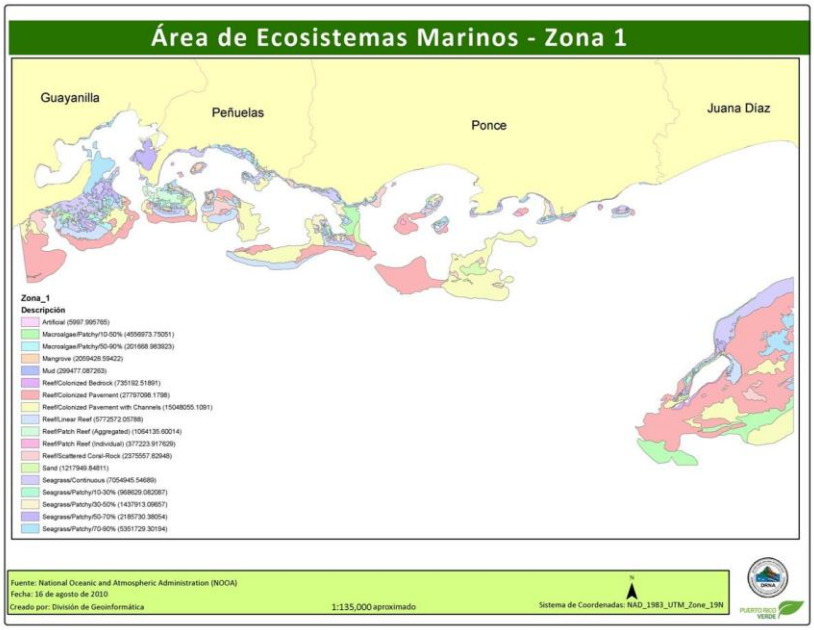


	1	2	3	4	5	6
B2	24	21	1	3	5	0
CR	11	20	7	4	0	0
CR-M	0	0	3	2	1	0
CRR						
PR	1	40	6	2	17	22
PM	4	0	0	0	0	0
PP	0	0	0	9	0	6

Preferred spatial use scenario

Southeast sub-areas: 1-a marine ecosystems, 2-b coastal zone map.

(1-a)

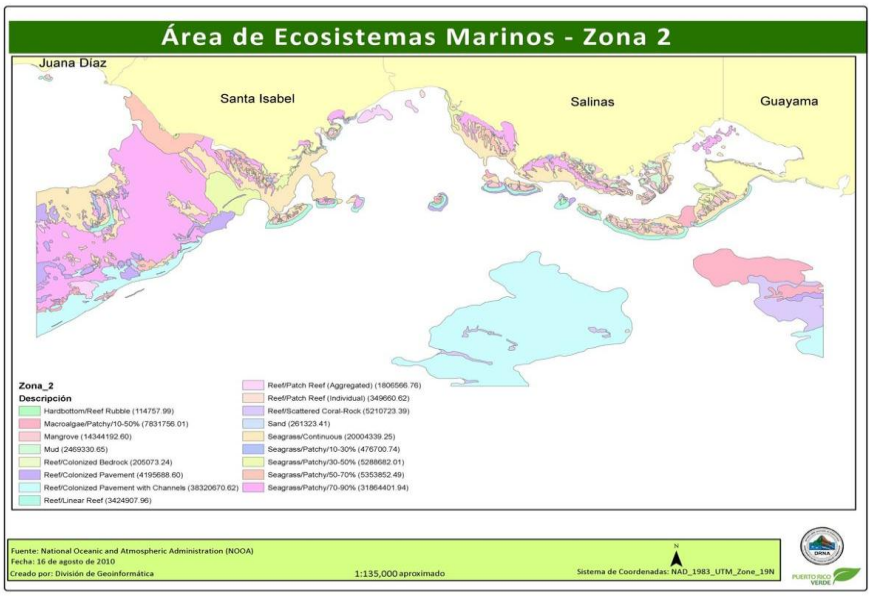


(1-b)

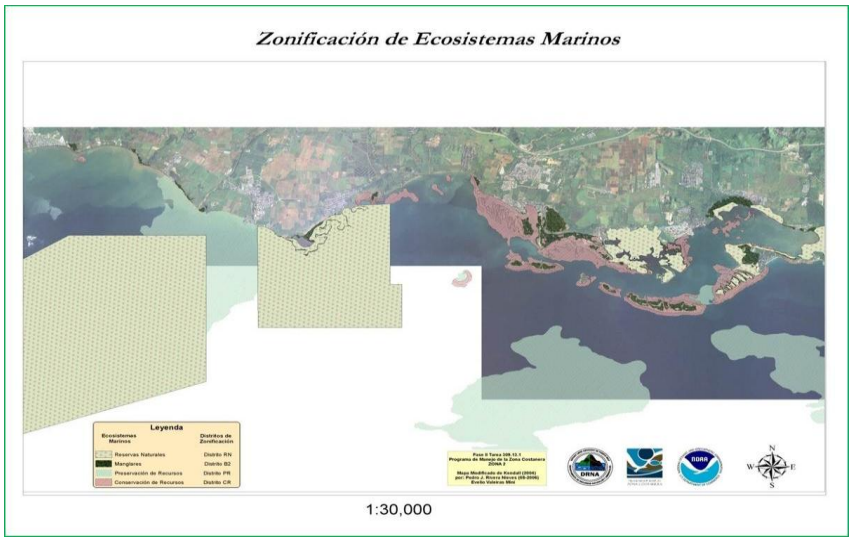
Preferred spatial use scenario

Southeast sub-areas : 2-a marine ecosystems, 2-b coastal zone map

(2-a)



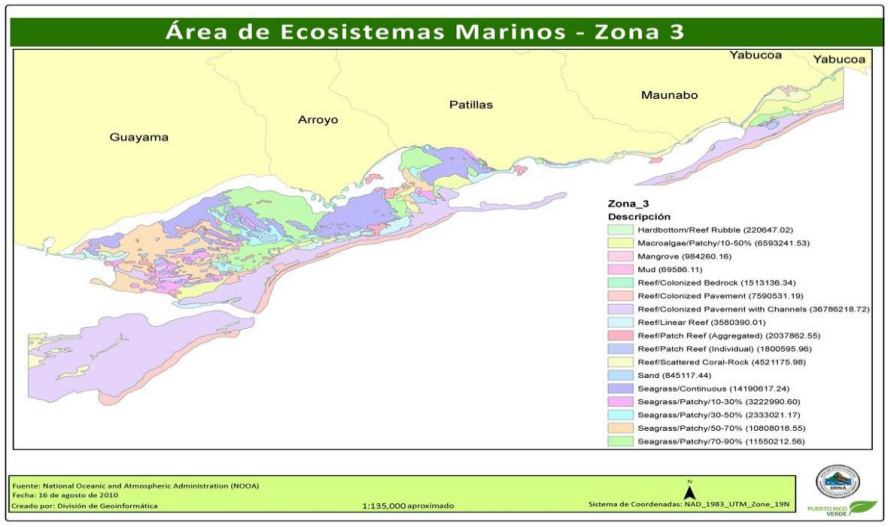
(2-b)



Preferred spatial use scenario

Southeast sub-areas : 3-a marine ecosystems , 3-b coastal zone map.

(3-a)

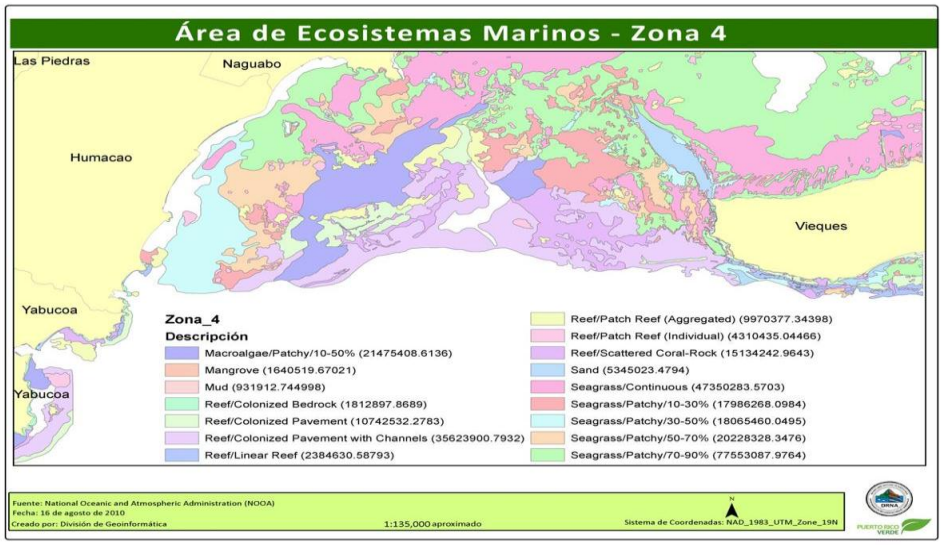


(3-b)

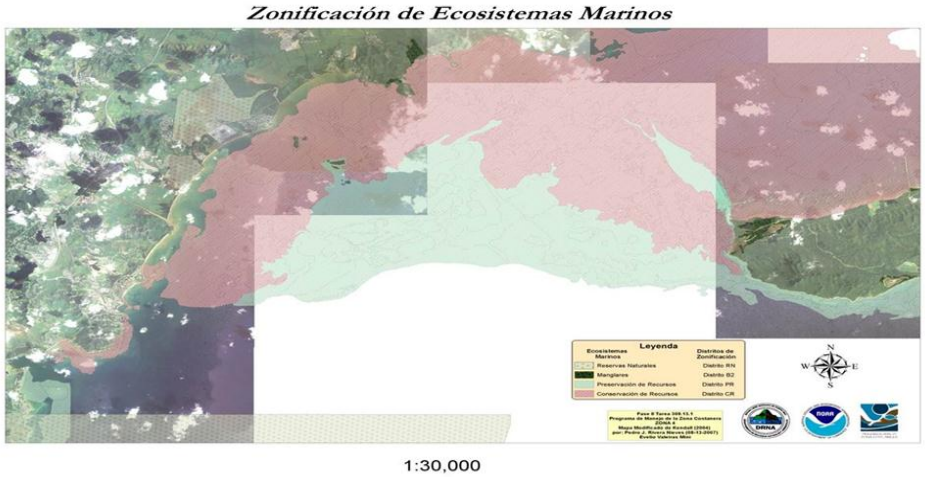
Preferred spatial use scenario

Southeast sub-areas : 4-a marine ecosystem, 4-b coastal zone map.

(4-a)



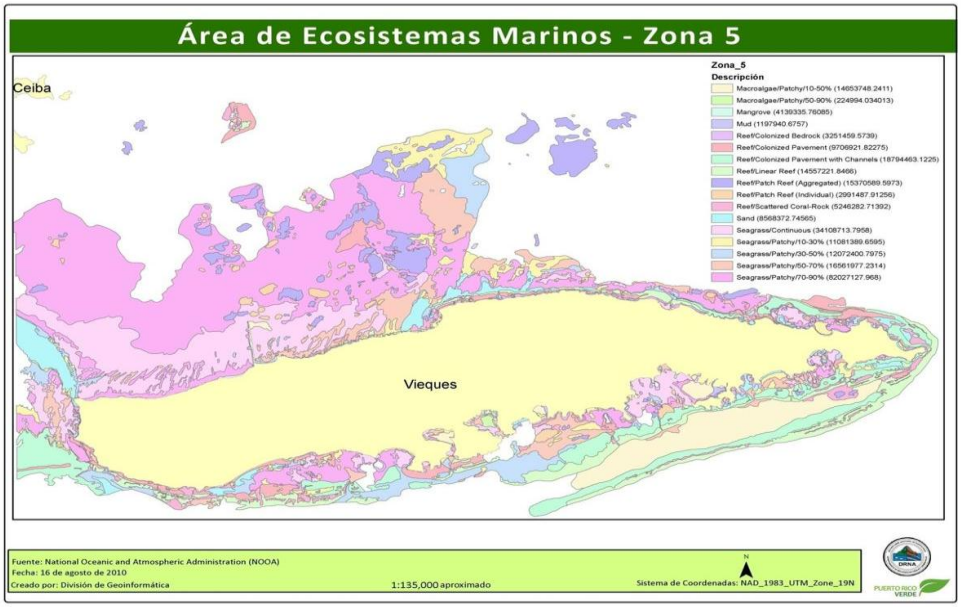
(4-b)



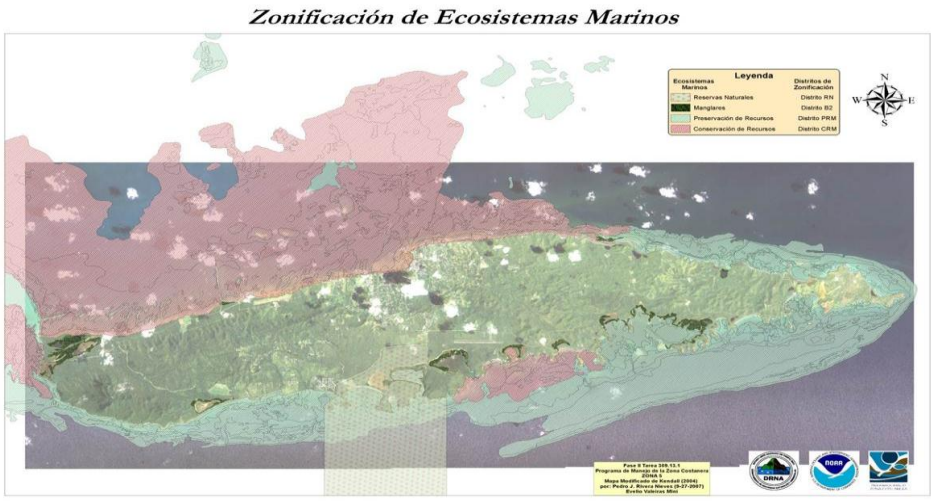
Preferred spatial use scenario

Southeast sub-areas : 5-a marine ecosystem, 5-b coastal zone map.

(5-a)



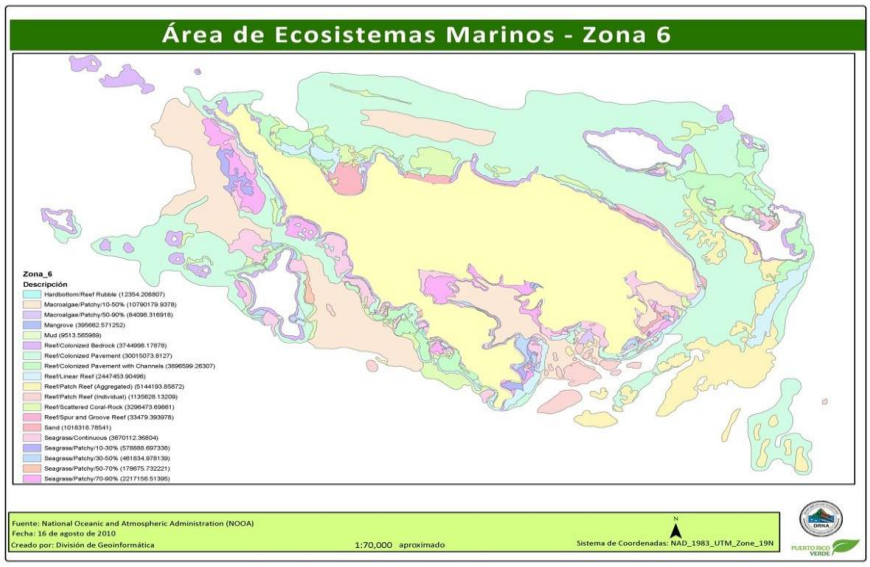
(5-b)



Preferred spatial use scenario

Southeast sub-area : 6-a marine ecosystem, 6-b coastal zone map.

(6-a)

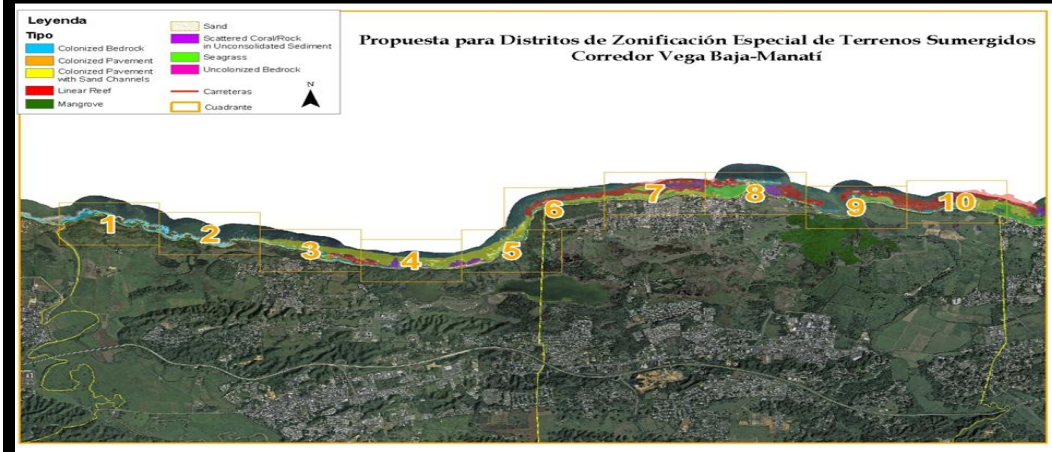


(6-b)

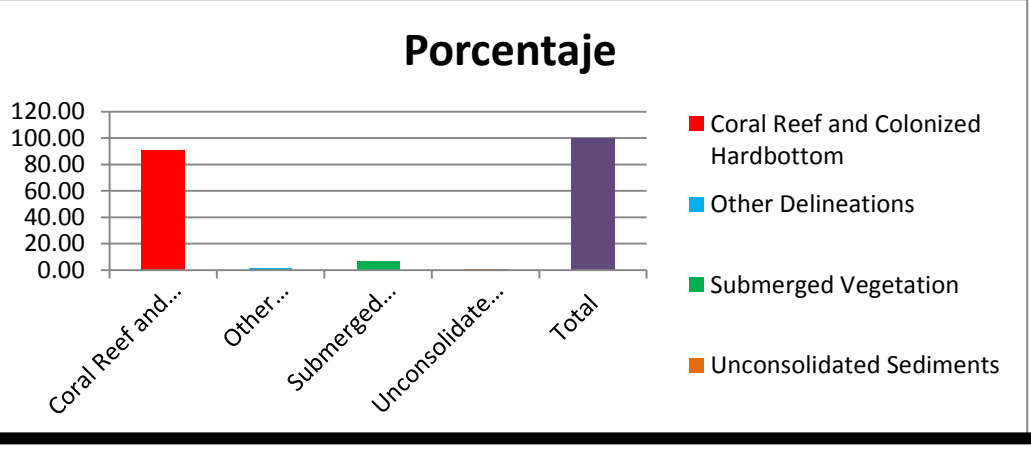
b- Northern Coastal Sub-Areas (3-10)

This area has been proposed as a Natural Reserve by Grupo Vida's, a communitarian environmental group. Coastal zoning maps were developed for an offshore section between Manati and Vega Baja as part of a participatory mapping exercise. Coral reefs (red polygons) were classified as (CRM), marine resource conservation.

Geographical distribution of Coastal and Marine Habitats:

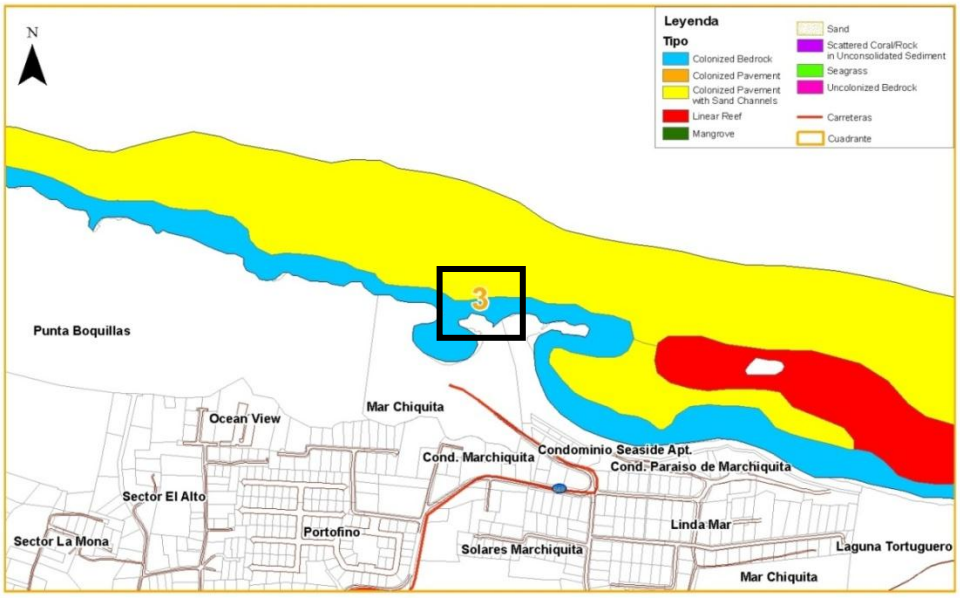


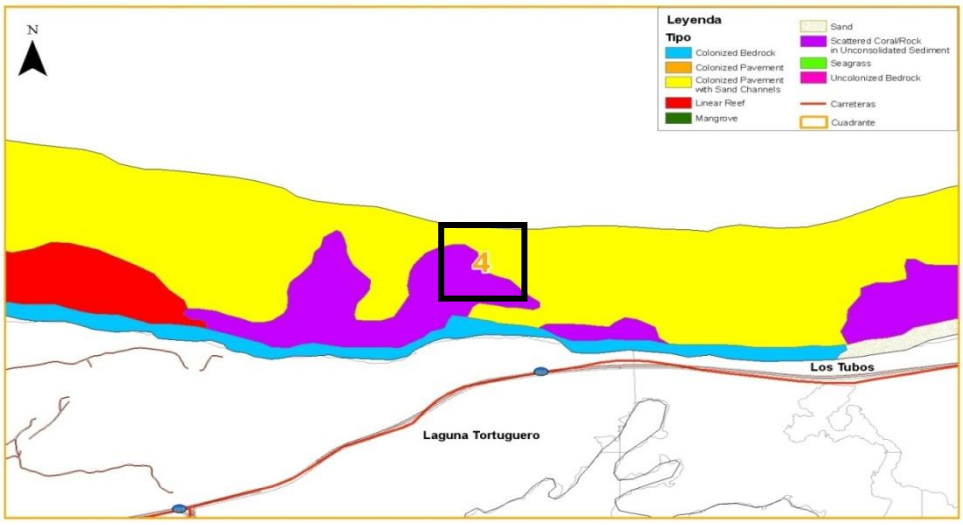
HABITAT	Metros Cuadrados	Cuerdas	%
Coral Reef and Colonized Hardbottom	6825606.85	1736.62	**90.68**
Other Delineations	103869.41	26.43	**1.38**
Submerged Vegetation	527080.24	134.10	**7.00**
Unconsolidated Sediments	70936.47	18.05	**0.94**
Total	7527492.95	1915.20	**100.00**



Preferred spatial use scenario

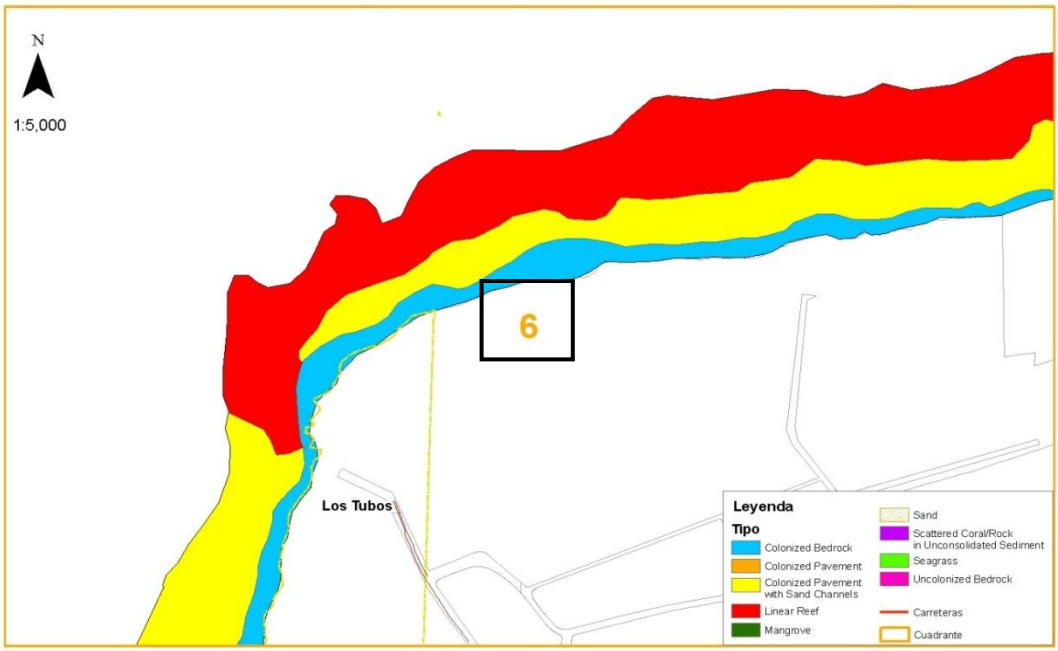
Northern coastal sub areas (3-4)

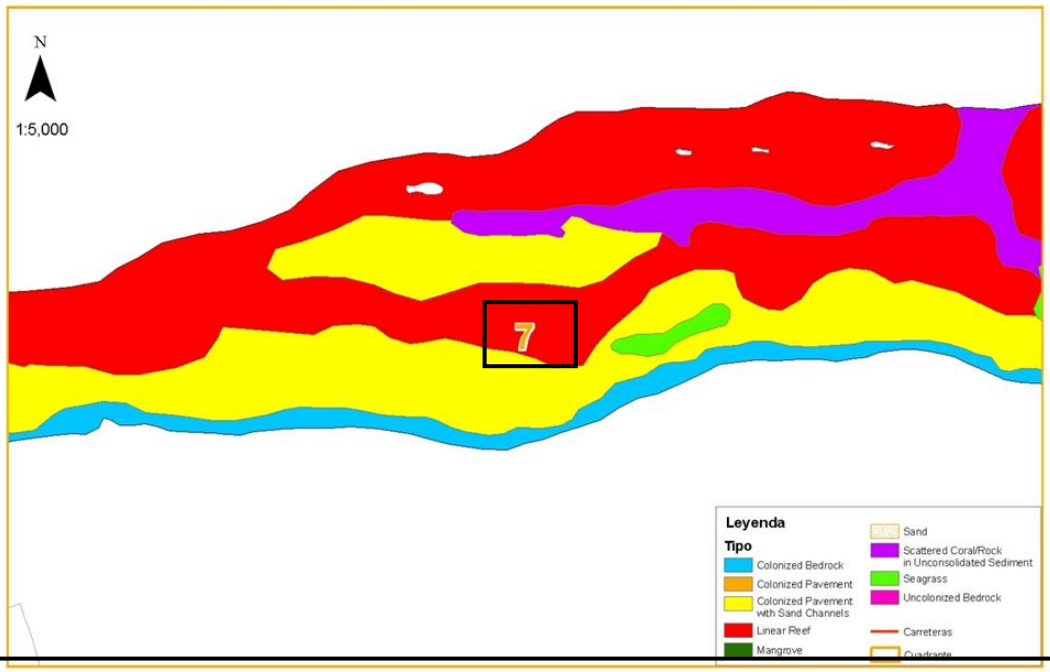




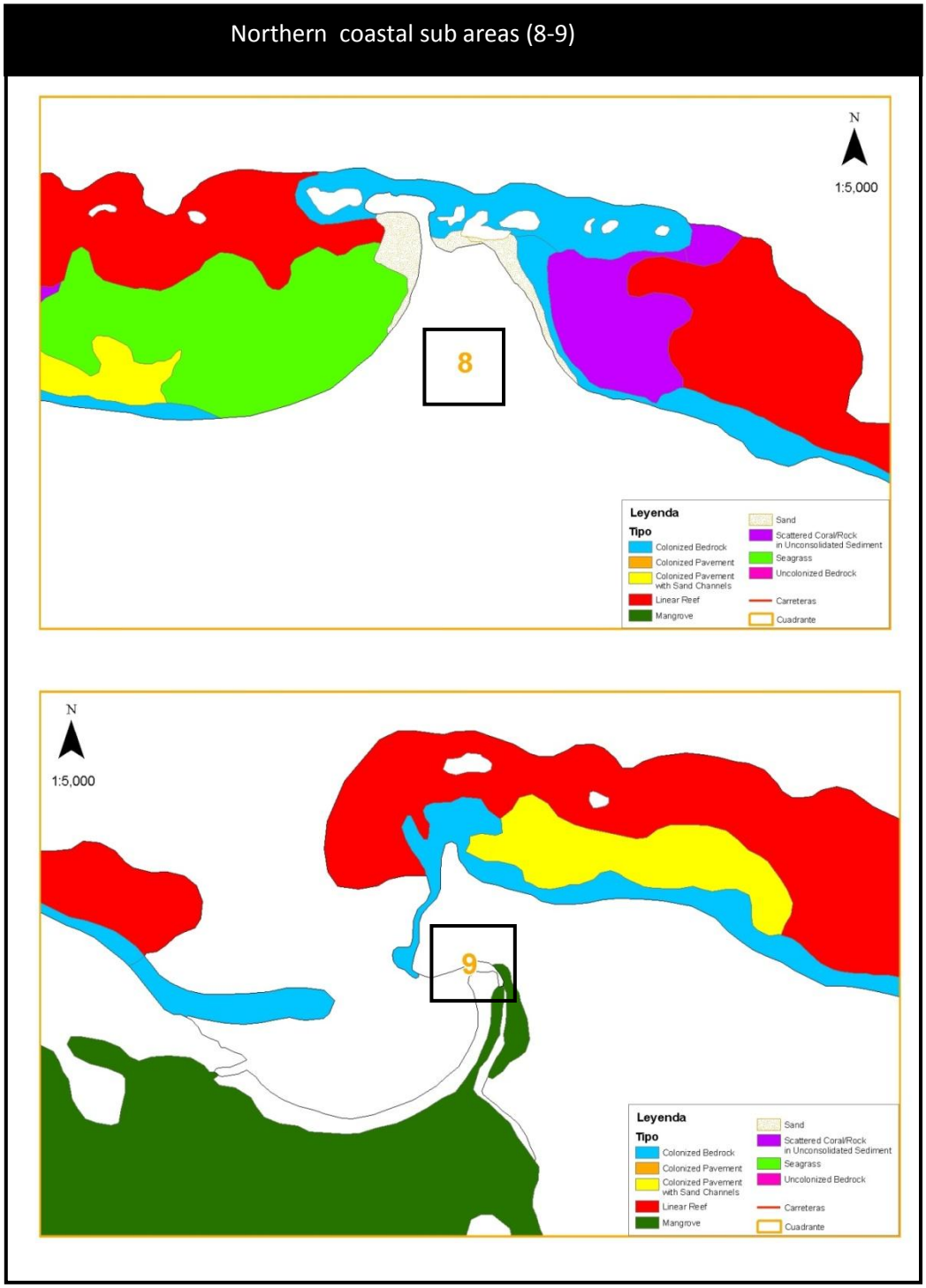
Preferred spatial use scenario

Northern sub areas (6-7)



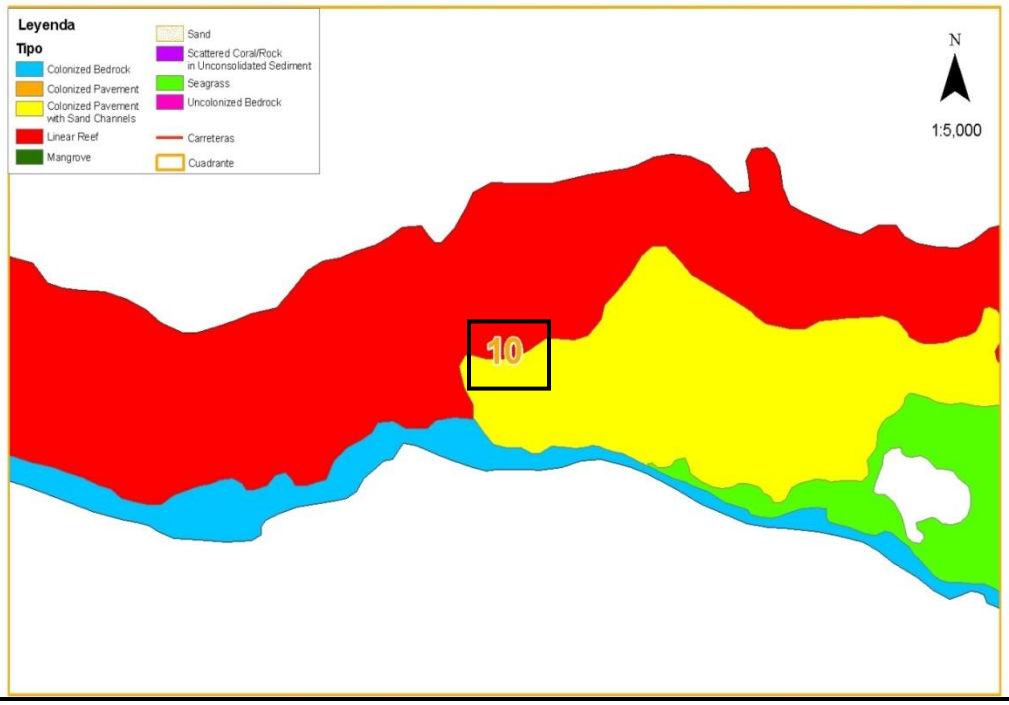


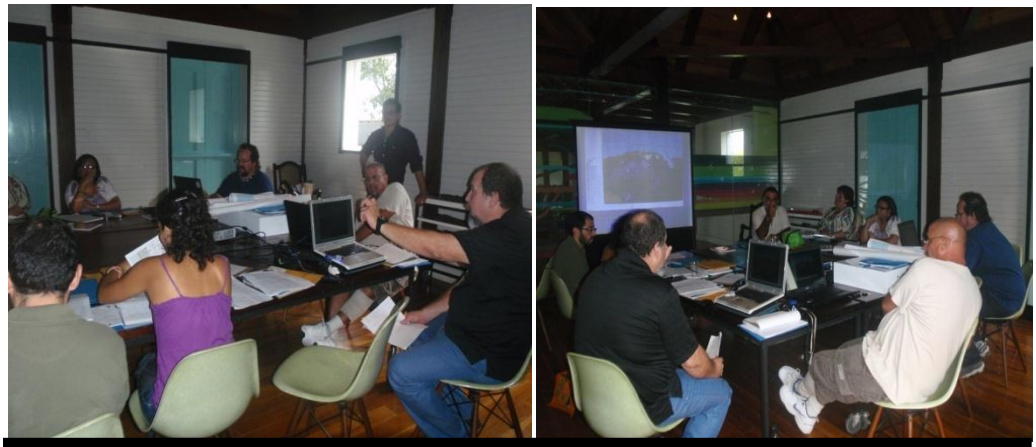
Preferred spatial use scenario



Preferred spatial use scenario

Northern sub area (10)



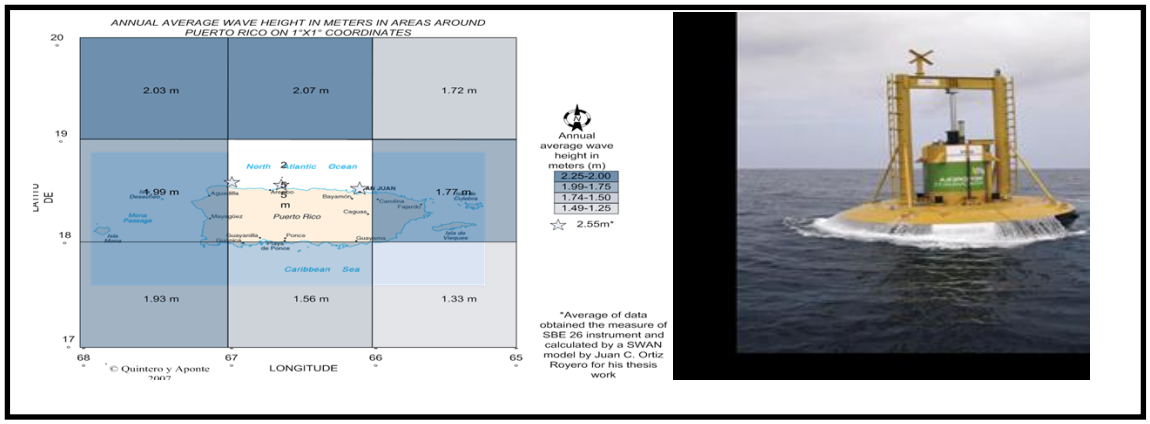


Mapping exercise – Hacienda la Esperanza , Manatí Puerto Rico

<u>Targeted management goal (2):</u> Facilitate the decisional process and inter- relations between government and society.

a-Achievable Renewable Energy :

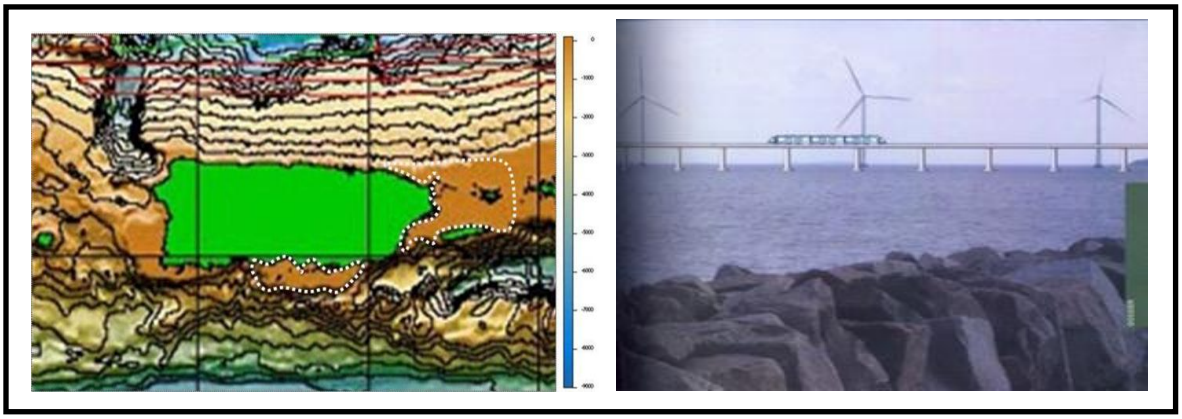
- Ocean waves



Represents the largest, naturally produced, untapped energy resource for Puerto Rico. Has an extraordinary potential. With close to 17,000,000 MWh of potential annual production using only 10% of the available ocean space in the North West Coast

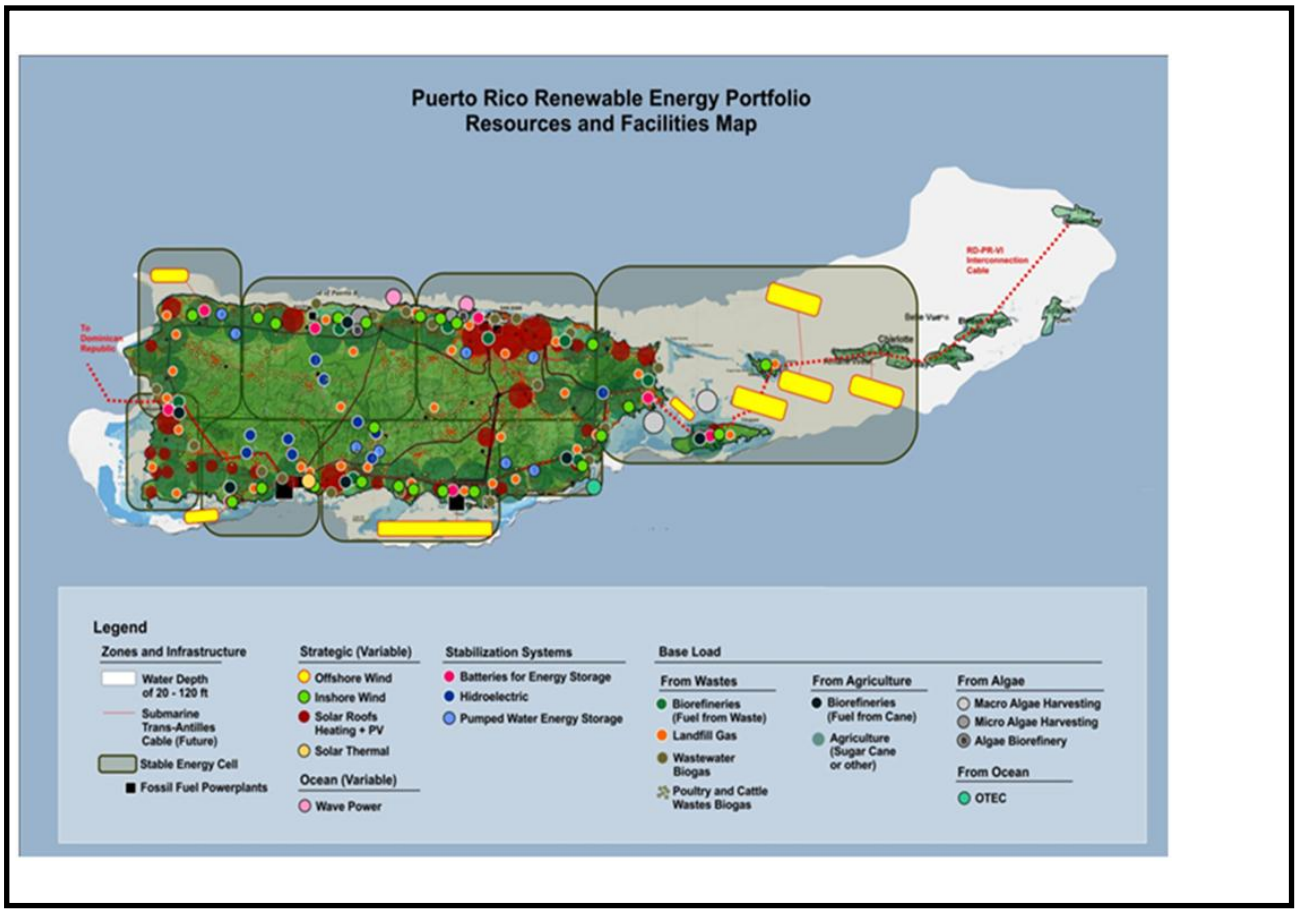
- Offshore Wind Farms

Offer a very high potential of electricity production in Puerto Rico and offer the advantage of no land use. Even with its higher capital cost offshore wind remains attractive and competitive cost wise.

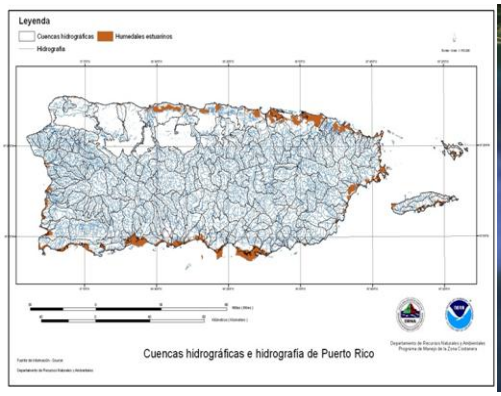


The report submitted by Colluci and others (2007), to the Puerto Rico Energy Affairs Administration (PREAA) recommends wind, solar photovoltaic and ocean waves as the renewable resources/technologies to be targeted via Renewable Portfolio Standards in the immediate future. A clearly achievable use of only 10% of these resources was estimated to provide 115% of the 2006 electric energy demand.

Preferred spatial use scenario

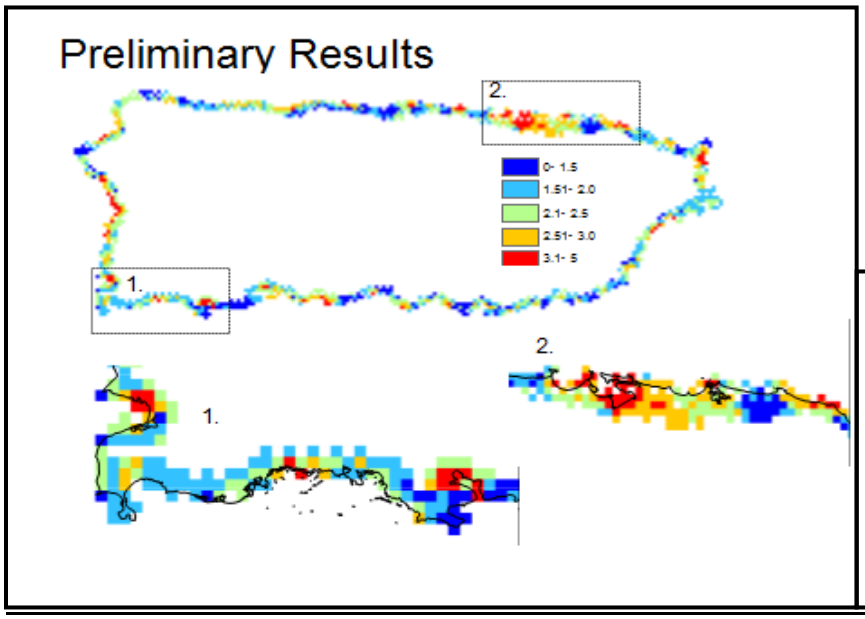


b-Modeling Coastal Degradation Risk



Natural and socioeconomic coastal variables specific to Puerto Rico were used to produce an overall risk ratio scale specifically related to the degradation of coral reef ecosystems. Using these data within GIS, the coastal areas were mapped for their cumulative risk.

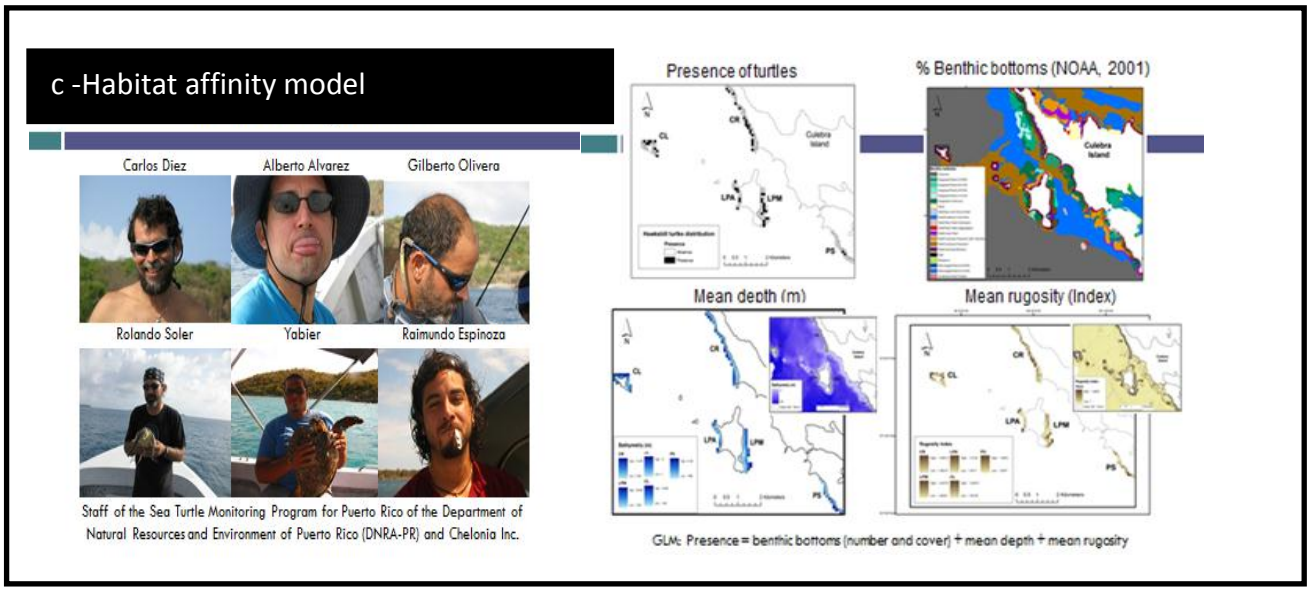
Preferred spatial use scenario



Vulnerability Ranking

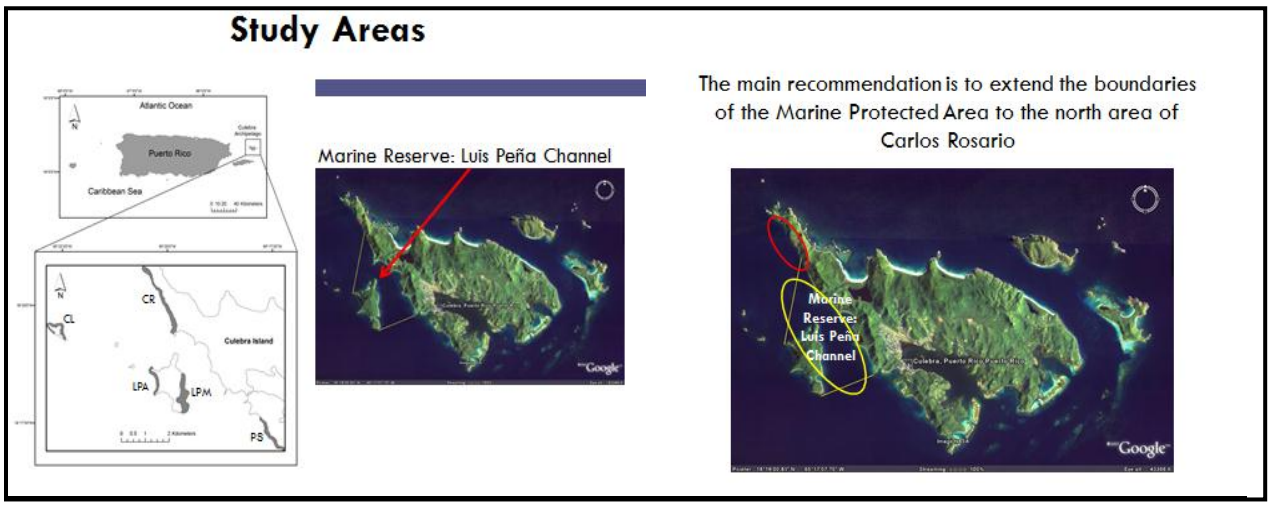
Variable	None (0)	Low(1)	(2)	Moderate (3)	(4)	High (5)
Land use	Forest			Shrub	pasture	Urban
River discharge	0	<43304	1674	323907	774935	4714614
Relative Erosion	0	15	16-60	51-125	126-200	201-220
Fisheries pressure	0	1-13	14-21	22-32	33-48	49-125

$$VR = \frac{X_A + X_B + X_C + \ldots X_n}{N}$$

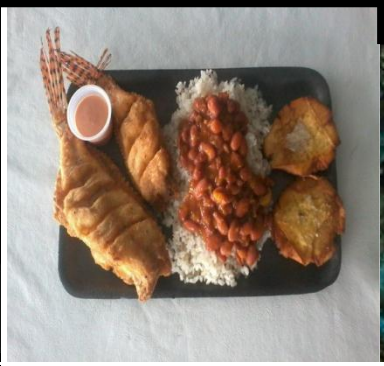


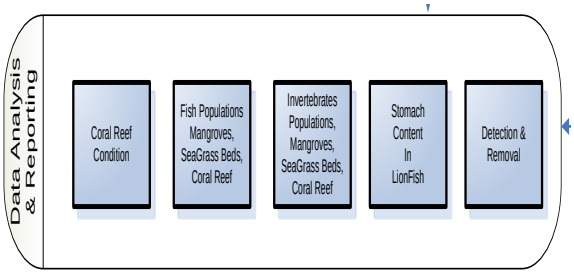
This is the first approach to understand distribution of juvenile hawksbill sea turtles in the Caribbean by using predictor variables. It could be used to identify critical habitats to protect this species including other life stages of turtles. Habitat affinity needs to be completed with a distribution model and confirmation of presence of turtles around the Archipelago.

Preferred spatial use scenario



d-Lionfish response program





In 2004, the first lionfish were reported in the Bahamas and since 2007, they have spread rapidly through the northern and western Caribbean. The mostly likely pathway of introduction for lionfish is via home aquariums; lionfish that were illegally dumped by their owners into Atlantic waters.

Preferred spatial use scenario

Reporte avistamientos del Pez León:

Área Suroeste
Laboratorio de Investigaciones Pesqueras - DRNA
787-833-2025

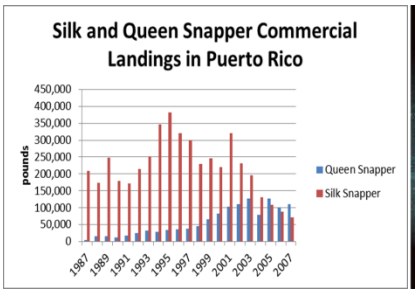
Área Norte
Oficinas Centrales DRNA
787-999-2200 Ext. 2690, 2694
njimenez@drna.gobierno.pr
rdelmoral@drna.gobierno.pr

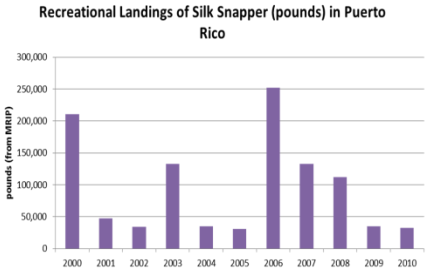
Isla
ECOTONO, Inc.
A través de nuestra página Web
www.caribbeanlionfish.org
y/o
info@caribbeanlionfish.org

Para reportes luego de las 5:00 p.m.
o durante fines de semana:
787-370-0099

<u>Targeted management goal (3) :</u> Obtain equilibrium between productive activities and natural resource protection.

Fisheries

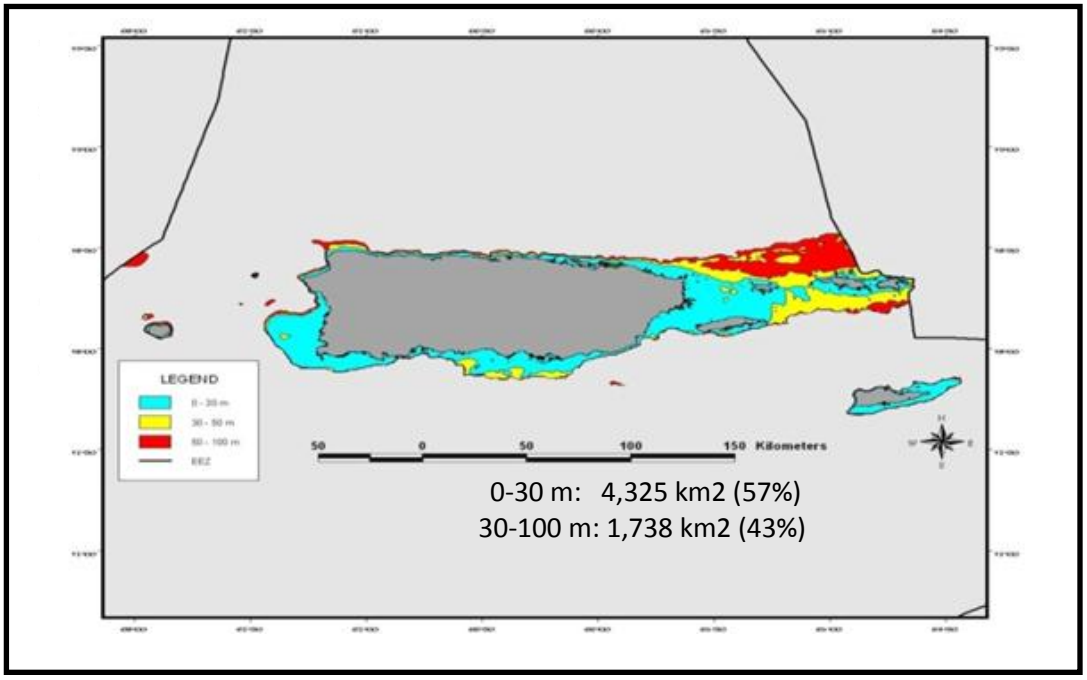




Data from the Fisheries Research Lab/ DNER and Cumming, Matos-Caraballo and others from the SEDAR 26 in 2011.

There is as much potential coral reef habitat at combined depths of 30 to 100 m. These are the upper slopes where the fishery for larger snappers and groupers take place. The first step in using an ecosystem approach to management must be to identify and bound the ecosystem and most importantly to be able to establish and know the connectivity among these – from shallow to deep – these are all part of the large marine ecosystem. Bathymetry, biodiversity, rugosity, and other ecological factors must be considered.

Preferred spatial use scenario

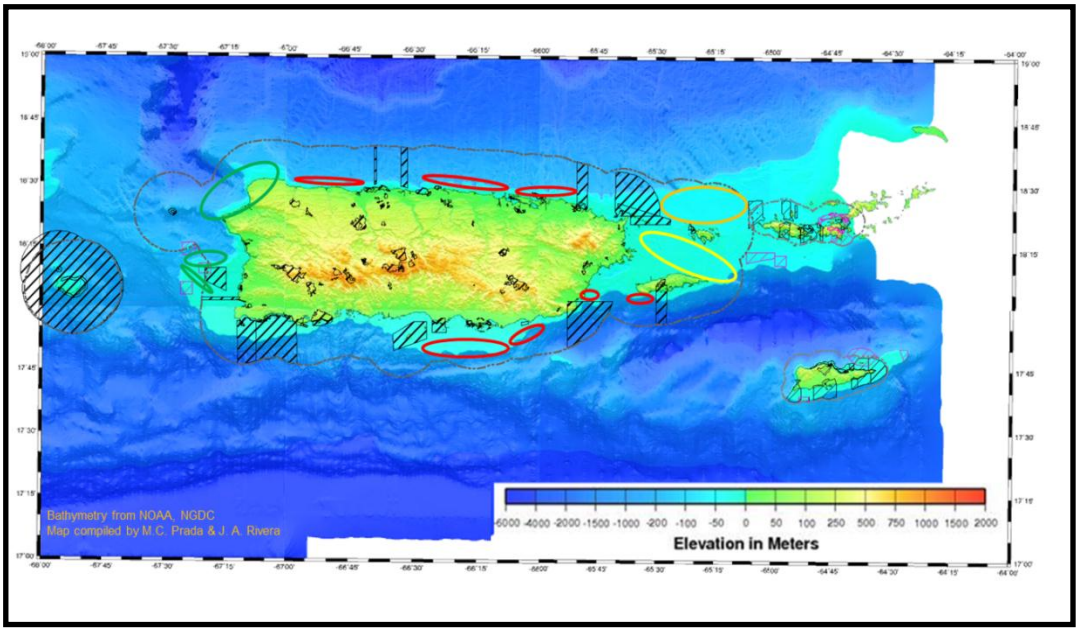


Targeted management goal (4)- Offer investment opportunities for private and public sectors (Industrial,Mariculture, Tourism).

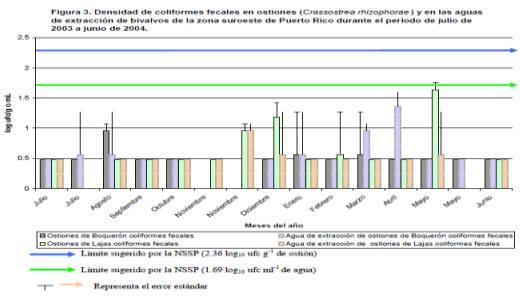
a-Open Ocean Aquaculture

Planning for zoning marine areas for the culture of fish, in part, is being driven by the shift in world total fisheries production trend. Sea Station cages were used for the grow out of Cobia (Rachycentrum canadum) in PR & Panama. Belize, Dominican Republic, Mexico and Colombia are using surface cages to grow same species. Mexico is also experimenting with grow out of Peneaus vannamei inside Aquapods in the Sea of Cortez . Other countries such as Australia have significant aquaculture ventures and are using zoning as an ordination method to regulate this activity

Preferred spatial scenarios

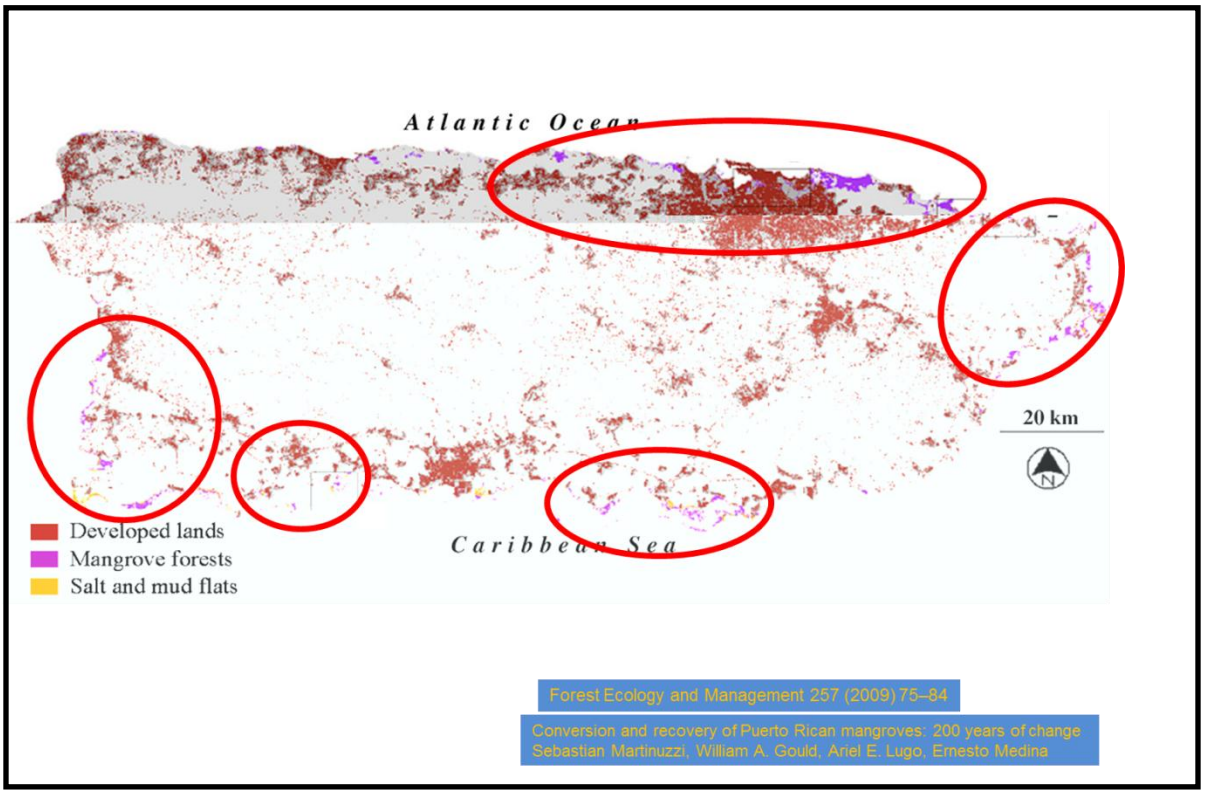


b-Coastal lagoons and bays aquaculture

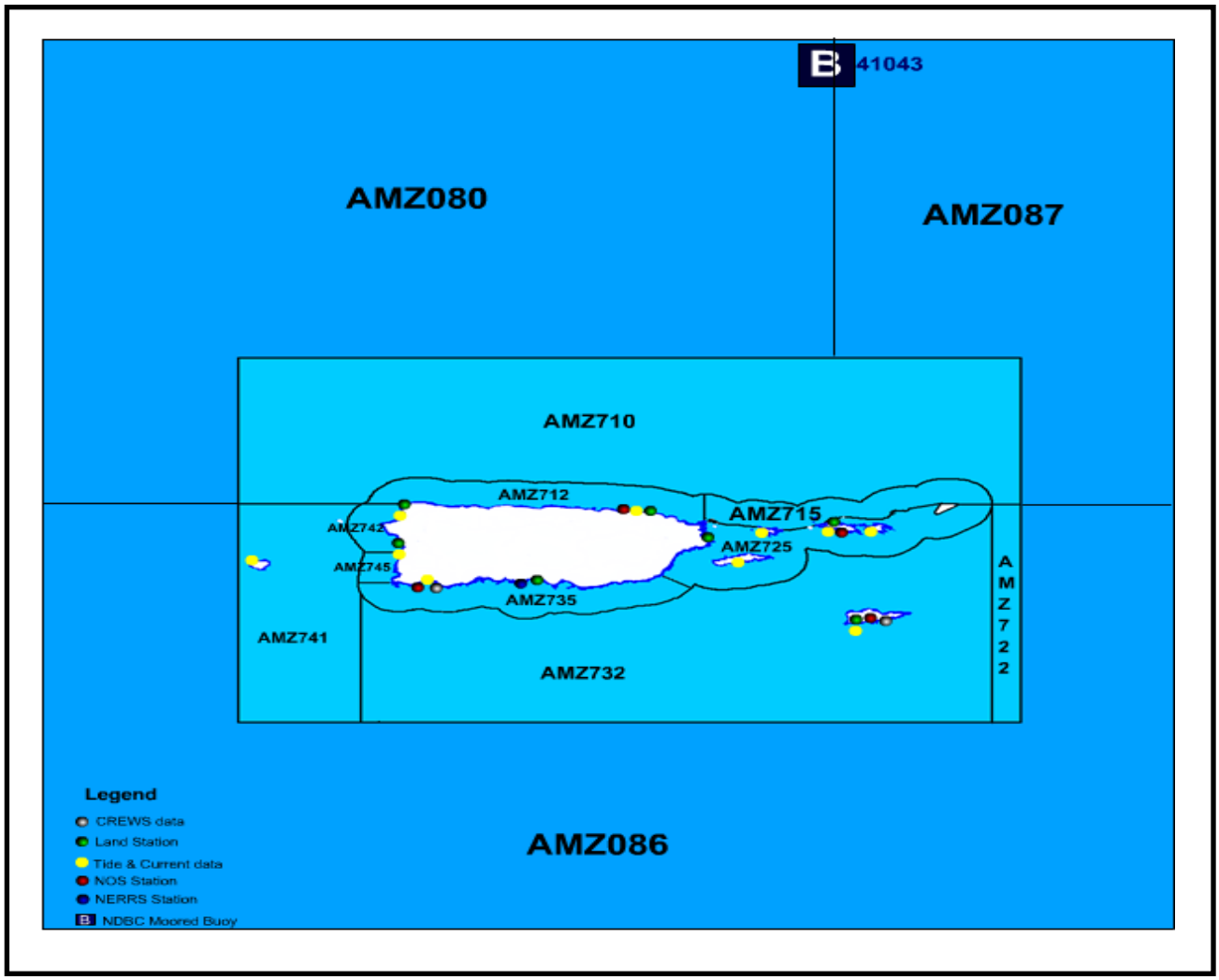


Using Mollusks for aquaculture in Coastal Lagoon and bays. They act as filtering organisms reducing the nutrients loads, suspended particles and coliform bacteria. This ecological action improves the water quality of habitats for other organisms.

Preferred spatial use scenarios



Using the NOAA NWS weather observation and prediction zones for PR as a proxy for different sea and wind conditions, one can assign preferential ranking to the zoning of open ocean aquaculture ventures. Green being the most preferred , yellow , the second best followed by orange and red, the least preferred



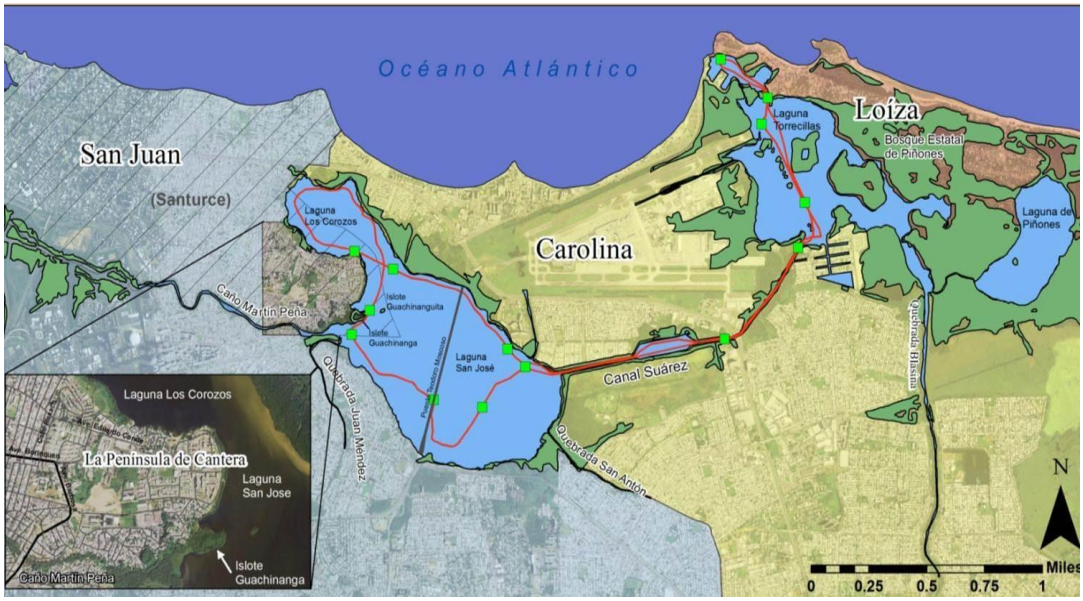
The Puerto Rico Senate adopted Project 581 on March 31, 1999, requesting the Land Authority to designate 75 acres for the development of aquaculture projects. However, there has been no change in the aquaculture industry as a result of this action

<u>Targeted management goal (5) :</u> Stimulate the sustainable use of marine spaces and the effectiveness of public policies.

Marine Education

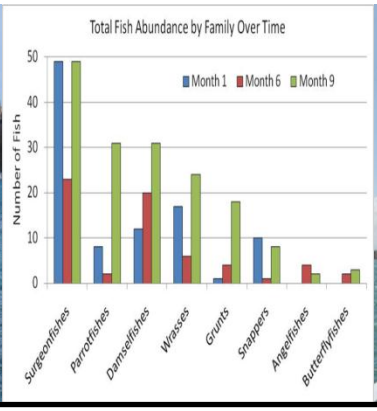
Stimulate the use and conservation of natural areas through communitarian activities related to local tourism. Natural interpretation of marine environments and cultural resources to educate and motivate visitor's awareness in conservation, and enhance the value of coastal and marine resources. An initiative of Expeditions Eco y Peninsula.

Preferred spatial use scenario



<u>Targeted management Goal (6)</u> : Promotion of productive activities with no adverse impacts in suitable areas

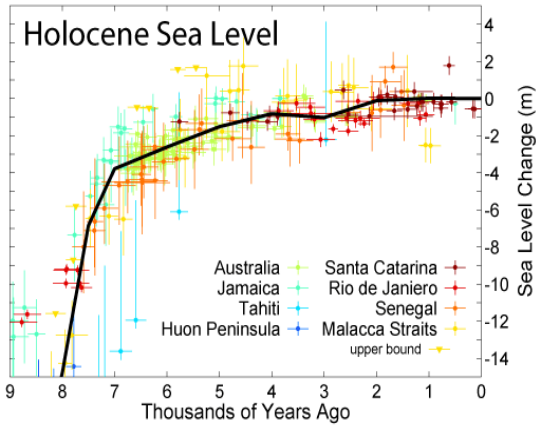
a-Underwater Reef Trails



The underwater trail constructed by the San Juan Bay Estuarine program is made of thirty underwater modules deployed at interval of of 2 to 5 meters, extending approximately a 100 meters distance from shore. In Puerto Rico at Caja de Muertos Natural Reserve (Ponce) , and other parts of the world were similar structures have been deployed in the bottom of the sea, an increase in the biodiversity of marine organism's and recreational activities like diving and fish watching has been observed.

Preferred spatial use scenario

b-Underwater Archeological Parks



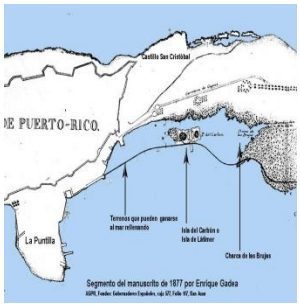
Maritime archeology is a scientific discipline within anthropology that studies past human interaction with the sea, through the excavation of ports, shipwrecks, inundated prehistoric sites, etc. The oldest prehistoric sites in Puerto Rico are found under the sea. Potential underwater archeological parks described during the 2010 Annual conference of Marine Spatial Planning are presented.

Preferred spatial use scenarios

- **Isla Verde site**

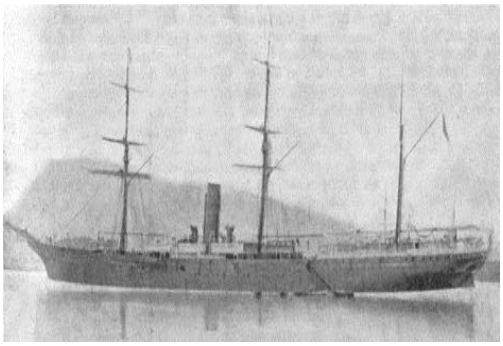
First excavation of a submerged prehistoric site in the Caribbean (1980) . Found in early 1970's by JV and A. Camacho 800 to 1200 BP. Ceramics, stone adzes, human bones, manatee & turtle bones. Near Spanish shipwreck (16th century). Declared as a Natural Reserve by Legislation on 2012 through the effort of Arrecifes Pro Ciudad, an environmental communitarian group.

- **Pier 6 as History**



Transition from sail to steam . Modern pier built over “Isla del Carbons”, Diving inspection of magnetic anomalies from previous magnetometer surveys lead to the discovery of two anchors and two cannon excavated in fill. Charcoal samples from seabed were recovered.

- **S.S. Antonio López, 1898**



Hispano-American war National Landmark. First underwater historic monument visited by the ex -governor of Puerto Rico, Hon. Pedro Rosello.

2.3 Management issues for stakeholders

The following considerations must be met to ensure successful implantation of the Sub-Regional Coastal and Marine Spatial Plan:

- **Marine and Coastal Habitats**

Reef systems and aquatic vegetation shared by two natural reserves, but excluded from their legal limits are not subject to the same use and custodial restrictions. Therefore, these natural habitats could be disturbed to the extent in which they could be reduced or totally lost affecting the physical and functional connectivity of their species. From an ecologic perspective, system fragmentation is one of the processes most severely affecting biodiversity (Chassis and Morera 2007). The smaller the fragments resulting from the disturbance are, the population density will be less, and the risk of species extinction will be greater.

- **Fisheries**

The high biodiversity associated with deep-sea coral communities has shown potential value for commercially important fishes as they rely on deep-sea coral habitat for protection from predators and for enhanced feeding opportunities. Furthermore, deep-sea corals may provide significant opportunities for advancing pharmaceutical and medicinal applications. For example, several deep water sponges—often associated with deep-sea coral communities—have unusual

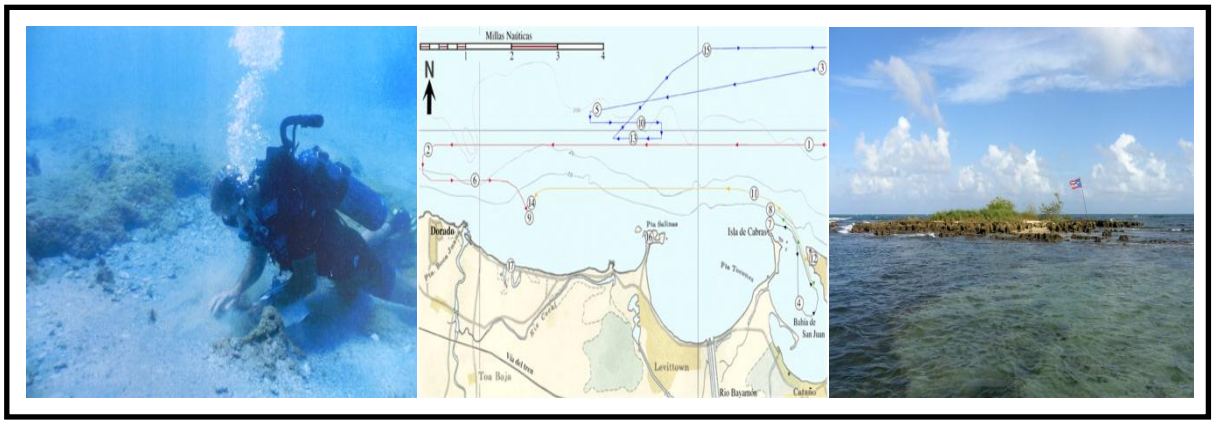
qualities that may potentially aid in the development of drugs for cancer, heart disease, and other medical treatments.

- **Coral reefs**

Despite scientific advances in the understanding of deep-sea corals, there is still very little known about their growth rates, reproductive cycles, their functional role as habitat for marine species, and their effects on biodiversity. Unlike their shallow water relatives, which rely heavily on photosynthesis to produce food, deep-sea corals take in plankton and organic matter for much their energy needs. Deep-sea corals are also often extremely long-lived, slow growing animals, characteristics that make them particularly vulnerable to physical disturbance.

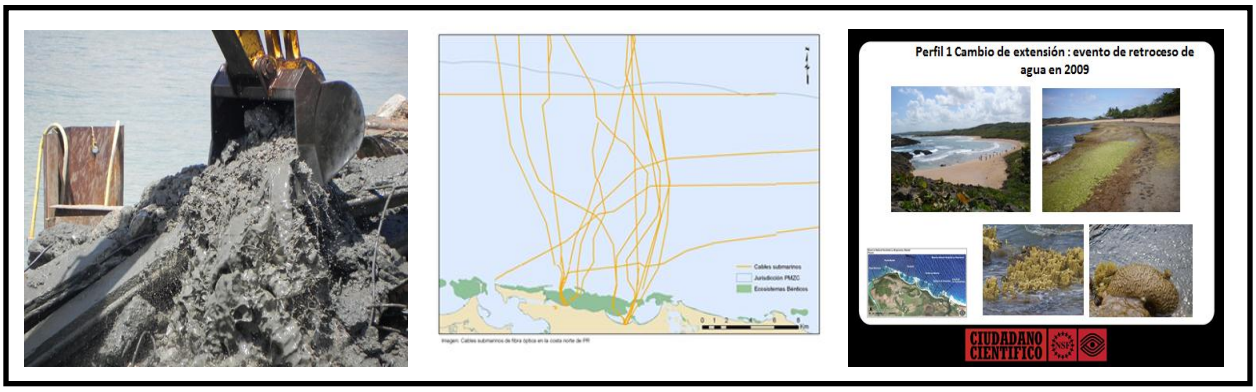
- **Mariculture**

Identify means for supporting appropriate use of ocean resources that drive the regional economy, like areas of high commercial fishing effort and value, areas of concentrated commerce and commercial fishing traffic, areas of concentrated recreational activity. Involve the community in identifying appropriate locations and scale for such an investment



- **Maritime Archeology :**

Develop undersea archaeological parks to attract attention of global tourism , creating a new vision of Puerto Rico's past. Developing public awareness of maritime heritage, combining natural and cultural preservation through communitarian support of research, in areas like Coastal Geoarchaeology & Zooarchaeology Erosion, Tectonics, Eustasy, Mortar Analysis Masonry Compaction, Artifact Drift. Provide educational incentives to extend PR prehistory from 4000 to 7000 BP.



- **Dredging and Filling**

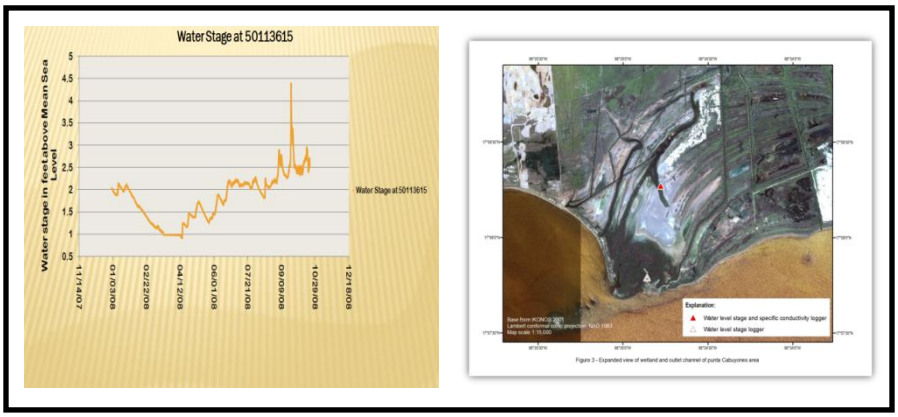
Identify dredging areas which has not been previously dredged or which extends the original dredged width, depth, length, or otherwise alters the original boundaries of a previously dredged area for the purposes of improving navigation or flushing of an embayment or harbor. Consider impacts to historical and biological resources in these areas; explore and clarify possible hazards, and develop recommendations to address use conflicts.

- **Sand and Gravel**

Predictions for sea-level rise and erosion of our coastal resources may rise precipitously the pressure to extract sand from the ocean. Therefore it will be necessary to distinguish between areas that may be suitable for sand and gravel mining and areas where sand and gravel mining is clearly unsuitable due to resources or conflicting uses. Protection of unique natural, cultural and other values shall be balanced with economic development

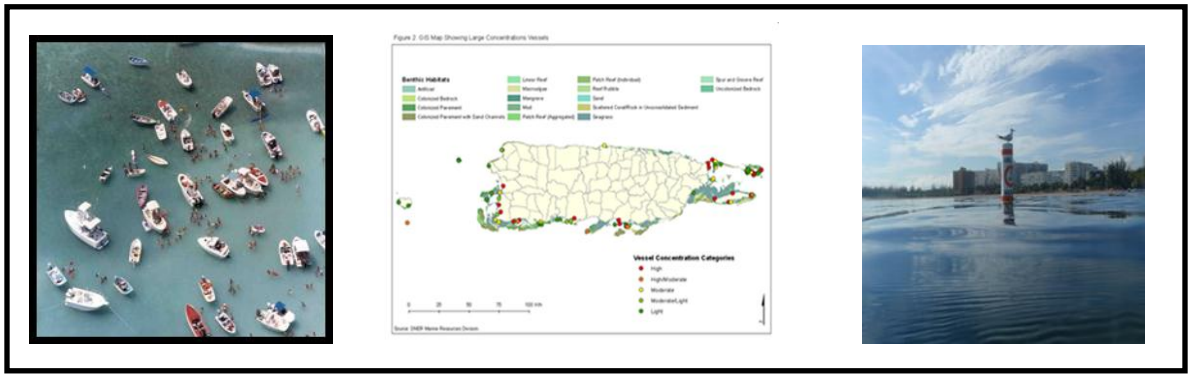
- **Cable and Pipes**

Renewable energy development will require connections to existing power infrastructure through cables; other cable installations may be needed to increase other infrastructure capacity. Consider impacts to the ocean resources that currently, or may in the future, support the regional economy. Identify preferred cable and pipeline routes, connection points, and identify areas that are clearly unsuitable due to impacts to the natural resources and ecosystems in the planning Area.



- **Saltwater intrusion**

Acquisition of wetland and associate areas to compensate for the potential negative impact of saltwater intrusion. Need of hydrologic baseline information about groundwater occurrence and movement, temporal variations in the chemical, isotopic, and physical properties of groundwater and surface water, define relations between sea-level stage (tidal cycle), wetland stage and ground-water levels, to develop a zoning plan for the restoration and management of freshwater wetlands.



- **Marine Law Enforcement**

Coastal zoning maps can be used for marine law enforcement by designing more efficient surveillance routes along submerged zoned districts, reducing the cost of traveling trips, and enforcing anchoring regulations by allocating violators to plotted ecosystems in maps. A zoning plan for establishing mooring buoys in natural reserves is being developed.

- **Alternate energy sites**

Distinguish between areas that may be suitable for siting renewable energy technologies and other areas that are clearly unsuitable due to resources or conflicting uses. Define appropriate scale for renewable energy projects within identified sub-areas, and recommend regulations for the review of renewable energy technological regulation

- **Ocean currents and tides**

Using currently available technology the potential electric generation is too small in comparison to wave energy and thus economically unfeasible.

- **Ocean Waves**

Environmental, social and community concerns must be addressed in parallel with engineering developments for the sustainable use of ocean waves to produce electricity. Public policy, for licensing ocean space to harness its energy, must be developed. According to the PREAA report it is recommend to perform pilot plant studies in Puerto Rico that include actual ocean wave measurements and technology validation.

- **OTEC**

OTEC is considered a "base load" alternative versus other renewable resources that are more variable in nature. Although Puerto Rico is considered by many to possess excellent potential for OTEC, many unknowns regarding the technical, ecological, economic and social viability of this technology are still to be addressed,

- Groups currently proposing OTEC for Puerto Rico do not disclose their economic and financial estimates to maintain a commercial advantage over other proponents.
- It is not possible to make a reliable economic comparison with other technologies under this lack of available data.
- OTEC is a potentially disrupting technology to the environment given the massive flows of sea water necessary to achieve megawatt levels of power generation. this includes piping (20–40 ft diameter), pumps, etc.
- Maintenance costs considering corrosion and bio-fouling must be estimated carefully and conservatively.
- The social and community site specific impacts such as fishing, ocean recreational sports, and coastal tourism developments must also be discussed in detail.

QUEMA DE BIOMASA			
	Pesimista	Optimista	Unidades
Área cultivada	100,000	100,000	hectáreas
Rendimiento (sólidos secos/ha/año)	20	50	toneladas métricas/ha
Valor energético (quema a granel - solido seco)	$2.5x10^{12}$	$5x10^{12}$	kJ/año
Contenido de humedad	89	70	% de humedad a ser removido
Fracción de energia para secar algas	> 100 %	68	% de energía consumido al secar algas
Est consumo de energía interno	25	25	% de energía consumido en la cosecha y otros procesos
Rendimiento neto de energía	<0	18	Equiv. de barril de petroleo/ha
Rendimiento neto de energía	< 0	$1.80x10^{6}$	Equiv. de barril de petroleo/año
% de necesidad energética de PR	< 0	2.64%	(basado en el consumo de 2006/07)
Tamaño de plantaciones para suplir 50% del consumo	n/a	$1.89x10^{6}$	Hectáreas cultivadas necesarias

CONVERSION EN BIOGAS			
	Pesimista	Optimista	Unidades
Área cultivada	100,000	100,000	Hectáreas
Rendimiento (sólidos secos/ha/año)	20	50	toneladas métricas/ha
Estimado de consumo interno de energía	2/3	2/3	porciento de energía consumida en el cultivo y otros procesos
Calidad de biogás	65.00%	70%	Contenido de metano
Estimado de calor de biogás	20,500	22,100	Valor térmico (KJ/M^3)
Rendimiento neto de energía	5.3	14.3	Equiv .de barril de petroleo/ha
Rendimiento neto de energía	$5.30x10^{3}$	$1.43x10^{6}$	Equiv. de barril de petroleo /año
% de necesidad energética de PR	0.78%	2.10%	(basado en el consumo de 2006/07)
Tamaño de plantaciones para suplir 50% del consumo	$6.43x10^{6}$	$2.38x10^{6}$	Hectáreas cultivadas necesarias

- **Agricultural Biomass**

Microalgae biomass has the potential to provide electric energy in excess of the 2006 electric energy demand of 20,600,000 MWh. Its impact could be even higher if biofuels are considered as a source of power. The following countries, Scotland , South Corea, Japan, Italy, Chile and Argentina have initiated the growth of marine algae in their coastal áreas for energy production. A conservative estimate of land use, potential number of turbines to be installed and estimated energy production for both large and small wind turbines was presented during the Marine Spatial Conference of 2011 . (G.W. Gervais , UPR Environmental Science Program) DOD grant # W911NF-11-0218.

3. EVOLUTION OF COASTAL MARINE SPATIAL PLANNING

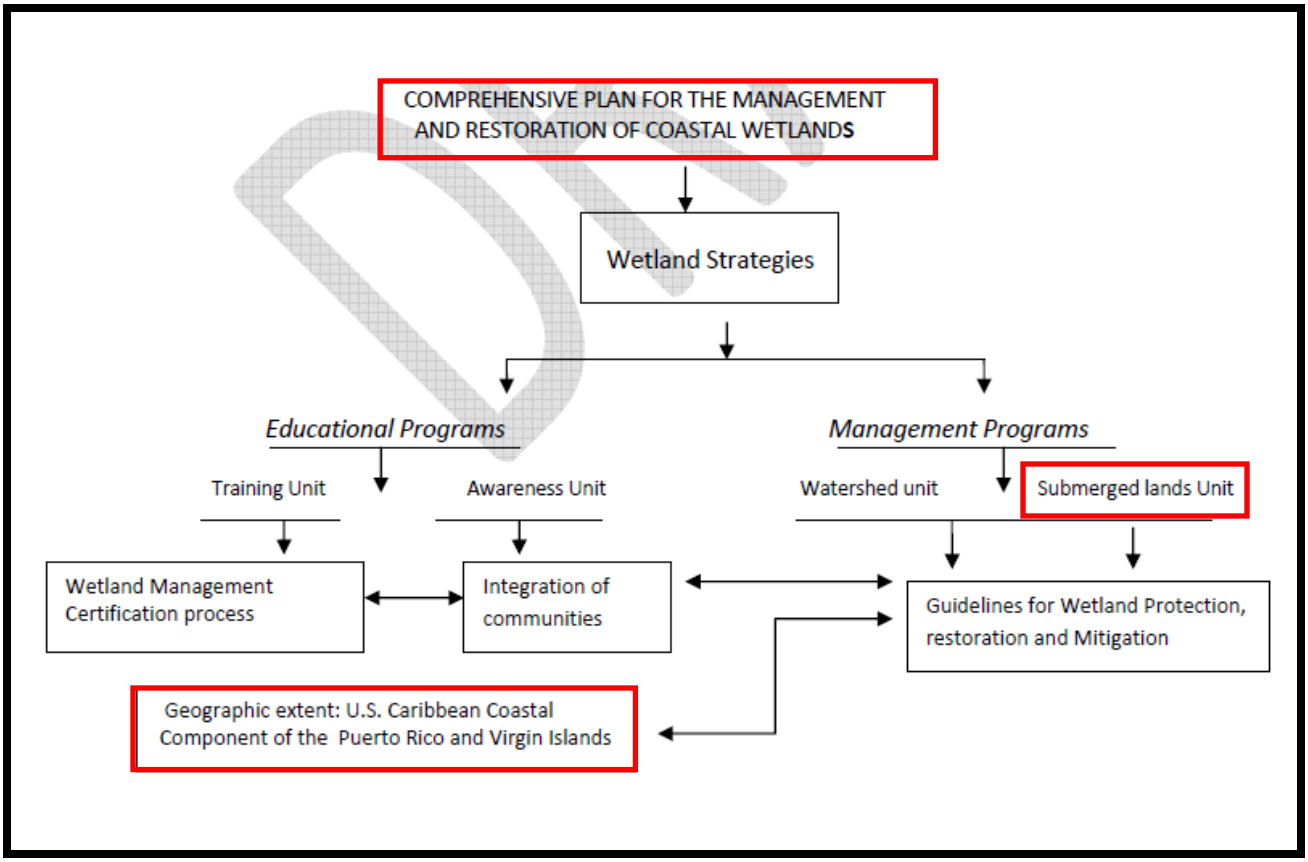
3.1 Planning Components

Under U.S. Executive Order #13547, Stewardship of the Ocean, Our Coasts, and the Great Lakes in July 2010, President Obama committed the nation to the development of a National Ocean Policy (NOP) and to the use of a planning process for use and stewardship of our ocean and Great Lakes. NOP framework recommends that CMSP planning occur within a set of new regional planning bodies, the recommended new structures would be carried out by federal, states, local and tribal authorities under existing applicable statutes.

The experience gained as a result of the wetlands zoning effort provides the basis for identifying opportunities for incorporating submerged and intertidal wetlands into an overall strategic plan to protect Puerto Rico, and particularly it's densely populated urban areas, from the threats posed by climate change and sea level rise. The submerged lands, intertidal wetlands, and reef systems, in addition to their ecological value, play a vital function in providing the "soft infrastructure" that protects life and property by buffering inland areas from the impacts of storm surge and other coastal hazards. Using zoning districts as a planning tool to protect biodiversity also points a direction to comprehensive ecosystem-based ocean management.

The Puerto Rico CMP is developing a multilayered strategy in which the wetlands component of the Sec. 309 program will focus on wetlands protection, preservation, remediation, and expansion of wetlands and related submerged ecosystems (sea grass beds and coral reefs). The dual objective will be ecosystem protection and the use of these systems to minimize the socio-economic and physical impacts of sea level rise and coastal hazards as a result of climate change.

PRCMP will initially incorporate the principles of marine spatial planning and ecosystem-based management through Sub Regional Marine Spatial Planning Committees. Key players in these committees will be integrated by Professional Planners from coastal municipalities, Scientific Advisors from Academic Institutions and intergovernmental agencies, along with identified stakeholders. At the same time, PRCMP will continue to work in coordination with the Government of the U.S. Virgin Islands, the U.S. Fish and Wildlife Service, NOAA's National Marine Fisheries Service, PRPB, PREQB and DNER to develop the U.S. Caribbean Region Ocean Planning and Landscape Conservation Initiatives.



The Governments of Puerto Rico and the U.S. Virgin Islands have agreed to pursue the development of the U.S. Caribbean Regional Ocean Partnership. Both jurisdictions recognize the need for a coordinated perspective on the mapping, monitoring, and management of marine corridors. This work is proposed to be developed following the guidelines issued by the White House through the Executive Order of President Obama (July 2010).

3.1 Preconditions.

Selection of management goals should consider the extent of interest and participation from local communities to promote them successfully in the long term. Review and evaluation of responses to the spatial designation of coastal uses has to be incorporated as part of the purposes and objectives for coastal zoning designations.

PRCMP has retained a consultant to conduct the analysis of the Legal and Institutional Framework for the development of the Regional Ocean Partnership and initiate U.S. Caribbean Region Coastal and Marine Spatial Planning.

3.2 Plan Implementation

The framework of this plan must be created with the help of users groups and coastal communities to guide their joint efforts to implement the multilayered strategies formulated in the plan, as an initiative for developing institutional and governmental solutions to resource use conflicts. This will enable Puerto Rico to comprehensively address issues such as energy facility siting, aquaculture, marine debris, and certain aspects of climate change.

PRCMP developed and maintains its Remote Sensing and GIS unit. This system is integrated with DNER's GIS and the newly developed Government-wide Information System. This Island-wide system provides spatial data and metadata to support resource management.

Pursuing work on these components in a coordinated way represents an opportunity for coastal zone management to play a central role in contributing to sustainable development while simultaneously enhancing coastal ecosystems.

References :

Broadwater John, 2007. *History, Treasure, and Resource Management: a Brief Overview of Legislation Concerning Submerged Cultural Resources.* International Submerged Lands Management Conference. Williamburg, Virginia. Virginia Marine Resources Commisión.

Cowardin L.M. Carter, Virginia, Golet, F.C., y La Roe, E.T. (1979). *Classification of wetlands and deepwater habitats of the United States: US Fish and Wildlife Service* Report FWS/OBS-79/31,131 p.

Consortium for Ocean Leadership. *Science Requirements for Marine Spatial Planning.*

Douglas M. Johnston ande Phillip M. Saunders. 1988. *Ocean Boundary Making: Regional Issues and Developments.* Lodón, England, CROC Helm LTD.

Departamento de Recursos Naturales y Ambientales. *Guía Práctica de Leyes, Reglamentos y Ordenes Administrativas relacionados con los corales y ambientes asociados.* Vilmarie Roman Padro.

(DRNA), 2010. *Plan de Manejo de la Zona Costanera de Puerto Rico* (Revisado).

(DRNA) 2012. *Plan de Manejo Área de Planificación Especial de Vieques.* División de Planificación de recursos Terrestres

Department for the Environment, Food and Rural Affairs (DEFRA), UK, 2005, 34pp. *Marine Spatial Planning Literature Review,*

F. Douvere, F. Maes, A. Vanhulle, J.Schrijvers, 2007. *The role of marine spatial planning in sea use management: The Belgian case.* Marine Policy 31 182-191.

(FDGC) Federal Geographic Data Committee, Marine Boundary Working Group, 2006. *Marine Managed Areas: Best Practices for Boundary Making*

García Ortiz Mercedes, 2002. *La Conservación de la Biodiversidad Marina: Las áreas Marinas Protegidas.* Estatuto Jurídico del Ámbito Geográfico de las Áreas Marinas Protegidas (Cap. VIII).

Hernández Delgado Edwin A. (1)(2), Laureano Ricardo, Montalvo Ricardo ,2007.*Los jardines submarinos de Vega Baja: Tesoros escondidos.* (1)Universidad de Puerto Rico, Departamento de Biología, Grupo de Investigación en Arrecifes de Coral, Apt. 23360, San Juan, PR 00931-3360. coral_giac@yahoo.com(2) UPR, Centro para la Ecología Tropical Aplicada y Conservación

(IOP) Interagency Ocean Policy task Force, 2009. *Interim Framework for effective Coastal and Marine Spatial Planning*. The White House Executive Office.
Interagency Ocean Policy Task Force , 2010. *Interim Framework for Effective Coastal and Marine Spatial Planning.*

International Fund for Agricultural Development (IAFD). *Integrated Approaches to Participatory Development: Participatory Mapping Toolbox*. Website, www.iapad.org/tollbox.htm.

(IFAD) 2009. *Good practices for Participatory Mapping*. Rome Italy, website www.ifad.org/pub/map/PM_web.pdf.

Jonson., R.E. and L.F. Thormahlen. 2002. *Underwater parks: Three case studies, and a Premier on Marine Boundary Issues.* Applied Geography, Volume 19. Number 1 , 10-19.

(JP) Junta de Planificación. 1995. *Plan y Reglamento Especial para el Sector Punta Picua*. Área de Planificación Física, Negociado Planes de Usos de Terreno

(JP) Junta de Planificación, 1983. *Reglamento de Zonificación de la Zona Costanera y de Accesos a las playas y Costas de Puerto Rico.* Negociado Planes de uso de terreno

(JP) Junta de Planificación,2009. *Reglamento Conjunto aprobado por la Ley número 161 del 1ero de diciembre de 2009, conocida como Ley de la reforma del Proceso de Permisos de Puerto Rico.*

Kendall M.S. , Curtis R. Kruer, Ken R. Buja, John D. Christensen, Ernesto Díaz, Robert A. Warner and Mark E. Monaco, 2004. *A Characterization of the Shallow-Water Coral Reefs and Associated Habitats of Puerto Rico. Gulf and Caribbean Research Vol.16 (2). 172-184.*

Le Gore and Associates, 2002. *Phase II monitoring for the export fisheries of marine international fish and invertebrates in Puerto Rico. Puerto Rico Department of Natural and Environmental Resources.*

Laureano Ricardo. 2011. *EL Corredor Submarino de Manati-Vega Baja. Grupo Vidas. Hacienda La Esperanza Manatí, Puerto Rico, Fideicomiso de Conservación.*

Matos-Caraballo, 2004. Puerto Rico/*NMFS Cooperative Fisheries Statistics Program. April 2001-march 2004. Final Report submitted to the National Marine Fisheries Service by the Fisheries Research Laboratory.* Puerto Rico Department of Natural and Environmental Resources

Narváez Víctor González PPL., 2011 . *Ordenación Territorial Hacienda La Esperanza Manatí, Puerto Rico, Fideicomiso de Conservación.* Municipio Autónomo de Manatí Departamento de Planificación y Ordenación Territorial Estratégica.

(NOAA) National Oceanic Atmospheric Administration , *Stakeholder Engagement Strategies for Participatory Mapping,* Coastal Services Center.

(NOAA), 2009. *Mesophotic Coral Ecosystrems Research Strategy: International workshop to prioritize Research and Management Needs for Mesophotic Coral Ecosystems.* NOOA Technical Memorandum NOS NCCOS 98 and OAR OER 2. Florida.

Odel Jay. 2007. *Planning for Biodiversity Conservation on Submerged Lands* International Submerged Lands Management Conference. Williamburg, Virginia. Virginia Marine Resources Commisión.

Ortiz, G. 2012. Plan de Ordenamiento de Uso de Embarcaciones y Establecimiento de Boyas de Amarre Reservas Naturales: La Parguera, Bosque Estatal de Guánica, Caja de Muertos, Arrecifes de la Cordillera y Canal Luis Peña. Vicente & Associates, Inc. Sometido al Programa de Conservación y Manejo de Arrecifes de Coral, Departamentode Recursos Naturales y Ambientales. Tarea CRI-10 NOAA Awards NA08NOS4190388 y NA09NOS4190056, 166 pp.

Partnerships for Health Reform (HR) . *Policy tool kit for Health Reform Participation*. Stakeholder Analysis Guidelines Section 2.

Pebbles Victoria, 2006. *Great Lakes Lands Policy and Management: A Comparative Analysis of Eight States Coastal and submerged Lands Laws, Regulations, and Policies.* International Submerged Lands Management Conference, Red Bank, New Jersey, USA. Department of Environmental Protection, Coastal Management Office

Puerto Rico Telephone, 2011. Guía de teléfonos Área metropolitana Residencial/Comercial.

Rutheford H. Platt , 1996. *Land Use and Society*. *Geography, Law, and Public Policy*. Island Press , Washingto DC.

U. S. Department of the Interior, 2011. National Coastal and Marine Spatial Planning Workshop, Washington ,DC.

Valeiras Miní Evelio (1), 2006. *Zoning the Submerged Lands of Puerto Rico, International Submerged Lands Management* Conference, Red Bank, New Jersey, USA. Department of Environmental Protection, Coastal Management Office. (1) Puerto Rico Department of Natural and Environmental Resources , Coastal Zone Division.

Valeiras Mini Evelio, 2007*. Alternativa a la Fragmentación de los Espacios Marinos*. Ambiente Natural Vol.III Núm.V.

Valeiras Mini Evelio, 2008. *Plan y Reglamentación para el Ordenamiento Territorial de los Terrenos Sumergidos de Puerto Rico*. Departamento de Recursos Naturales y Ambientales, División Zona Costanera.

Valeiras Mini Evelio), 2008. *Marine Spatial Planning Guidelines for the Submerged Lands of Puerto Rico.* Departamento de Recursos Naturales y Ambientales

Valeiras Miní Evelio ,2011. *La Integración de la Planificación del Uso de los Espacios Marinos al Manejo de la Zona Costanera, Hacienda La Esperanza, Manatí, P.R*., Fideicomiso de Conservación, Departamento de Recursos Naturales y Ambientales, División de Zona Costanera.

Westington Meredith, 2007. *Developing Federal Maritime Zones and Boundaries: History and State of the Art.* International Submerged Lands Management Conference. Williamburg, Virginia. Virginia Marine Resources Commisión.

Wendell J.E. ,2005. *The State of Coral Reef Ecosystems of the United States and the Pacific Freely Associated States* .NOAA Technical Memorandum NOS. 11 NOAA/NCCOS Center for Coastal Monitoring and Assessment's Biogeography Tea, Silver Spring, MD., 522pp

Annex (1): Participatory mapping exercise staff

Participants (2011) : Northern sub-areas (3-10)

Name & Affiliation
Grupo Vidas: Ricardo Laureano- Especialista en Astronomía Náutica & Navegación Mario B. Pérez- Biólogo Oficina de Planificación Municipal de Manatí: Plan. Víctor D. González Narváez – Director Myrna Beltrán Cintrón- Funcionaria Administrativa Mayda I. Colon Rivera- Ayudante de Planificación Fideicomiso de Conservación Hacienda La Esperanza: Julian M. Rosado- Bióloga Marina Centro de Ecología Tropical Aplicada y Conservación Universidad de Puerto Rico: Dr. Edwin A. Hernández- Investigador Afiliado Centro de Servicios a la Comunidad Universidad Metropolitana Lic. Eduardo A. Quijano Rivera - Director Instituto Internacional de Dasonomía Tropical GAP Marino: Mariano L. Solórzano- Cartógrafo Suhey Ortiz Rosa- Oceanógrafa Departamento de Recursos Naturales y Ambientales División Zona Costanera: Plan. Evelio Valeiras Miní- Planificador Ambiental

Participants (2009): Southern sub- areas (1-6)

Local Coastal Planning offices	
Plan. Migdalia Martínez Laboy Directora Interina Municipio de Ponce	Hon.Maritza Meléndez Nazario Oficina del Alcalde Municipio de Naguabo
Sr.Carlos Pereza Director Oficina de Obras Publicas Municipio de Santa Isabel	Plan. Antonio Bouet Director Oficina de Planificación Municipio de Yabucoa
Sra.Ivette Ortiz Directora Programa de Fondos Federales Municipio de Salinas	Hon. Ramon Hernandez Torres Oficina del Alcalde Municipio de Juana Díaz
Sr. Francisco González Director Oficina de Planificación Municipio de Guayama	Hon. Basilio Figueroa de Jesus Oficina del Alcalde Municipio de Arroyo
Plan. Angel Díaz Director Oficina de Planificación Municipio de Humacao	Hon. Benjamin Cintron Lebron Oficina del Alcalde Municipio de Patillas
Sr. Felix Garcia Director Oficina de Planificación Municipio de Culebra	Hon. Jorge Luis Marques Perez Oficina del Alcalde Municipio de Maunabo
Sra.Julia Vélez Directora Oficina de Planificación Municipio de Vieques	Hon. Pedro Colon Osorio Oficina del Alcalde Municipio de Ceiba

Participants (2007): Southern sub-areas (1-6)

NAME	AFILIATION
Dr. Conrada M. Calzada	Univ. Católica Biol. Dept.
Jesús Morales (SD Instructor)	Blue Water Scuba
Dr. Richard Fontanez	CEC
Miguel Sánchez (SD Instructor)	La Casa del Buzo
Frank S. González (Enviromental Leader)	Red Limieda
Plan. García Javier Mercado	Environmental Quality Board
Dr. Edwin Hernández D.	UPR Rió Piedras Biol. Dept.
Merianne Meyn (Encironmental Leader)	Misión Industrial
Plan. Ebenezer Negron	Planning Board
Dr José Luis Vega	Arqueologícal Sub. Com.
Dra. Graciela Gracia M.	Caribbean Fisheries Council
Ángel Rovira (SD Instructor)	La Parguera Divers
Pedro Díaz (Director)	Geological Survey
Biol. Luis Rivera	DRNA Fisheries Lab
Biol. Jesús Leño	DRNA Fisheries Lab.
Dr. Edgardo Ojeda	Mayaguez Sea Grant UPR
Dr. Jorge García Sais	UPR Biol. Dep. Mayagüez
	Snaper Farms
Biol, José Rivera	Noaa Fisheries

Participants (2006): Southern sub-areas (1-6)

NAME	DIVISION
(Sec. Aux.) Biol. José R. Rosario	Permits Area Divisions
Plan, Luis D. Beltrán	Patrimonial Resources
Biol. Daniel David	Patrimonial Resources
(Director) Plan.Luisa N. González	Consulting & Planning
(Director) Plan.Nancy M. Vázquez	Natural Resources Planning
Plan.Clarimar Díaz Rivera	Natural Resources Planning
Plan.Nuria Mercedes Ávila	Natural ResourcesPlanning
Plan.Anna Ortiz Romper	Natural Resources Planning
(Director) Educ. Astrid J. Green	Outreach & Education
Biol, Victor Suarez	Education
Educ.José Casas	Education
(Director) Biol.Julio Toro	Dredging & Filling
(Director) Plan. José Luís Padilla	Public Domain
Biol. Gadiel Ayala Jorge	Public Domain
Biol.Javier Ramos	Public Domain
(Director) Geol.Maria D. Coronado	Environmental Planning
Plan. Rafael Pérez	Environmetal Planning
Plan.Carlos Adorno	Environmental Planning
Plan.Jenny Fortuno Borrero	Environmental Planning
(Director) Dr.Craig Lilyestrom	Marine Resources
(Cmdt.) Rosaly Rosa Vélez	Marine Rangers
(Cmdt.) Ismael Rojas Reyes	Marine Rangers
(Cmdt.) Luis Vega	Marine rangers
(Capt.) Frank Hacker	Marine Rangers
(Capt.) Víctor Rojas	Marine Rangers
(Capt.) Nelson Roldan Calero	Marine Rangers
(Tnt.) José Santiago Div. Marítima	Marine Rangers
(Tnt.) Harold Remires Pagan	Marine Rangers
(Tnt.) Antonio Rivera Román	Marine Rangers
(Tnt.) José Javier Tavarez O.	Marine Rangers

Annex 2 : List of presentations at the Annual Coastal and Marine Spatial Planning Conferences

Participants (2011):

- Los cuerpos de agua: vehículos de expresión religiosa de los pueblos. José Longo, M Ph, Jd, Departamento de Geografía, Universidad de Puerto Rico, Recinto de Río Piedras.
- Ciencia, Historia y Filosofía: Arqueología Náutica. Dr. Jesús Vega, Antropólogo y Arqueólogo Náutico, Instituto de Arqueología y Oceanografía.
- Aspectos legales sobre el uso y manejo de los espacios marinos protegidos de Puerto Rico. Dr. José Seguinot Barbosa, Departamento de salud Ambiental, Escuela Graduada de Salud Pública, Recinto de Ciencias Médicas de Puerto Rico.
- Monitoreando y mejorando el Estuario de la Bahía de San Juan y sus espacios: Lecciones aprendidas de un estuario urbano. Sr. Jorge Bauzá Ortega, Oceanógrafo y Asesor Científico, Programa del Estuario de la Bahía de San Juan.
- El Proyecto ENLACE del Caño Martín Peña. Lyvia N. Rodríguez del Valle, MAURP, Directora Ejecutiva, Corporación del Proyecto ENLACE del Cano Martin Peña.
- Proyecto Gap Marino de Puerto Rico. María Isabel Herrera-Montes, William A. Gould, Mariano Solórzano, Patricia Rincón, Suhey Ortíz-Rosa, Benjamin Crain, Jessica Castro, Maya Quiñones, Gary Potts, Nilda Jiménez, IITF, U.S. Forest Service; DRNA.
- Description of novel details on the habitat of the silk snapper (Lutjanus vivanus) off the West Coast of Puerto Rico. Graciela García-Moliner, Eugenio Piñeiro Soler, Roy Armstrong and Hanu Singh, Caribbean Fishery Management Council.
- Resumen del estatus conocido del pez león. Dr. Craig Lilyestrom, Director, División de Recursos Marinos, Departamento de Recursos Naturales y Ambientales.
- Caracterización y análisis del paisajismo sonoro del arrecife de coral del cayo Sor Isolina Ferrer en la bahía de Ponce. Dr. Conrado Calzada Cordero, Pontificia Universidad Católica de Ponce.
- La Zonificación para el cultivo de moluscos como mecanismo para ayudar a mejorar la calidad de las aguas costeras en Lagunas y Bahías de PR. Jose A. Rivera, NOAA Fisheries.

- Energía Oceánica en Puerto Rico. Dr. José Colluci PE., Dr. Efraín O'Neill Carillo, PE, Dr. Agustín Irizarry Rivera, PE y Sorangelis Rodríguez, Universidad de Puerto Rico, Recinto de Mayagüez.

- Las algas marinas y la conversión de su biomasa cruda a combustibles gaseosos o líquidos. G.W Gervais, Martínez Morales E. Y Marty-Rivera M., Programa de Ciencias Ambientales, Universidad de Puerto Rico, Recinto de Río Piedras.

- From Habitat mapping to ecological Function: Incorporating hábitat into coral reef fisheries management. Richard Appledoorn, Francisco E. Pagán, Idelfonso Ruiz, Departamento de Ciencias Marinas, Universidad de Puerto Rico, Recinto de Mayagüez, Puerto Rico.

- How to Assess and Map Risks to coral reefs. Idelfonso Ruiz, Richard S. Appledoorn, Francisco Pagán; Departamento de Ciencias Marinas, Universidad de Puerto Rico, Recinto de Mayagüez, Puerto Rico.

- Including Ecological Function into hábitat Networks using Numerical Modeling: Assessing Performance and Cost. Francisco E. Pagán, Dr. Richard Appeldoorn , Idelfonso Ruiz; Departamento de Ciencias Marinas, Universidad de Puerto Rico, Recinto de Mayagüez.

- Valoración Económica de las Playas de Puerto Rico. Luis Villanueva, Escuela Graduada de Planificación, Universidad de Puerto Rico, Recinto de Río Piedras.

- Estudio de los cambios en elevación, ancho y granulometría de la Playa Cibuco en Vega Baja (Marzo- Mayo 2011): su posible relación con procesos hidrológicos del Río Cibuco. Stephanie Cuevas, José A. Nevarez, Departamento de Geografía, Universidad de Puerto Rico, Recinto de Río Piedras.

- Técnicas Geomáticas para el Manejo de la Erosión Costera en Barceloneta, Puerto Rico. Jason J. Otero Torres y Juan L. Amaro Amaro, Departamento de Ciencias Geomáticas, Universidad Politécnica de Puerto Rico.

- Relación existente entre la escorrentía superficial ocasionada por eventos de precipitación, y los valores de los parámetros medidos por el programa de monitoreo de calidad de agua del EBSJ. Yanitza V. Hernández Santiago, M.Sc., Universidad de Puerto Rico, Recinto de Ciencias Médicas, Escuela Graduada de Salud Pública, Departamento de Salud Ambiental.

- Impactos del Cambio Climático en Zonas Costero-Marinas de Puerto Rico. Kasey R. Jacobs, Coordinadora; Proyecto de Adaptación Costera de Puerto Rico, Departamento de Recursos Naturales y Ambientales .

Participants (2010):

- Habitat Areas of Particular Concern: Seasonal area closures in Puerto Rico to protect fish spawning aggregations Graciela García-Moliner, Caribbean Fishery Management Council.

- Cambios climáticos, riesgos costeros y la planificación de los espacios marinos. Ernesto L. Díaz. Director División Zona Costanera, Departamento de Recursos Naturales y Ambientales

- Integrated Gap Analysis Project: Assessing conservation of freshwater, estuarine, marine, and terrestrial biodiversity. William Gould, Research Ecologist, International Institute of Tropical Forestry

- Sportfish Gap: Conservation of Puerto Rico's freshwater and marine recreational fisheries resources. Nilda M. Jiménez, División Recursos Marinos, Departamento de Recursos Naturales y Ambientales

- Understanding the abundance and distribution of hawksbill sea turtles (Eretmochelys imbricata) through seascape features in Caribbean coral reefs. Patricia Rincón-Díaz[1], Carlos Diez[2], Alberto Sabat[1], [1]Departamento de Biología, Universidad de P.R., Recinto de Río Piedras, [2]Departamento de Recursos Naturales y Ambientales.

- Reserva marina arrecife de la Isla Verde: Una propuesta comunitaria de conservación. Paco López-Mujica, Arrecifes Pro-Ciudad, Inc.

- Mapping and monitoring of Acropora palmata: Informing management efforts for the recovery of a threatened coral. Michelle Scharer[1], Micheal Nemeth[1], Carlos Diez[2], [1]Departamento de Biología, Universidad de Puerto Rico, Recinto de Mayagüez, [2]Departamento de Recursos Naturales y Ambientales.

- Restauración de arrecifes de coral con estructuras artificiales. Samuel E. Suleimán Ramos, Director/ Fundador, Sociedad Ambiente Marino.

- El carso, las cuevas y los terrenos sumergidos, una relación poco estudiada y documentada. Julio Rodríguez, Ramón Carrasquillo, Sociedad Espeleológica de Puerto Rico.

- Caracterización de los indicadores geomórficos costeros y marinos de la Playa Tómbolo, Manatí, Puerto Rico (2008-2010): su importancia para el manejo de la zona costanera. Maritza Barreto PhD., Departamento de Geografía, Universidad de Puerto Rico, Río Piedras.

- La hidrodinámica de la Reserva Marina Tres Palmas, Rincón, P.R. Miguel Canals, Catedrático Auxiliar, Departamento de Ciencias e Ingeniería y Materiales UPRM, Director, Laboratorio de Hidrodinámica Costera UPRM.

- Ciclo anual en línea de costa y sedimentos en la Reserva Marina Tres Palmas, Rincón, P.R. Kristina R. Scott[1], Miguel Canals[2], Wilson Ramírez[1]. [1]Departamento de Geología, UPRM, [2]Departamento de Ciencias e Ingeniería, UPRM.

- The Hydrogeological and Hydrologic Character of the Punta Cabullones Coastal Barrier in Ponce, Southern Puerto Rico. Jesús Rodríguez Martínez, U.S. Geological Survey.

- Implantación del Plan de Co-Manejo para el Control del "Lionfish" / Pez León en Puerto Rico. Joel Meléndez Díaz, PPL, Ecotono, Inc.

- Marine zones for the culture of fish in Puerto Rico. José A. Rivera, NOAA Fisheries.

- Expediciones Península, una novedosa experiencia de ecoturismo comunitario en los espacios marinos y terrenos sumergidos del sistema de lagunas y canales del Estuario de Boca de Cangrejos. Fernando Silva Caraballo, Director, Instituto de Ciencias para la Conservación de Puerto Rico (INCICO).

- Zoning the submerged lands of Puerto Rico: The integration of Coastal Zone Management to Marine Spatial Planning. Evelio Valeiras Miní, PPL., División Zona Costanera, Departamento de Recursos Naturales y Ambientales.

- Planning the future of the oceans: Gordon and Betty Moore Foundation. Fondo Musical: Francisco Jiménez Cruz, Violinista (Orquesta Sinfónica de Puerto Rico)

Annex 3 : CMSP STATEKEHOLDERS LIST

Puerto Rico Governmental Sector

SECTOR	SUBSECTOR	# TO INTERVIEW	INTERNAL/EXTERNAL
GOVERNMENT	Autoridad de Acueductos y Alcantarillados	Director aux. de Planificación 787-999-1717 ext.246.	External
	Depto. De Agricultura	Programa de Estrategia para la Preservación y Conservación 787-725-3040	External
		Programa para el Fomento Desarrollo y Administración Pesca 787-724-4911	External
	Autoridad de Carreteras y Transportación	Planificación Estratégica 787-721-8766	External
		Estudios Ambientales 787-729-1583	External
		Sistemas de Información Geográfico 787-721-8759	External
		Puentes 787-740-5627	External
		Auditoria Transporte Marítimo 787-756-8012	External
		Programación y Estudios Especiales 787-729-1580	Exernal
	Bomberos de Puerto Rico	Rescate Operaciones Especiales 787-754-1007	Exernal
		Jefe-Prevención de Incendios 787-728-3698	Exernal
	Comisión de Servicios Públicos	Coordinación de Demoliciones y Excavaciones 787-763-4900	Exernal
	Comisión Industrial de PR	Presidente 787-781-0615	Exernal

SECTOR	SUBSECTOR	# TO INTERVIEW	INTERNAL/EXTERNAL
Government	Comisionado de Asuntos Municipales	Comisionado 787-754-8827	Exernal
		Sistemas de información geográfico 787-754-7334	Exernal
	Comisionado de Seguros	Comisionado 787-304-6082	Exernal
	Compañía de Comercio y Exportación de PR	Expansión Internacional 787-294-1010	Exernal
	Compañía de Turismo	Planificación 787-721-2157	Exernal
		Transportación turística 787-999-2100	Exernal
	Oficina Estatal Conservación Histórica	Cuadro General 787-751-0160	Exernal
	Corporación de Puerto Rico Difusión Pública	Director 787-281-8710	Exernal
		Sub director- Noticias 787-766-8993	Exernal
	Emergencias Medicas	Director ejecutivo 787-754-2550	Exernal
		Transportación 787-751-7928	Exernal
	Instituto de Cultura Puertorriqueña	Director ejecutivo 787-722-1811	Exernal
		Arqueología 787-723-2686	Exernal
		Consejo Arqueológico Terrestre 787-721-6828	Exernal
		Archivo General de Puerto Rico 787-725-1060	Exernal
		Sistemas de inf. 787-724-4312	Exernal
	Desarrollo Econ/ Comercio	Secretario 787-766-2900	Exernal

SECTOR	SUBSECTOR	# TO INTERVIEW	INTERNAL/EXTERNAL
Government	Desperdicios Solidos	787-765-7575	External
	Departamento de Estado	Secretario 787-723-4343	Exernal
		Relaciones exteriors 787-721-1751	Exernal
	Financiamineto de la Infraestructura	787-763-5757	Exernal
	Financiamiento SosioeconomicoComunidades Especiales	787-977-7060	Exernal
	Fomento Industrial	Director Ejecutivo 787-764-1415	Exernal
		Sistemas de Informacion 787-754-0290	Exernal
	Gerencia y Presupuesto	Tecnologia de Informacion 787-977-9200	Exernal
	Oficina Gobernador	Gobernador 787-721-7000	Exernal
		Directora Protocolo y Guias Turisticas-Erica Candelaria	Exernal
		Asesor Urbanismo Infraestructura y Planificacion- Ing. CarlosE. Renta Giusti	Exernal
		Asuntos Federales y Política Nacional-Yanira Martinez	Exernal

SECTOR	SUBSECTOR	# TO INTERVIEW	INTERNAL/EXTERNAL
Government	Oficina Gobernador	Asesor Asuntos Legislativos-Philip Mesa Pabon	External
		Asesor Energia y Ambiente- Jose L. Valenzuela Vega	Exernal
	Guardia Nacional de PR	Oficial Adm. De Comando 787-722-3497	Exernal
	Depto. Hacienda	Secretario aux. Asuntos Economicos 787-722-1571	Exernal
	Instituto Socieconomico Comunitario	787-763-5230	Exernal
	Junta de Calidad Ambiental	Presidente 767-8056	Exernal
		Planificacion 787-766-1027	Exernal
		Asesoramiento Cientifico 787-767-8119	Exernal
		Negociado Planificacion de Agua 787-751-5548	Exernal
		Muestro de Aguas 787-721-53-17	Exernal
		Contaminacion de Terrenos 787-763-4448	Exernal
		Laboratorio Ambiental 787-722-1710	Exernal

SECTOR	SUBSECTOR	# TO INTERVIEW	INTERNAL/EXTERNAL
Government	Justicia Depto. Secretario	Planificacion 787-721-7700	External
		Sistemas de Informacion 787-721-791-2964	Exernal
	Manejo de Emergencias y Desastres	787-724-0124	Exernal
	Parques Nacionales	Director Ejecutivo 787-622-5227	Exernal
		Planificacion 787-622-5240	Exernal
		Sistemas de Informacion 787-622-5224	Exernal
	Planificacion Junta	Presidente 787-727-4444	Exernal
		Director Programa Planificacion Economica y Social 787-722-2070	Exernal
		Sub-programa Planificación Fisica 787-722-1675	Exernal
		Sub –Programa Planes de Usos de Terrenos 787-722-2780	Exernal
		Unidad de Hidrologia 787-722-1797	Exernal
		Sub-Programa de consulta sobre usos de Terrenos 787-722-2430	Exernal
		Director SiF 787-722-2670	Exernal
		Consistencia Federal 787-726-0289	Exernal

SECTOR	SUBSECTOR	# TO INTERVIEW	INTERNAL/EXTERNAL
Government	Policia de PR	FURA 787-277-7545	External
		Tecnologia Informatica 787-781-0718	Exernal
		Dir. Operaciones de Campo 787-781-3445	Exernal
		Unidad Vigilancia Maritima 787-7901-6161	Exernal
	Puertos de PR Autoridad	Dir. Ejecutivo 787-729-8805	Exernal
		Dir. Ejecutivo Aux en Ing. Constr. Y Planificacion 787-729-8743	Exernal
		Asuntos Ambientales 787-729-8974	Exernal
		Negociado Maritimo 787-729-8724	Exernal
		Transportacion Maritima 787-729-8889	Exernal
		Operaciones Maritimas 787-729-8727	Exernal
		Seguridad Maritima 787-729-8725	Exernal
	Recreación y Deportes	Secretario 787-721-8259	Internal
	DRNA	Secretario 787-999-2200	Internal
		Ernesto Diaz Dir. Zona Costanera	Internal
		Craig.L Dir. R Marinos	Internal
		Jose L. Dir. Bienes de Dominio Publico	Internal

SECTOR	SUBSECTOR	# TO INTERVIEW	INTERNAL/EXTERNAL
Government	Depto. De Salud	Secretario 787-721-8259	External
		Secretaria aux. de Salud Ambiental 787-763-1842	External
		Registro Demografico Central 787-767-9120	External
	Terrenos Adm.	Dir. Ejecutivo 787-753-9414	External
		Planificacion 787-753-9492	External
	Tierras Autoridad	Dir. Ejecutivo 787-722-3934	External
	UPR Rio Piedras	Decanato Estudios Graduados e Investigaciones 787-764-2960	Exernal
		Escuela Planificacion 787-763-7590	Exernal
		Escuela Arquitectura 787-763-5377	Exernal
		Escuela de Leyes 787-999-9595	Exernal
		Facultad Naturales 787-763-6565	Exernal
		Escuela- Biologia	Exernal
		Escuela- C. Amb.	Exernal
		Facultad Ciencias Sociales 787-	Exernal
		Depto. Geografia	Exernal
		Depto. Antropologia	Exernal
		Depto. Economia	Exernal
		Depto. Ciencias Políticas	Exernal
		Depto. Sociologia	Exernal

SECTOR	SUBSECTOR	# TO INTERVIEW	INTERNAL/EXTERNAL
Government	UPR Rio Piedras	Recinto Ciencias Medicas- Decanato de Asuntos Académicos 787-758-2556	Exernal
		Ciencias de la Salud 787-	Exernal
		Salud Ambiental	Exernal
		Sistemas de Informacion 787-751-6770	Exernal
	Energia Electrica Autoridad	Dir. Ejecutivo787-751-4666	External
		Planificación y Protección Ambiental 787-751-4884	External

Data developed by the Coastal Zone Management Division, Department of Natural and Environmental Resources.

Annex (4) : Official letters

A-Request for Public notice of Coastal Zoning Maps exhibits

Estado Libre Asociado de Puerto Rico

Departamento de Recursos Naturales y Ambientales

PO Box 366147
San Juan, PR 00936
Tel. (787) 999-2200
Fax: (787) 999-2303

25 de septiembre de 2008

Hon. Javier Vélez Arocho
Secretario

P/C Ernesto L. Díaz Velázquez
Administrador
Administración de Recursos Naturales

Evelio J. Valeiras Miní
Planificador Ambiental III
División de Zona Costanera

MAPAS DE ZONIFICACIÓN Y COMITÉ (RPME)

Los mapas de zonificación de los ecosistemas marinos y de los terrenos sumergidos estarán disponibles para la revisión del público en general durante las fechas y lugares indicados a continuación. El Comité de Revisión y Planificación Marino Especial que coordinará la revisión de estos mapas ha sido organizado; se incluye la lista de las personas que lo integrarán para su aprobación final.

ITINEREARIO TENTATIVO REVISIÓN MAPAS DE ZONIFICACIÓN

MES	FECHA	LUGAR
ENERO	19-23	Reserva Natural Caño Tiburones, Arecibo
MARZO	23-27	Reserva Natural Estuarina Bahía de Jobos, Guayama
MAYO	18-22	Oficina Central DRNA, San Juan

COMITÉ DE REVISIÓN Y PLANIFICACIÓN MARINO ESPACIAL (CRPME)

NOMBRE	AGENCIA
Plan. Evelio Valeiras Miní	Departamento de Recursos Naturales y Ambientales
Dr. Juan Vera Vega	Instituto de Cultura
Dra. Graciela García-Moliner	Consejo de Pesca del Caribe
Dr. Edgardo Ojeda	Sea Grant

B--Letter for the review and tramital of the Southern Region Zoning Plan.

GOBIERNO DE PUERTO RICO

Departamento de Recursos Naturales y Ambientales

1 de septiembre de 2010

Hon. Daniel J. Galán Kercadó
Secretario

P/C: Sra. Damaris Delgado López
Directora
Negociado de Costas, Reservas y Refugios

Sr. Ernesto L. Díaz Velázquez
Director
División de Zona Costanera

Evelio Valeiras Miní
Planificador Ambiental III
División de Zona Costanera

PROYECTO DE ZONIFICACIÓN DE TERRENOS SUMERGIDOS

Como parte de la Estrategia para la Conservación y Manejo de los Humedales desarrollada en el marco del Programa de Manejo de la Zona Costanera (Section 309-CZMA, 1972) se estableció el plan de trabajo para atender las necesidades de planificación, zonificación y manejo de diferentes categorías de humedales. A tales efectos, se utilizó el sistema COWARDIAN y se determinaron las prioridades de acción para los humedales marinos, estuarinos y palustrinos.

Los terrenos sumergidos bajo las aguas jurisdiccionales de Puerto Rico (9 millas náuticas) constituyeron los primeros tipos de humedales para los cuales se desarrolló el proceso de planificación y zonificación de los hábitats que ameritan protección especial.

Como parte del proceso de planificación de estos espacios, el 18 de agosto de 2010 se celebró el primer ciclo de conferencias sobre los Espacios Marinos, actividad realizada en el auditorio del DRNA que contó con la participación de sobre 200 personas.

Finalmente, se somete para su consideración el documento que sería presentado a la Junta de Planificación relacionados a la zonificación de los terrenos sumergidos de la región del sureste.

Estamos a su disposición para aclarar cualquier duda al respecto.

PUERTO RICO VERDE

PO Box 366147, San Juan, PR 00936
Tel. 787.999.2200 • Fax. 787.999.2303

Annex 5: Official Ocean Week Proclaim

GOBIERNO DE PUERTO RICO
LA FORTALEZA
SAN JUAN, PUERTO RICO

Boletín
Administrativo
Núm.: P-2011- 227

Proclama
del Gobernador de Puerto Rico

Semana del Océano

POR CUANTO: Dos terceras partes de la superficie de la Tierra están cubiertas por océanos, que constituyen una fuente de importantes recursos. El mar, en interacción con la atmósfera, la litósfera y la biosfera, favorece las condiciones que posibilitan las distintas formas de vida en nuestro planeta;

POR CUANTO: El océano y el clima están intrincadamente unidos. El océano desempeña un rol crucial manteniendo las condiciones climáticas del Planeta Tierra, mientras que la vida en los océanos está sujeta y resulta vulnerable a los cambios climáticos que se manifiestan a través del tiempo geológico;

POR CUANTO: Para lograr un balance entre el ambiente y el desarrollo sostenible de los espacios marinos es imperativo planificar iniciativas encaminadas a la conservación de la diversidad biológica y la utilización racional de las riquezas marinas, garantizando así el bienestar de futuras generaciones;

POR CUANTO: El Departamento de Recursos Naturales y su Programa de Manejo de la Zona Costanera celebran la Semana del Océano, a fin de proveer la oportunidad de participar en actividades educativas, científicas y artísticas que fortalezcan el contacto de la población con el océano, propiciando el interés por conservar sus espacios marinos;

POR TANTO: YO, LUIS G. FORTUÑO, Gobernador de Puerto Rico, en virtud de la autoridad que me confieren la Constitución y las Leyes de Puerto Rico, proclamo del 5 al 8 de agosto de 2011, **SEMANA DEL OCÉANO**. Al así hacerlo, exhorto al pueblo de Puerto Rico, a las entidades públicas y privadas, e igualmente, a los medios de comunicación a la participación en las actividades alusivas a esta conmemoración de eminente interés público.

EN TESTIMONIO DE LO CUAL, firmo la presente y hago estampar en ella el Gran Sello del Estado Libre Asociado de Puerto Rico, en la Ciudad de San Juan, hoy, 6 de julio de 2011.

LUIS G. FORTUÑO

Promulgada de acuerdo con la Ley, hoy, 6 de julio de 2011.

KENNETH McCLINTOCK HERNÁNDEZ
Secretario de Estado