The Cabo Rojo Project:

CABO ROJO CONSERVATION PLAN

March, 2014

Puerto Rico

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Conservando la naturaleza.
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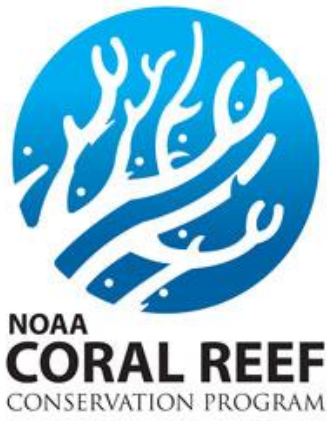

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EXECUTIVE SUMMARY

This Cabo Rojo Conservation Plan guides activities to move towards effectively conserving the coastal and marine natural and cultural resources of southwest Puerto Rico over the next 5 years. It specifically addresses issues within the Cabo Rojo Coral Priority Region and the following designated protected areas: **Arrecifes de Tourmaline Nature Reserve and the marine extensions of Finca Belvedere and Punta Guaniquilla Nature Reserves.** The Plan was developed with participation from the community in southwest Puerto Rico, fishers, Cabo the Puerto Rico Department of Natural and Environmental Resources (DNER), the University of Puerto Rico (UPR), The Nature Conservancy (TNC) and the National Oceanic and Atmospheric Administration (NOAA).

Through a series of workshops and consultations, the Conservation Action Planning (CAP) process was employed to identify priority conservation resources and their condition, understanding of human activities and other threats impacting the resources, and selection of strategies for improving or maintaining the resources of southwest Puerto Rico. The process of working through CAP for protected areas results in a plan based on a solid ecological foundation focused on specific and attainable strategies for biodiversity conservation and threat abatement. This Plan should be revised after 5 years of implementation to take into account changing conditions and priorities.

The CONSERVATION TARGETS in Cabo Rojo that this plan aims to protect, enhance and restore are:

- **Coral Reef Communities**
- **Seagrass Beds**
- **Mangroves**
- **Manatees**
- **Sea Turtles**
- **Fish aggregations**
- **Queen Conch**
- **Crabs**
- **Sustainable Commercial fishing**

The primary THREATS to these conservation targets are:

1. **Unsustainable Fishing**
2. **Contamination**
3. **Sedimentation**
4. **Degradation of Terrestrial Habitat**
5. **Lionfish**
6. **Marine Debris**
7. **Jet Ski**
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12. **Harvesting**

1. INTRODUCTION

1.1 Purpose and Scope

This Cabo Rojo Conservation Plan has been developed to guide conservation activities to protect the system of coastal and marine resources of southwest Puerto Rico including seagrass beds, coral reef communities, mangroves and associated marine and coastal species. It specifically addresses the following designated areas: **Arrecifes de Tourmaline Nature Reserve and the marine extensions of Finca Belvedere and Punta Guaniquilla Nature Reserves.**

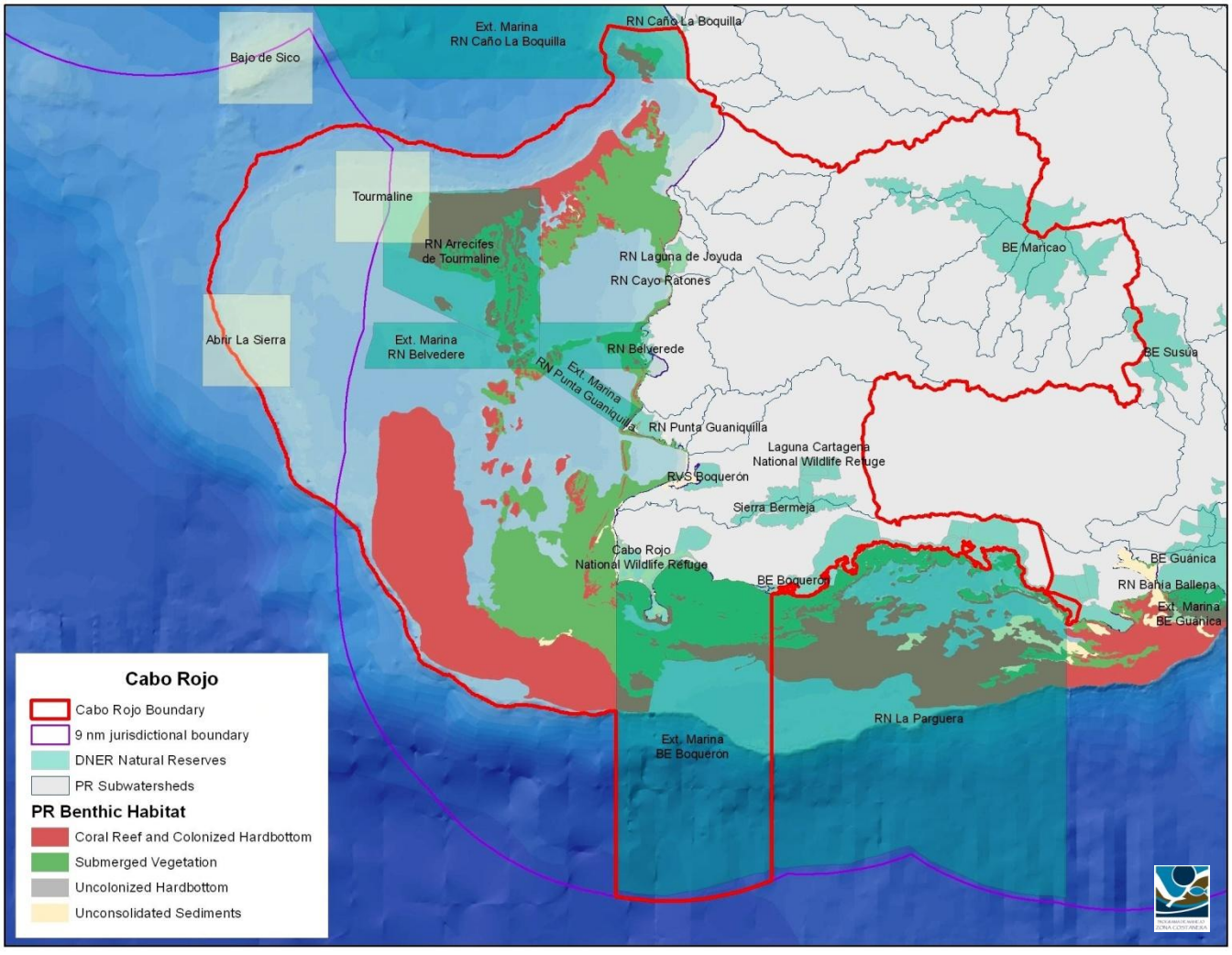

Figure 1: Map of southwest Puerto Rico, including Arrecifes de Tourmaline Natural Reserve and the marine extensions of Finca Belvedere and Punta Guaniquilla Natural Reserves.

This Conservation Plan is designed to guide near-term (1-5 years) objectives and activities. The Plan is part of an adaptive and iterative process, and is open to modifications based on periodic evaluation of

conservation activities and results. The monitoring program included in the Plan is designed to provide the framework for the evaluation of the effectiveness of the conservation strategies. Each action undertaken by management should be evaluated to ensure that it is achieving the objectives set forth throughout this plan. This plan should be revised with stakeholder input after a period of 5 years to reflect the results of the monitoring program. Specific sections, such as the strategies, should be reviewed on a more frequent basis to adapt to changes.

1.2 Site Description

The three designated areas described in this Plan, Arrecifes de Tourmaline Natural Reserve and the marine extensions of Finca Belvedere and Punta Guaniquilla Natural Reserves (collectively referred to as "Reserves"), located in the Cabo Rojo coral priority region cover important coastal, marine and fisheries resources, including mangrove forests, seagrass beds and coral reef communities (*Figure 1*).

The Cabo Rojo watershed is emblematic of many coastal watersheds across the Caribbean where poorly planned coastal development and persistent land based sources of pollution have severely impacted the coastal and marine environments. Our focus area is restricted to 2 sub-watersheds, the Combate Watershed and Joyuda Lagoon Watershed. In this effort while we do gather information on the threats and impacts in and from these watersheds, we will not focus on watershed work. For further information on watershed work implementation in Cabo Rojo please refer to the "Early Action Projects for the Cabo Rojo Priority Management Area" document.

The coastal communities of the Municipality of Cabo Rojo are located adjacent to the designated areas. Residents, visitors and business owners use the areas for recreational and commercial purposes, the area is known for being the capital of Puerto Rican tourism, its rich fishing tradition and a heavily researched area described in detail below.

Recreational use:
The beaches and coastlines of southwest Puerto Rico are favored sites for recreation, for both residents and visitors, particularly the beaches at Playa Sucia, Combate, Boquerón, Buye, Cayo Piñero (also referred to as Cayo Ratones), among others. An active recreational water sports community partakes in power boating, kayaking, jet skiing, paddle boarding, kite surfing and sailing from public beach access points and marinas located at Boquerón, Puerto Real and Joyuda as well as other spots along the coast.

Commercial use:
A concentration of towns, hotels, restaurants and marinas are around the southwest Puerto Rico coastline. There are powerboat, sail, water sports equipment and scuba diving businesses. The municipality is known as a tourism destination.

Fishing:

Encompassing Puerto Rico's largest marine platform, the west coast of the Island is also host to the most important commercial fishing sector in Puerto Rico. Due to the large fishing area recreational and sport fishing is also an important activity in the area.

Scientific Research:

Southwest Puerto Rico is home to the University of Puerto Rico's Mayagüez Campus and the Magueyes Island field Station. The diverse habitats in southwest Puerto Rico provide extensive research opportunities for faculty, undergraduate, graduate, doctoral and post-doctoral students.

II. CONSERVATION PLAN

2.1 Conservation Action Planning

The initiative to build a comprehensive conservation plan for the marine protected areas within the Cabo Rojo coral priority region in SW Puerto Rico began in December 2012. Conservation Action Planning (CAP) is a straightforward and proven approach for planning, implementing and measuring success for conservation projects. CAP is TNC's version of the Open Standards for the Practice of Conservation of the Conservation Measures Partnership. CAP addresses a complete project cycle—including design, implementation and evaluation. CAP is based on the principles of adaptive management and is designed to facilitate and utilize input from stakeholders.

The CAP Process was implemented through a series of planning meetings and workshops with local stakeholders, community members, fishers, academics, researchers and government officials. Facilitated discussions resulted in the identification of priority conservation resources and their condition, understanding of human activities and other threats impacting the resources, and selection of strategies for improving or maintaining the resources of southwest Puerto Rico. The process of working through CAP for protected areas results in a plan based on a solid ecological foundation focused on specific and attainable strategies for biodiversity conservation and threat abatement.

This process relied heavily on community expertise, with community workshops held on March 11-13 2013 with fishers in Puerto Real and June 12-13 2013 at UPR's Magueyes field station with the academic community and government officials. Various one-on-one meetings were held from December 2012 through September 2013 to generate input on conservation target viability, threat ranking, strategies and monitoring. The resulting Cabo Rojo Conservation Plan is a culmination of input from various stakeholders vested in southwest Puerto Rico.

2.2 VISION

A vision statement was developed to encompass the values of various stakeholders that live near, recreate in and depend on the marine reserves their livelihoods.

> To maintain and restore functional coastal and marine ecosystems that promotes compatible recreational and commercial uses and ecological integrity through effective management and research.

III. Conservation Targets and Condition

The resources within southwest Puerto Rico that stakeholders, resource managers and experts felt were the primary targets of our conservation efforts were identified in the workshops. These Conservation Targets are specific to the Reserves and associated coastal habitat and provide a basis for all subsequent planning steps.

These targets were developed through consensus during the CAP process. Where possible, species were "grouped" due to common threats or strategies or "nested" within a habitat. Other priority resources will act as indicators of successful management of the targets and be gauged by measuring presence, population levels, biomass, or status of these species.

The priority Conservation Targets were determined to be:

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- **Fish aggregations**
- **Queen Conch**
- **Crabs**
- **Sustainable Commercial fishing**

The condition of the Conservation Targets was assessed through consultations with conservation target experts. The following condition for each target is included in the Table 1 below.

Table 1. Conservation Target Viability Matrix

Conservation Target	Condition
Coral Reef Communities	Poor
Seagrass Beds	Good
Mangroves	Good
Manatees	Good
Sea Turtles	Fair
Fish Aggregations	Poor
Queen Conch	Fair
Crabs	Good
Sustainable Commercial Fishing	Fair

There were certain Conservation Targets that were identified during the CAP process that were not included in the final list. These included important species such as sharks and rays, pelagic fish and sea cucumbers; however it was determined that additional research is needed on these species prior to developing conservation strategies.

Many of the Elasmobranchs use a variety of marine habitats during their life history and Cabo Rojo seems to be an important area for all stages but of particular importance- nursing grounds. It's reported that Sea Cucumbers (*holothurians*) have been fished in Puerto Rico for the Asian market (through a Miami fish dealer). Due to their unregulated status in Puerto Rico in recent years (2011-2012) an overexploitation and aggressive harvest have seemingly devastated near shore Sea Cucumber populations in Puerto Rico. No stock assessment has been done to assess this fishery and very little research has been done locally.

In Puerto Rico typical pelagic fishes like dorado, tunas, marlin, wahoo, sharks and mackerel are highly valued by recreational and commercial fishers and are part of an industry that generated millions of dollars in Puerto Rico which also need additional research. Lastly, an important mention was watersheds, which will be addressed through the "Early action projects for the Cabo Rojo Priority Management Area" watershed efforts and not in the conservation plan.

The following briefly describes the role of relevant Conservation Targets in the ecosystem, their characteristics, condition and extent, and pressures on these resources.

3.1 Coral Reef Communities

Corals grow throughout most of the insular shelf along the northeast, east, and southern coastlines, yet the physical, climatic and oceanographic conditions that affect reef development vary markedly among insular shelf segments. Fringing coral reefs are by far the most common. Puerto Rican coral reefs are the richest in the US Caribbean, with 43 hard coral species identified (WRI Reefs at Risk in the Caribbean). Overall, 93 percent of Puerto Rico's reefs were rated as threatened in the Reefs at Risk analysis, with 84 percent at high risk and therefore among the most threatened in the Caribbean. The predicted overfishing threatens almost all of Puerto Rico's coral reefs. Puerto Rican reef catches have plummeted during the last two decades and show the classic signs of overfishing. Fish landings reported between 1979 and 1990 fell 69 percent. The decline in the abundance of large fish and the massive region-wide mortality of the long spined urchin represent a major shift in community structure on Puerto Rican reefs. In addition, spiny lobster is overfished, resulting in increases in coral-eating mollusks and more damage to coral (WRI Reefs at Risk in the Caribbean).

3.2 Seagrass Beds

Seagrasses are found throughout the Caribbean. They grow in the reef lagoons between the beaches and coral reefs or form extensive meadows in protected bays and estuaries. In Puerto Rico there are seven species, *Thalassia testudinum* (turtle grass), *Halophila decipiens*, *H. baillonis* and *H. engelmannii* (paddle grasses), *Halodule beaudettei* (shoal grass), *Syringodium filiforme* (manatee grass), and *Ruppia maritima* (widgeon grass) (Vicente, 1992). In shallow waters the most common species are *Syringodium filiforme*, *Thalassia testudinum* and *Halodule beaudettei*, while the 3 species of *Halophila* found in the island are not abundant in shallow areas and are less frequently reported.

Of the 7 species recognized in the Caribbean, *Thalassia testudinum* (turtle grass), is the most abundant in the region. *Syringodium filiforme* (manatee grass), has a similar geographical distribution and usually grows intermixed with *Thalassia testudinum*. However, it may also grow in monospecific meadows or patches from the upper sublittoral to more than 20m. *Halodule wrightii* (shoal grass), is found throughout the wider Caribbean region. It is found growing on sand and mud from the intertidal down to 5m. *Ruppia maritima* (widgeon grass), is also found throughout the Caribbean but in shallower, brackish waters of bays and estuaries between 0 and 2.5m deep.

Globally, seagrasses play an important role in maintaining productivity. They are responsible for approximately 1% of total primary production and 15% of total carbon storage (Hemminga and Duarte, 2000). Constanza et al. (1997) shows that seagrass/algal beds have twice the ecosystem service value, measured in thousands of dollars per hectare per year, as that of mangrove-saltmarsh complexes and five times the ecosystem service value of reefs. They influence the physical, chemical, and biological environments in coastal waters, providing numerous ecological services to the marine environment such as nutrient cycling and food web structure. Seagrasses are also an important food source for

green sea turtles and manatees, and provide critical habitat for many commercially and recreationally important fishery species (Beck et al. 2001).

3.3 Mangroves

Coastal wetlands include saltwater and freshwater wetlands located within coastal watersheds. Puerto Rico, located northeast of the Caribbean Sea, has a subtropical climate, frequent rainfall and a unique topography ideal for coastal wetland development and growth. One of the most common coastal wetland ecosystems in Puerto Rico are mangrove forest. Cintrón et al (1978) define mangrove ecosystems as "*all salt-influenced wetlands that are part of the tidally driven coastal complex, including the community of mangrove trees, adjacent salt and mudflats, halophytic herbaceous and shrub vegetation, and saline lagoons often associated with mangrove trees*."

These ecosystems are amongst the most productive, providing habitat to a wide range of plants and animals and contributing to the biological productivity of shallow waters around the island. Mangroves also provide ecosystem services essential to people and the environment including flood protection, erosion control and carbon sequestration, amongst others. In Puerto Rico, mangroves also contain numerous recreational and historical resources that are valued by the community, local residents and visitors. However, human activity such as agriculture and urban and rural development has led to loss of these ecosystems throughout the island.

3.4 Manatees

The Antillean manatee (*Trichechus manatus manatus*, hereafter manatee) inhabiting Puerto Rico's coastal waters, is a subspecies of the endangered West Indian manatee (*Trichechus manatus*). The Antillean manatee is found in eastern Mexico and Central America, northern and eastern South America, and in the Greater Antilles (Lefebvre et al. 1989). It inhabits riverine and coastal systems in the subtropical Western Atlantic Coastal Zone from the Bahamas to Brazil, including the Gulf of Mexico. The distribution of the Antillean manatee extends eastward only to Puerto Rico. Studies in Puerto Rico suggest that manatees favor habitats that are protected from severe wave action, harbor submerged aquatic vegetation, and have some source of fresh water (Powell et al. 1981, Rathbun et al. 1985, Mignucci-Giannoni 1989). Relatively higher concentrations of manatees are found in four areas: Ceiba on the east coast, Jobos Bay area between Guayama and Salinas on the southeast coast, Guayanilla and Guánica Bay area on the southwest coast, and between Cabo Rojo and Mayagüez (Guanajibo River mouth) in the west coast (Powell et al. 1981, Rathbun et al. 1985, Freeman and Quintero 1990, Mignucci-Giannoni et al. 2004, USFWS 2007, USFWS unpublished data).

3.5 Sea Turtles

Sea turtles are air-breathing reptiles, well-adapted to life in the marine environment, that inhabit tropical and subtropical ocean waters throughout the world. Of the 7 species of sea turtles, 3 are found in Puerto Rico's coastal waters and nest locally. These are the Hawksbill (*Eretmochelys imbricata*), Green (*Chelonia mydas*) and Leatherback (*Dermochelys coriacea*) sea turtles. One case of a stranded Olive Ridley (*Lepidochelys olivacea*) has been reported and a Loggerhead turtle (*Caretta caretta*) was once tracked from a nesting beach in Bonaire to a feeding ground near the east coast of Puerto Rico.

Sea turtles are exposed to a number of threats such as entanglement in gillnets or pound nets that may cause drowning or serious injuries to their flippers from constriction by the lines or ropes. Also, long line gear can hook turtles in the jaw, esophagus, or flippers, while trawls do not allow turtles to escape resulting in drowning. All sea turtles occurring in U.S. waters are listed under the Endangered Species Act (ESA) and are under the joint jurisdiction of NOAA Fisheries and the U.S. Fish and Wildlife Service.

3.6 Fish Aggregations (Snapper, Grouper, Parrot)

Fish aggregations are known natural phenomena defined as any temporary aggregations formed by fishes that have migrated at a specific time and specific locations for the purpose of spawning. They can range from small groups to many thousands of individuals, making fish aggregations highly vulnerable to overexploitation. In Puerto Rico, aggregation of groupers, snappers and parrot fish is a critical stage in their life cycles. Fish behavior during aggregation periods makes them extremely susceptible to overfishing and populations are threaten by lack of regulations and failure to comply with fishing prohibitions. Both snappers and groupers are highly prized by commercial and recreational fishers in Puerto Rico because of its good quality flesh. They are highly susceptible to targeted fishing as they aggregate to spawn at predictable times and locations (Kojis, B.L. and Quinn, N.J. 2011). Unmanaged fishing during aggregations has rapidly reduced snapper and grouper fish populations with undesirable impacts on the species. Seasonal prohibitions in Puerto Rico are designed to protect adult individuals during reproduction and aggregation periods of certain species of snappers and groupers and can extend for approximately 3 months.

3.7 Queen Conch

Queen conch (*Strombus gigas*) is a large, marine, gastropod that grows to a maximum of about 12 inches (30.4 cm) long and weighing about 5 pounds (2.3 kg). During their larvae phase, queen conchs spend about 18-40 days floating and feeding in the plankton before settling to the bottom and metamorphosing into the adult form. Once in their benthic, adult form, they graze on algae and detritus. They live in sand, seagrass bed, and coral reef habitats and are found in warm, shallow water

generally not deeper than 70 feet. In Puerto Rico, there has been increasing concern about the conch fishery as populations have been decreasing. The queen conch is a highly prized commercial species for both their edible meat and attractive shell, which are used for jewelry. Trade from some Caribbean countries is suspected to be unsustainable and illegal harvest, including fishing in foreign waters or under closure periods is a common problem in the region (Theile, 2001). As a result, the queen conch abundance is declining due to overfishing and poaching.

3.8 Crabs (Blue Land Crab, Blue Crab)

The blue land crab (*Cardisoma guanhumi*) is a tropical, semi-terrestrial crab generally found in tropical and subtropical estuaries. They inhabit coastal areas such as mangroves, saline soils, dunes and rivers and pond banks. They can measure up to 6 in (15cm) across its carapace. In its juvenile form, the crab is a dark brown, purple, or orange in color and as an adult, it is a bluish-gray color. The blue land crabs are terrestrial and are found as far as 5 miles from the shoreline. However, blue land crab's eggs and larvae are pelagic so they return to the sea to breed. They are primarily vegetarians, preferring tender leaves, fruits, berries, flowers and some vegetables but occasionally they will eat beetles or other large insects.

In Puerto Rico the blue land crab is an important commercial species. It has been intensively exploited as a food source and populations in the island have been reported to be declining during the last 40 years as a response to overharvesting and habitat modifications (Govender and Rodriguez-Fourquet 2008; Rodriguez-Fourquet and Sabat 2009). There is a minimum size limit and harvesting prohibitions of blue land crabs between July 15 and October 15. Also, state forests and reserves in Puerto Rico are off-limits to crab harvesting.

The blue crab (*Calinectus sapidus*) is a bottom-dweller found in a variety of habitats ranging from the salt waters to almost fresh waters. They are especially common in estuaries, but their habitat ranges from the low tide line to waters 120 feet (36 m) deep. They are identified by their distinct body color, which is generally a bright blue along the frontal area and an olive brown in the remainder of the body. *Callinectes sapidus* can grow to 25 cm in carapace length (CL), with carapace width being approximately twice the length. Blue crabs in Puerto Rico are the basis of a significant commercial harvest and recreational fishery.

3.9 Sustainable Commercial Fishing

Sustainable fishing is defined by any fishing activity involved in catching a species of fish or shellfish that ensures the habitat and ecosystem supporting the fishery remains in good condition for the future. A sustainable fishery has sufficient spawning fish to produce the next generation, while allowing fishing to take place. It involves maintaining populations of target species in order to allow

their natural role in ecosystems and preserve sustainable reproduction rates. It is known that depletion of fish stocks due to fishing beyond sustainable levels is irreversible. In Puerto Rico, overfishing has resulted in a decrease of individual fish stocks and disruption of entire ecosystems. Studies of the Puerto Rico commercial fisheries have raised concern as to the condition of several species or species groups (Matos-Caraballo 2002). In the last few decades, declining landings in some fisheries off Puerto Rico have been reported (Matos-Caraballo, 2004). In some cases, unsustainable fishing in Puerto Rico is the result of inefficient fisheries rules, regulations and enforcement measures, where the fishing capacity and efforts are not sufficiently limited or controlled.

Sustainable fishing activities involve: eliminating the use of fishing gear that creates a high level of bycatch, or the incidental catch of non-target species, closing feeding, breeding and spawning grounds to protect marine ecosystems and reducing or eliminating destructive fishing practices is essential to sustainable fishing.

IV Threats

Threats to resources can directly impact a conservation target or indirectly impact an ecological process important to sustaining the conservation target. Knowing the threats forms the basis for formulating strategies and activities for the management of resources in southwest Puerto Rico.

The threats to conservation targets were identified through workshops and consultations with experts and are discussed in detail below. Threats were ranked by their Contribution, Scope, Severity and Irreversibility. The threat matrix (Table 2) ranks the impact of threats to conservation targets, demonstrating how overall impacts elevate targets necessitating the most attention for conservation, protection or restoration (e.g., Fish Aggregations), or abatement of critical threats (e.g., Unsustainable Fishing). The resulting criteria-based ranking helps prioritize conservation actions. This is important because in any given management or conservation area, there are always many activities that can be undertaken. However, conservation actions should be directed by what can be accomplished to truly address critical threats. Threats are ranked in the matrix based on existing knowledge and science and should be revised as threats change.

Table 2. Threat Ranking Matrix

Threats \Targets	Coral Reefs	Seagrass Beds	Mangroves	Manatees	Sea Turtles	Fish Aggregations	Queen Conch	Crabs	Sustainable Commercial Fishing	Summary Threat Rating
Unsustainable fishing	High					Very High	Low	Low	Very High	Very High
Extended high sea temperature	Very High	Med				Very High				Very High
Contamination		Very High		Low			Low			High
Lionfish	Very High								High	High
Degradation of terrestrial habitat					Med			Very High		High
Sedimentation	Very High	Med	Med							High

The threat ranking results in Table 2 indicate that threats posing the greatest harm to resources fall into the following categories: Unsustainable or Illegal Fishing and Extractive Activities, Climate Change Impacts, Land Based Sources of Pollution, Habitat Loss or Degradation, and Invasive Species. Specifically unsustainable fishing and extended high sea temperatures ranked as very high threats while contamination, sedimentation, nutrient loading, degradation of terrestrial habitat, and lionfish ranked as high threats. Described in more detail below, these threat ranking results guided the development of specific strategies to abate these critical threats in southwest Puerto Rico.

The following threats were identified by experts and local stakeholders as threats to conservation resources and ranked very high or high in the threat ranking matrix: unsustainable fishing, extended high sea temperatures, contamination, sedimentation, nutrient loading, degradation of terrestrial habitat, and lionfish.

Unsustainable fishing is harmful to several conservation targets including coral reef communities, fish aggregations and sustainable commercial fishing. In southwest Puerto Rico, unregulated and regulated fishing by recreational fishers has increased stress on both commercial and recreational fish stocks. Unlicensed recreational fishers have become competition for licensed commercial fishers by flooding the market and lowering the market price for specific commercial species, while also harvesting beyond the recreational limits of certain commercial species. Harvesting of herbivorous fish species is also a problem as Puerto Rico currently does not have any regulations on harvesting most of these species (ex. Parrot fish) which without regulations, unsustainable fishing can lead to unchecked growth of detrimental algae on coral reefs.

Extended high sea temperatures threaten coral reef communities, seagrass beds, and spawning aggregations. During extended elevated sea temperature events corals are susceptible to coral bleaching. Corals will often recover after short duration high temperature episodes; however following extended durations of elevated sea temperatures, bleaching becomes permanent. Coral bleaching is becoming more prominent throughout the Caribbean as sea temperatures rise. Seagrass beds and fish aggregations are also vulnerable to changes in sea temperature.

Land based sources of pollution including contamination, sedimentation, and nutrient loading impact the majority of the conservation targets. Resulting in decreased water and sediment quality as well as overabundance of nutrients, these threats are often addressed through watershed improvement projects to limit contribution to the marine and coastal environment.

Degradation of terrestrial habitat impacts both available habitat for crabs and nesting areas for sea turtles.

The invasive Indo-Pacific lionfish threatens local fish populations where it has been introduced in many areas of the Caribbean. Several factors make the lionfish a significant threat including its voracious appetite for native fish, ability to reproduce quickly and lack of local predators. In Puerto Rico however, it also may be a part of the solution as a local and export market for lionfish develops.

These prominent threats, identified as priorities by the threat ranking matrix helped guide the development of strategies to focus efforts on addressing the primary threats to conservation targets.

2.6 Conservation Strategies and Action Steps

Participants in the Cabo Rojo CAP process developed strategies and action steps to address the critical threats. This is one of the most critical sections of the conservation plan and will guide activities undertaken in the next years of early implementation as well as longer-term (5 year) implementation.

The objectives were written to be **SMART** which guides us into an implementation plan for the next five years.

SPECIFIC (What area? What target will this benefit? Focus on linkage to a specific threat.)

MEASUREABLE (How will we know that we've reached our objective?)

ACHIEVABLE, REALISTIC (Within capacity and our timeframe?)

RESULTS ORIENTED (Success! Gets us to the desired status and rating for the target and improves the target)

TIME-BOUND (establishes 5 years to start to show progress. Can also suggest an objective of longer-term viability to reach by 5-40 yrs.)

The **objective** is a specific statement that details the desired accomplishments or outcomes of a particular set of activities within a project, typically set for *abatement of critical threats* and for *restoration of degraded key ecological attributes* (*Table 3*). Core questions asked were, "What do we need to accomplish?", and "How will our objective affect the given threat?"

The objectives then led us to **strategies** for Cabo Rojo (*Table 4*). A conservation strategy is a broad course of action intended to achieve a specific objective (outcome) that abates a threat, and/or enhances the viability of a conservation target. A strategy will include the activities required to accomplish each objective, and the specific **action steps** required to complete each strategic action (*Table 5*). Core questions asked to determine what our strategies should be were, "What is the most effective way to achieve the results we stated in our objective?" What is the most effective way to abate this threat (threat = source + stresses it causes) or multiple threats?" and "Will the strategic actions accomplish the objective?"

*An **OBJECTIVE** is where you want to be. A **STRATEGY** is how you will get there.* The following tables show priority ranked strategies for Cabo Rojo and the Objectives-Strategies-Action Steps. This is the foundation of the Conservation Plan; these tables need to be constantly reviewed, updated, and likely amended to reflect new needs or other information that can feed into management decisions. Periodic updates will be necessary as activities progress, or as priorities change.

Table 3. Summary of High Priority Strategies for Cabo Rojo ranked by priority, impact and feasibility

1. **High Priority Strategies**	
Focus Enforcement in Nursery Areas	
TARGETS: Sustainable Commercial Fishing, Fish Aggregations, Coral Reef Communities	
THREATS: Unsustainable fishing	
STRATEGY: Reduce illegal fishing in nursery areas by targeted enforcement.	
OBJECTIVE 1. Within 2 years, reduce illegal net fishing by 50% in nursery areas.	
Description: In the Cabo Rojo Coral Priority Region there are several lagoons already designated by law as protected areas. These lagoons serve as critical nursing grounds to many important commercial, recreational and sport fishing species. Regulations and gear restrictions already exist, specific to these areas, however unsustainable, over extractive and illegal takes from these lagoons are common practice. With targeted enforcement of these areas, combined with the strategic location and limited access points to the lagoons, the creation of an active enforcement operation that aims to fully eliminate illegal fishing within these specific critical areas is very feasible. Improved signage is also needed to clearly state what practices are allowed and which carry penalties under the law. Cabo Rojo is known as the capital of Puerto Rican tourism and known for its fishing activities. Outreach to local communities to raise awareness about this specific issue is also needed. Additionally, several of the access points, where wetlands and other native vegetation that have been cut or cleared to facilitate boat access and trash dumping grounds, need active restoration. Restoring these key sites not only would begin to further restrict access but would also help with erosion control and prevent illegal dumping within the protected area. This project requires the collaboration of several stakeholders to be successful, but is also targeted enough to be completed in the short term with many resources already available as well as additional funding for the restoration and outreach efforts.	
Key Actions:	**Lead: DNER**
1. Identify valuable fish nursery areas, monitor and survey lagoon species.	**Proposed Partners: TNC, NOAA, UPR, Sea Grant, Protectores de Cuencas, Cabo Rojeños Prosalud y Ambiente, local fishers**
2. Develop materials and conduct outreach to public of the importance of lagoons and nursery grounds and the benefit to the local economy.	**When: 1 year for this initial phase. Once this project is launched, 3-5 years will be needed for the restoration efforts to be successful. The targeted enforcement need to have high visibility to deter illegal activities during the first 2 years and DNER rangers need to establish a regular patrol schedule for these areas.**
3. Target enforcement presence in protected lagoons within the Cabo Rojo Coral Priority Region (Joyuda, Rincon, Guaniquilla, etc)	**Expected Costs: ≤ $75,000**
4. Restore key sites surrounding the lagoons	**Proposed Funding Source: NOAA Restoration Center, NOAA CRCP, Sport fish restoration**
5. Establish Monitoring plan and schedule to track effectiveness of enforcement, outreach, restoration, and lagoon biodiversity and integrity.	**Products or Outputs: Map of primary nursery areas and signage at sites, outreach materials and efforts in local communities, restoration of previously identified impaired areas used for illegal dumping, substantial reduction in illegal fishing during first year of project.**
	Other considerations: DNER has key personnel spread within various divisions that have the capacity to conduct many of these efforts. Coordination with the DNER to identify project staff is needed as well as collaborating with local community groups through specific co-management agreements that outlines responsibilities, duties and concrete management actions.

2. **Create and establish regulations for species that are not currently regulated**	
TARGETS: Sustainable Commercial Fishing, Fish Aggregations, Coral Reef Communities	
THREATS: Unsustainable Fishing	
STRATEGY: Establish regulations on take limits and reduce take limits on species of commercial value	
OBJECTIVE 1. Within 2 years, establish regulations and take limits for species currently not regulated by the DNER for both commercial and recreational fisheries.	
Description: In Puerto Rico in both the recreational and commercial fisheries there are several species that are currently being caught without regulation or take limits. In an effort to move towards more sustainable fisheries, regulations need to be created for all targeted species. Additionally, research is needed on local species that have an international demand or market to prevent a future overexploitation of these stocks, as has already happened with the sea cucumber.	
Key Actions:	Lead: DNER
1. Inventory which species are being taken by recreational fishers and commercial fishers (including species for ornamental or aquarium purposes).	Proposed Partners: CFMC, Sea Grant, UPR, TNC, fishers, local NGOs, fisher associations
2. Using the best available science include regulations for the species that aren't already included in the Puerto Rico Marine species regulations.	When: Years 1-2
3. Have the fisher sector review the proposed regulations before finalizing and evaluate the proposed impact of the additional species regulated.	**Expected Costs**: ≤ $15,000
4. Update and review for new species or changes in regulations at least every 5 years.	Proposed Funding Source: TBD
	Products or Outputs: Take limits modified
	Other considerations: Economic analysis might also need to measure the impacts of these regulations on the fisher sectors.

3. **Training for commercial fishers**	
TARGETS: Coral Reef Communities, Fish Aggregations, Queen Conch, Sustainable Commercial Fishing, Crabs	
THREATS: Unsustainable Fishing	
STRATEGY: Increase compliance with commercial fishing regulations	
OBJECTIVE 1. Train 100% of commercial fishers in rules and regulations to reduce illegal fishing and improve compliance with local and federal regulations within 24 months.	
Program Description: In Puerto Rico the requirements to be a licensed commercial fisher are unclear. The need for an established commercial fisher's license education program has been identified in order for the commercial fishing community to be able to comply with all the fishing regulations in place in Puerto Rico. Update: Implementation of this effort has already been started, by the DNER in collaboration with the CFMC and TNC. For further information please refer to the DNER's Commercial Fishers Education Program (PEPCO as it's known in Spanish).	
Key Actions:	Lead: DNER
1. Develop training materials, and identify staff to conduct training.	Proposed Partners: CFMC, NOAA, PR Dept. of Agriculture, TNC, Sea Grant, UPR
2. Identify amount of trainings required to address the need from the commercial fishing sector.	When: Began in Feb-March 2014
3. Conduct trainings.	**Expected Costs**: ≤ $10,000
4. Monitor effectiveness of trainings.	Proposed Funding Source: DNER, NOAA, TNC, CFMC, Sea Grant, PR Dept. of Agriculture
	Products or Outputs: Commercial fishers further comply with PR fisheries regulations.
	Other considerations:

4. **Reduce (with the aim of eliminating) the sale of recreationally caught seafood**	
TARGETS: Coral Reef Communities, Fish Aggregations, Queen Conch, Sustainable Commercial Fishing	
THREATS: Unsustainable Fishing	
STRATEGY: Enforce the regulation banning the sale of recreationally caught seafood	
OBJECTIVE 1. Within 1 year stop the sale of recreationally caught seafood at sport fishing events.	
Program Description: A rough estimate done by a DNER fisheries official at sport fishing tournaments is that approximately up to $80,000 of market priced fish is being sold illegally a the end of major sport fishing tournaments. This number is based around Dorado (*Coryphaena hippurus*) a major sport fishing target. Current regulation for recreational fishers allows 10 dorados/person or 30/vessel/day. Despite having DNER Ranger presence at sport fishing events many private companies show up at the event ready with freezers to purchase much of the event's take. From anecdotal and personal communications, a major impact from this illegal sale of fish is that it's being sold drastically below market price. Additionally, these fish are not being reported as commercial catch. With all these factors combined, the sale of fish from tournaments could be having an extreme impact on the economics of this fishery. By reducing the take allowed in recreational and sport tournaments, the competition aspect can continue to thrive without the excessive catch.	
Key Actions:	Lead: DNER
1. Outreach and education on illegality of sale of recreationally caught fish targeted at sport fishing events.	Proposed Partners: Marinas, CFMC, Sea Grant, UPR, TNC, Sport fishing promoters, local NGOs, Recreational fishers
2. Change in the fisheries regulations reducing the take allowable for certain species.	When: Within 2 years at major sport fishing events and competitions.
	Expected Costs:$20,000
	Proposed Funding Source: Sport fish, FWS, NOAA
	Products or Outputs: Decrease of available fish for sale following tournaments
	Other considerations:

5. **Reduce sale of seafood caught out of season**	
TARGETS: Sustainable Commercial Fisheries, Conch	
THREATS: Unsustainable Fishing	
STRATEGY: Reduce the sale of queen conch caught during seasonal closures	
OBJECTIVE 1. Within 2 years reduce the sale of queen conch during its closed season	
Program Description: Queen conch is consistently being sold at local Cabo Rojo markets and restaurants during the closed season. Outreach efforts to educate restaurants in Cabo Rojo as well as Island wide about the purchase and sale conch out of season are needed. Beside the environmental impact on conch stocks, the sale of conch during the 3 month closure affects its market price. Consequences of illegal conch harvest and sales have always been incurred by fishers but restaurants and consumers have seldom felt any consequence. An outreach campaign during the seasonal closures specifically for restaurants is needed for them to be able to adjust their menus to local seafood availability.	
Key Actions:	Lead: DNER
1. Develop outreach material	Proposed Partners: Sea Grant, TNC, CFMC, UPR, Fishers, Restaurants
2. Begin campaign 1 month before closure. Collaborate during closure with restaurants and fishers.	When: 2 years
3. Publically recognize restaurants and fishers willing to make the commitment to follow the law and promote sustainable fishing practices.	**Expected Costs**:$50,000
	Proposed Funding Source: TBD
	Products or Outputs: Reduction of illegally caught and sold queen conch
	Other considerations:

6. <u>Establish no take area in Bahia Sucia</u>	
TARGETS: Coral Reef Communities, Fish Aggregations, Sustainable Commercial Fishing	
THREATS: Unsustainable Fishing	
STRATEGY: Reduce take of Juvenile Sharks and protection of Shark and Ray Nursery in Bahia Sucia.	
OBJECTIVE 1. Promote legislation to only allow catch and release fishing in Bahia Sucia within 2 years.	
Program Description: Cabo Rojo locals have known that the area surrounding the Cabo Rojo lighthouse is a hot spot for juvenile sharks and rays. Concerned commercial and recreational fishers have identified this unsustainable practice of targeting shark pups for their meat to be sold as shish kabobs. Through several interviews with local fisheries experts and site visits to assess the conditions of the area, we believe that this is a shark and ray nursery. The area is already designated as the marine extension of the Boquerón State Forest and establishing regulations to make it catch and release would benefit the sharks and rays using this nursing ground. This initiative already has recreational and commercial fisher support but more outreach is necessary in order for this regulation to receive complete community buy in.	
Key Actions:	Lead: DNER
1. Draft Catch and release Only regulation	Proposed Partners: CFMC, Sea Grant, TNC, NOAA
2.Outreach and public meeting with community	When: 2 years
3. Approve Regulation	**Expected Costs**:$15,000
	Proposed Funding Source: NOAA, FWS, CFMC, Sea Grant
	Products or Outputs: Increase in shark and ray nursery success
	Other considerations:

7. **Incorporate commercial fishers into coral nursery efforts**	
TARGETS: Coral Reef Communities, Sustainable Commercial Fishing	
THREATS: Unsustainable fishing, Extended high sea temperature, Sedimentation, Acidification	
STRATEGY: Protect and Restore Coral Reefs	
OBJECTIVE 1. Enhance local capacity to develop, operate and maintain coral nurseries.	
Program Description: The Cabo Rojo Coral Priority area is one rich with fishers. These fishers know the local environment better than anyone else since they're out on and in the water on a daily basis. Two of the area's most important fisheries are lobster and conch. In Puerto Rico these are taken by divers. To utilize this local diving expertise this project proposes incorporating dive fishers into coral nursery work. While the dive fishers are expert divers most of them lack any type of formal certification. In order to operate coral nurseries minimum standards need to be met for safety and quality control. Dive fishers will be trained in first aid and CRP and certified in rescue diving and coral nurseries. Training the dive fishers will allow for them to be brought into direct restoration efforts, earn an additional income during work on coral nurseries and will also create a fleet of capable personnel to be able to respond to emergency restoration efforts during grounding events.	
Key Actions:	Lead: DNER
1. Identify dive fishers to participate and dive instructors for certification. Host a roundtable with all partners involved to discuss expected outcomes, schedule, and commitments.	Proposed Partners: Cabo Rojo nursery operators, NOAA Restoration Center, local dive fishers, TNC, UPR
2. Begin dive training and coral management and nursery certification training.	When: 2 years
3. Once fishers are dive certified, begin in field training of coral nursery work.	**Expected Costs**: $150,000
4. Evaluate participants on skills acquired and conduct additional training as required.	Proposed Funding Source: NOAA CRCP, NOAA Restoration Center, CFMC, Sea Grant, PR Dept. of Agriculture
5. Integrate fishers into Coral Nursery proposals as the maintenance cost of operating nurseries.	**Products or Outputs: Local fishers involved in coral nursery management and maintenance.**
	Other considerations:

8. **Develop lionfish market**
TARGETS: Sustainable Commercial Fishing, Coral Reef Communities, Fish Aggregations, Crabs
THREATS: Lionfish
STRATEGY: Develop a New Sustainable Fishery
OBJECTIVE 1. Provide an alternate target species to target and commercialize during the queen conch closure.
OBJECTIVE 2. Control of the invasive lionfish
Program Description: In Puerto Rico a stable market for lionfish has not been created yet. Both demand and supply exist, but a disconnect between them will not allow for a stable market. In order for a market to be beneficial to its stakeholders and as a control measure for the invasive lionfish a steady demand needs to be present for continuous removal efforts to occur. Mass appeal for the consumption of lionfish needs to be created within what is already being consumed locally. Taking advantage of the budding fishery, this presents an opportunity to not only create an alternate target species but also create a sustainable. TNC has already developed this concept around the creation of a lionfish Community Supported Fishery to be implemented through a Marine Conservation agreement between dive fishers and restaurant owners.

Key Actions:	Lead: TNC
1. Identify Fishers and Restaurants willing to participate.	Proposed Partners: Fishers, Restaurants, DNER, Sea Grant, NFWF, PR Dept. of Agriculture, Proyecto Pterois, CFMC, NOAA
2. Develop MCA terms with stakeholders.	When: 2 years
3. Launch efforts fishing lionfish and supplying restaurants.	**Expected Costs**: $100,000
4. Launch lionfish marketing campaign	Proposed Funding Source:
5. Evaluate effectiveness of control measure and cost-benefit to fishers.	**Products or Outputs:**
	Other considerations:

9. **Install mooring buoys and aids to Navigation**	
TARGETS: Coral Reef Communities, Seagrass Beds, Manatees	
THREATS: Boat damage, Jet Ski	
STRATEGY: Install mooring buoys and aids to Navigation at preferred locations previously identified by local stakeholders and users.	
OBJECTIVE 1. Within 2 years install a system of buoys that prevents groundings and facilitates responsible recreational use.	
Program Description: The Cabo Rojo Coral Priority area aside from having the largest fishing platform in Puerto Rico is also known as Puerto Rico's internal tourism capitol. This means that people from across the Island have a heavy use of the Cabo Rojo marine environment. The area has insufficient moorings or no mooring at key sites. Many times recreation users in their attempt to be responsible boaters and avoid using their anchors in coral reef areas, have installed make shift moorings. General coordinates for the areas of need, for recreational and tourism moorings and aids to navigation have been identified in as part of the human use mapping efforts TNC conducted in Cabo Rojo.	
Key Actions:	Lead: DNER
1. Identify exact coordinates and amount of mooring and aids to navigation needed.	Proposed Partners: FWS, NOAA, NMFS, TNC, Marinas, Tourism operators, FURA, US Coast Guard
2. Validate information with stakeholders and users	When: 2 years
3. After permitting process is complete install moorings.	**Expected Costs**:$100,000
4. Explore the establish co-management agreements with mooring users to provide maintenance at specific sites.	Proposed Funding Source: FWS, NOAA
	Products or Outputs:
	Other considerations:

10. **Outreach, zoning and enforcement of jet skis**	
TARGETS: Coral Reef Communities, Manatees, Seagrass beds	
THREATS: Jet Ski, boat damage	
STRATEGY: Reduce Jet Ski Conflicts	
OBJECTIVE 1. Within 1 year establish Jet Ski use areas	
Program Description: Jet Ski users have continuously come up during many discussions over conflicts of use of the marine environment. Jet Ski users have a legal right to use personal watercraft in accordance to local regulations. However, this high powered vessel enters in conflict with other users as well as species and ecosystems in the marine environment. Use and speed zones specifically designated for Jet Skis need to be created and addressed in the Cabo Rojo Coral Priority region. Jet Ski users need to be provided with areas in which they can enjoy their personal watercrafts without endangering themselves, others, or the environment. Reducing conflict while providing a safe space for this recreational activity is in the interest of the marine environment and human safety.	
Key Actions:	Lead: DNER
1. Identify Jet Ski use areas and conflicts within that area.	Proposed Partners: FURA, Sea Grant, UPR, Jet Ski Users/renters
2. Have a Jet Ski user roundtable to address Jet Ski user's needs.	When: 1.5 years
3. Create Jet Ski use and speed zones and validate with users.	**Expected Costs**: $15,000
4. Create a map to be published and made public to be used at Cabo Rojo areas Jet Ski rentals.	Proposed Funding Source:
	Products or Outputs:
	Other considerations:

11. **Effectively develop and implement recreational licensing program**
TARGETS: Conch, Sustainable Commercial Fishing, Fish aggregations, Coral Reef Communities, Crabs
THREATS: Unsustainable Fishing
STRATEGY: Develop and implement a recreational fishing licensing program
OBJECTIVE 1. Within 3 years develop, create and license all recreational fishers in Puerto Rico.
Program Description: The need to create an effective Recreational Fishing license in Puerto Rico has reached its tipping point. Being able to quantify the amount of recreational fishers in Puerto Rico would be beneficial to address the needs of this large community on Island. Creating a licensing program would also generate revenue that the local DNER could reinvest into fisheries management efforts and improvement in the services that the recreational fishing community receive. The economic benefit that recreational and sports fishing generates across the Island is tremendous however recreational fisheries is also one of the most unregulated activities that happen on a daily basis. Due to this lack of regulation tensions have grown between commercial and recreational fishers. While many recreational fishers are responsible, others due to the lack of regulations and means to reach out to this community fish indiscriminately. Implementing recreational fishing licenses would not help fisheries management in Puerto Rico but would also help ease tensions with the commercial sector and create a new revenue stream to address many of the issues that both commercial and recreational fishers face.

Key Actions:	Lead: DNER
1. Develop Recreational fishers licensing program	Proposed Partners: Pesca Playa y Ambiente, TNC, Sea Grant, Regata, Marinas, Boat shows, Sport fishing events
2. Develop materials for program	When: 3 years
3. Evaluate and analyze pricing for Recreational licenses and methods for sales and collection	**Expected Costs**: $200,000
4. Create an account associated with regulations and an executive order as to how funds collected from the licenses are to be spent.	Proposed Funding Source:
5. Begin pilot licensing program with Recreational fishers.	**Products or Outputs:**
6. Evaluate pilot process through adaptive management, and launch large scale licensing efforts.	Other considerations:

12. **Co-Management of Cayo Piñero**
TARGETS: Coral Reef Communities, Seagrass Beds
THREATS: Degradation of Terrestrial Habitat, Marine Debris
STRATEGY: Increase management of critical areas through establishment of co-management structure between local concession and enforcement
OBJECTIVE 1. Develop co-management concessions within 1 year at Isla de Piñero.
Program Description: Natural Reserve Cayo Ratones, also known as Cayo Piñero under the jurisdiction of the DNER is a special case in the Cabo Rojo coral priority area. This natural reserve has one tourism concessionaire, Aventuras Tourmaline who take tourist over for half day and day trips to the Island. This concessionaire has also taken it upon himself to clean up the island's trash left by other tourist that visit the island. The concessionaire also happens to live in front of the small natural reserve. The Island also has other maintenance duties that this tourism operator takes it upon himself to make sure are in proper order. Having a well maintained Natural reserve is in the benefit of the tourism operator this allows for an enjoyable tourist experience and facilitates return customers. However, management and maintenance of natural reserves fall under the jurisdiction of the DNER. Cayo Piñero presents itself as an ideal opportunity for the creation of co-management agreements that specify needed actions to be undertaken by the party entering into the agreement with the DNER. This agreement with a concessionaire will save the DNER staff time and funds that would otherwise be used for maintenance of this natural reserve. In exchange for these activities under the co-management agreement with this concessionaire a special discounted fee could be adjusted to reflect the investment incurred for the actions that are undertaken. This would need to be discussed and negotiated between the DNER and the Concessionaire.

Key Actions:	Lead: DNER
1 Develop co-management concessionaire process	Proposed Partners: Cabo Rojeños Pro Salud y Ambiente, Aventuras Tourmaline, TNC
2 Establish specific actions for co-management of Isla Piñero with Adventures Tourmaline and Cabo Rojeños Pro Salud y Ambiente.	When: 1 year
3. Implement Co-management agreement	**Expected Costs**: $25,000
4. Evaluate co-management agreement effectiveness.	Proposed Funding Source:
	Products or Outputs:
	Other considerations:

2.7 Monitoring and Evaluation of Effectiveness

A *Monitoring Plan* was developed to assess the status of the resources in the Reserves with the aim to evaluate the effectiveness of some of the strategies proposed in this conservation plan. Having a plan for monitoring will enable managers to see whether a strategy is working as planned and thus whether adjustments are needed. This Plan needs to be constantly reviewed, updated, and likely amended to reflect new needs or other information that can feed into management decisions. Periodic updates will be necessary as cost estimates, funding, and results are determined as well as new conservation targets and threats are identified and prioritized.

The Plan contains essential elements needed to track the resources and strategies; indicators, methods, frequency and timing, and costs (among others). These are tied back to the Strategies and Action Steps of the Plan.

Indicators can be quantitative measures or qualitative observations. Good indicators meet the following criteria:

- Measurable: Able to be recorded and analyzed in quantitative or in discreet qualitative terms.
- Clear: Presented or described in such a way that its meaning will be the same to all people.
- Sensitive: Changing proportionately in response to actual changes in the condition or item being measured.

Methods are specific techniques used to collect data to measure an indicator. Good methods meet the following criteria:

- Accurate: Gives minimal or no error.
- Reliable: Results obtained using the method is consistently repeatable.
- Cost-Effective: Not overly expensive for the data the method yields or for the resources available to the project.
- Feasible: Project team has people who can use the method, as well as the material and financial resources to use the method.
- Appropriate: Appropriate to the environmental, cultural, and political context of the project.

Table 4. Cabo Rojo Monitoring Plan

Target	Threat Category	Indicator	Methods	Frequency
Coral Reef Communities	Unsustainable or Illegal Fishing and Extractive Activities, Climate Change Impacts, Land Based Sources of Pollution, Invasive Species, Boating Activities and Infrastructure, Marine Debris, Incompatible Practices	Species composition, coral cover, disease, mortality, herbivory, lionfish presence, water temperature, water quality	Field measurements (AGRRA, various UPR-RUM, NOAA NCRMP)	Annually
Seagrass Beds	Unsustainable or Illegal Fishing and Extractive Activities, Climate Change Impacts, Land Based Sources of Pollution, Boating Activities and Infrastructure, Marine Debris, Incompatible Practices	Diversity, shoot density, distribution, seagrass :algae ratio	Field measurements (permanent quadrants, seagrass: algae ratio assessments)	Annually
Mangroves	Land Based Sources of Pollution, Habitat Loss or Degradation	Density, diameter, biomass, spatial representation	Field measurements (permanent plots, spatial coverage)	Every other year
Manatees	Unsustainable or Illegal Fishing and Extractive Activities, Land Based Sources of Pollution, Habitat Loss or Degradation, Boating Activities and Infrastructure, Marine Debris, Incompatible Practices	Baseline numbers	Field counts	Annually
Sea Turtles	Unsustainable or Illegal Fishing and Extractive Activities, Habitat Loss or Degradation, Marine Debris	Abundance, distribution, nesting success	Field monitoring (nesting sites, success and frequency)	Annually (during nesting season)
Fish Aggregations	Unsustainable or Illegal Fishing and Extractive Activities, Climate Change Impacts, Boating Activities and Infrastructure	Biomass, abundance, size structure, distribution	Field monitoring (acoustic and optical)	During spawning (depends on species)
Queen Conch	Unsustainable or Illegal Fishing and Extractive Activities, Land Based Sources of Pollution	Abundance, maturity, distribution	Field monitoring	Annually
Crabs	Unsustainable or Illegal Fishing and Extractive Activities, Climate Change Impacts, Habitat Loss or Degradation, Invasive Species	Abundance, size, distribution	Field monitoring (burrow and trapping)	Annually
Sustainable Commercial Fishing	Unsustainable or Illegal Fishing and Extractive Activities, Land Based Sources of Pollution, Invasive Species	Numbers of fishers, species fished, catch surveys, fisheries stocks, CPU, compliance with fisheries regulations and closure.	Social and market surveys, fisheries statistics, site verification	Annually

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