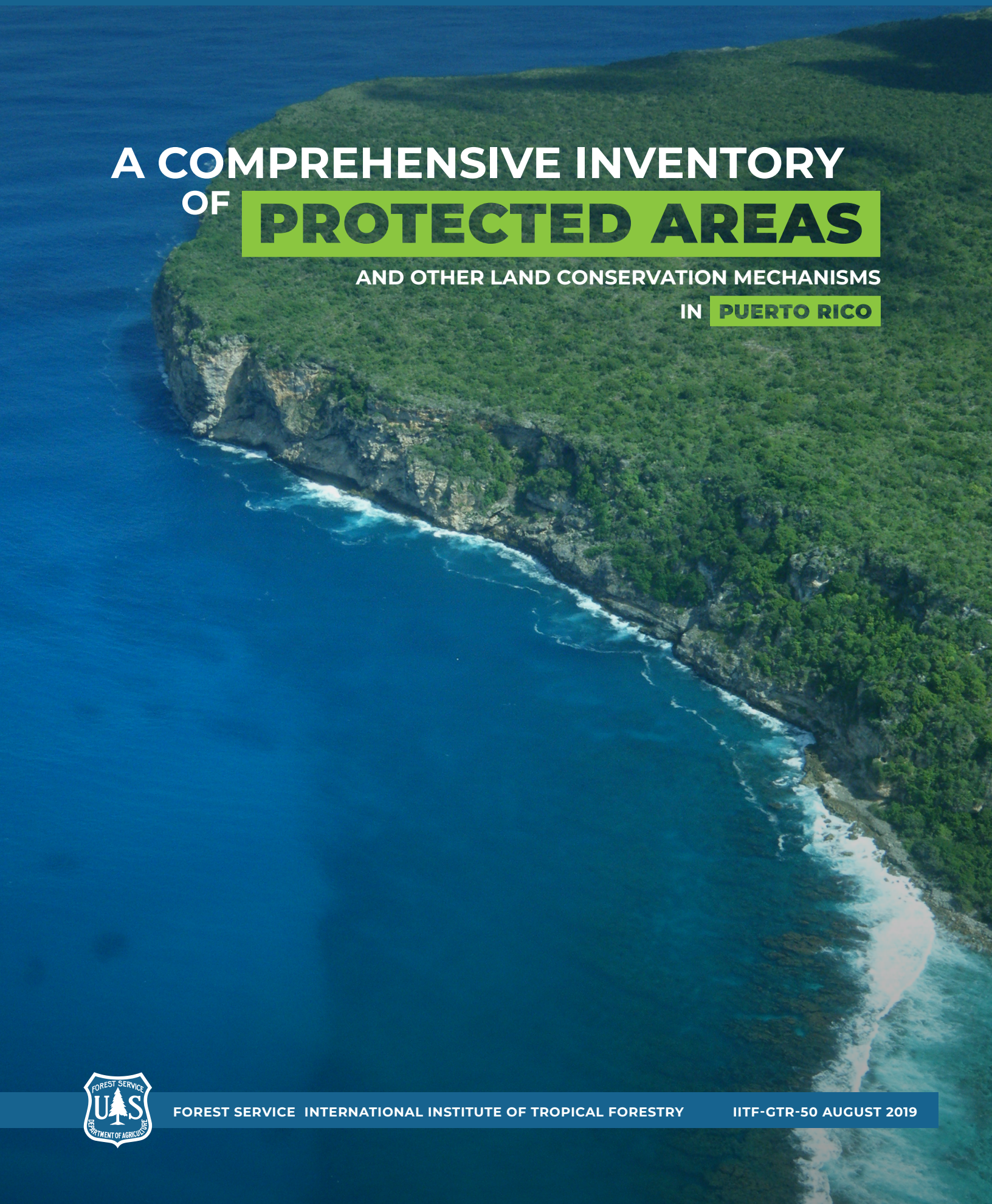
USDA UNITED STATES DEPARTMENT OF AGRICULTURE



A COMPREHENSIVE INVENTORY OF PROTECTED AREAS

AND OTHER LAND CONSERVATION MECHANISMS IN PUERTO RICO

FOREST SERVICE INTERNATIONAL INSTITUTE OF TROPICAL FORESTRY IITF-GTR-50 AUGUST 2019

Cover Photo: Mona and Monito Island Natural Reserve. Photo by: Robert van Dam

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A COMPREHENSIVE INVENTORY OF PROTECTED AREAS AND OTHER LAND CONSERVATION MECHANISMS IN PUERTO RICO

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ABSTRACT

Geospatial inventories of protected areas and information regarding additional conservation mechanisms that were established to protect natural resources are useful in evaluating conservation effectiveness and supporting conservation planning at broader scales. The lack of a single inventory and common terminology among stakeholders in Puerto Rico was identified as a major limitation in planning and monitoring conservation effectiveness across the island. This report describes the multiagency/organization effort to facilitate communication among managers and stakeholders of protected areas toward an integrated system for the conservation of natural and cultural resources in Puerto Rico.

Keywords: conservation, protected areas, spatial inventory, Puerto Rico.

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El Yunque National Forest. Photo by: Karla M. Morales



El Yunque National Forest. Photo by: Karla M. Morales

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Iguana from Mona island *(Cyclura cornuta stejnegeri)*. Photo by: Robert van Dam

FOREWORD

The lands described in this report are in various ways "protected" because of special value and vulnerability. The natural features of our island have the potential to attract and benefit us once we learn to value and appreciate them. The objective of this publication is more than a geography lesson, rather it is to create a common understanding. To the degree that it invites public interest, it will achieve this end.

FRANK WADSWORTH

Forester, conservationist and volunteer at USDA Forest Service, International Institute of Tropical Forestry

Photo by: Matthew Kane

PREFACE

The conservation movements in the late 1800s and early 1900s were a call to protect land, water, and wildlife from urban development and industrial uses. They helped convince Americans that natural resources in rural areas were important. In the 21st century, the boundaries of urban and rural resources have become more complex, and the services people expect from natural areas are more diverse. In recent decades, the connectivity of landscapes, people, materials, and energy has increased exponentially. Intentions, plans, policies, and actions in one sector of society may have unexpected consequences for others. The need for a broad perspective, communication, and feedback in resource management has never been so clear, with a growing human population and growing demand for food, clean air and water, and well-being. The way we use the land and sea around us has played a role in the development of human society and government. The conservation of resources implies collectively assessing needs and priorities in order to manage resources for future generations. Island countries in particular face difficult questions in terms of resource use because of the limited land areas and intensity of pressures from high population densities, sea-level rise, aquifer salinization, and heavy dependence on surface waters. Climate change poses additional challenges, with projections of increasing extreme climatic events such as droughts and storms. Hurricanes Irma and Maria devastated Puerto Rico in the fall of 2017. The collapse in communications, transportation, and energy affected all segments of society–including the management of natural areas and the ecosystem services they provide. Almost 2 years after the hurricanes, natural ecosystems are recovering from defoliation–but the loss of forest structure, human infrastructure, and the associated services provided by these will take longer. The inventory of protected lands and other conservation mechanisms in Puerto Rico described in this report is, on one hand, a simple cataloging of management areas and conservation programs. It is, on the other hand, part of an evolution in collective conservation, connecting intentions with outcomes in a new way, and building collaborations among agencies and organizations that can serve long-term objectives. The partners collaborating in this effort have made a commitment not only to compile and assess the current scenario of conservation mechanisms, but to continue to collaborate in the maintenance and dissemination of this information so that it serves as a common framework for conservation planning and management action in Puerto Rico.

WILLIAM GOULD
February 5, 2018

Research Ecologist at USDA Forest Service, International Institute of Tropical Forestry



Cañón San Cristóbal. Photo by: Para La Naturaleza

ACRONYMS AND ABBREVIATIONS

Caribbean Landscape Conservation Cooperative	(CLCC)
Center for Urban, Community and Business Action of Río Piedras	(CAUCE, in Spanish)
Citizens of the Karst	(CDK)
Conservation Action Team	(CAT)
Critical Wildlife Area	(CWA)
Puerto Rico Department of Natural and Environmental Resources	(DNER)
Puerto Rico Department of Recreation and Sports	(DRS)
Endangered Species Act	(ESA)
Environmental Quality Board	(EQB)
Farm Service Agency	(FSA)
Geographic Information System	(GIS)
Important Bird and Biodiversity Areas	(IBA)
Integrated System for the Conservation of Nature	(ISCN)
International Institute of Tropical Forestry	(IITF)
International Union for the Conservation of Nature	(IUCN)
Institute of Puerto Rican Culture	(IPC)
Karst Conservation Zone	(KCZ)
Marine Protected Area	(MPA)
Memorandum of Understanding	(MOU)
Migratory Bird Treaty Act	(MBTA)
National Oceanographic and Atmospheric Administration	(NOAA)
National Wildlife Refuge	(NWR)
Natural Resources Conservation Services	(NRCS)
Non-governmental Organization	(NGO)
Para La Naturaleza	(PLN)
Partners for Fish and Wildlife	(PFW)
Plan and Regulation of the Karst Special Planning Area	(PRAPEC, in Spanish)
Protected Areas Conservation Action Team	(PA-CAT)
Protected Areas Database of the United States	(PAD-US)
Puerto Rico Conservation Trust	(PRCT)
Puerto Rico Gap Analysis Program	(PRGAP)
Puerto Rico Oversight, Management, and Economic Stability Act	(PROMESA)
Puerto Rico Planning Board	(PRPB)
Restricted Zone	(RZ)
Special Planning Zone	(SPZ)
Specially Protected Rustic Soil	(SPRS)
United Nations Educational, Scientific and Cultural Organization	(UNESCO)
United States of America	U.S.
U.S. Department of Agriculture	(USDA)
U.S. Department of the Interior	(DOI)
U.S. Fish and Wildlife Service	(USFWS)
U.S. Virgin Islands	(USVI)
University of Puerto Rico	(UPR)
World Database on Protected Areas	(WDPA)

Hacienda Buena Vista. Photo by: Para La Naturaleza

INTRODUCTION

Issues surrounding optimal uses of the land and other natural resources are a priority of decision making for governing institutions at local to international scales. The increasing rate of land change and the intensification of land use (Allan et al. 2015), the increasing world population and global demands for food (Tilman et al. 2011), together with the pace of climate change (IPCC 2016) are some of the major challenges for the preservation of natural and semi-natural environments in a more urban (Seto et al. 2012) and globalized world (Grau and Aide 2008).

The complex matrix of land governance brings urgency to the need for clear information, shared and agreed upon by a wide range of managers and stakeholders that can guide and inform resource management. Government agencies and non-governmental organizations (NGOs) have increasingly recognized the need for collaborative conservation efforts and for long-lived frameworks for collaborative conservation planning (Fischman et al. 2014; Wondolleck and Yaffee 2000).

The establishment of a protected area, "a geographically defined area, which is designated, regulated and managed to achieve specific conservation objectives" (United Nations 1992), is a fundamental piece for conservation planning. Protected areas are a widely adopted strategy for conserving in situ biodiversity, but also to mitigate the adverse effects of climate change (Dudley et al. 2010; Naughton-Treves et al. 2005). Protected areas provide many direct and indirect benefits to society, including clean water, food, open space for recreation, and access to nature that are associated with health benefits (Cox et al. 2017, Dadvand et al. 2015). Protected areas play a key role in carbon sequestration (Soares-Filho et al., 2010) and an increasingly important role in policies for Reducing Emissions from Deforestation and Degradation (REDD+; Watson et al. 2014) and buffering of natural hazards, such as storm surges and sea level rises (Boulton et al. 2016; McCurdy et al. 2010).

Furthermore, protected areas can be a source of economic growth, particularly through consumer spending on outdoor recreational activities and equipment, as they generate jobs and support local communities (White et al. 2016).

Traditionally, protected areas have been recognized and established because of their natural values and role in biodiversity and for resource conservation. Although this remains the main goal for the establishment of protected areas, the paradigm has shifted from exclusionary uninhabited protected areas to include protected areas that recognize that people and their cultures are historically linked with nature (Secretariat of the Convention on Biological Diversity 2008). This is the case of sacred sites with spiritual values (Wild and McLeod 2008), archaeological sites with a special meaning for humans, and sustainable agricultural use areas, the protection of which also promotes the protection of the environment and the preservation of biological diversity (Daniel et al. 2012).

The protection of cultural sites with natural areas associated enable understanding our past cultures and traditions, including how our ancestors related with the land. For many societies—particularly of indigenous people—sacred places, geologic features, plants, or animals are linked to traditional practices that involve the protection of geographic areas, landscapes, ecosystems, or species (Wild and McLeod 2008). These spiritual and traditional values maintain people's connection with nature, motivating them to learn, care for, and protect the environment. Protected areas, however, also have cultural and spiritual significance for people who do not consider themselves religious or spiritual—as places of calm, inspiration, or cultural heritage.

Because of the many ways by which protected areas improve environmental sustainability and promote human welfare, many organizations have made efforts to track protected area establishment and measure progress and success. For example, at the global scale, the United Nations includes the world percentage of protected areas as an indicator for Goal 7 (environmental sustainability) of the Millennium Development Goals (United Nations 2016).

A comprehensive inventory of protected areas and other land conservation mechanisms is fundamental to support decision-making, local economic development, and systematic conservation planning at any scale (Baskent and Keles 2005; de Groot et al. 2010). Easily accessible and understandable information enables agencies, planners, researchers, and the public to better identify, prioritize, assess, manage, and protect those areas to achieve conservation targets in the most effective and efficient ways.

This report describes the initiation and outcomes of the Protected Areas Conservation Action Team (PA-CAT) in Puerto Rico, including:

(1) The methodology used to develop and maintain a comprehensive inventory of terrestrial protected areas for the island, including the development and adoption of a local definition of "protected areas."

(2) A summary and analysis as of December 2016 of the inventory of protected areas.

3) A folded map with the 2018 inventory of protected areas.

(4) An overview of other conservation mechanisms available for the island.

(5) Information on the the marine protected areas.

Hacienda Buena Vista. Photo by: Para La Naturaleza

PROTECTED AREAS IN PUERTO RICO: WHY ARE THEY IMPORTANT?

Photo by: Ozark

1

PROTECTED AREAS IN PUERTO RICO: WHY ARE THEY IMPORTANT?

Over the last several decades, Puerto Rico has moved from an agricultural to an industrial and service-based economy (Dietz 1989). During the transition, forest cover increased from 6 percent to over 55 percent across the island (Birdsey and Weaver 1982; Brandeis and Turner 2013; Domínguez-Cristóbal 2000). Although forest is currently the most dominant land cover in Puerto Rico (Gould et al. 2008), conserving the island's natural environments and wildlife still includes many challenges: a high proportion of introduced species (Miller et al. 2016; Rojas-Sandoval and Acevedo-Rodríguez 2015), a declining but still high human population density (U.S. Census Bureau 2015), and high rates of urban development (Martinuzzi et al. 2007) in which roads (López et al. 2001) and housing construction (Stein et al. 2014) are important contributors, even around protected areas (Castro-Prieto et al. 2017). Other challenges for conserving natural resources in Puerto Rico include the island's high dependence on fossil fuels, which constitute about 50 percent of the supplied electricity (U.S. Energy Information Administration 2017) and extreme weather events (e.g., severe droughts and hurricanes) that are projected to become more intense due to climate change (Hayhoe 2013; Henareh-Khalyani et al. 2016; Méndez-Lázaro et al. 2015; Puerto Rico Climate Change Council Working Group 1 2012).

More recently, Puerto Rico's economic and fiscal crisis has created a new layer of uncertainty as to how public lands will be governed and has opened the door to many questions about the future use of public protected areas on the island (PROMESA 2016; Snow 2017). At the same time, food security concerns, the increasing demand for local food, and growing support for local agriculture have increased the amount of lands in agricultural production (Blasor 2016). However, new uncertainties have arisen about how much and where to grow more food (Gould et al. 2017).

Puerto Rico is within the Caribbean Islands Biodiversity Hotspot (Myers et al. 2000), a region internationally recognized for its high species-richness and endemism (BirdLife International 2010). The island has a plant diversity that includes about 3,126 species of seed plants (Smithsonian National Museum of Natural History 2016) and provides habitat to 426 terrestrial vertebrate species, including 360 native vertebrate species; many of these species are endemic to the island or the Caribbean region (Joglar 2005; Gould et al. 2008). Furthermore, the island encompasses a wide range of ecosystems, including rain, wet, moist, and dry forests, grasslands, shrublands, karst, caves, underground rivers, mangroves, seagrass beds, and coral reefs (Miller and Lugo 2009).

Protected areas in Puerto Rico encompass large portions of habitat with high ecological value, including salt flats and large extensions of mature secondary forest (Lugo et al. 2012). Further, they encompass the regions with the highest vertebrate diversity across the island (Castro-Prieto et al. 2016), providing habitat for several endemic, threatened, and endangered species, such as the crested toad *(Peltophryne lemur)*, the Puerto Rican nightjar *(Antrostomus noctitherus*), and globally endangered species, such as hawksbill sea turtles *(Eretmochelys imbricata).*

Protected areas in Puerto Rico are valuable for local, regional, and international research. For example, El Yunque National Forest, also known as the Luquillo Experimental Forest, is one of the most extensively studied tropical forests in the world (González et al. 2013, Harris et al. 2012). This forest is a living laboratory and a point of reference for pioneer research on tropical ecology, including disturbance regime, forest recovery and restoration (Brokaw et al. 2013). Furthermore, it is home to long-term research to study the effects of climate change and hurricanes, the Iguaca Aviary (a captive-breeding facility for the endangered Puerto Rican parrot *Amazona vittata*), the Canopy Trimming Experiment, the Tropical Responses to Altered Climate Experiment, and the El Verde and the Sabana Field Research Stations among others (Quiñones et al. 2018).

Furthermore, protected areas in Puerto Rico provide several ecosystem services. For example, they serve to ameliorate local weather conditions as they contribute to reducing the urban heat island effect that alters temperature, humidity, and precipitation in urban settings (Murphy et al. 2011). An analysis of the ecological, social, and economic values of El Yunque National Forest (115 km^2) reported that this forest provides 22 different ecosystem services (López-Marrero and Hermansen-Báez 2011), including water supply for 20 percent of the population of the island (Heartsill-Scalley and López-Marrero 2014) and a place for outdoor recreation for over 600,000 annual visitors (Quiñones et al. 2018). Wetlands, such as those found in the Cabo Rojo National Wildlife Refuge and the Piñones State Forest, act as natural barriers to control coastal erosion, storms, and floods (Miller and Lugo 2009). The different coastal wetlands and near-shore habitats in the island (e.g., mangroves and seagrass beds) are valuable for wildlife and for essential spawning and nursery areas for over 500 species of fish and several crustaceans that are important for subsistence and commercial fisheries within the U.S. Caribbean region (Stedman and Delgado 2004).

In Puerto Rico, protected areas have been shown to be effective in restricting urban development within their boundaries and offer some resistance to the sprawling expansion of the urban footprint across the island (Helmer 2004; fig. 1). Besides ecological amenities, protected areas in urban areas, such as Laguna del Condado Natural Estuarine Reserve, San Patricio, and the San Juan Ecological Corridor, provide open spaces for urban dwellers to exercise, recreate, and connect with nature.

ECOSYSTEM SERVICES are the benefits people obtain from ecosystems. These benefits include provisioning services, such as food and water; regulating services, such as flood and disease control; cultural, spiritual, and recreational services; and supporting services, such as nutrient cycling, that maintain the conditions for life on Earth (United Nations Environmental Program [UNEP] 2005).



Guajil Pinto (*Mycteroperca tigris*). Photo by: Héctor Ruiz

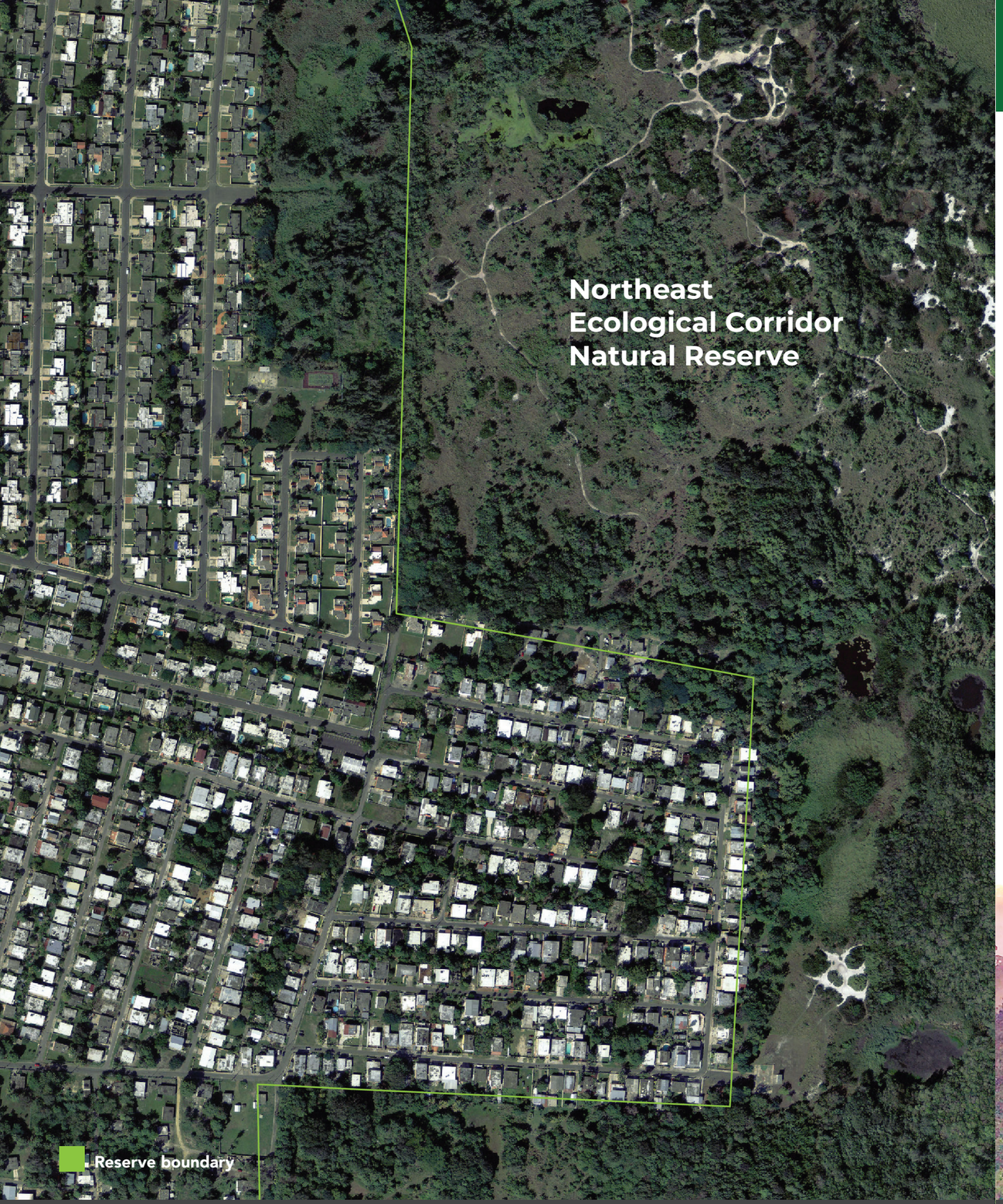


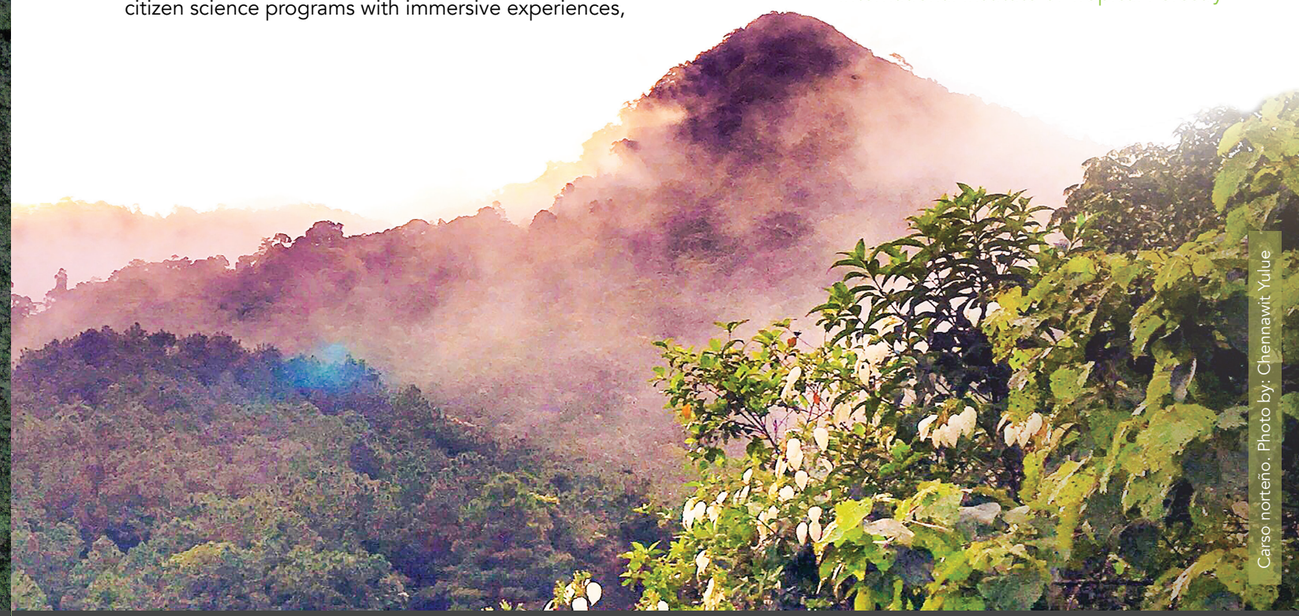
Figure 1. Urban expansion contiguous to the Northeast Ecological Corridor Natural Reserve.

In addition, protected areas provide an opportunity for governance and community participation. It is around protected areas that several communities in Puerto Rico have created strong conservation initiatives, coalitions, and groups that have become leaders in participatory managing and planning. For example, El Yunque National Forest is one of the early adopters of the Forest Service "all lands" policy for the development of forest management plans, which encourages participatory planning and working beyond the boundaries of the forest in conservation actions. Protected areas provide important spaces for outreach, informal science education, and volunteering. Along these lines, the Puerto Rico Legislature approved Law No. 36 of 2015, The Green Connection Program Act ("Programa Contacto Verde"), administered by the Puerto Rico Department of Education, in coordination with the Puerto Rico Department of Natural and Environmental Resources (DNER) to ensure the participation of students and their families in workshops and visits to protected areas. Furthermore, programs using citizen science engage individuals in performing or managing research-related tasks and, at the same time, assist scientists to accomplish greater research objectives within protected areas (Dickinson et al. 2010). As a leader in utilizing citizen science, the Puerto Rico Conservation Trust (PRCT), through its unit Para La Naturaleza (PLN), has engaged over 104,000 volunteer participations and 328,000 volunteer hours in citizen science programs with immersive experiences, including observation, field data collection, bird counts, reforestation, invasive species management, maintenance of native and endemic tree nurseries, gardens, and archaeological work among others (PRCT 2008). These activities helped develop conservation knowledge and skills, and encouraged volunteers to become stewards of nature.

Furthermore, protected areas in the island are an important source of economic growth. Several initiatives of ecotourism are associated with marine and terrestrial protected areas through the recreational services they provide to visitors. As an example, the economic value of the coral reef-related activities in the northeast of Puerto Rico was estimated at nearly $2 billion (Estudios Técnicos Inc. 2007).

"GREEN AREAS AND PROTECTED AREAS INCREASE OUR QUALITY OF LIFE IN PUERTO RICO. WE NEED TO PROTECT THEM TO SAFEGUARD OUR SPECIES, ENJOY WITH OUR FRIENDS AND FAMILIES IN GREEN AREAS, REDUCE FLOOD RISK, AND IMPROVE WATER QUALITY."

ARIEL LUGO
Director of the USDA Forest Service,
International Institute of Tropical Forestry


Carso norteño. Photo by: Chennawit Yulue

2

LEGAL MECHANISMS FOR DESIGNATION AND ESTABLISHMENT OF PUBLIC PROTECTED AREAS IN PUERTO RICO

Hacienda La Esperanza. Photo by: Para La Naturaleza

LEGAL MECHANISMS FOR DESIGNATION AND ESTABLISHMENT OF PUBLIC PROTECTED AREAS IN PUERTO RICO

In Puerto Rico, a complex set of legal mechanisms protects the island's natural and cultural heritage in public and private lands and its surrounding waters. These mechanisms are under the jurisdiction of local (i.e., Puerto Rico) and Federal (i.e., United States) governmental agencies and non-government organizations (NGOs) operating at different scales and with different objectives—some complimentary and others not. This section describes the legal mechanisms used for the designation of public protected areas.

LOCAL DESIGNATIONS

Local designations of public domain lands and waters fall into three main groups (fig. 2, appendixes A and B):

- **Commonwealth Forests**
- **Natural Reserves, Estuarine Reserves, and Marine Reserves**
- **Wildlife Refuges**

Commonwealth Forests are established for the conservation of habitat, water, silviculture, and public recreation through proclamations issued by the Governor of Puerto Rico, in accordance with the Puerto Rico Forests Act (Act 133, 1975) (fig. 2). Similarly, Wildlife Refuges (fig. 2) are areas set aside for the conservation of wildlife species and habitats where sport hunting activities are strictly prohibited, except for two areas: Boquerón and Humacao. These designations are established by the Secretary of DNER under the New Wildlife Act (Act 241, 1999) and listed in DNER Regulation No. 6765 (Regulation for the Conservation and Management of Wildlife, Exotic Species, and Hunting in the Commonwealth of Puerto Rico (appendix B). Only areas that are already managed by DNER may be designated as Wildlife Refuges. In contrast, mechanisms to establish new nature reserves are multiple and diverse. In 1978, the Coastal Zone Management Program proposed the designation of 26 coastal areas of high ecological value that were subject to current or potential use conflicts. Later, the Puerto Rico Natural Heritage Program Act (Act 150, 1988) was established for the identification and prospective protection of areas with high ecological values in Puerto Rico. Based on those two measures, DNER identifies candidate areas and submits a Designation Document to be evaluated and approved by the Puerto Rico Planning Board (PRPB), which later issues a Designation Resolution for the new reserve.

This is the most common and widely implemented mechanism (fig. 2). Alternatively, the PRPB Organic Act (Act 75, 1975) grants this agency the faculty to identify, evaluate, and designate areas through an internal process that may include the development of Special Planning Areas to establish zoning regulations in and around these areas, which are also formalized by a Designation Document (fig. 2).

Alternatively, the PRPB Organic Act (Act 75, 1975) grants this agency the faculty to identify, evaluate, and designate areas through an internal process that may include the development of Special Planning Areas to establish zoning regulations in and around these areas, which are also formalized by a Designation Document (fig. 2). No additional legal action is needed through these administrative processes. Other areas of great ecological, cultural, or historical value can be established through the Legislative Assembly. In this case, the Puerto Rico Legislature may (1) issue a law requiring DNER and PRPB—or any other agency with direct and fundamental responsibilities associated with the resource—to work on a designation through ordinary administrative procedures, or (2) issue a law to designate the area directly and mandate DNER and PRPB to determine its geographical boundaries. Last, (3) another mechanism takes place when the Governor of Puerto Rico establishes a new public policy for the protection of an area of exceptional ecological value through an Executive Order entrusting DNER and PRPB with the fulfillment of the concerning subsequent administrative procedures (fig. 2).

Photo by: Hans Hillewaert

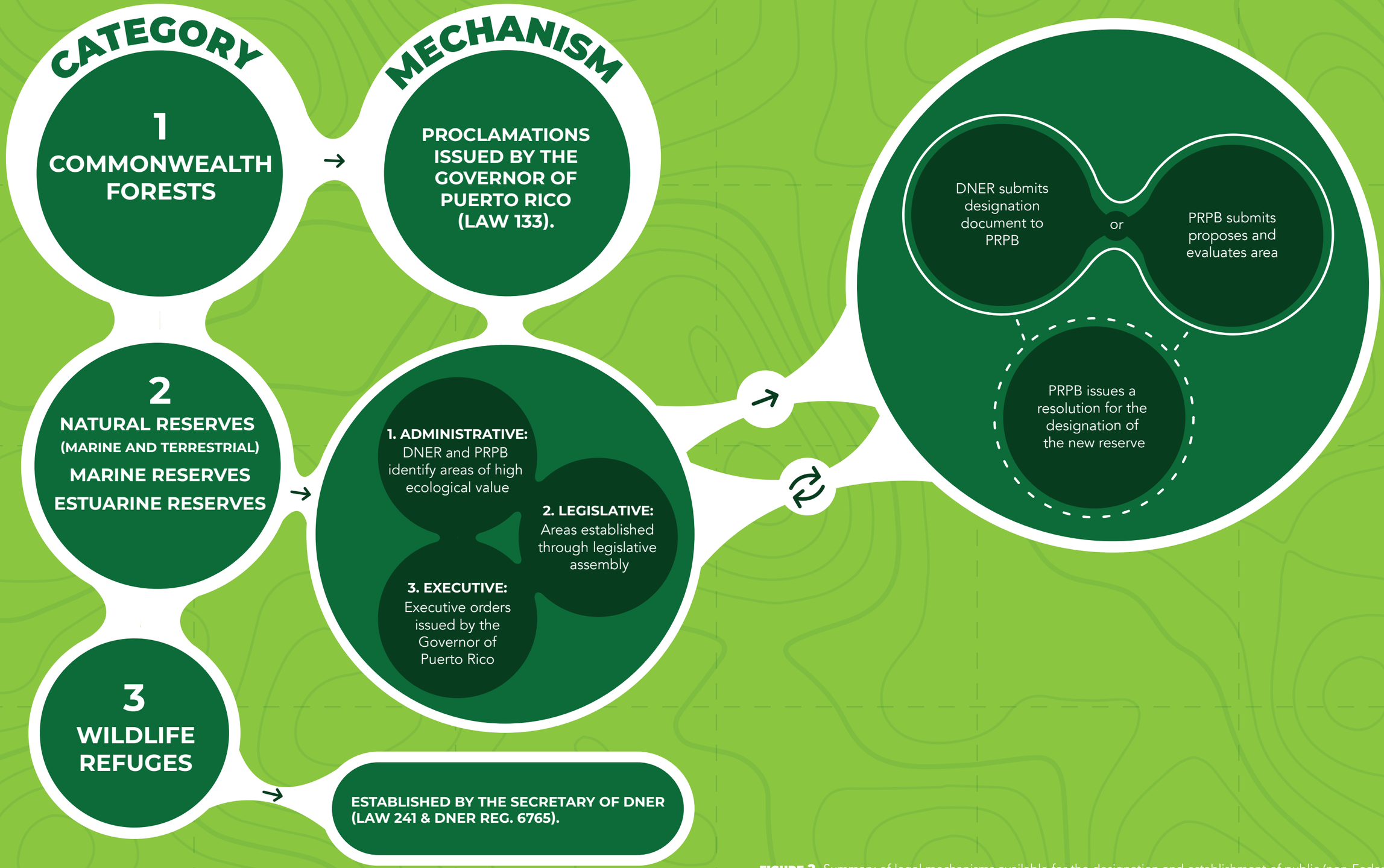


FIGURE 2. Summary of legal mechanisms available for the designation and establishment of public (non-Federal) protected areas in Puerto Rico.

LEGAL MECHANISMS FOR DESIGNATION AND ESTABLISHMENT OF PUBLIC PROTECTED AREAS IN PUERTO RICO

Puerto Rico National Parks Program, under the Puerto Rico Department of Recreation and Sports (DRS), manages several spaces of ecological value, such as monuments, caves, parks, beaches, and forests, promoting conservation through education and recreational use. Due to their immense ecological value, some national parks (e.g., Finca Seven Seas and Bahía Bioluminiscente de Vieques) are designated as nature reserves and operate under management practices aimed to guarantee the protection of their natural resources. In a similar manner, areas managed by PLN (e.g., Cabezas de San Juan, Hacienda La Esperanza), have also received Nature Reserve designations.

FEDERAL DESIGNATIONS

On the Federal level, several land and marine protection mechanisms have been implemented in the island (appendix A). Although all of them contribute to land conservation as a whole, three main categories are used to establish formal designations of protected areas in Puerto Rico: (1) a national forest established through the Forest Service Organic Administrative Act of 1897 (as amended), (2) a national estuarine research reserve established through the Coastal Zone Management Act of 1972 (as amended), and (3) five national wildlife refuges (NWRs) established through the National Wildlife Refuge System Act of 1966 (as amended) and the NWR System Improvement Act of 1997. The NWR system is the only system of Federal lands devoted specifically to wildlife, and it is considered a network of diverse and strategically located habitats that benefits wildlife, provides incomparable outdoor experiences, and protects a healthy environment. Land acquisition in the NWR system occurs by lease, purchase, exchange, donation, withdrawal from the public domain, or management agreement. Primary funding for Federal land acquisition comes from two sources: (1) Congressional appropriations under the Land and Water Conservation Fund, and (2) Migratory Bird Conservation Act funds, including proceeds from the sale of Duck Stamps and import duties on arms and ammunition.



Medio Mundo y Daguao. Photos by: Para La Naturaleza

SUPPLEMENTARY DESIGNATIONS

Other legal designations applied to already-established protected areas and surrounding lands supplement the most used public designations discussed previously. Some of these designations are also mentioned in the "Other Conservation Mechanisms" section (see page 80). For example, zoning regulations in the Puerto Rico Land Use Plan (Puerto Rico Planning Board 2016) classifies 33 percent of the land as especially protected rustic (rural) terrain for the conservation of the landscape, ecosystems, water resources, and agriculture. Another supplementary designation is the Law of Bosque Modelo Nacional de Puerto Rico (trans. Puerto Rico National Model Forest; Act 182, 2014), which designates the creation and establishment of a landscape management initiative to promote the sustainable development of forest-based landscapes across the world (Besseau et al. 2002). The Bosque Modelo in Puerto Rico covers about 1,500 km^2, connecting 19 protected areas and surrounding areas in 31 municipalities in Puerto Rico (Casa Pueblo 2016).

Some protected areas have additional designations that contribute to the overall protection of the area. For example, El Yunque National Forest is also designated as the Luquillo Experimental Forest Wilderness Area, Research Natural Area, and Wild Scenic Rivers (USDA Forest Service 2012). Furthermore, El Yunque National Forest and Guánica Commonwealth Forest are Biosphere Reserves, internationally recognized protected areas that are legally constituted and managed by the governments of the countries where they are located. The World Network of Biosphere Reserves is comprised of 669 areas in 120 countries (UNESCO 2016), and certified by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) Man and the Biosphere Program. These areas are not only recognized for their ecological value but also because they provide opportunities to establish sustainable development practices that benefit the ecosystems as well as the human communities around them.



Medio Mundo y Daguao. Photos by: Para La Naturaleza

3

PREVIOUS EFFORTS TO QUANTIFY AND TRACK PROTECTED AREAS

Cañón San Cristóbal. Photo by: Para La Naturaleza

PREVIOUS EFFORTS TO QUANTIFY AND TRACK PROTECTED AREAS

In 2004, the International Institute of Tropical Forestry (IITF) and the United States Department of Agriculture (USDA) Forest Service, developed the first multi-agency and island-wide inventory of protected areas using modern geographic information system (GIS) technology as a component of the Puerto Rico Gap Analysis Project (PRGAP) (Gould et al. 2008). The PRGAP inventory merged individual inventories developed by different agencies, and it also included land managed by NGOs and conservation easements.

In 2010, the IITF updated the PRGAP inventory of protected areas by individually contacting GIS technicians in local and Federal Government agencies and other stakeholders. A new database was released and published as a Forest Service research map (Gould et al. 2011). In 2013, an updated follow up to the Forest Service research map that included a spatial analysis of the protected areas was published (Quiñones et al. 2013).

In addition, since 2006, a protected areas guide was developed and is regularly updated by the Department of Natural and Enviromental Resources (DNER) Coastal Zone Management Program, but only for areas the agency owns or manages (Programa de Manejo de la Zona Costanera 2016). For example, DNER reports acquisitions and updated protected areas boundaries to the Puerto Rico Planning Board (PRPB) and publishes these data in the annual report of the Environmental Quality Board (EQB). In recent years, the DNER has made progress reporting to the PRPB and the EQB not only the protected areas the agency manages, but also areas managed by Para La Naturaleza (PLN), U.S. Fish and Wildlife Services (USFWS), and USDA Forest Service.

SHORTCOMINGS OF PAST INVENTORIES

Although the number and amount of land and sea protected for conservation has increased in Puerto Rico, the absence of a comprehensive protected areas law and a local definition were identified as major limitations for updating the inventory. Various inventories of protected areas for the island have evolved without a standard methodology and, thus, desynchronized from each other. This difficulty in finding reliable information is a major limitation for conservation practitioners and land managers.

In general, major shortcomings of past inventories in Puerto Rico include the lack of a unified legal definition of "protected area," common terminology, and lack of guidelines and protocols for standardization. The lack of guidelines and an established framework to maintain an up-to-date single inventory of protected areas for the island has resulted in replicated inventories with inconsistent content and quality, duplication of efforts, and an urgent need for an agreed-upon mechanism for collaboratively compiling and updating the geospatial inventory of protected areas in Puerto Rico.

El Yunque National Forest. Photo by: Karla M. Morales

WHY DO WE NEED A COMPREHENSIVE GEOSPATIAL INVENTORY OF PROTECTED AREAS?

As a mechanism for communication, a single official comprehensive geospatial inventory of protected areas for Puerto Rico enables planners, decision makers, land managers, and the public to know exactly where, how much, and by what mechanisms land is protected for conservation across the island. Geospatial inventories also support decision making regarding the allocation of funds for conservation, including identifying conservation gaps, designing corridors, promoting programs for habitat enhancement in private lands, and developing outreach and management activities, among others.

A comprehensive inventory of public and private lands set aside for conservation in Puerto Rico has multiple applications and users, ranging from governmental agencies, policymakers, land use planners, resource managers, land developers, researchers, tourism agencies, and businesses, and advocacy groups. For example, a detailed description of which protected areas are open to the general public, how to access them, and what services are provided would promote recreation in protected areas and would foster an outdoor recreation economy around them.

A **GEOSPATIAL INVENTORY** provides the framework for analysis, synthesis, acquisition, and application of inventory and monitoring data.



A detailed description of which protected areas are open to the general public, how to access them, and what services are provided would promote recreation in protected areas and would foster an outdoor recreation economy around them.

Hacienda La Esperanza Natural Reserve. Photo by: Para La Naturaleza

4

THE PROTECTED AREAS CONSERVATION ACTION TEAM

El Yunque National Forest. Photo by: Karla M. Morales

THE CARIBBEAN LANDSCAPE CONSERVATION COOPERATIVE, CONSERVATION ACTION TEAMS, AND THE PROTECTED AREAS CONSERVATION ACTION TEAM

Landscape Conservation Cooperatives are a network of collaborative organizations that address one of the principal challenges of conservation for the future—whether we can develop effective long-term frameworks for collaboration where agencies and individuals articulate a shared set of values, prioritize resources, and develop the vision, tools, science, and communication needed to restore, conserve, and sustain those resources (Gould et al. 2016).

The Caribbean LCC (CLCC) was one of 22 cooperatives spanning the United States and parts of Canada, Mexico, and the Caribbean. The mission of the CLCC was to develop and implement coordinated, efficient, and effective landscape conservation design and strategies to conserve, restore, and sustain ecological and cultural resources and human well-being in the Caribbean (Murry et al. 2015). The organizational structure of the CLCC included a steering committee led by an executive team and a staff that worked with science and stakeholder advisory groups, research teams, and a Partnership Community (fig. 3). The Partnership Community included citizens, agencies, and organizations that make up a community of science providers and users in Puerto Rico and U.S. Virgin Islands (USVI). Collaborative conservation activity within the CLCC was a function of the steering committee implementing regional landscape conservation design and coordinating efforts across agencies and organizations via Conservation Action Teams (CATs). Once initiated, CATs worked toward well-articulated objectives aligned with the shared objectives of the CLCC. One of these teams is the Protected Areas Conservation Action Team (PA-CAT), still active.



Playa Grande El Paraíso Natural Reserve. Photo by: Karla M. Morales

INTERNATIONAL LANDSCAPE CONSERVATION COOPERATIVE NETWORK: 22 LCCs

SOUTHEAST CONSERVATION ADAPTATION STRATEGY: 6 LCCs

CARIBBEAN LANDSCAPE CONSERVATION COOPERATIVE

STEERING COMMITTEE & STAFF

PARTNERSHIP COMMUNITY

Scientific Community
(Science Providers & Users)
Agencies
Universities
Private Sector
Climate Science Center
USDA Climate Hubs
NGOs
Science Partnerships

Conservation Action Teams & Research Projects

Management and Practitioner Community
(Providers & Users)
Agencies
Universities
Private Sector
NGOs
Community Groups
Coalitions

Caribbean Landscape Conservation Cooperative
LANDSCAPE CONSERVATION COOPERATIVE NETWORK

FIGURA 3. Organizational structure of the Caribbean Landscape Conservation Cooperative.



Photo by: Danil Silantev

The PA-CAT is a strategic team developed by the CLCC to provide information and guidance in support of the establishment and management of a comprehensive protected areas system in Puerto Rico and the USVI. The PA-CAT includes participants from Federal, commonwealth, and territorial agencies, universities, NGOs, and individuals from private industry. The team functions through a network governance approach, and leadership is collaborative depending on the task at hand or the current situation within partner entities (Imperial et al. 2016).

The PA-CAT was developed through two separate processes that were then merged, as it became apparent that some priorities, goals, and objectives overlapped. Figure 4 summarizes the most important events that led to the creation of the PA-CAT as well as the team's most relevant outcomes. One of the most important outcomes includes a Memorandum of Understanding (MOU) among the agencies and organizations that safeguards natural resources in Puerto Rico. The goal of this MOU is to compile, update, describe, and disseminate information on protected areas and other conservation mechanisms in Puerto Rico to be used as a fundamental tool for strategic conservation planning in Puerto Rico (appendix C).

IN THIS ERA OF CHALLENGES AND LIMITED FINANCIAL RESOURCES, IT IS EVEN MORE IMPORTANT THAT AGENCIES AND NON-GOVERNMENTAL ORGANIZATIONS WORK TOGETHER TO SYNTHESIZE INFORMATION, COORDINATE SCIENTIFIC RESEARCH, FACILITATE THE EXCHANGE OF KNOWLEDGE, AND WORK TOWARD EFFECTIVE ECOSYSTEM MANAGEMENT AT THE ISLAND LEVEL.

William Gould
Research Ecologist at the USDA Forest Service, International Institute of Tropical Forestry

Photo by: Chris Abney

2013

Idea to create a team brainstormed at annual CLCC meeting by representatives from the Foundation for Development Planning, Inc., PLN, The Nature Conservancy, Bahia Beach Resort, and the St. Croix Environmental Association. Priorities identified were a review of co-management initiatives in the Caribbean and identification of best practices, facilitation of a cohesive and ongoing dialogue concerning protected areas development in the two jurisdictions, as well as cooperation between the two territories, and guidance on the establishment of the institutional framework for protected areas development in the USVI.

IITF brought the idea of a comprehensive inventory of protected areas for Puerto Rico and USVI and potentially for the Caribbean. The CLCC staff worked with the 2013 stakeholders to update the draft proposal.

2014

Ideas, goals, and tasks from each meeting were combined and CLCC staff worked with partners to put into proposal format and shopped around to potential new members.

Puerto Rico's Secretary of DNER convened a group from the IITF, PLN, and the DNER to discuss ways to enhance protected areas information and management in Puerto Rico.

The draft proposal was further revised through a series of meetings with staff from the DNER, PLN, and the CLCC.

2015

Revisions from Steering Committee made by the PA-CAT. Member agencies began appointing technicians to the team.

Proposal submitted to the CLCC Steering Committee. Conditional approval granted. Modifications needed were Federal compliance for an advisory group and more specificity to USVI.

Apr 6 2015

First official meeting of the PA-CAT hosted by the DNER. Final revisions to proposal included and short-term work plan developed (appendix C).

Apr 16 2015

First technical work session.

Sep 2015

Release of the first version of the PA-CAT inventory and map and second PA-CAT full team meeting.This map was a "clean version" to start with.

Nov 2015

Approval of the proposed definition of protected area for Puerto Rico.

Dec 2015

Released the second version of the PA-CAT inventory and map.

Apr 2016

Six organizations participating in the PA-CAT signed a memorandum of understanding committing to the long-term accomplishment of PA-CAT goals.

Jun 2016

Third PA-CAT full team meeting.

Dec 2016

Released the third version of the PA-CAT inventory and map.

FIGURE 4. Summary of events that promoted the development of the PA-CAT, and the team's most important outcomes since its creation.

THE NEED FOR COMMON LANGUAGE: A LOCAL DEFINITION OF PROTECTED AREA



El Yunque National Forest. Photo by: Karla M. Morales

ON NOVEMBER 2015, THE FOLLOWING DEFINITION OF PROTECTED AREA WAS APPROVED UNANIMOUSLY BY THE PA-CAT FULL TEAM:

"A GEOGRAPHIC AREA CLEARLY DEFINED AND DELIMITED THROUGH LEGAL OR OTHER EFFECTIVE MEANS FOR THE LONG-TERM CONSERVATION OF ITS NATURAL RESOURCES, BIODIVERSITY, ECOSYSTEM SERVICES, AND ASSOCIATED CULTURAL VALUES."

One of the most important goals of the PA-CAT is to promote common terminology, facilitate communication, and improve data sharing among the different agencies and institutions that manage protected areas and conservation programs in Puerto Rico and USVI.

The PA-CAT recognized that a local definition of a protected area was fundamental to develop the comprehensive inventory and to create a methodology to help assess potential protected areas not included in previous inventories. To accomplish this, the PA-CAT analyzed and compared the definition of a protected area proposed by the International Union for the Conservation of Nature (IUCN) (Dudley and Stolton 2008), the definition of protected areas proposed in the draft of the Puerto Rico Protected Areas Law (Departamento de Recursos Naturales y Ambientales 2009a), the one used by the Protected Areas Database of the United States (PAD-US), and definitions adopted by different countries (appendix D). Although the definition was originally developed for terrestrial protected areas, this definition is also compatible for Marine Protected Areas (MPAs).

The adopted definition follows international recommendations to include a wide range of land and water management categories in both public and private lands (Dudley 2008). According to IUCN, a private protected area is a protected area under private governance by individuals, NGOs, for-profit owners, corporations, research entities, or religious entities (Stolton et al. 2014). The definition of a protected area does not consider ownership as a criterion for an area to be eligible. This definition allows the identification of management approaches and managers that had not been included previously. Table 1 describes the four criteria that all protected areas must comply with to be integrated in the comprehensive inventory.

TABLE 1 - CRITERIA USED TO DEFINE A PROTECTED AREA IN PUERTO RICO

Geographic area clearly defined and delimited	An area spatially defined, with agreed and well-delimited boundaries identified in a map, or based on detailed physical features (e.g., road, river) or cadaster number.
Through legal or other effective means	Legal means include area designated by law through executive or administrative orders (e.g., natural reserves and State forests). Other effective means include land acquired by DNER under the Forest Legacy Program, or private lands in conservation easements, or private lands with specific regulations or in long-term (see the following long-term definition) programs that promote biodiversity conservation and restrict the exploitation of natural resources or land use change. Other important means also include international conventions (e.g., UNESCO Biosphere Reserve), traditional normative for land protection like in indigenous reserves, or by nongovernmental organizations with strong legal foundation.
For the long-term	Ideally, protected areas should demonstrate intent to conserve in perpetuity, or at least "long-term" (a period of at least 25 years, according to IUCN). Since, it is difficult to draw a line between short-, mid-, and long-term, a case by case study is needed to determine this, in which other elements are used to define the temporality including existing regulations, historic engagement, advocacy and involvement of different stakeholders.
Conservation of nature, biodiversity, ecosystem services, and associated cultural values	Protected areas are primarily established for the maintenance of biodiversity at all levels: genes, species, viable populations, communities, and entire ecosystems and are expected to protect endangered species and their habitats. The maintenance of in situ biodiversity is associated with the production of multiple ecosystem services for humans, such as food, water, nutrient cycling and soil formation, and outdoor recreation. Furthermore, protected areas may contain scenic landscapes, geologic forms, or other elements with spiritual, religious, cultural value that do not interfere with the conservation goal of the protected area.



El Yunque National Forest. Photo by: Gary Potts

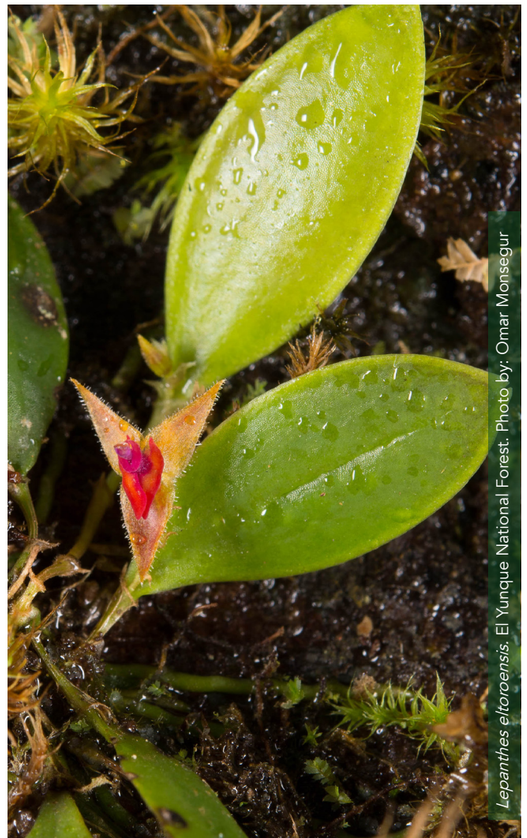
AN UPDATED INVENTORY OF PROTECTED AREAS



El Yunque National Forest. Photo by: Karla M. Morales

Inventorying the island's protected areas had three important steps.

It is important to clarify that new areas were automatically integrated in the comprehensive inventory when they were previously recognized as protected areas by any of the main agencies, institutions, and NGOs that usually manage protected areas around the island (e.g., the acquisition of lands for conservation by or the establishment of Conservation Easement with PLN) as part of the third step. Candidate areas nominated by PA-CAT were those established through mechanisms that had not been previously considered, but met the criteria that define a Protected Area (table 1). These nominated areas were assessed by the full PA-CAT and, if recognized as meeting the definition of protected areas, they were included in the comprehensive inventory. The fourth step in the inventory process will consist of sharing the comprehensive inventory with the World Database on Protected Areas (WDPA) and the Protected Areas Database of the United States (PAD-US). This step and technical details as to how the inventory can be maintained will be articulated in a data sharing protocol that is under development. The protocol will include guidelines as to how to update the inventory and technical requirements that the spatial data must meet to be included in the inventory.



Lepanthes eltoroensis. El Yunque National Forest. Photo by: Omar Monsegur

THE DEVELOPMENT OF THE INVENTORY OF NATURAL PROTECTED AREAS WAS CARRIED OUT IN THREE PHASES:

1 Data compilation, in which updated shapefiles of protected areas already included in past inventories were compiled, edited, and saved into a single file or layer with the same geographic projection using ArcGIS 10.2.2 by Esri.

2 Data editing, in which topology was checked, duplicated boundaries were eliminated, boundary errors were corrected, and protected areas' official names were assigned to maintain consistency.

3 Inventory update was completed

- **a** Integrating new designations or acquisitions by any of the usual protected areas managers in Puerto Rico.
- **b** Nominating new areas as candidate areas to be integrated into the comprehensive inventory.

FIGURE 5. Process and steps taken during the development of the new inventory of protected areas.

5

WHAT, WHERE, HOW, AND HOW MUCH IS PROTECTED

Photo by: Karla M. Morales

PROTECTED AREAS

By December 2016, Puerto Rico had 159 terrestrial protected areas in Puerto Rico, occupying 16.1 percent (1,436 km^2) of the island's land surface (8,934 km^2) and 27 MPA covering 26.7 percent (3,618 km^2) of Puerto Rico's territorial waters within 9 nautical miles (13,552 km^2) (fig. 6, appendix E). Before the first comprehensive inventory, terrestrial protected areas occupied about 8.6 percent of the island. The duplication in percentage of protected area indicates the adoption of the definition, which allowed the inclusion of the Restricted Zone within the Karst Special Planning Zone and other areas described below (fig. 7). For MPAs, major increases occurred in 1985 and 1986 due to the integration of Arrecifes de Guayama and La Cordillera Nature Reserves (fig. 7). Marine areas regulated by seasonal closures (e.g., Abrir La Sierra, Bajo de Sico, and Tourmaline Banks) were not included in this inventory because their temporal protection does not comply with the long-term criteria that an area must have to be integrated in the inventory.

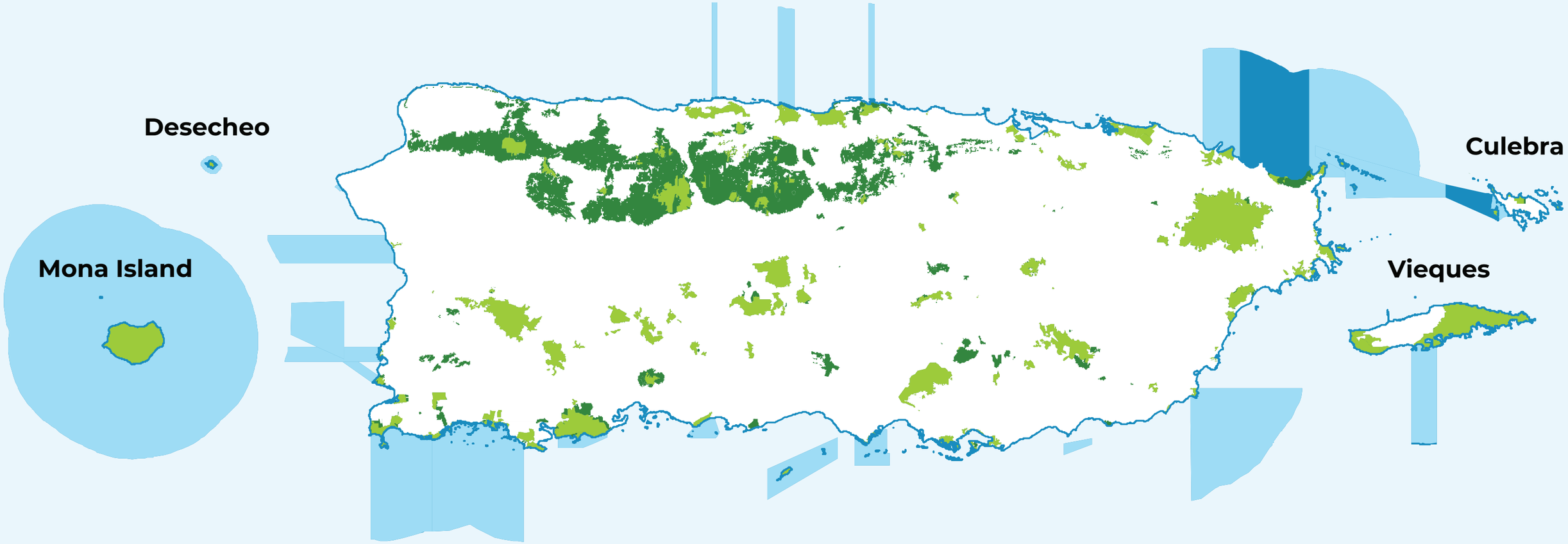
THIS SIGNIFICANT CONSERVATION RATE INCREASE FROM 8 PERCENT TO 16 PERCENT IS THE RESULT OF COLLABORATION AMONG MANY SECTORS THAT ARE WORKING TOGETHER TO EFFECTIVELY IMPLEMENT CONSERVATION SCIENCE AND PROMOTE CREATIVE TOOLS, SUCH AS EASEMENTS, LAND USE PLANS, AND COMMUNITY INITIATIVES.

FERNANDO LLOVERAS SAN MIGUEL
President of Para La Naturaleza,
Puerto Rico Conservation Trust



Photo by: Tobias Tullius

PUERTO RICO



PROTECTED AREAS

Database of 2013

PACAT inventory 2016*

0 N 40km

FIGURE 6. Map of protected areas in Puerto Rico comparing the information available before the comprehensive inventory when terrestrial protected areas occupied approximately 8.6 percent.

* Includes protected areas with updated boundaries and new protected areas.

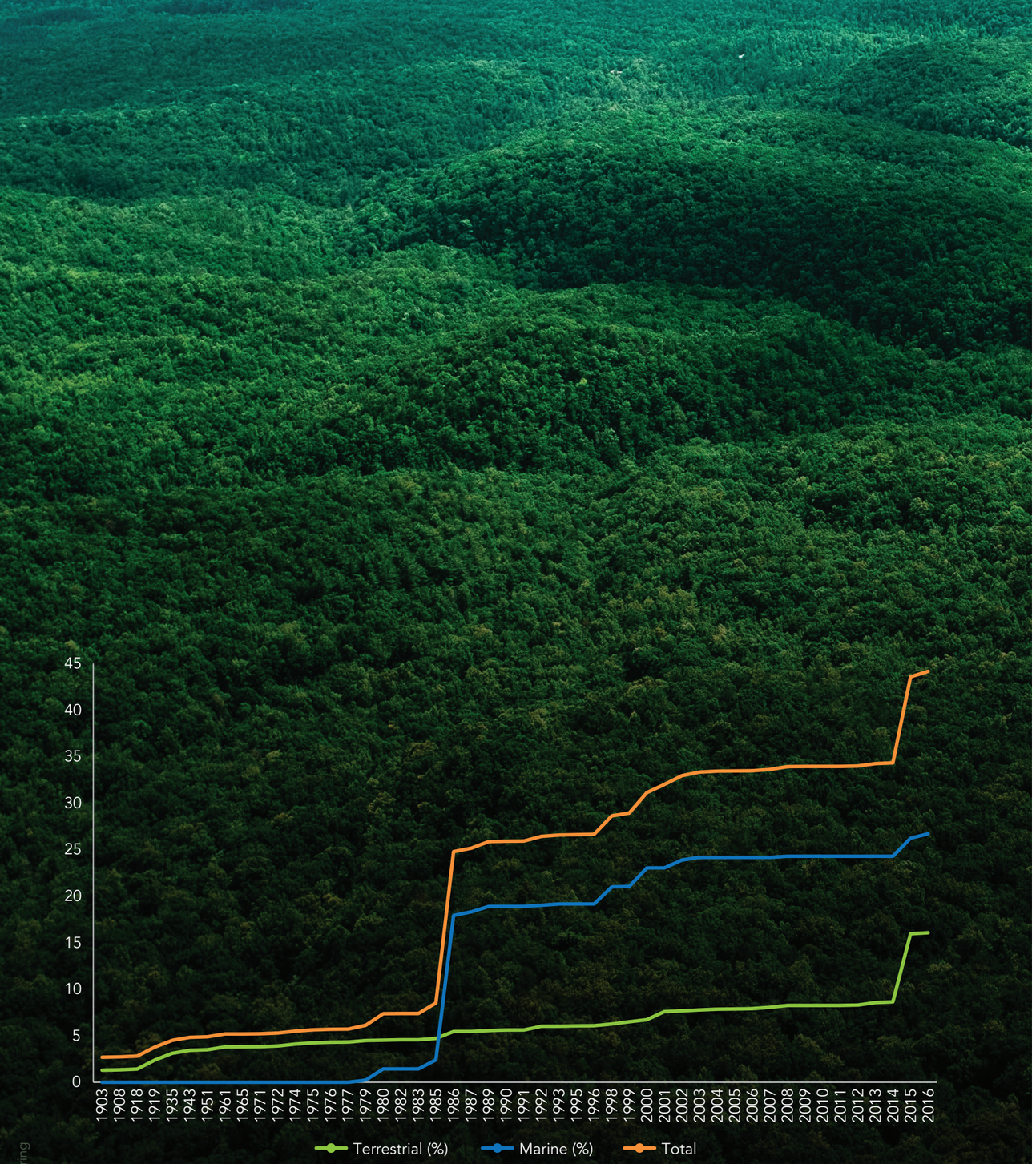


FIGURE 7. Percentage of terrestrial and marine protected areas in Puerto Rico, from 1903 to 2016. Percentage of marine protected areas was calculated based on the total extent of Puerto Rico's territorial waters, which extend 9 nautical miles off the coast.

Photo by: Adam Kring

NEW COMPONENTS INTEGRATED TO THE INVENTORY

THE KARST RESTRICTED ZONE

One of the most important outcomes of the PA-CAT inventory was the inclusion of the Karst Restricted Zone (RZ). The karst physiography encompasses one of the most biodiverse regions in Puerto Rico, as it provides habitat for several endemic and endangered species, comprises the largest aquifer on the island, and the largest portion of mature forest, coastal wetlands, estuaries, and underground system of caves across the island (Lugo et al. 2001). For various reasons, lands zoned for conservation purposes are usually not considered protected areas in the traditional sense because they tend not to comply with the criteria of long-term conservation.

Specific zones within the northern karst region, however, have stricter land use regulations. In 1999, the legislature approved Act 292 for the Protection and Conservation of the Karst Physiography of Puerto Rico, ordering the DNER to identify karst areas that should be restricted from mining and other high-intensity activities (e.g., urban development). In 2008, the DNER completed this analysis (Departamento de Recursos Naturales y Ambientales 2009b) after receiving a court order (2002) resulting from a lawsuit for noncompliance generated by the NGO Ciudadanos del Karso (trans. Citizens of the Karst-CDK).

In 2013, the PRPB classified the northern karst region as a Special Planning Zone (SPZ) because of its high ecological value, restricting urban expansion and other activities that accelerate deforestation and degradation of natural ecosystems in both private and public lands within this region (Plan y Reglamento del Área de Planificación Especial del Carso, or PRAPEC). The DNER's study identified priority conservation areas within the SPZ that were designated by the PRPB as the RZ to preserve biodiversity and ecosystem functions and to prohibit land exploitation of any type within this zone. The RZ occupies 7.2 percent (647 km^2) of Puerto Rico and, like many designated protected areas, it includes both public and privately owned lands. The strict protection of this area is the sum of legislative, community, academic, administrative, and NGOs' efforts, as well as judicial decisions.

The PA-CAT proposed to name this zone the Karst Conservation Zone (KCZ), where conservation of nature can coexist with other activities (e.g., sustainable agriculture and ecotourism) that do not harm the ecological characteristics of this zone in both public and private lands. For example, this type of area with multiple uses is recognized by IUCN as a protected area under Category V (appendix F) in which the interaction between human beings and nature has produced an area of distinct character with significant ecological, biological, cultural, and scenic values; and where safeguarding this interaction is vital to protecting and sustaining the area, the conservation of nature, and other values (Dudley 2008).

CAGUANA INDIGENOUS CEREMONIAL PARK

“THE GOAL OF PROTECTING THE NATURAL AND CULTURAL HERITAGE OF PUERTO RICO IS VITAL TO ENSURE SUSTAINABLE DEVELOPMENT NOW AND FOR THE FUTURE GENERATIONS OF THE ISLAND.”

LEOPOLDO MIRANDA
Regional Director, USFWS

One of the sites that complies with all the characteristics of a natural area with cultural significance in Puerto Rico is the Caguana Indigenous Ceremonial Park, in the municipality of Utuado. This park is a small property (less than 1 km^2) managed since 1965 by the Institute of Puerto Rican Culture (IPC). This park represents one of the most important archeological sites for the Taíno culture in the Caribbean region. The site is composed of 10 bateyes (or plazas) and several well-preserved petroglyphs. It is located next to the Tanamá River, very close to the KCZ, and surrounded by the Guarionex mountains (IPC unpublished). The park has a management plan that promotes the conservation of archaeological and cultural resources in accordance with the natural environment, such as native fauna and flora. Furthermore, the park is a National Historic Landmark, an important place for archeological research related to Taíno culture in the Caribbean, as well as an important visitor center with more than 20,000 visitors per year.



Caguana Indigenous Ceremonial Park. Photo by: Geoff Gallice

NEW COMPONENTS INTEGRATED TO THE UPDATED INVENTORY

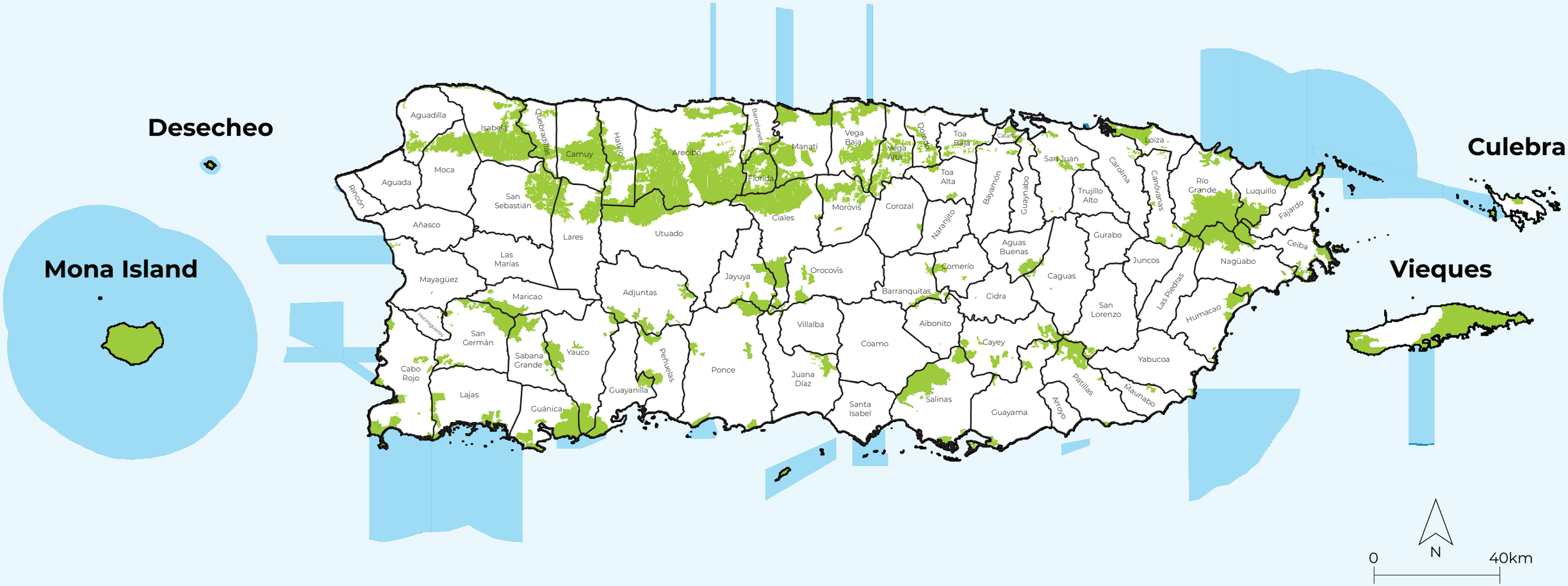
Cañon San Cristobal. Photo by: Para La Naturaleza

PRIVATE PROTECTED AREAS

In Puerto Rico, legal tools for private land conservation are numerous (McCormack 2004), as well as entities that own or manage these private lands, including NGOs, foundations, and individuals. Some private protected areas and the mechanisms used by private managers to safeguard lands are described in the following section. In Puerto Rico, most protected areas managed by PLN (~132 km^2) are private protected areas: owned by the NGO or by individuals in conservation easements. The PRCT, and its unit PLN, is a well-established nonprofit NGO whose main purpose is the development and preservation of Puerto Rico's natural resources and the protection and enhancement of its environment. This NGO was created in 1968 through a memorandum of understanding between the U.S. Department of the Interior (DOI) and the Government of Puerto Rico. The PRCT's deed of constitution was signed in 1970. In 1972, they initiated land acquisition with the protection of lands surrounding the La Parguera bioluminescent bay in Lajas. In 2012, the Trust received the Land Trust Alliance Commission Accreditation, certifying that it meets stringent national standards and practices in conservation. Lands owned in fee by the PRCT are classified or named Protected Natural Areas. The title "Nature Reserve," however, is applied to PRCT areas officially designated as such by DNER and the PRPB.

Another example of private protected area in Puerto Rico are those lands managed by CDK, a nonprofit NGO incorporated in 1994, dedicated to the protection and conservation of the natural resources in the karstic region. This NGO owns and manages about 1.5 km^2 of protected areas in the northern karst of Puerto Rico. Similarly, Las Casas de la Selva is home to the Tropic Ventures Sustainable Forestry and Rainforest Enrichment Project in the municipality of Patillas. The nearly 4 km^2 of forestland includes preservation of forest areas for research, education, ecotourism (2.7 km^2), and sustainable commercial wood production (1.2 km^2). Las Casas de la Selva is one of the ten projects and affiliates of Global Ecotechnics Corporation, owned and managed by Tropic Ventures and the Tropic Ventures Educational and Research Foundation (a nonprofit corporation) since 1983. Las Casas de la Selva has a management plan for managing its forest and is an active participant of the Forest Stewardship Program. One major criticism for recognizing private areas within comprehensive inventories of protected areas is the temporality of the protection, which mostly depends on the private landowner's will. In Puerto Rico, however, several mechanisms ensure permanence of protection on private lands, including land acquisition by a conservation land trust, conservation easements, and laws and regulations.

PROTECTED AREAS BY MUNICIPALITY



Among the municipalities with the largest percentage of terrestrial protected areas are Florida, Vieques, and Arecibo, whereas Trujillo Alto, Juncos, and Rincón are some of the municipalities with the lowest proportion of protected area (less than 1 percent; fig. 8). In general, 33 municipalities in Puerto Rico have less than 10 percent of their land inside protected areas, 29 municipalities have from 10 percent to 29 percent, 11 municipalities have from 30 percent to 50 percent, and only 3 municipalities have more than 50 percent of their administrative boundary inside protected areas (fig. 9). **This information does not include conservation mechanisms at the municipal level, so further research is needed to assess available conservation mechanisms at this level, including municipal parks that could be candidate protected areas.**

PROTECTED AREAS BY MUNICIPALITY

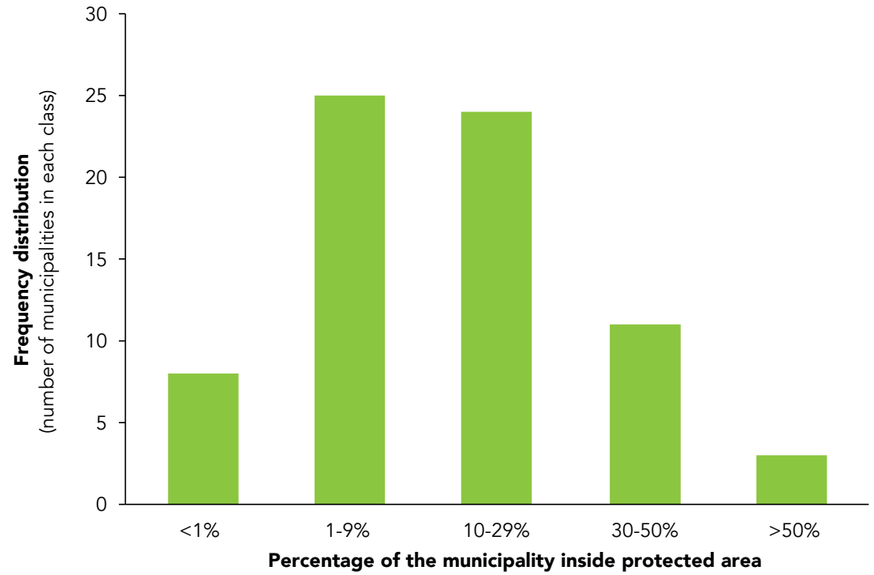


FIGURE 8. Number of municipalities in each class according to the percent of their area that is inside protected areas.



Carey turtle *(Eretmochelys imbricata)*, Mona and Monito island Natural Reserve. Photo by: Michelle Scharer



Yellow chinned Anole (*Anolis gundlachi*). El Yunque National Forest. Photo by: Gary Potts.

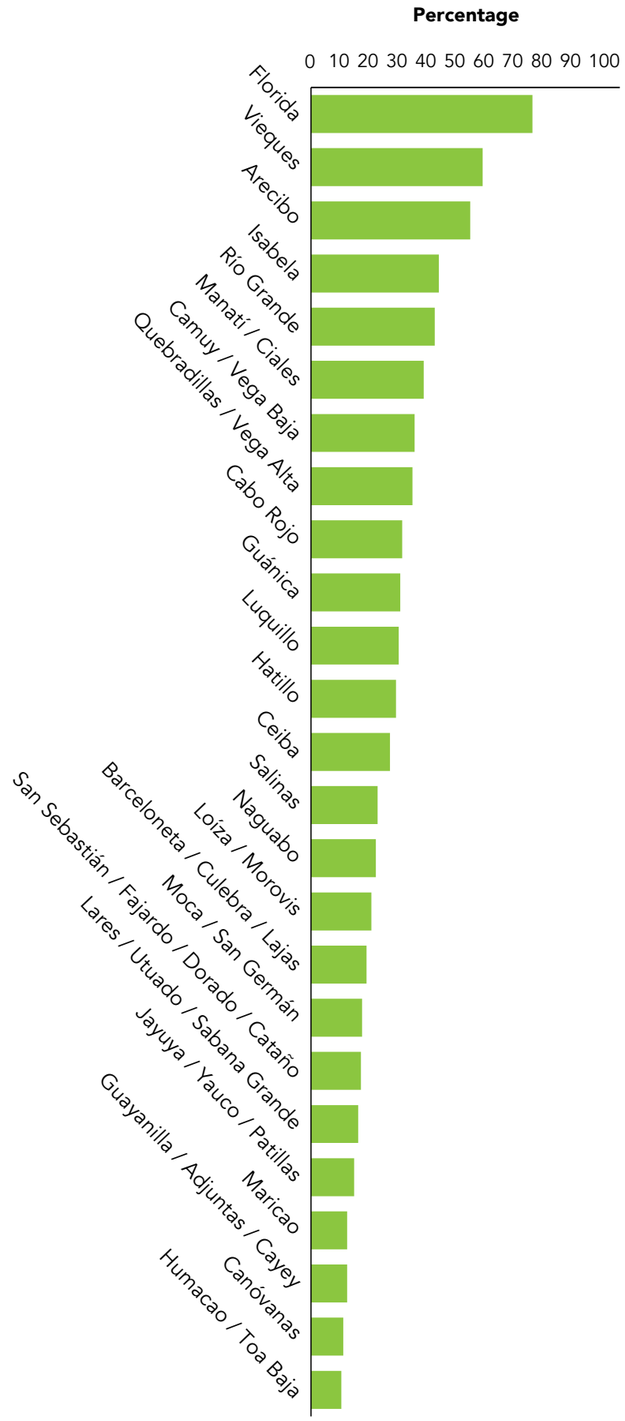


FIGURE 9. Municipalities that have > 10 percent of their area within protected areas.



Pterocarpus Forest. Photo by: Para La Naturaleza.



LAND COVER, LAND USE, KEY ECOSYSTEMS, AND WILDLIFE INSIDE PROTECTED AREAS

In terms of habitat, 56 percent (50.2 km^2) of the total area classified as forested wetlands (typically mangroves) in the 2000 land cover map (Gould et al. 2008) is inside protected areas, whereas 18 percent (47.9 km^2) of the non-forested wetland is protected by protected areas (table 2). About 47 percent (1,374 km^2) of the most natural and ecologically valuable land use categories (i.e., rustic, ecological, and hydrologic) in the 2015 Puerto Rico Land Use Plan (PRPB 2016) occur within protected areas (table 2). Seventy percent (616 km^2) of the terrestrial components of Critical Wildlife Areas (CWAs) (Ventosa-Febles et al. 2005), and 64 percent (923 km^2) of Important Bird and Biodiversity Areas (IBAs) in Puerto Rico (Anadón-Irizarry et al. 2009) are protected. DNER mapped CWAs, which represent important compendiums of species and habitats of concern across the island (Ventosa-Febles et al. 2005), whereas IBAs include sites of international significance for biodiversity conservation, particularly endangered, endemic, and migratory birds (BirdLife International 2017). In addition, the new inventory comprises 29 percent (987.7 km^2) of core forest, an important conservation feature (Vogt et al. 2007), is protected. Area and proportions of other forest classes within protected areas are shown in table 3 as well as their description and contribution in conservation planning.

Table 2 - *Proportion of land cover classes (Gould et al. 2008) and land use categories (Puerto Rico Planning Board 2015) inside protected areas*

	Inside protected areas	Island-wide	Inside protected areas
Land cover classes	**Square kilometers**		**Percentage**
Forested wetlands	50.2	89.6	56
Inland water	29.9	85.4	35
Natural barrens	4.6	16.6	28
Forest	919.6	3,454.2	27
Nonforested wetlands	47.9	270.2	18
Woodland and shrubland	171.2	1,179.7	15
Grasslands	198.6	2,871.0	7
Built-up surface	9.2	982.5	1
Land use categories			
SPRS ecologic, hydrologic, and landscape	1,374.5	2,916.6	47
Water	25.2	102.8	25
Transportation	6.1	365.0	2
SPRS agriculture and common rustic land	44.8	4,295.3	1
Urban	15.0	1,259.3	1

WHEN YOU HAVE:	MULTIPLY BY:	TO GET:
Kilometers (km)	621	Miles
Square kilometers (km^2)	0.386	Square miles
Square kilometers (km^2)	247.1	Acreages

Table 3

a) Morphologic Spatial Pattern Analysis describing the total area (km^2) and the percentage of the forest structure within protected areas.

Forest structure	Inside protected area	Island-wide	Inside protected area
	Square kilometers		*Percentage*
Edge	569.5	67.4	12
Islet	65.9	3.3	5
Core	3,413.0	987.7	29
Bridge	115.5	8.9	8
Perforation	277.0	54.0	20
Loop	100.8	15.1	15
Branch	182.0	13.5	7
Total	4,723.6	1,149.8	24

b) Description of the forest structure and the contribution of each class for conservation.

Forest structure	Description	Relevance for conservation
Edge	Outer core boundary	Some species prefer to dwell in the foreground/background interface, particularly exotics.
Islet	Isolated forest patches that are too small to contain core pixels	The result of forest loss, but may also be important as stepping stones between cores. Focus class for restoration.
Core	Forest pixels whose distance to nonforest pixels is greater than the given edge width (in this study, 1 pixel= 15x15 m).	Focal class for conservation goals.
Bridge	Set of contiguous noncore forest pixels that connect at least two different cores	Structural connectors or corridors that could potentially be used by some species to move across the landscape.
Perforation	Similar to edges, but corresponding to the inner boundary of the core area	Perforations inside core habitat is a key sign for fragmentation.
Loop	Similar to bridges but connecting with the same core area	Informs about connectivity.
Branch	Pixels that do not correspond to any of the previous six categories	The result of a bridge or corridor getting interrupted, or if it continues growing it may provide connectivity; focus class for restoration.

Photo by: Karla M. Morales

OWNERSHIP, GOVERNANCE, AND MANAGEMENT

A preliminary analysis of protected areas ownership data available in the PA-CAT inventory indicates that only 4 percent (357 km²) of Puerto Rico is owned by DNER, USDA Forest Service, U.S. Fish and Wildlife Service (USFWS), and private NGOs. This percentage does not take into account the protected areas owned by other public agencies (e.g., University of Puerto Rico [UPR] and Autoridad de Tierras). More research is needed to determine protected areas ownership.

Governance of terrestrial protected areas in Puerto Rico is 90 percent public (by local and Federal Government), and 10 percent private (by NGOs or individuals). For MPAs, governance is mostly public, whereas only the Laguna del Condado Nature Reserve has shared governance among local and Federal public agencies, NGOs, and other representatives of the community.

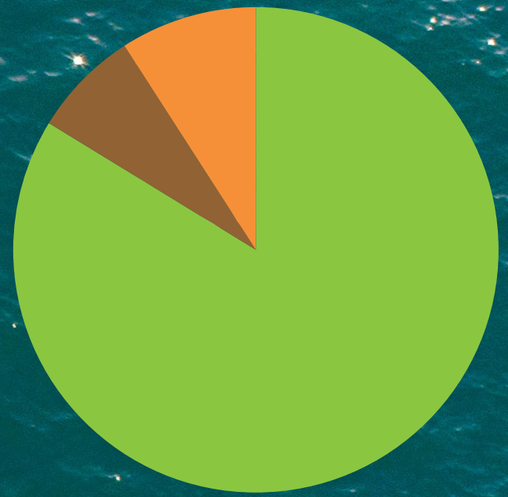
Most important managers of public protected areas are: DNER (84 percent of the public land), USDA Forest Service (9 percent), and USFWS (7 percent; fig. 12a). Other public managers are the UPR, IPC, and the Department of Recreation and Sports (DRS) but the proportion of land they manage is relatively low (less than 1 percent) so they are not shown in this figure. Private managers in Puerto Rico include PLN (93 percent of the private land), Casa Pueblo (4 percent), Tropic Ventures (2 percent), and CDK (1 percent; fig. 12b). Another private entity that manages a protected area in Puerto Rico is the Luis Muñoz Marín Foundation, which is not included in the chart as the land under its administration represents less than 1 percent of the total private protected area in the island.





GOVERNANCE is defined as the interactions among structures, processes, and traditions that determine how power and responsibilities are exercised, how decisions are taken, and who holds power, authority, and responsibility. **MANAGEMENT** refers to what is done in pursuit of given objectives, including the means and actions to achieve such objectives (Borrini-Feyerabend and Hill 2015).

PUBLIC PROTECTED AREAS

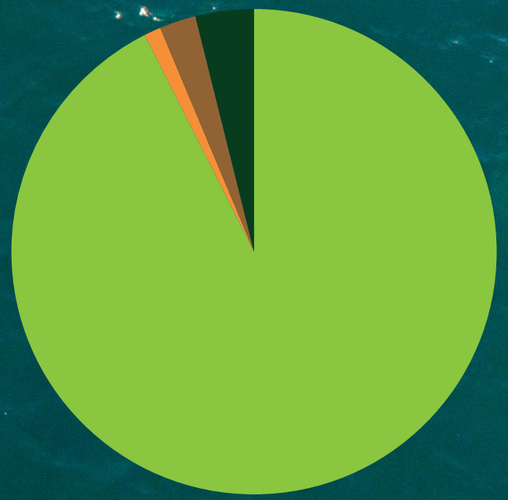


US Forest Service

Department of Natural Resources

U.S. Fish & Wildlife Service

PRIVATE PROTECTED AREAS



Para la Naturaleza

Cuidadanos del Karso

Tropic Ventures

Taller de Arte y Cultura (Casa Pueblo)

FIGURE 10. Managers of most of the protected areas in Puerto Rico.

Photo by: Daniel Mcculloug

COLLABORATIVE MANAGEMENT

Participatory planning and collaborative management have become instrumental management strategies for public protected areas in Puerto Rico. Community-based groups and NGOs have played a crucial role in establishing collaborations with commonwealth agencies involved in the designation and management of protected areas and resources. Approximately 23 NGOs or community-based groups have collaboration agreements with DNER to manage some protected areas (table 4). Efforts range from lobbying for the protection of specific resources to co-management agreements in designated areas. These collaborations between different sectors have proven to be most effective in the establishment and management of these areas (Guerrero 2006).

An example of participatory initiatives is Casa Pueblo, a community-based, self-management project that started in 1980 and is committed to the appreciation and protection of natural, cultural, and human resources. Casa Pueblo led the creation of the Bosque del Pueblo de Adjuntas Commonwealth Forest (The People's Forest) as the first Forest Preserve in Puerto Rico managed by a community-based organization (Taller de Arte y Cultura). This organization advocated for the designation of the Bosque Modelo de Puerto Rico.

Another example of community participation was the development of the management plan for El Yunque National Forest. El Yunque was an early adopter of the Forest Service 2012 Planning Rule "all lands approach" establishing landscape-scale management with an integrated approach that acknowledges the interdependence of ecological processes with socioeconomic systems. The resulting management plan goes a step further in collaboration as it includes "promoting and strengthening the co-management and the social and ecological identity and connectivity of the region through improved public participation and involvement in decision making."



Arccheological Site in the Cabezas de San Juan Natural Reserve. Photo by: Para La Naturaleza

Table 4 - Formal co-management agreements (signed from 2013 to 2016) between different entities and the Department of Natural and Environmental Resources to manage natural protected areas in Puerto Rico

Entity	Natural protected area/resource	Municipality
Comité Pro Desarrollo de Maunabo	Humedal Punta Tuna Natural Reserve	Maunabo
Fidecomiso de Conservación e Historia de Vieques	Bahía Bioluminiscente de Vieques Natural Reserve	Vieques
Protectores de Cuencas	Bosque Seco de Guánica Commonwealth Forest	Guánica
Arrecifes Pro Ciudad	Arrecifes de Isla Verde Marine Reserve	Carolina
Sociedad Ornitológica de Puerto Rico (SOPI)	Cambalache Commonwealth Forest	Arecibo
Iniciativa de Eco-Desarrollo de Bahía de Jobos (IDEBAJO)	Estuarine Research Reserve Bahía de Jobos (JOBANERR)	Salinas/ Guayama
Amigos de Tres Palmas	Tres Palmas Marine Reserve	Rincón
Coalición Pro Corredor Ecológico del Noreste (CPCEN)	Corredor Ecológico del Noreste (CEN) Natural Reserve	Luquillo/ Fajardo
Corredor del Yaguazo	Ciénaga Las Cucharillas Natural Reserve	Cataño
ALAPÁS (Alianza Laura Aponte por la Paz Social)	Bosque del Nuevo Milenio Commonwealth Forest	San Juan
Taller de Arte y Cultura	Bosque del Pueblo de Adjuntas Commonwealth Forest	Adjuntas
Ecohospedería El Cantar del Bosque Río Abajo	Río Abajo Commonwealth Forest	Utuado
Corporación Comunitaria Caño Tiburones	Caño Tiburones Natural Reserve	Arecibo/ Barceloneta
Comité Cívico Los Filtros	Los Filtros Urban Forest (Usufructo de la AAA al DRNA)	Guaynabo
Fundación Luis Muñoz Marín	Doña Inés Park	San Juan
Boys & Girls Club	Several protected areas	N/A
Amigos de la Poza del Obispo	Poza del Obispo Beach ZMT managed by DNER	Arecibo
Defensores del Ambiente y la Cacería de Isla de Mona (DACIM)	Isla de Mona Natural Reserve	Mayagüez
Comunidad Asociada de Caparra Heights	San Patricio Commonwealth Forest	Guaynabo
Programa de Educación Comunal de Entrega y Servicio (PECES)	Humacao Natural Reserve	Humacao/ Naguabo
Leaders of the World, Inc.	Coastal resources of Península de Cantera, Islote de la Guachinanga	San Juan
Club Cívico Recreativo y Cultural de Palos Blancos	Monte Choca Commonwealth Forest	Corozal/ Naranjito
COPI (Corporación Piñones se Integra)	Piñones Commonwealth Forest	Carolina/Loíza

N/A = not applicable.

Foto por: Matthew-Kane

MANAGEMENT CATEGORIES

In the comprehensive inventory, more than one-half of the land in protected areas (~851 km^2) hold some of the local and Federal designations above mentioned, distributed as follows: 23 percent (382 km^2) is Nature Reserve, 16 percent (254 km^2) is Commonwealth Forest, 7 percent (115 km^2) is National Forest, and 6 percent (102 km^2) is National Wildlife Refuge. Some Commonwealth Forests and Nature Reserves also have more than one designation, including National Wildlife Refuge, Ecological Corridor, and Biosphere Reserve. Similarly, El Yunque National Forest has five additional designations within its boundary, including a Wilderness Area with a special protection status. Other local designations that may represent local management categories include a small percentage of the total land protected (1 percent, 24 km^2) and includes Commonwealth Parks, Ceremonial Park, and National Historic Landmark administered by DRS and IPC, respectively. The remaining land in protected area includes the KCZ (40 percent, 647 km^2), the private protected areas (5 percent, 75 km^2), and Conservation Easements (2 percent, 36 km^2).



Mona and Monito Island Natural Reserve. Photo by: J.P. Zegarra



Desecheo Island Marine Reserve. Photo by: J.P. Zegarra

6

OTHER CONSERVATION MECHANISMS

Photo by: Stephen Di

INTEGRATED SYSTEM FOR THE CONSERVATION OF NATURE

In the following section, we describe other geoespatial conservation mechanisms that, although they are not protected areas, contribute to what we describe as an Integrated System for the Conservation of Nature (ISCN) in Puerto Rico.

The PA-CAT identified five conservation mechanisms envisioned as the ISCN (fig. 11):

PROTECTED AREAS

LAWS AND REGULATIONS THAT PROTECT ENDANGERED SPECIES, CRITICAL HABITATS, AND KEY ECOSYSTEMS

LAND USE POLICY AND REGULATIONS

CONSERVATION INCENTIVES PROGRAMS

INDIVIDUAL AND COMMUNITY-BASED ACTIONS

These mechanisms have a wide range of subcomponents and vary in their conservation target, legal foundations, spatial extent, and potential for long-term conservation and effectiveness. Figures 12 and 13 depict the spatial extent of some of these mechanisms.

Susúa Commonwealth Forest, Photo by: Josefina Diez-Castro

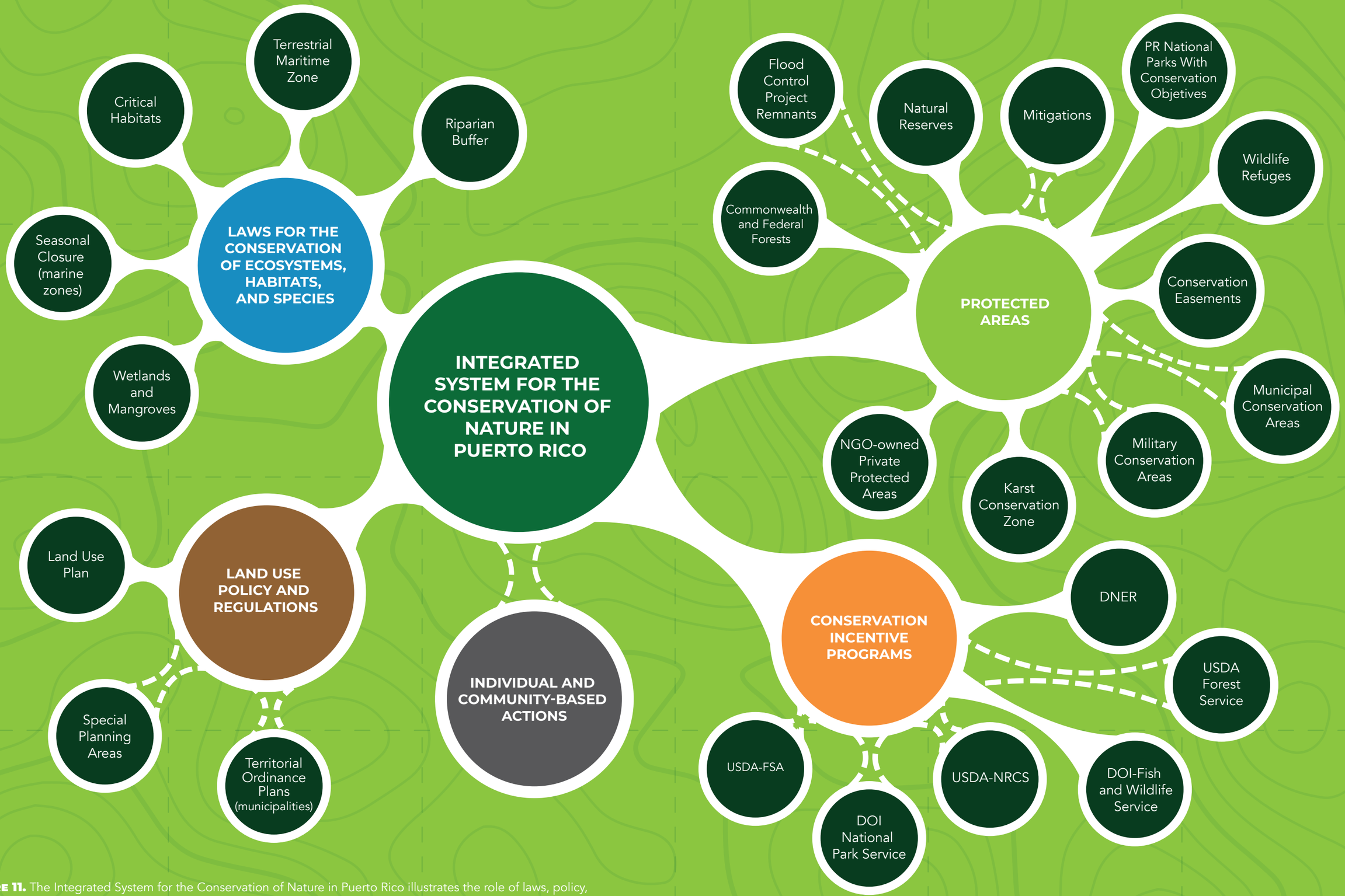


FIGURE 11. The Integrated System for the Conservation of Nature in Puerto Rico illustrates the role of laws, policy, incentive programs and protected areas as complementary conservation mechanisms. Dashed connecting lines highlight opportunities for further development.

a)



Protected areas

c)



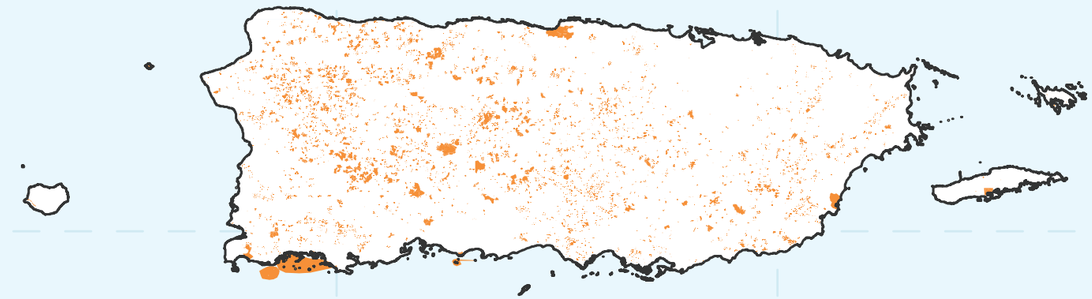
Species, habitats, and ecosystems conservation laws

b)



Land use policy and regulations

d)



Conservation incentive programs

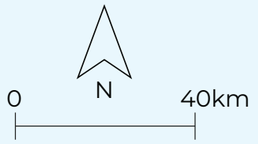


FIGURE 12. Maps illustrating examples of geospatial conservation mechanisms within the Puerto Rico Integrated System for the Conservation of Nature. These maps provide an overview of the multiple conservation mechanisms at play on publicly and privately owned lands in Puerto Rico, including a) protected areas, b) land use policy and regulations (e.g., Specially Protected Rustic Soil as in the Puerto Rico Land Use Plan), c) species, habitats and key ecosystems protected by local and Federal laws (e.g., critical habitats, buffer zones aside rivers, water bodies, coastal zone, and wetlands), and d) areas currently enrolled in different conservation incentive programs (e.g., Auxiliary Forests, Environmental Quality Incentive Program, Partners for Fish and Wildlife, and Forest Stewardship Program).

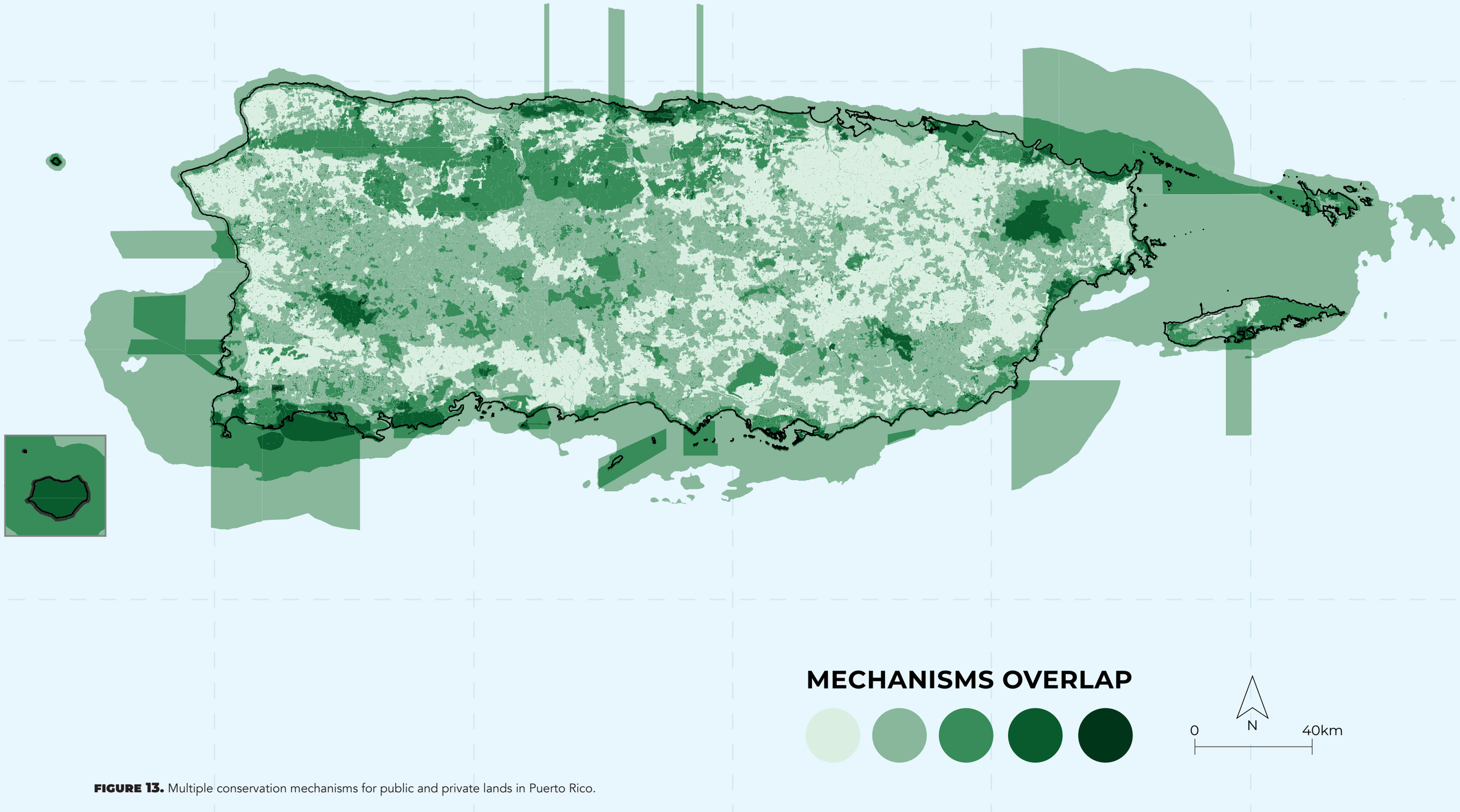


FIGURE 13. Multiple conservation mechanisms for public and private lands in Puerto Rico.

SPECIES, HABITATS, AND ECOSYSTEM CONSERVATION LAWS AND REGULATIONS

Puerto Rico has local and Federal laws that protect natural resources by regulating activities that could harm them. These laws include the Environmental Policy Law of Puerto Rico, National Environmental Policy Act, and many others (appendix B). Some of these laws have a geospatial component that can be mapped and quantified. For that reason, the PA-CAT recognized them as an important component of the ISCN (fig. 11). Some examples of the laws and regulations that have a spatially explicit component include the Wetlands Policy Law of Puerto Rico and the North American Wetlands Conservation Act that protect mangroves and other wetlands and the Zona Marítimo Terrestre (Maritime Terrestrial Zone) Regulation that controls uses in the coastal zone.

In addition, Puerto Rico has another set of local and Federal laws to protect species of conservation concern (i.e., critically endangered, endangered, threatened, and vulnerable), and their habitats (appendix B). For example, the Commonwealth of Puerto Rico approved the New Wildlife Law of Puerto Rico in 1999 (Law No. 241–1999, Nueva Ley de Vida Silvestre de Puerto Rico), the purpose of which is to declare all wildlife species within the Commonwealth's jurisdiction as patrimony of Puerto Rico; protect, conserve, and enhance both native and migratory wildlife species; and issue permits, including those to regulate hunting activities and species introduction.

In 2004, the Commonwealth of Puerto Rico approved the Regulation Governing the Management of Vulnerable and Endangered Species in the Commonwealth of Puerto Rico (Regulation No 6766; Reglamento para Regir el Manejo de las Especies Vulnerables y en Peligro de Extinción en el Estado Libre Asociado de Puerto Rico). This regulation prohibits collecting, killing, or harming 133 species listed as threatened or endangered under Territorial law (appendix G). The regulation also prohibits possessing, transporting, or selling items derived from these species and requires authorization from the DNER Secretary for any action that may affect their habitats. This regulation allows the Commonwealth of Puerto Rico to protect the species by designating Critical Essential Habitat (CEH) or Critical Habitat (CH) for these species. To date, six species have been designated CH (appendix B) under the Regulation No. 6766.

In addition to laws and regulations under the jurisdiction of the Commonwealth of Puerto Rico, the Endangered Species Act (ESA) provides legislation to promote conservation of species considered threatened or at risk of extinction. In Puerto Rico, the USFWS has designated 79 animals and plants as either threatened or endangered species (appendix G). The ESA requires the Secretaries of the Department of the Interior (DOI) and the Department of Commerce (DOC) to designate Federal CH. To date, 12 species listed under the ESA have designated CH. Another law that also provides protection to certain birds is the Migratory Bird Treaty Act (MBTA). The MBTA makes it unlawful to pursue, hunt, take, capture, kill, manipulate, or destroy any migratory bird, or any part, nest, or egg of such bird. The MBTA also makes any product (whether or not manufactured, which consists of or is comprised in whole or part) of any such bird or any part, nest, or egg thereof illegal.

LAND USE POLICY AND REGULATIONS

Comprehensive land use policy and regulations are another important conservation mechanism in Puerto Rico (fig. 11). Land use plans seek to organize and regulate land use so that human development can occur without adversely affecting the resources on which humans depend and to reduce or prevent land use conflicts. The regulation of land uses usually involves specifying where and how much land should be devoted to various types of human activities (e.g., industrial, agricultural, and residential) according to certain social, economic, and environmental criteria and priorities. Although the power to plan and implement land use plans rests primarily on State governments and their institutions, citizen participation in both areas is crucial.

Puerto Rico has a robust legal background supporting regulation and government oversight to protect the public interest and well-being. The Constitution of Puerto Rico, signed in 1952, specifically states that "The most effective conservation of natural resources will be the public policy of the Commonwealth, and the greatest development and use of them for the general benefit of the public…."

The PRPB was created in 1942 as part of the Executive Branch with the purpose of guiding "the integral development of Puerto Rico in a coordinated, adequate and economic manner in agreement with the present and future social necessities and the human, environmental, physical and economic resources" (Act 413, 1942). This general purpose was maintained when the agency was restructured in 1975 (Act 75, 1975). The PRPB remains responsible for designing and implementing island-wide planning policy for land use and socio-economic development.



Lyonia truncata. Photo by: Omar Monsegur

"EFFORTS OF THE PLANNING BOARD AND ITS LAND USE PLAN INDICATE THAT 31 PERCENT OF PUERTO RICO HAS HIGH ECOLOGICAL VALUE AND DESERVES PROTECTION."

LUIS GARCÍA PELATTI
Former President of the
Puerto Rico Planning Board

The Autonomous Municipalities Act (Act 81, 1991) changed the planning landscape by empowering municipalities to develop their own territorial plans in coordination with and with final approval of the PRPB. The Autonomous Municipalities Act mandated the classification of the entire municipal territory under three general categories: urban, developable, and rural. Rural lands were further subdivided into "common" and "especially protected" (agricultural or conservation). Until then, most rural areas were "unzoned," and urban development in these areas were evaluated and approved by the PRPB using a discretionary mechanism called "site consultation".

Municipal Autonomy did not have the effect of reducing the pervasive use of "site consultations," and many sectors of society claimed the need to protect prime agricultural lands and areas of high ecological value. Furthermore, the public had concerns regarding constructions in high-risk areas, such as floodways or areas susceptible to landslides. In 2004, the legislature of Puerto Rico approved Act 550, creating a special office under the PRPB to develop a comprehensive land use plan for Puerto Rico. The law seeks to avoid discrepancies between municipal land use plans and to establish a common methodology to determine the best land uses for the islands of Puerto Rico.

The Puerto Rico Land Use plan was finally completed in 2015 (PRPB 2016). One of its main goals is to preserve and protect natural, archaeological or agricultural resources, and rural and environmentally sensitive lands from the adverse effects of uncontrolled urban development. It establishes that rural areas should be protected from urbanization due either to their current and potential agricultural, natural, and recreational values, because they pose risks to public health or safety or for not being necessary to meet expectations of urban growth in the foreseeable future. Though land use plans are an essential conservation mechanism, their effectiveness is subject to proper implementation by agencies and citizens alike. Land Use Plans are also subject to changes in overall government policies and priorities. Currently, almost half (47 percent, 1,374.5 km^2) of the Specially Protected Rustic Soil designated across the island is within protected areas (table 2). This class encompasses key ecosystems, including hydrological systems fundamental for biodiversity conservation around the island and for the sustenance of other ecosystem services.



Photo by: Northern karst

CONSERVATION INCENTIVES PROGRAMS

Conservation incentives programs seek to promote sustainable use of the land, the conservation of natural and cultural resources, and the maintenance and protection of ecosystem services primarily in private lands. The implementation of these programs encourage a wide range of practices and diverse activities for the preservation, conservation, management, and improvement of sustainable ecosystem services and wildlife habitats, including agricultural practices, tourism, forestry, and recreation. Conservation incentives are available to nonindustrial private landowners, communities, and agricultural producers in the form of financial assistance, land easements, tax breaks, loans, or other technical assistance programs, and their participation is voluntary (Mayer and Tikka 2006). These incentives are particularly important conservation mechanisms in Puerto Rico, where over 80 percent of all forest area is in private holding (Brandeis and Turner 2013). Many of these programs have a spatial component, which can be integrated in the ISCN herein proposed (fig. 11).

The spatial distribution and application of these programs are dynamic as priorities, appropriations, and legislation change. They are sometimes integrated across agencies and sometimes not. Programs rarely have identical objectives and may be complementary or conflicting in terms of what practices are incentivized. However, understanding the spatial distribution and application of incentive programs, integrated with an understanding of protected areas and regulatory policies, and the distribution of species and habitats of concern can be of enormous benefit to landscape-scale conservation planning in Puerto Rico.

For example, the 2014 Agricultural Act, known as the 2014 Farm Bill, is an omnibus, multi-year piece of legislation that governs the authority and appropriation of funds for a wide array of USDA programs. Title II of the 2014 Farm Bill governs the allocation of funds through conservation incentives directed toward the use of sustainable farm practices to promote the sustainable development of rural communities and to avoid the conversion of forest lands, wetlands, and grasslands into other uses. Additional legislation provides authorization that enables the creation and funding of a wide array of conservation incentive programs through agencies from DOI, USDA, the Environmental Protection Agency, National Oceanographic and Atmospheric Administration, and agencies at the local level, such as the DNER and Puerto Rico Department of Agriculture.

Within USDA, the Farm Service Agency (FSA), Rural Development, and Natural Resources Conservation Service (NRCS) are agencies that offer programs directed toward the execution of sustainable farming practices and the development of rural areas. Additionally, NRCS and FSA offer programs that have been designed to conserve land tracts or protect natural resources within farmlands. FSA offers rental payments and further financial assistance through its Conservation Reserve Program to agricultural producers who abide by a 10- to 15-year contract that sets apart environmentally sensitive farmland for conservation. Similarly, NRCS offers programs that provide financial and technical assistance to farmers who implement sustainable conservation practices to reduce soil erosion and sedimentation, reduce sources of pollution, conserve ground and surface water, and protect other natural resources on their lands. Examples of NRCS programs include the Environmental Quality Incentives Program and the Conservation Stewardship Program. Furthermore, NRCS offers financial assistance and authorizes the creation of land easements to protect naturally sensitive areas or to safeguard communities from natural disasters through the following programs: the Agricultural Conservation Easement Program, the Emergency Watershed Protection Program, Regional Conservation Partnership Program, and Healthy Forests Reserve Program. NRCS works in partnership with USFWS in the Working Lands for Wildlife Program to offer technical and financial assistance to agricultural producers who voluntarily restore and conserve high-priority habitats of select endangered or threatened species. In 2014, NRCS, in partnership with the Forest Service, established the Joint Chiefs' Landscape Restoration Partnership. It provides financial or technical assistance to nonindustrial private forest landowners who are interested in restoring landscapes, reducing wildfire threats, and protecting water resources.

The Forest Service is another USDA agency that administers conservation incentives programs intended to protect forested areas from conversion to agricultural land and other uses. The Forest Legacy Program and the Community Forest and Open Space Conservation Program are administered by the Forest Service and, through these programs, the agency offers financial assistance for the acquisition of forestland that is subject to development pressure or that presents clear benefits to nearby communities. On the other hand, the Urban & Community Forestry Program provides financial assistance to municipalities, nonprofit organizations, educational institutions, or local agencies that develop projects directed to the protection, conservation, and administration of public and private urban ecosystems. Under the Forest Stewardship Program, Puerto Rico DNER personnel offer technical assistance to private landowners who prepare management plans for environmentally sustainable uses that will be implemented on private properties for a 10-year period. Having a management plan makes landowners eligible for further assistance from other Federal agencies, such as NRCS and USFWS.



USFWS in DOI administers various conservation incentive programs to ensure the recovery of Federal trust species and the conservation and restoration of private and public lands. USFWS and the Forest Service work within their missions collaboratively to engage citizens in conservation practices to enhance the protection of critical habitats for federally listed species. USFWS Habitat Restoration Programs are the USFWS Partners for Fish and Wildlife (PFW) Program and the Coastal Program. The mission of USFWS Coastal and PFW Programs is to protect and recover Federal Trust Species (threatened and endangered species, migratory birds, and inter-jurisdictional fish) by supporting restoration of high priority habitats to restore important fish and wildlife species on private and public lands. These programs provide financial and technical assistance for voluntary, on-the-ground habitat restoration and protection projects through locally based field coordinators. The programs recognize the need to balance residential, tourist, commercial, agriculture, and industrial needs with conservation of important habitats and species, and work closely with other Federal and local agencies, NGOs, and private partners to carry out restoration projects. The programs offer technical and financial assistance to landowners who are also interested in restoring and maintaining conservation practices on their property for a minimum of 10 years.

Other USFWS programs, such as the Candidate Conservation Agreement (with Assurances), the Habitat Conservation Plans Program, and the Safe Harbor Agreements, offer private landowners technical assistance or contractual assurances related to the activities they can carry out on their property, as long as their activities do not purposely affect threatened or endangered species. The North American Wetlands Conservation Fund, the National Coastal Wetlands Conservation Grant, and the Recovery Land Acquisition Program are additional USFWS programs that provide financial assistance for restoration and conservation projects carried out in wetlands. These programs also provide financial assistance for land acquisition.

USFWS administers the Wildlife and Sport Fish Restoration Programs destined to restore, manage, and conserve wildlife, such as sport fish, species that are not hunted or fished, wild birds, and mammals and their habitats. These programs and grants provide financial assistance to local agencies or associations that are willing to carry out conservation or education and research projects. In addition, the Cooperative Endangered Species Conservation Fund, under Section 6 of the ESA, provides funding to States and Territories to implement recovery actions, including habitat restoration practices, for federally listed and at-risk species.

Another program directed toward the conservation of natural resources on private lands is the Rivers, Trails, and Conservation Assistance Program of the U.S. National Park Service. This program offers technical assistance and information regarding different Federal funding sources to communities who want to conserve and carry out recreational activities on historic sites, forestland, and other natural environments. Through the Readiness and Environmental Protection Integration Program and the Sentinel Landscapes Partnerships Program, the Department of Defense, DOI, and USDA in partnership with the local government or other private conservation organizations to conserve natural resources or preserve compatible land uses surrounding military installations.

At the local level, PLN and the Real Estate Division from the Puerto Rico DNER manage the Conservation Easement and Donation of Private Land Program, directed toward the creation of land easements and the addition of new protected natural areas through donations (of private land). Nonindustrial private forests owners can join the DNER Auxiliary Forests Program, which offers property tax exemptions for the protected land parcel.

A CONSERVATION EASEMENT is a voluntary agreement between a landowner and a nonprofit organization or government agency dedicated to conservation. Through the agreement, the owner maintains ownership and the right to transfer the land title, but guarantees that future uses will be compatible with conservation objectives. The landowner "gives up" certain land use rights associated with the property—often the right to subdivide or develop—while the land remains in private hands, allowing owners to retain private property rights (PLN 2016).



Playa Grande El Paraíso Natural Reserve. Photo by: Karla M. Morales.

INDIVIDUAL AND COMMUNITY-BASED ACTIONS

Throughout the island, individuals, businesses, and community groups work to conserve the natural and cultural resources in their neighborhoods and open lands. The individuals and groups may or may not be registered or have 501(c)(3) status as an NGO in the Commonwealth or the United States. Their motivations vary but, at some point, these individuals and groups made the personal decision to take conservation action. Often times they are working to manage and conserve open space or parcels with natural land cover (or any other natural resources) that might be unused public lands or abandoned private lands or their own properties using human capital and personal or fund-raised cash resources. Though these efforts may not comply with all criteria that define a protected area, these conservation activities can be recognized as part of the broader conservation picture, as their efforts contribute to enhance biodiversity and natural heritage of Puerto Rico. Examples of conservation efforts in this category include Bahía Beach Resort and Golf Club in Río Grande, Madre Tierra Atabey Corps in Guayanilla, and the Capetillo Community Urban Garden-Nursery-Forest in San Juan.

To illustrate, the Bahía Beach Resort and Golf Club is a private landowner that actively works to conserve many of the natural features found on their property and the ecological integrity and connectivity on its vicinity. They employ a staff of natural resource specialists and educators, and guests at the resort and golf club benefit from a variety of recreational and educational activities as do local school groups and the local community. The resort also has a partnership with the Alma de la Bahía Foundation, a not-for-profit organization (by Puerto Rico commonwealth standards), that promotes the protection of natural resources, ecosystems, and wildlife; it contributes to community development through conservation initiatives, environmental education, and social involvement to support local sustainability. At the resort, an ecological design and natural resource management plan were developed and are used by staff to monitor the resources on the property. Active conservation activities within the resort facilities include invasive species removal, enhancing the connectivity of regional biological corridors, bird rescue and recovery, and reforestation. They also partner with the Puerto Rico Center for Manatee Conservation, the Espíritu Santo River Watershed group, and collaborated with the development of the management plan for El Yunque National Forest (Cañón 2014).

"WE ARE COMMITTED TO THE CONSERVATION OF NATURAL RESOURCES, ECOSYSTEMS AND WILDLIFE IN PUERTO RICO, AND HONORED TO PARTICIPATE IN THIS INITIATIVE THAT HAS ALLOWED JOINING EFFORTS WITH PUBLIC AND PRIVATE ORGANIZATIONS TO SUPPORT THE CONSOLIDATION OF A CONSERVATION SYSTEM THAT HAS AS ITS CORE DIFFERENT CATEGORIES OF PROTECTED AREAS."

MARTIN SMITH
Manager of Bahía Beach Resort &
Golf Club and Director of Alma de Bahía Foundation

INDIVIDUAL AND COMMUNITY-BASED ACTIONS

Another example is Madre Tierra Atabey Corp., an environmental conservation and education organization in the south region of the island in the municipality of Guayanilla, which registered with the Commonwealth in 2010. They were founded to address the issue identified in the U.S. Toxic Emissions Inventory that approximately 3 million pounds of toxic chemicals are released to the atmosphere annually in the region. This was related to dozens of clandestine landfills, sedimentation, and illegal discharges into water bodies, affecting the local quality of life and environment. From its foundation, the organization began to develop service proposals, workshops, and tools to help citizens to create environmental awareness and guide them toward an environmental-conservationist culture. To date, they have concentrated on seven projects and four activities, receiving funding from the Ford Motor Environmental Conservation Grant and Toyota Foundation. They are best known for their red mangrove restoration projects in the Guayanilla Bay Estuary, for which they received the 2013 EPA Environmental Champion Award.

Finally, the Capetillo Community Urban Garden Nursery Forest is located in San Juan. The Department of Housing and the Office of Special Communities relocated families living there due to its location in a flood-prone sector and exposure to poor environmental conditions, including sanitary system discharges and the accumulation of garbage and household appliances. The land was abandoned, becoming a clandestine landfill and a place of illegal activities. In this situation, the neighbors of the area came to the Center for Urban, Community, and Business Action of Río Piedras (CAUCE) looking for solutions to stop this deterioration. At the end of 2007, the community began to develop the Capetillo Community Garden project. It received support from members of the Capetillo community, with CAUCE, and the sponsorship of the Puerto Rico Toyota Foundation, the Urban and Community Forestry Program, Civil Action and Education Corporation, and the collaboration of dozens of volunteers. The forested area that is protected by this community is called the Isla del Diablo Urban Forest, home to 25 species of birds, of which two are endemic.

Another example are the community and civil action groups that collaborate with the DNER in the protection and management of sea turtles in the island. These groups have contributed to improve the documentation and monitoring of nesting beaches, as well as on the designation of new protected areas (e.g., Natural Reserve: Playa Grande el Paraiso, Arrecifes Isla Verde, and Northeast Ecological Corridor).



Hacienda La Esperanza. Photo by: Para La Naturaleza



7

NEXT STEPS

Puerto Rican Crested Toad *(Peltophryne lemur)*. Photo by: Para La Naturaleza

NEXT STEPS

COMPILATION, UPDATE, AND DATA SHARING PROTOCOL

Updating the spatial inventory of protected areas is a dynamic process that requires effective communication among stakeholders, including public and private entities. The development of a formal protocol will expedite future actions to move from a manual update procedure to a formal and systematic process. The PA-CAT is working on a Data Sharing Protocol to set the guidelines for compiling, uploading, and sharing protected areas spatial data in Puerto Rico.

CROSSWALK AMONG LOCAL, NATIONAL, AND INTERNATIONAL MANAGEMENT CATEGORIES

In order to continue promoting the use of common language to refer to protected areas in Puerto Rico, the PA-CAT is in the process of developing a crosswalk between local management categories, with gap analysis program codes used by the Protected Areas Database of the United States (PAD-US) (USGS 2011) and IUCN management categories (appendix F). Because of Puerto Rico's economic and political relationships with the United States, it is important to integrate the island's protected areas in PAD-US, as this database is the national geodatabase that represents public land ownership and conservation lands and privately protected areas for the conterminous United States, Alaska, Hawaii, Puerto Rico, the Pacific, and the U.S. Virgin Islands. At the same time, using the IUCN management categories allows integrating the data of the protected areas of Puerto Rico into the World Database of Protected Areas, which enables comparing and evaluating the accomplishments of Puerto Rico in a regional and international context.

A COMPREHENSIVE LEGAL FRAMEWORK FOR PROTECTED AREAS

As described in this report, protected area management and strategic conservation planning in Puerto Rico could benefit greatly from the development of a comprehensive legal framework for protected natural areas. Figuring out the scope of this law requires the participation of diverse sectors. The framework should incorporate a formal protected area definition and management categories that would help guide protected area managers and provide a solid foundation for future designations and management plans. The framework could also consider the other conservation mechanisms presented in this report and concentrate on the gaps and needs to promote a comprehensive protected areas system in Puerto Rico.



Photo by: Robert van Dam

8

CONCLUSIONS

The information contained in this report represents the sustained effort of a number of individuals and agencies that have a shared vision of the importance of clear, complete, accurate, and publicly available information about land conservation in Puerto Rico. The information shows clearly that conservation is a shared challenge. The designation and management of protected areas is the foundation of a whole range of conservation mechanisms that are dynamic, tied to a variety of laws and regulations, governed by a diverse set of agencies and organizations, and shaped by the land and resources, as well as the people and agencies that manage them.

Although several mechanisms are in place to protect ecosystem services, wildlife, and their habitats in Puerto Rico, the primary threat to protection continues to be habitat loss or modification. For this reason, ecosystem conservation is one of the most difficult challenges facing Federal, State, and private environmental organizations, and landowners in the 21st century. In Puerto Rico, part of the challenge is due to the fact that a large portion of the ecologically important areas are on private lands and that landowners, resource managers, and regulatory mechanisms have to harmonize conflictive uses with the protection of natural resources and the conservation of wildlife species and their habitats.

Under this scenario, updating and sharing the inventory of protected areas as well as other conservation mechanisms on public and private lands enables evaluating their effectiveness in protecting priority conservation areas in Puerto Rico (appendix H). In turn, it helps agencies and nongovernmental organizations prioritize where to allocate funds to acquire land, designate new protected areas and/or focus on incentive programs. This is a fundamental step, given the difficulties, such as the scarcity of funds, the conflictive use of land, and climate change.



Maria Luisa Conservation Easement. Photo by: Para La Naturaleza

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APPENDIXES

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Mona and Monito Island Natural Reserve. Photo by: Robert van Dam

Appendix A. Definitions and legal framework of some legal mechanisms used to protect natural resources in Puerto Rico, including local management categories of protected areas

Mechanism	Legal definition	Legal framework	Administrator
Commonwealth Forest	Land that due to its location, physical, topographic, or geological characteristics are primarily valuable for forestry, use including watershed development and protection, erosion control, recreation, or forest management purposes.	Ley de Bosques de Puerto Rico (Law 133 of 1975, as amended)	DNER
Urban Commonwealth Forest	Municipal land of forest value located in urban areas whose ownership is transferred to the Commonwealth.	Ley de Bosques de Puerto Rico (Law 133 of 1975, as amended)	Municipality owner of the land
State Auxiliary Forest	Private land exceeding 5 "cuerdas" (4.8 acres) in contiguous areas and dedicated exclusively to the development of forests for purposes other than the production of coffee or fruits.	Ley de Bosques de Puerto Rico (Law 133 of 1975, as amended)	Private landowner
Biological Corridor	Lands constituting a natural corridor linking two or more forest systems for the purpose of expanding the habitat of a species, as long as they have not already been designated as Commonwealth Forests or Commonwealth Auxiliary Forests or do not present ownership conflicts.	Ley para la Unificación de los Bosques Estatales de Maricao, Susúa, Guánica, Toro Negro, Guilarte y Pueblo de Adjuntas (Law 14 of 1999)	DNER
Buffer zone	The natural fringe bordering forest systems that protect their integrity, which serve as a transition zones between wildlife and anthropological influences, except when they have already been designated as Commonwealth Forests or Auxiliary Forests.	Ley para la unificación de los Bosques Estatales de Maricao, Susúa, Guánica, Toro Negro, Guilarte y Pueblo de Adjuntas (Law 14 of 1999)	DNER
Natural Reserve	Areas with important coastal resources, subject to actual or potential conflicts of use and that must be preserved, conserved, or restored to their previous natural condition.	Programa de Manejo de la Zona Costanera (1978, as amended)	DNER; in some cases Puerto Rico Land Trust delegated by the DNER
(Area of) Natural Reserve	Areas that due to their physical, ecological, and geographical characteristics or the value of their natural resources, require their conservation, preservation, and restoration to their natural state.	Reglamento de Zonificación de Puerto Rico (Planning Regulation No. 4, 2000) —Ley del Programa de Patrimonio Natural de Puerto Rico (Law 150 of 1988, as amended)	DNER; in some cases Puerto Rico Land Trust delegated by the DNER

Appendix A. Definitions and legal framework of some legal mechanisms used to protect natural resources in Puerto Rico, including local management categories of protected areas

Mechanism	Legal definition	Legal framework	Administrator
Land use zoning Puerto Rico Planning Board that restricts the development on areas where natural resources are protected	Specially Protected Rustic Soil: ecologic, ecologic-agriculture, ecologic-hydric, ecologic-landscape, agriculture, agriculture-landscape, agriculture-hydric, hydric, landscape, rustic common soil, urban, non-programmed urban, programmed urban, transportation, water.	Reglamento de Zonificación de Puerto Rico (Planning Regulation No. 4, 2000)	Puerto Rico Planning Board designates and implements zoning classes, but does not administer them
Common rustic soils and Specially Protected Rustic Soils	Land classification in Land Use Plans to categorize those lands that must be expressly protected from urbanization processes due to their present or potential agricultural (or livestock), natural, or recreational value, or because the area represents a threat to public health or security. Another valid reason to conserve the area is the fact that there might be no real motive to develop the area.	Ley de Municipios Autónomos de Puerto Rico (Law 81 of 1991, as amended)	Each municipality designates and implements these zoning classes, but only administers that land that it owns or whose administration has been delegated
Classifications of use of water bodies of the Environmental Quality Board	These classifications are designed to protect the integrity of certain aquatic resources and their uses. The classifications are: Coastal and estuarine waters of exceptional quality (SA); Coastal and estuarine waters for recreational use (SB); Coastal Water for Human Interaction (SC); Superficial Recreational Waters and Drinking Water Supply (SD); and Superficial Waters of Exceptional Quality and Wetlands (SE).	Reglamento de Estándares de Calidad de Agua de Puerto Rico (1990)	Puerto Rico Environmental Quality Board designates and implements these classes, but does not administer the areas
Ecologically Sensitive Area	Areas designated as "ecologically sensitive" by the DNER or by a municipality in their Management Plans.	Reglamento de Zonificación de Puerto Rico (Planning Regulation No. 4, 2000)	DNER or the counties that do the designation
of the Coastal Zone	Area that includes the land of Puerto Rico from the seashore 1,000 meters inland or to where the main coastal resources are extended. Also, includes sea waters and any immersed ground from the shore until 9 nautical miles offshore.	Programa de Manejo de la Zona Costanera (1978, as amended)	DNER and the Puerto Rico Planning Board
Special planning area	Areas with important natural resources subject to present or future conflicts of use, requiring detailed planning.	Programa de Manejo de la Zona Costanera (1978, as amended)	DNER designates these areas and the Puerto Rico Planning Board implements the designation, but it does not represent any type of activity in charge of administering the land

Appendix A. Definitions and legal framework of some legal mechanisms used to protect natural resources in Puerto Rico, including local management categories of protected areas

Mechanism	Legal definition	Legal framework	Administrator
Terrestrial marine zone	Littoral space of Puerto Rico that is completely or partially covered by sea waves or tides, including those areas covered by the largest waves during storms. In addition, it includes the land gained from the sea and its accessions and terrains, as well as river banks up to where they are navigable or where the areas are sensitive to tides.	Reglamento para el aprovechamiento, vigilancia, conservación y administración de las aguas territoriales, los terrenos sumergidos bajo éstas y la Zona Marítimo Terrestre (1992, as amended)	DNER
Areas with fishing ban	Includes interior water bodies or sea waters where fishing is partially or completely restricted for the protection of public health or for fishery restoration.	Ley de Pesquerías de Puerto Rico (Law 278 of 1998, as amended)	DNER
Ecotouristic Zone	Areas with ecotourism potential.	Ley de Ecoturismo de Puerto Rico (Law 340 of 1998, as amended)	DNER, Puerto Rico Planning Board, Puerto Rico Tourism Company
Areas of coral reef recovery	Marine reef areas impacted and degraded by human or natural causes that require the imposition of human restrictions to restore them.	Ley para la Protección, Conservación y Manejo de los Arrecifes de Coral en Puerto Rico (Law 147 of 1999)	DNER
Urban forest	Biological communities dominated by trees, including associated fauna, found within urban areas or in urban-rural transition areas. Includes private lands or areas owned by the State or a county.	Ley de Bosques Urbanos de Puerto Rico (Law 213 of 1999)	Private land owner
Natural Critical Habitat	Land parcels where species requiring protection, special handling are threatened or in danger of extinction can be reintroduced.	Nueva Ley de Vida Silvestre de Puerto Rico (Law 241 of 1999)	Private landowner
Wildlife Refuge	Areas banned for sport hunting and whose uses would be compatible with the purposes of the Law that define them.	Nueva Ley de Vida Silvestre de Puerto Rico (Law 241 of 1999)	DNER
Hunting grounds	Private land used mainly for sport hunting in which its owners, landlord, or administrator offer the hunter hunting resources in exchange for payment.	Nueva Ley de Vida Silvestre de Puerto Rico (Law 241 of 1999)	Private landowner
Wildlife Reserve	Areas administered for the management and propagation of wildlife where port hunting and recreational or scientific activities are allowed.	Nueva Ley de Vida Silvestre de Puerto Rico (Law 241 of 1999)	DNER
Area of conservation (of the Karst zone)	Areas of the Karstic Zone that, due to their ecological and hydrological importance, cannot be used under any circumstances for the extraction of materials from the earth's crust for commercial purposes, not for commercial exploitation.	Ley para la Protección y Conservación de la Fisiografía Cársica de Puerto Rico (Law 292 of 1999)	DNER

Appendix A. Definitions and legal framework of some legal mechanisms used to protect natural resources in Puerto Rico, including local management categories of protected areas

Mechanism	Legal definition	Legal framework	Administrator
Wetland	Transition areas between aquatic and terrestrial systems frequently flooded or saturated by surface and groundwater for a period of time that occur frequently enough that led to changes in the composition of soils, which control the type of vegetation adapted to grow in the area, and that constitute natural resources of high value that must be preserved for the benefit of present and future generations.	Ley Orgánica del Departamento de Recursos Naturales y Ambientales (Law 23 of 1972, as amended)	DNER
Area of protection of natural resources	Those marine and aquatic places that are physically delimited and reserved for protection, from the effect of human activities and natural events, its fauna and flora, as well as other natural and environmental resources that have been included in the charts.	Ley de Navegación y Seguridad Acuática de Puerto Rico (Law 430 of 2000)	DNER
Sinkhole	Hollow of circular shape of varying diameter from several meters to a kilometer that is formed in karst areas. Its depth can be of several hundred of meters.	Ley para la protección y conservación de las cuevas, cavernas o sumideros de Puerto Rico (Law 111 of 1985, as amended)	DNER and the private landowner
Cave or cavern	Natural cavity, niche, chamber or series of chambers and galleries beneath the earth's surface, within a mountain, or formed by horizontal projection of rocks on a cliff.	Ley para la protección y conservación de las cuevas, cavernas o sumideros de Puerto Rico (Law 111 of 1985, as amended)	DNER and the private landowner
Marine Reserve	(Not defined)	Ley para Designar como Reserva Marina las Aguas Territoriales Alrededor de la Isla de Desecheo (Law 57 of 2000)	DNER
Natural Monument	Natural spaces consisting of formations of natural singularity or beauty, deserving to be objects of special protection or geological formation, and other landforms that raise special interest in their singularity or importance because of their landscapes scientific value.	Ley para Declarar como Monumento Natural las Cuevas del Barrio Guayabal en Juana Díaz (Law 129 of 2000)	DNER
National Forest	Areas for the improvement and protection of forests that ensure conditions conducive to water flow and that provide continuous supplies of wood for the use of citizens.	Organic Administrative Act (1897, as amended)	Forest Service (Department of Agriculture)
National Wildlife Refuge	Areas for the conservation and management of natural resources, such as wildlife, fisheries, plants, and their habitats for the benefits of present and future generations.	National Wildlife Refuge System Act (1966, as amended)	Fish and Wildlife Service (Department of the Interior)

Appendix A. Definitions and legal framework of some legal mechanisms used to protect natural resources in Puerto Rico, including local management categories of protected areas

National Estuary	Important national estuarine areas for the restoration of the quality of living resources and water resources for the enjoyment of the population.	Clean Water Act (1977, as amended)	San Juan Bay Estuary Program* delegated by the Environmental Protection Agency
National Estuarine Research Reserve	Representative estuarine system that is suitable for long-term research and contributes to the biogeographical and typological balance of the system.	Coastal Zone Management Act (1972, as amended)	DNER delegated by the National Oceanic and Atmospheric Administration (Department of Commerce)
Seasonally closed fishing area (Federal)	Marine areas where fishing is seasonally closed as needed for the conservation and management of habitats essential for fishing and as a fishery resource.	Magnuson-Stevens Fishery Management and Conservation Act (1976, as amended)	Caribbean Fishery Management Council (Department of Commerce)
Marine Conservation District	Marine areas of particular value or importance to marine ecosystems and which will be maintained in their natural state.	Fishery Management Plan, Regulatory Impact Review and Final Environmental Impact Statement for Corals and Reef Associated Plants and Invertebrates of Puerto Rico and the U.S. Virgin Islands (1994, as amended)	Caribbean Fishery Management Council (Department of Commerce)
National Park **(Federal)**	Areas for landscape conservation, those historical and natural objects, and wildlife, keeping them for the enjoyment of future generations.	National Park Service Organic Act (1916, as amended)	National Park Service (Department of the Interior)
Coastal Barrier	Depositional geological formation that is subject to the energy of waves, tides, and wind that protects aquatic habitats inland from the direct attack of the waves. Also, all adjacent associated aquatic habitats, including wetlands, marshes, estuaries, bays, and coastal waters, but only if such formations and their associated habitats contain few anthropogenic structures and if the human activities in such formation and their habitats do not significantly impede their geomorphic and ecological processes.	Coastal Barriers Resource Act (1982, as amended)	Fish and Wildlife Service (Department of Interior) Designate areas, but the law does not confers administrative authority over them

* The San Juan Bay Estuary Program does not administer areas; it coordinates and facilitates governmental and private efforts directed toward all of those objectives established by law. Note: this table was prepared by Grana Raffucci 2001, and some information in this table might be outdated [Raffucci, G. Personal communication (2016, by email). Technical assistant, DNER.

Appendix B. Expanded list of local and Federal legislation that protect natural resources in Puerto Rico

Year	Legal mechanism	Description
1800s	Proclamations for the protection of lands under the Spanish Crown	The purpose of these proclamations was to preserve and protect the remaining critical forest lands from agricultural clearing practices.
1886	Ley de Puertos para la Isla de Puerto Rico	This law includes the concepts of MaritimeTerrestrial Zone, littoral sea, and public domain lands.
1897	Forest Service Organic Administrative Act	Federal legislation for the protection and management of forest reserves in the United States.
1916	National Parks Service Organic Act	Established the National Park Service within the U.S. Department of the Interior.
1917	Section 2 of Act No. 22: Act to provide a forest service in Porto Rico, 1917	Establishes a forest service in Puerto Rico and allows the subsequent proclamation of Insular Forests.
1930	Puerto Rico Civil Code (Article 341)	Provides that rivers and their natural channels, including the continuous or discontinuous waters of springs or streams running through their natural channels, and the channels themselves, are in the public domain.
1952	Constitution of the Commonwealth of Puerto Rico (Article VI, Section 19)	Establishes public policy for the "most effective conservation of natural resources, as well as their greater development and use for the general benefit of the community".
1953	Creation of a Forest Service in Puerto Rico	A Forest Service was created as part of the Puerto Rico Department of Agriculture. It was later transferred to DNER through Act 23, 1972.
1961	Ley 114 de 1961: Ley de la Compañía de Parques Nacionales de Puerto Rico, con enmiendas	Act 114: Establishes the Puerto Rico National Parks Company, amended.
1965	Land and Water Conservation Fund Act	Federal legislation to provide funds and matching grants for the acquisition of land and water, and easements on land and water. The main emphases of the fund are recreation and the protection of national natural treasures, parks, protected forest and wildlife areas.

Appendix B. Expanded list of local and Federal legislation that protect natural resources in Puerto Rico

1966	National Wildlife Refuge System Act	Federal legislation for the administration of all areas in National Wildlife Refuge system.
1968	Ley 151 de 1968: Ley de muelles y puertos, con enmiendas	Act 151: To regulate management and activities in ports and docks in Puerto Rico. This law also defines the concept on Maritime Terrestrial Zone, amended.
1970	Ley 9 de 1970: Ley Sobre Política Pública Ambiental de Puerto Rico, derogada	Act 9: Puerto Rico Environmental Public Policy Act [replaced by Act 416 (2004)].
1972	Ley 23 de 1972: Ley Orgánica del DRN[A]	Act 23: Department of Natural [and Environmental] Resources Organic Act, amended. Creates the Department of Natural Resources, currently known as Department of Natural and Environmental Resources.
1972	U.S. Coastal Zone Management Act	Federal legislation to encourage coastal States to develop and implement coastal zone management programs to preserve, protect, develop, restore, or enhance coastal resources.
1973	Resolución 18 de la Cámara de Representantes del 2 de marzo de 1973	Resolution 18: Highlights the need to organize the uses and activities of the 13 public forest areas of the Commonwealth. It orders DN[E]R to prepare a State Forest Master Plan.
1973	Endangered Species Act	Federal legislation to protect and recover imperiled species and the ecosystems upon which they depend
c. 1974	The Master Plan of the Commonwealth Forests of Puerto Rico	Document published by DN[E]R following Resolution 18 of 1973. It acknowledged that forests were being threatened by segmentation, inappropriate uses within their vicinity, loss of wildlife species, loss of recreational opportunities, and the need for a system to integrate forest management. As a result, individual management plans for some forests were started.
1975	Ley 75 de 1975: Ley Orgánica de la Junta de Planificación de Puerto Rico, con enmiendas	Act 75: The PRPB Organic Act orders the establishment of zoning regulations for forestlands in Puerto Rico.
1975	Ley 133 de 1975: Ley de Bosques de Puerto Rico, con enmiendas	Act 133: Established forest management policies in Puerto Rico and the creation of the DNER Forest Service, amended.
1975	Mona Island Forest Reserve - Commonwealth Forest Reserve Master Plan (Draft)	Defines DNER forest policies.
1976	Ley 70 de 1976: Ley de Vida Silvestre [sustituida por la Ley 241 de 1999]	Act 70: First Puerto Rico Wildlife Act [replaced by Act 241 (1999)]

Appendix B. Expanded list of local and Federal legislation that protect natural resources in Puerto Rico

1976	Ley 136 de 1976: Ley para la conservación, el desarrollo y uso de los recursos de agua de Puerto Rico	Act 136: To maintain the quality of waters needed to ensure the well-being, security, and development of Puerto Rico, ensure the supply of water needed by present and future generations.
1976	Magnuson-Stevens Fishery Management and Conservation Act	Federal legislation governing marine fisheries management in U.S. Federal waters. It fosters long-term biological and economic sustainability of U.S. marine fisheries out to 200 nautical miles from shore, amended.
1976	Ley 132 de 1976: Ley de Arena, Grava y Piedra, con enmiendas	Act 132: To regulate the extraction of sand, gravel, stone, earth, silica, calcite, clay and any other similar component of the earth's crust for commercial use and which is not regulated as an economic mineral of public and private land.
1977	Clean Water Act	Federal legislation for the integrity of waters bodies, to prevent pollution sources, provide assistance to publicly owned treatment works for the improvement of wastewater treatment, and maintain the integrity of wetlands.
1978	Adoption of the Puerto Rico Coastal Zone Management Program	Establishes the Governing Document of the Coastal Zone Management Program as the coastal element of the Land Use Plan in Puerto Rico.
1978	Cooperative Forestry Assistance Act	Federal legislation to provide assistance to States and private landowners on forest management and stewardship, fire protection, insect and disease control, reforestation and urban forestry. Amended in 1990 by the "Farm Bill" that establishes the Forest Legacy Program.
1979	Reglamento 2577 (DRNA): Reglamento para Controlar la Extracción, Posesión, Transportación y Venta de Recursos Coralinos en Puerto Rico, del Departamento de Recursos Naturales y Ambientales	DNER Regulation 2577: To control the extraction, possession, transportation and sale of coral resources in Puerto Rico.
1980	Fish and Wildlife Conservation Act	Federal legislation to protect fish and wildlife when Federal actions result in the control or modification of a natural stream or body of water, and to provide authority for the involvement of the U.S. Fish and Wildlife Service in evaluating impacts to fish and wildlife from proposed water resource development projects.
1982	Coastal Barriers Resources Act	Federal legislation to protect coastal areas that serve as barriers against wind and tidal forces caused by coastal storms, and serve as habitat for aquatic species.
1983	Reglamento 17 (Junta de Planificación): Reglamento de Zonificación de la Zona	PRPB Regulation 17: For the zoning of the Puerto Rico Coastal Zone and access to beaches and coasts (replaced by the Joint

Appendix B. Expanded list of local and Federal legislation that protect natural resources in Puerto Rico

	Costanera y Acceso a las Playas y Costas de Puerto Rico (sustituido por el Reglamento Conjunto para la evaluación y expedición de permisos relacionados al desarrollo y uso de terrenos)	Regulation for the evaluation and issuance of permits related to the development and use of land).
1985	Reglamento 3266 (Junta de Planificación): Reglamento de Zonificación Especial para las zonas No Urbanas para los Municipios circundantes al Bosque Nacional del Caribe [actualmente conocido como el Bosque Nacional El Yunque], enmendado	PRPB Regulation 3266: Special zoning regulations for nonurban areas for municipalities surrounding the Caribbean National Forest [currently known as El Yunque National Forest], amended.
1985	Ley 111 de 1985: Ley para la protección y conservación de cuevas, cavernas y sumideros de Puerto Rico, con enmiendas	Act 111: To protect and preserve caves, caves or sinks, their formations and natural materials, flora, fauna, water, and archaeological values, amended.
1988	Ley 112 de 1988: Ley de Protección del Patrimonio Arqueológico Terrestre de Puerto Rico, con enmiendas	Act 112: To declare archaeological sites, objects, deposits, artifacts, "documents," or materials as heritage of the people of Puerto Rico; to create the Council for the Protection of the Land Archaeological Heritage of Puerto Rico; to establish certain obligations with respect to any excavation, construction and reconstruction work carried out in Puerto Rico, amended.
1988	Ley 150 de 1988: Ley del Programa de Patrimonio Natural de Puerto Rico	Act 150: To create the Natural Heritage Program of Puerto Rico.
1992	Reglamento 4860 (DRNA): Reglamento para el Aprovechamiento, Vigilancia, Conservación y Administración de las Aguas Territoriales, los Terrenos Sumergidos Bajo Estas y la Zona Marítimo Terrestre, del Departamento de Recursos Naturales y Ambientales, con enmiendas	DNER Regulation 4860: For the use, monitoring, conservation, and management of territorial waters, submerged land, and the Maritime Land Zone, as amended.
1997	National Wildlife Refuge System Improvement Act	Amends the National Wildlife Refuge System Administration Act of 1966 and provides an "Organic Act" for the Refuge System.
1998	*Ley 192 de 1998: Para establecer el Bosque Estatal del Nuevo Milenio	Act 192: For the establishment of the Nuevo Milenio Commonwealth Forest.
1998	*Ley 314 de 1998: Ley de política pública sobre humedales en Puerto Rico, con enmiendas	Act 314: To declare public policy on wetlands in Puerto Rico, and to order the designation of lands belonging to the Land Authority, the Caño or Ciénaga Tiburones as a Nature Reserve, amended.
1999	Ley 147 de 1999: Para la protección, conservación y manejo de los arrecifes de coral en Puerto Rico	Act 147: For the protection, conservation and management of coral reefs in Puerto Rico.

Appendix B. Expanded list of local and Federal legislation that protect natural resources in Puerto Rico

1999	Ley 213 de 1999: Ley de Bosques Urbanos de Puerto Rico	Act 213: To establish the public policy for the creation, establishment, management, restoration, and conservation of the Urban Forests of Puerto Rico; Create the figure of the Municipal Sowing Professional and establish their functions and duties; and create the Municipal Forestation Fund.
1999	*Ley 228 de 1999: Ley de la Reserva Natural de la Finca "Seven Seas"	Act 247: To designate the Finca Seven Seas Nature Reserve.
1999	Ley 241 de 1999: Nueva Ley de Vida Silvestre del Estado Libre Asociado de Puerto Rico, con enmiendas	Act 241: To protect, conserve and promote native and migratory wildlife species; to regulate hunting activities; to issue, renew, and revoke hunting licenses, permits to operate game reserve and hunting or collection permits for scientific, educational, recovery or population control purposes; and to establish regulations for the introduction of exotic species to Puerto Rico.
1999	Ley 247 de 1999: Ley para la unificación de los Bosques Estatales de Maricao, Susúa, Guánica, Toro Negro, Guilarte y Pueblo de Adjuntas	Act 247: To designate biological corridors between the Maricao, Susúa, Guánica, Toro Negro, Guilarte, and Pueblo de Adjuntas Forests.
1999	Ley 292 de 1999: Ley para la Protección y Conservación de la Fisiografía Cársica de Puerto Rico	Act 292: For the protection and conservation of the karst region of Puerto Rico.
1999	Ley 293 de 1999: Ley para crear la Junta Interagencial para el manejo de las playas de Puerto Rico	Act 293: To create the Interagency Board for the management of beaches in Puerto Rico.
2000	*Ley 57 de 2000: Para designar como reserva marina, media milla de las aguas territoriales marítimas alrededor de la Isla Desecheo	Act 57: To designate a Marine Reserve 0.5 mile of maritime territorial waters around Desecheo Island.
2000	*Ley 93 de 2000: Para declarar como Monumentos Históricos de Puerto Rico la Cueva Lucero y el manantial que se origina en el mismo lugar en el Municipio de Juana Díaz	Act 93: To declare as Historical Monuments the Cueva Lucero and the spring that originates in the same place in the Municipality of Juana Díaz.
2000	*Ley 129 de 2000: Para declarar como monumento natural el área donde se encuentra localizado el Cerro de Las Cuevas del Barrio Guayabal en el municipio de Juana Díaz	Act 129: To declare as natural monument the area where the Cerro de Las Cuevas is located.
2000	*Ley 201 de 2000: Para ordenar a la Junta de Planificación que designe como reserva	Act 201: To order the designation of areas around Laguna Joyuda as a Nature Reserve

	natural los ecosistemas en los alrededores de la Laguna Joyuda	
2000	*Ley 283 de 2000: Ley de la Reserva Natural de las Piedras del Collado	Act 283: To designate the Piedras del Collado mounds, located in the municipality of Salinas as a Nature Reserve.
2000	Reglamento 4 (Junta de Planificación): Reglamento de Zonificación	PRPB Regulation 4: Zoning regulations replaced by the Joint Regulation, as amended.
2001	Ley 9 de 2001: Ley del Sistema de Parques Nacionales de Puerto Rico	Act 9: To establish the Puerto Rico National Parks System, its objectives, administration, powers, and duties of the Executive Director of the Puerto Rico National Parks Company; establish the procedure for its designation and the areas that will initially be part of this System.
2001	Ley 108 de 2001: Ley del Programa "Adopte una Hectárea"	Act 108: To establish the "Adopte una Hectárea" Program.
2001	Ley 147 de 2001: Para enmendar la Ley Núm. 314 de 24 de diciembre de 1998, a fin de prohibir la caza en los terrenos pertenecientes a la Autoridad de Tierras, en el área conocida como el Caño o Ciénaga Tiburones	Act 147: To amend Act 314 of 1998, to prohibit hunting on lands belonging to the Land Authority in the area known as the Caño or Ciénaga Tiburones.
2001	Ley 183 de 2001: Ley de Servidumbre de Conservación de Puerto Rico, con enmiendas	Act 183: For the establishment of Conservation Easements in Puerto Rico, amended.
2002	*Ley 245 de 2002: Para declarar el sistema de cuevas y cavernas de Aguas Buenas, como área de Reserva Natural	Act 245: To designate the Aguas Buenas Cave System as a Nature Reserve.
2003	Ley 49 de 2003: Para establecer la política pública sobre la prevención de inundaciones en Puerto Rico, la conservación de ríos y quebradas y la dedicación a uso público de fajas verdes	Act 49: To establish public policy on flood prevention, the conservation of rivers and streams, and the public use of green corridors in rivers and streams.
2003	*Ley 175 de 2003: Para la conservación y desarrollo de la Reserva Natural Cueva del Indio	Act 175: For the management of the Cueva del Indio Nature Reserve.
2003	*Ley 206 de 2003: Para designar el Corredor Ecológico de San Juan	Act 206: For the designation of the San Juan Ecological Corridor.
2003	Ley 268 de 2003: Ley del Fondo para la Adquisición y Conservación de Terrenos en Puerto Rico	Act 268: To establish the Fund for the Acquisition and Conservation of Land in Puerto Rico.

2003	*Ley 295 de 2003: Para declarar y designar como bosque el área el Monte de Choca	Act 295: For the designation of the Monte Choca Forest in the municipality of Corozal.
2004	Reglamento 6765 (DRNA): Para regir la conservación y el manejo de la fauna silvestre, las especies exóticas y la caza en el Estado Libre Asociado de Puerto Rico	DNER Regulation 6765: For the conservation and management of wildlife, exotic species, and hunting in the Commonwealth of Puerto Rico.
2004	Reglamento 6766 (DRNA): Para regir el manejo de las especies vulnerables y en peligro de extinción en el Estado Libre Asociado de Puerto Rico	DNER Regulation 6766: For the management of vulnerable and endangered species in the Commonwealth of Puerto Rico.
2004	Reglamento 6770 (DRNA): Para regir el uso, manejo y administración de áreas recreativas y de acampar bajo la jurisdicción del DRNA	DNER Regulation 6770: For the use, management, and administration of recreational and camping areas under the jurisdiction of the DNER.
2004	Ley 267 de 2004: Ley sobre Política Pública de Desarrollo Sostenible	Act 267: To establish sustainable development public policies in Puerto Rico.
2004	Ley 416 de 2004: Ley de Política Pública Ambiental, según enmendada	Act 416: To establish environmental public policies in Puerto Rico. Substitutes Act 9 of 1970.
2004	*Ley 471 de 2004: Ley de Reserva Natural del Río Indio	Act 471: To establish the Río Indio Nature Reserve.
2004	Ley 550 de 2004: Ley para el Plan de Uso de Terrenos del Estado Libre Asociado de Puerto Rico	Act 550: To develop a comprehensive land use plan for Puerto Rico.
2005	Ley 45 de 2005: Para enmendar la Ley de bosques de Puerto Rico	Act 45: Amendments to the Puerto Rico Forest Act.
2007	*Ley 192 de 13 de 2007: Para establecer la Reserva Natural del Cerro Las Planadas	Act 92: To designate the Cerro Las Planadas Nature Reserve.
2007	*Ley 227 de 2007: Para designar la Reserva Natural de Punta Cucharas	Act 227: To designate the Punta Cucharas Nature Reserve in the municipality of Ponce.
2008	*Ley 92 de 2008: Para designar como Reserva Natural el Humedal de Punta Viento	Act 92: To establish the Humedal de Punta Viento Nature Reserve in the municipality of Patillas.

Appendix B. Expanded list of local and Federal legislation that protect natural resources in Puerto Rico

2009	*Ley 27 de 2009: Para declarar el área que comprende el centro geográfico de Puerto Rico, ubicado en el Municipio de Orocovis, como área de Reserva Natural de Puerto Rico	Act 27: To declare the area comprising the geographical center of Puerto Rico, located in the Municipality of Orocovis, as a Natural Reserve.
2010	Reglamento 7949 (DRNA): Reglamento de pesca de Puerto Rico	DNER Regulation 7949: Puerto Rico fishing regulations.
2010	Reglamento Conjunto (Junta de Planificación) de permisos para obras de construcción y Usos de Terrenos, con enmiendas	Joint Regulation of permits for construction works and land use. Replaces PRPB Regulations 3, 4, and 13, amended.
2011	Reglamento 8013 (DRNA): Reglamento para Autorizar y Conferir Concesiones en Áreas bajo la Jurisdicción y Administración del DRNA, con enmiendas	DNER Regulation 8013: To authorize and confer concessions in areas under the jurisdiction of the DRNA, with amendments.
2012	*Ley 46 de 2012: Para declarar el sistema de cuevas, cavernas y zanjones que ubica en el espacio geográfico de los Barrios Barahona y Torrecillas, entre los municipios de Morovis y Ciales, mejor conocido como “Las Cabachuelas”, área de Reserva Natural de Puerto Rico	Act 46: To designate Las Cabachuelas Nature Reserve on the system of caves and ditches located between the municipalities of Morovis and Ciales.
2012	*Ley 126 de 2012: Ley de la Reserva Natural del Corredor Ecológico del Noreste, con enmiendas	Act 126: To establish the Northeast Ecological Corridor Nature Reserve, amended.
2014	Reglamento 8486 (Junta de Planificación): Plan y Reglamento del Área de Planificación Especial del Carso	PRPB Regulation 8486: Management Plan and Regulations for the Karst Region Special Planning Area.
2014	*Ley 58 de 2014: Ley de la Reserva Natural de la Playa Lucía	Act 58: To establish the Playa Lucía Nature Reserve in the Municipality of Yabucoa
2014	Ley 180 de 2014: Ley para crear el Programa de Ríos Patrimoniales, Ríos de Alto Valor Natural y Ríos Recreacionales de Puerto Rico	Act 180: To create the Heritage Rivers Program, High Value Natural Rivers and Recreational Rivers of Puerto Rico.
2015	Ley 36 de 2015: Ley del Programa Contacto Verde	Act 36: Green Connection Program Act, administered by the Puerto Rico Department of Education in coordination with the DNER to foster the participation of students and their families in workshops and visits to protected areas.
2015	Plan de Uso de Terrenos de Puerto Rico	Puerto Rico Land Use Plan, zoning regulations approved by the

Appendix B. Expanded list of local and Federal legislation that protect natural resources in Puerto Rico

		PRPB.
2015	Planes Sectoriales y Reglamentos de la Reserva Natural del Corredor Ecológico del Noreste y áreas adyacentes	Sectoral Plans and Regulations of the Northeast Ecological Corridor Nature and the areas around it.
2016	Reglamento 8809 (DRNA): Reglamento de arrecifes de coral	DNER Coral Reefs Regulation 8809.
2016	Reglamento para la Adquisición de Bienes Inmuebles y Derechos Reales del DRNA (Borrador del DRNA)	Regulations for the Acquisition of Real State Property and Rights of the DNER (DNER Draft).
2016	Reglamento para la administración, aprovechamiento, rehabilitación y conservación de la Reserva Natural Estuarina de la Laguna del Condado (Borrador del DRNA)	Regulations for the administration, exploitation, rehabilitation, and conservation of the Laguna del Condado Estuary Nature Reserve. (DNER Draft).

* = laws that designate protected areas.

Appendix C. Memorandum of Understanding to collaborate in the development, description, documentation, and dissemination of information related to protected areas and other conservation mechanisms in Puerto Rico for the purposes of strategic conservation planning.

MEMORANDUM OF UNDERSTANDING
16-MU-11120101-003

Among

The Puerto Rico Department of Natural and Environmental Resources;

Para La Naturaleza;

The United States Department of Agriculture,
Forest Service International Institute of Tropical Forestry;

The United States Department of the Interior, Fish and Wildlife Service;

Bahía Beach Resort and Golf Club and Alma de Bahía Foundation;

and

The Puerto Rico Planning Board

For

The collaboration in the development, description, documentation, and dissemination of information related to protected areas and other conservation mechanisms in Puerto Rico for the purposes of strategic conservation planning

I. Purpose

The purpose of this Memorandum of Understanding (MOU) is to strengthen the cooperation among the Parties in the delivery of scientifically-sound information for policy and decision making, manage information to comprehensively describe protected areas and other conservation mechanisms and support strategic conservation planning that will promote the protection of natural and cultural resources in Puerto Rico's public and private lands.

II. Parties Description

The Department of Natural and Environmental Resources (DNER) was created under Act No. 23 of June 20, 1972, as amended, known as the "Organic Act of the Department of Natural and Environmental Resources". DNER's constitutional and executive mandates are directed on the protection and management of Puerto Rico's natural and environmental resources in a sustainable manner to guarantee its existence use and services for present and future generations while promoting a better quality of life. This agency has the ministerial duty to establish the public policy on environmental protection, management and sustainable of our natural resources, enforcing laws and regulations for its application while promoting environmental educational programs and community-based projects for collaboration of natural resource conservation practices.

The Puerto Rico Planning Board (PRPB) was created under Act No. 75 of June 24, 1975, as amended, known as the "Puerto Rico Planning Board Organic Act". The PRPB develops and implements public policy on planning, land use, economic and social development, and advices the Governor and the Legislative Assembly in related matters. The PRPB general purpose is to guide the comprehensive development of Puerto Rico according to present and future social needs; balance human, environmental, physical and economic resources in order to promote health, safety, order, coexistence and prosperity; promote organized economic development and create favorable conditions for the development of our society.

The U.S. Forest Service International Institute of Tropical Forestry (USFS-IITF) is a tropical forestry research and technology transfer institute located in Río Piedras, Puerto Rico. The USFS-IITF mission is to develop and disseminate scientifically based knowledge that contributes to the conservation of forests, wildlife, and watersheds of the American tropics in the context of environmental change.

The U.S. Fish and Wildlife Service (USFWS) works with others, to conserve, and protect a healthy environment and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the people. The Service's major responsibilities are for migratory birds, endangered species, certain marine mammals, habitat restoration, and freshwater and anadromous fish.

Para La Naturaleza, Inc., a non-profit corporation organized and existing under the laws of the Commonwealth of Puerto Rico with register number 63294. The corporation goal is to integrate society at large in the conservation of natural ecosystems, in order to increase the amount of protected lands in Puerto Rico, from the actual 8 percent to 33 percent by the year 2033. Para La Naturaleza, Inc. seeks to provide each person and each community with transformative experiences that can inspire and motivate concrete actions for nature.

The Alma de Bahia Foundation is a non for profit organization, which main purposes are to promote the conservation of natural resources, ecosystems and wildlife in Puerto Rico, contributing to the cultural, social and economic development of neighboring communities, instilling awareness in and educating the public about natural resources, and protecting local ecosystem by controlling invasive species and rescuing fauna. In addition, Bahia Beach Resort & Golf Club, is a private sustainable development and nature sanctuary that partners with public and private organizations to protect endangered species, ecosystems and habitats of conservation concern in Puerto Rico. Bahia Beach Resort is one of the 21 resorts worldwide designated as a Certified Gold Audubon International Signature Sanctuary, and currently is the only resort in the Caribbean with this distinction.

III. Authorities

This MOU is entered into among the named Parties under the authority of:

Puerto Rico Department of Natural and Environmental Resources:

Act No. 23 of June 20, 1972, as amended, known as the "Organic Act of the Department of Natural and Environmental Resources";

Act No. 133 of July 1, 1975, as amended, known as the "Forest Act of Puerto Rico";

Act No. 241 of August 15, 1999, as amended, known as the "New Wildlife Act of Puerto Rico".

Puerto Rico Planning Board

Act No. 75 of June 24, 1975, as amended, known as the "Puerto Rico Planning Board Organic Act".

U.S. Fish and Wildlife Service:

Endangered Species Act (16 U.S.C. 1536)

Fish and Wildlife Coordination Act (16 U.S.C. §§ 661-667)

IV. Background

Protected areas are globally known as the most adopted strategy for promoting *in situ* biodiversity conservation by preventing natural habitat conversion and reducing anthropogenic threats. Hence, strong emphasis has been placed on protected areas development as the primary mechanism for protecting the most fragile and important ecosystems and other natural and cultural heritage resources.

The Caribbean Landscape Conservation Cooperative (CLCC) is a joint effort among governmental and non-governmental entities in Puerto Rico and U.S. Virgin Islands to support the conservation of natural and cultural resources in light of climate change and other landscape-scale stressors. The mission of this cooperative is to develop and provide the best available science and strategies to agencies, decision makers, organizations, researchers, and the general public in order to conserve, restore and sustain natural and cultural resources in the Caribbean.

One of the CLCC mechanisms to accomplish their mission is in the development and support of Conservation Action Teams (CATs). These teams are defined by a clear set of objectives, aligned with the CLCC mission, and reviewed by the CLCC Steering Committee for approval. In January 2015, the CLCC approved the creation of the Protected Area Conservation Action Team (PA-CAT) in order to promote information sharing among agencies involved in land

management and conservation planning and improve existing information in support of the identification, establishment and management of a comprehensive protected areas system in Puerto Rico and the U.S. Virgin Islands. In addition, the PA-CAT has proposed the establishment of an Integral System for the Conservation of Nature which will identify and map conservation mechanisms that include zoning, legal designations and regulation, incentive programs, past practice and land use planning, as well as protected areas, that contribute to the protection of natural and cultural resources in Puerto Rico's public and private lands.

Based on the International Union for the Conservation of Nature (IUCN), and the Protected Database of the United States (PADUS) the PA-CAT has defined a protected area as: "*A geographic area clearly defined and delimited through legal or other effective means for the long-term conservation of its natural resources, biodiversity, ecosystem services and associated cultural values*". This definition can serve as a fundamental tool for promoting a common language among the Parties and for comparing protected areas in Puerto Rico with those in the rest of the world.

The PA-CAT has members from government agencies, non-governmental organizations and universities in Puerto Rico and the US Virgin Islands. The PA-CAT has established a technical team which can assist the Parties in the accomplishment of the objectives and purpose of this MOU. The purpose and expected value of this Agreement is expected to persist after the specific objectives of the PA-CAT have been accomplished.

V. Roles and Responsibilities

As a group, the Parties will seek to **develop, describe, document, and disseminate information on Protected Areas and other conservation mechanisms in Puerto Rico for the purposes of strategic conservation planning**. The group will develop and maintain a standard of information management that clearly indicates the sources of information and inherent assumptions or uncertainties, and will strive for transparency and public accessibility of the information. The intent is to build, maintain, and share spatially-explicit information on conservation mechanisms to serve as a basis for conservation planning and decision making.

As a group the Parties will review annually the accomplishments, objectives, capacity, and needs of the collaboration in order to determine whether the Parties are most effectively working to the purpose of the MOU.

The Parties will:

1. Recognize the unique and valuable role each Party brings to the MOU.
2. Identify broad landscape practices and mechanisms that support conservation and restoration of natural and cultural resources in Puerto Rico's public and private lands.

3. Promote and facilitate data sharing, communication and collaborative work among agencies and organizations.
4. Support the development of multi-agency's guidelines (protocol) for data compilation, sharing, storage and systematic update.
5. Support the development of policies and decision making process with the best available information and science.
6. Work closely with the CLCC PA-CAT to refine goals and develop and deliver expected products resulting from the MOU.
7. Designate a Point of Contact and others as necessary to actively participate in the PA-CAT technical team - and who may provide technical guidance during the decision making process and may participate in, conference calls and meetings; provide technical expertise; provide and review data; communicate new information produced, and educate others as to value of this information in conservation or other land use planning.
8. Provide leadership for the planning, implementation and monitoring of projects developed to achieve the goals of the MOU.

VI. Modification of Agreement

This MOU constitutes the full, complete, and entire agreement between the parties hereto. No modification or amendment of this MOU shall be binding on either party unless such modification or amendment shall be in writing executed in duplicate by both parties hereto, attached to this MOU, and incorporated in and by reference made a part of this MOU.

VII. Termination of Agreement

Any party to this MOU may withdraw with a 60-day written notice. Such withdrawal shall be effective 60-days from the date such written notice is provided to the other parties to the agreement. In the event of termination by one or more of the parties, the other parties may initiate a new MOU between them if they agree that is necessary for the normal and efficient operation of the PA-CAT.

VIII. Terms and Conditions

A. This MOU will be in effect for a period of five (5) years from the date on which the last Party affixed its signature hereto.

B. This MOU is not intended to, and does not create any right, benefit, or trust, responsibility, substantive or procedural, enforceable at law or equity, by any party against the United States, its agencies, its officers, or any person.

C. This MOU is not intended to, and does not create any right, benefit, or trust, responsibility, substantive or procedural, enforceable at law or equity, by any party against the Commonwealth of Puerto Rico, its agencies, its officers, or any person.

D. This MOU does not affect or modify existing regulations or agency responsibilities and authorities. It specifically does not commit any agency to activities beyond the scope of its mission and authorities under its organic statutes.

E. The Parties will handle their own activities and utilize their own resources, including expenditures of their own funds, in pursuing the purposes of this MOU. Each party will carry out its separate activities in a coordinated and mutually beneficial manner.

F. This MOU is neither a fiscal nor a funds obligation document. Nothing in this agreement may be construed to obligate the Parties to any current or future expenditure of resources in advance of the availability of appropriations from Congress. Any endeavor involving reimbursement or contribution of funds between the parties to this MOU will be handled in accordance to applicable regulations and procedures, including those for federal government procurement and printing. Such endeavor will be outlined in separate agreements that shall be made in writing by representatives of the parties and shall be independently authorized in accordance with appropriate statutory authority. This MOU does not provide such authority.

G. All activities and programs, conducted under this MOU shall be in compliance with the nondiscrimination provisions contained in Titles VI and VII of the Civil Rights Act of 1964, as amended; Civil Rights Restoration Act of 1987 (Public Law 100-250); and other nondiscrimination statutes: namely, Section 504 of the Rehabilitation Act of 1973, Title IX of the Education Amendment of 1972, and the Age Discrimination Act of 1975. They will also be accordance with regulations of the Secretary of Agriculture (7 C.F.R.15, Subparts A & B), which provide that no person in the United States shall on the grounds of race, color, national origin, age, sex, religion, marital status, or handicap be excluded from participation in, be denied the benefits of, or otherwise be subjected to discrimination under any program or activity receiving Federal financial assistance from USDA or any agency thereof.

H. All activities conducted under this MOU shall be in compliance with the Drug-Free Workplace Act of 1988 (Public Law 100-690, Title V, Subtitle D).

I. This MOU in no way restricts the parties from working together or participating in similar activities with other public or private agencies, organizations, and individuals.

J. Any public notices or press releases issued by any of the parties with respect to this MOU or any related activities shall be subject to review and approval, in advance, by all parties to this agreement.

K. No member of, or delegate to Congress, or resident Commissioner, shall be admitted to any share or part of this agreement, or to any benefit that may arise from, but these provisions shall not be construed to extend to this agreement if made with a corporation for its general benefits.

L. All parties agree that neither party is an agent of the other, nor authorized to enter into business negotiations, agreements, or otherwise make commitments on behalf of the other and further, neither party shall be bound by the acts of the other, unless any such acts or commitments are expressly authorized in a prior written agreement signed by an officer or authorized representative of each party.

M. It is agreed by the parties hereto that, in the performance of this MOU, employees or agents of each respective party are not to be considered employees of the other party or parties.

N. The participation of each party to this agreement in activities conducted pursuant to this MOU is not intended to place either party or its representatives in a position of incurring tort liability arising from an action of the other party. Each party is responsible for any injury or property damage to third parties caused by negligence of its own officers, directors, or employees acting within the scope of their employment/official duty subject to such limitation as may be prescribed by applicable laws. Specifically, tort liability arising from negligent or wrongful acts or omissions of Service employees acting within the scope of employment shall be adjudicated pursuant to the Federal Tort Claims 28 U.S.C. Section 2671 et seq., the Federal Employees Compensation Act, U.S.C. Section 8101 et seq., or such other federal legal authority as may be pertinent. Likewise, tort liability arising from negligent or wrongful acts or omissions of officers, directors, or employees from non-federal agencies and/or non-governmental organizations or entities while acting within the scope of official duty shall be governed by the provisions of the laws of the Commonwealth of Puerto Rico.

O. The parties agree to implement the provisions of this MOU to the extent personnel are available and budgets allow.

P. Nothing in the MOU is intended to supersede any laws, regulations, or directives by which the parties must legally abide.

Q. Any information furnished to federal agencies under this agreement is subject to the Freedom Information Act (5 U.S. C. 552).

R. All parties will ensure that its employees have the proper training and certification required to conduct activities under this MOU.

S. Nothing in this agreement may be interpreted to imply that the United States, the Commonwealth, the United States Department of the Interior, the Fish and Wildlife Service, the United States Department of the Agriculture or the U.S. Forest Service International Institute of Tropical Forestry, Para la Naturaleza, the Puerto Rico Planning Board, and the Puerto Rico Department of Natural and Environmental Resources endorses any product, service or policy of Bahía Beach Resort and Golf Club and Alma de Bahía Foundation. Bahía Beach Resort and Golf Club and Alma de Bahía Foundation will not take any action or make any statement that suggests or implies such an endorsement.

T. Use of Logos: The use of Logos by any of the parties on any document, published media (such as Web page), printed publication, or audiovisual production requires prior written approval by the corresponding parties. The use of the U.S. Forest Service insignia on any published media, such as Web page, printed publication, or audiovisual production, permission must be granted from the U.S. Forest Service's Office of Communication. A written request must be submitted and approval granted in writing by the Office of Communications (Washington Office) prior to use of the insignia.

U. This agreement is subject to the provisions contained in the Department of Interior, Environment, and Related Agencies Appropriations Act, 2012, P.L. No. 112-74, Division E, Section 433 and 434 regarding corporate felony convictions and corporate federal tax delinquencies. Accordingly, by entering into this agreement party acknowledges that it: 1) does not have a tax delinquency, meaning that it is not subject to any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability, and (2) has not been convicted (or had an officer or agent acting on its behalf convicted) of a felony criminal violation under any Federal law within 24 months preceding the agreement, unless a suspending and debarring official of the United States Department of Agriculture has considered suspension or debarment is not necessary to protect the interests of the Government. If party fails to comply with these provisions, the U.S. Forest Service will annul the agreement and may recover any funds party has expended in violation of sections 433 and 434.

V. In accordance with Executive Order (EO) 13513, "Federal Leadership on Reducing Text Messaging While Driving," any and all text messaging by Federal employees is banned: a) while driving a Government owned vehicle (GOV) or driving a privately owned vehicle (POV) while on official Government business; or b) using any electronic equipment supplied by the Government when driving any vehicle at any time. All cooperators, their employees, volunteers,

and contractors are encouraged to adopt and enforce policies that ban text messaging when driving company owned, leased or rented vehicles, POVs or GOVs when driving while on official Government business or when performing any work for or on behalf of the Government.

W. Parties shall immediately inform the U.S. Forest Service if they or any of their principals are presently excluded, debarred, or suspended from entering into covered transactions with the federal government according to the terms of 2 CFR 180. Additional, should parties or any of their principals receive a transmittal letter or other official Federal notice of debarment or suspension, then they shall notify the U.S. Forest Service without undue delay. This applies whether the exclusion, debarment, or suspension is voluntary or involuntary.

X. Each signatory will provide within 30 days of the last signature, contact information about principal point of contacts for this MOU (i.e., name, phone, and email).

IX. Approval

IN WITNESS WHEREOF, the parties have caused this MOU to be executed by an authorized official on the date and year set forth below their signature:

Carmen R. Guerrero-Pérez
Secretary
Puerto Rico Department of Natural and Environmental Resources

Date APRIL 19, 2016

Ariel E. Lugo
Director
US Forest Service-IITF

Date APRIL 19, 2016

Fernando Lloveras San Miguel
President
Para la Naturaleza

Date APRIL 19, 2016

Leopoldo Miranda
Assistant Regional Director
Southeastern US, Puerto Rico & US Virgin Islands
U.S. Fish and Wildlife Service

Date APRIL 19, 2016

Luis García Pelatti
President
Puerto Rico Planning Board

Date APRIL 19, 2016

Martin Smith
President
Bahía Beach Resort & Golf Club and Alma de Bahía Foundation

Date APRIL 19, 2016

Appendix D. Definition of protected area, according to the Convention on Biological Diversity and IUCN, and examples of definitions adopted by different countries

Definitions	Source
International	
A geographically defined area which is designated, regulated and managed to achieve specific conservation objectives	Convention on Biological Diversity
A clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values	International Union for the Conservation of Nature (IUCN)
National	
Areas dedicated to the preservation of biological diversity and to other natural, recreation and cultural uses, managed for these purposes through legal or other effective means	United States, Protected Areas Database of the U.S. (PAD-US)
Portion of land and/or sea specially dedicated to the protection and maintenance of elements with significant biodiversity, as well as associated natural and cultural resources managed though legal or other effective means	Dominican Republic, Law #202
Areas of the national territory owned by the government, NGOs, or private organizations, legally established for conservation, fauna and flora restoration, sustainable management and, also for their genetic, historic, scenic, recreational, and archeological values, established in order to preserve the naturalness of biotic communities and unique geomorphologic features.	El Salvador, Law #233
Zones of the territory where the Nation has sovereignty and jurisdiction, where original environments have not suffered significant modifications by humans and/or need to be preserved and restored.	Mexico, Law #30
Recognized and designated continental and/or marine spaces of the national territory, including their categories and zonings, in order to conserve the biological diversity and associated cultural, scenic, and scientific values, as well as their contribution for the sustainable development of the country.	Peru, Law #26834
Group of natural areas in the national territory, including continental, insular and marine areas with representative ecosystems, that because of their unique environmental, historic, cultural, scenic or and value for research, deserve to be preserved like national heritage, even though they have been partially modified by humans.	Uruguay, Law #17234

Appendix E. Protected Areas 2018

Name in English	Name in Spanish	Administrator	Date Designated	Local Designation Category	Terrestrial/ Marine	Area (acres)	Area (km2)
Forest Legacy Program acquisition - Finca A. Matos	Adquisición del Programa de Legado Forestal - Finca A. Matos	Department of Nature and Environmental Resources (DNER)	2000	Forest Legacy Program acquisition	Terrestrial	80.79	0.33
Forest Legacy Program acquisition - Finca Banco Popular de PR	Adquisición del Programa de Legado Forestal - Finca Banco Popular de PR	Department of Nature and Environmental Resources (DNER)	2001	Forest Legacy Program acquisition	Terrestrial	95.18	0.39
Forest Legacy Program acquisition - Finca Busigó Maricao	Adquisición del Programa de Legado Forestal - Finca Busigó Maricao	Department of Nature and Environmental Resources (DNER)	2000	Forest Legacy Program acquisition	Terrestrial	264.40	1.07
Forest Legacy Program acquisition - Finca CDK1-Guillermety	Adquisición del Programa de Legado Forestal - Finca CDK1-Guillermety	Department of Nature and Environmental Resources (DNER)	2001	Forest Legacy Program acquisition	Terrestrial	445.44	1.80
Forest Legacy Program acquisition - Finca CDK2-Negrón	Adquisición del Programa de Legado Forestal - Finca CDK2-Negrón	Department of Nature and Environmental Resources (DNER)	2001	Forest Legacy Program acquisition	Terrestrial	73.81	0.30
Forest Legacy Program acquisition - Finca El Pitirre Inc. #16	Adquisición del Programa de Legado Forestal - Finca El Pitirre Inc. #16	Department of Nature and Environmental Resources (DNER)	2000	Forest Legacy Program acquisition	Terrestrial	2.22	0.01
Forest Legacy Program acquisition - Finca Fraticelli Guilarte	Adquisición del Programa de Legado Forestal - Finca Fraticelli Guilarte	Department of Nature and Environmental Resources (DNER)	2000	Forest Legacy Program acquisition	Terrestrial	36.52	0.15
Forest Legacy Program acquisition - Finca Gripiñas Toro Negro	Adquisición del Programa de Legado Forestal - Finca Gripiñas Toro Negro	Department of Nature and Environmental Resources (DNER)	2000	Forest Legacy Program acquisition	Terrestrial	489.93	1.98
Forest Legacy Program acquisition - Finca Hernández Dairy (3)	Adquisición del Programa de Legado Forestal - Finca Hernández Dairy (3)	Department of Nature and Environmental Resources (DNER)	2003	Forest Legacy Program acquisition	Terrestrial	78.79	0.32
Forest Legacy Program acquisition - Finca J. Gutiérrez	Adquisición del Programa de Legado Forestal - Finca J. Gutiérrez	Department of Nature and Environmental Resources (DNER)	2006	Forest Legacy Program acquisition	Terrestrial	15.67	0.06
Forest Legacy Program acquisition - Finca La Nuez Guilarte	Adquisición del Programa de Legado Forestal - Finca La Nuez Guilarte	Department of Nature and Environmental Resources (DNER)	1999	Forest Legacy Program acquisition	Terrestrial	75.45	0.31
Forest Legacy Program acquisition - Finca M. Rodríguez	Adquisición del Programa de Legado Forestal - Finca M. Rodriguez	Department of Nature and Environmental Resources (DNER)	2001	Forest Legacy Program acquisition	Terrestrial	151.55	0.61
Forest Legacy Program acquisition - Finca Mikasobe Carite	Adquisición del Programa de Legado Forestal - Finca Mikasobe Carite	Department of Nature and Environmental Resources (DNER)	2000	Forest Legacy Program acquisition	Terrestrial	57.39	0.23
Forest Legacy Program acquisition - Finca Mogotes Guilarte	Adquisición del Programa de Legado Forestal - Finca Mogotes Guilarte	Department of Nature and Environmental Resources (DNER)	1999	Forest Legacy Program acquisition	Terrestrial	219.34	0.89

Name in English	Name in Spanish	Administrator	Date Designated	Local Designation Category	Terrestrial/ Marine	Area (acres)	Area (km2)
Forest Legacy Program acquisition - Finca North Inv. & Prop., Inc.	Adquisición del Programa de Legado Forestal - Finca North Inv. & Prop., Inc.	Department of Nature and Environmental Resources (DNER)	2001	Forest Legacy Program acquisition	Terrestrial	137.95	0.56
Forest Legacy Program acquisition - Finca P. Hernández	Adquisición del Programa de Legado Forestal - Finca P. Hernández	Department of Nature and Environmental Resources (DNER)	1999	Forest Legacy Program acquisition	Terrestrial	64.55	0.26
Forest Legacy Program acquisition - Finca San Andrés Dairy	Adquisición del Programa de Legado Forestal - Finca San Andrés Dairy	Department of Nature and Environmental Resources (DNER)	2002	Forest Legacy Program acquisition	Terrestrial	73.60	0.30
Forest Legacy Program acquisition - Finca Sucesión Bauzá	Adquisición del Programa de Legado Forestal - Finca Sucesión Bauzá	Department of Nature and Environmental Resources (DNER)	2003	Forest Legacy Program acquisition	Terrestrial	446.97	1.81
Forest Legacy Program acquisition - Finca Sucesión López	Adquisición del Programa de Legado Forestal - Finca Sucesión López	Department of Nature and Environmental Resources (DNER)	2000	Forest Legacy Program acquisition	Terrestrial	141.91	0.57
Antiguo Acueducto del río Piedras / San Juan Ecological Corridor	Antiguo Acueducto del río Piedras/ CESJ	Para la Naturaleza	2006	Protected Natural Area - Ecological Corridor (Área Natural Protegida - Corredor Ecológico)	Terrestrial	8.80	0.04
Cupey Arboretum/San Juan Ecological Corridor	Arboretum de Cupey/ CESJ	Department of Nature and Environmental Resources (DNER)	2003	Urban Forest - Ecological Corridor (Bosque Urbano - Corredor Ecológico)	Terrestrial	136.41	0.55
Guayama Research Area	Área de Investigación Guayama	USDA Forest Service	2013	Research Area (Área de Investigación)	Terrestrial	329.69	1.33
Manatí Research Area	Área de Investigación Manatí	USDA Forest Service	2013	Research Area (Área de Investigación)	Terrestrial	89.63	0.36
Dorado Pterocarpus Forest Protected Natural Area	Área Natural Protegida Bosque de Pterocarpus de Dorado	Para la Naturaleza	1995	Protected Natural Area (Area Natural Protegida)	Terrestrial	27.49	0.11
Cañón Las Bocas Protected Natural Area	Área Natural Protegida Cañón Las Bocas	Department of Nature and Environmental Resources (DNER)	2015	Protected Natural Area (Area Natural Protegida)	Terrestrial	71.56	0.29
Cañón San Cristóbal Protected Natural Area	Área Natural Protegida Cañón San Cristóbal	Para la Naturaleza	1974	Protected Natural Area (Area Natural Protegida)	Terrestrial	1571.71	6.36
Cerro Felíz Protected Natural Area	Área Natural Protegida Cerro Felíz	Para la Naturaleza	2018	Protected Natural Area (Area Natural Protegida)	Terrestrial	50.70	0.21
Cerro La Tuna Protected Natural Area	Área Natural Protegida Cerro La Tuna	Para la Naturaleza	2015	Protected Natural Area (Area Natural Protegida)	Terrestrial	173.22	0.70
Cerro Las Mesas Protected Natural Area	Área Natural Protegida Cerro Las Mesas	Para la Naturaleza	1999	Protected Natural Area (Area Natural Protegida)	Terrestrial	14.60	0.06
Cordillera Sabana Alta Protected Natural Area	Área Natural Protegida Cordillera Sabana Alta	Para la Naturaleza	2015	Protected Natural Area (Area Natural Protegida)	Terrestrial	46.31	0.19

Appendix E. Protected Areas 2018

Name in English	Name in Spanish	Administrator	Date Designated	Local Designation Category	Terrestrial/ Marine	Area (acres)	Area (km2)
Cuevas El Convento Protected Natural Area	Área Natural Protegida Cuevas El Convento	Para la Naturaleza	2004	Protected Natural Area (Area Natural Protegida)	Terrestrial	879.43	3.56
Culebras Protected Natural Area	Área Natural Protegida Culebras	Para la Naturaleza	2012	Protected Natural Area (Area Natural Protegida)	Terrestrial	25.03	0.10
El Conuco Protected Natural Area	Área Natural Protegida El Conuco	Para la Naturaleza	2012	Protected Natural Area (Area Natural Protegida)	Terrestrial	35.82	0.14
El Conuco Protected Natural Area	Área Natural Protegida El Conuco	Para la Naturaleza	2012-2018	Protected Natural Area (Area Natural Protegida)	Terrestrial	121.84	0.49
Freddie Ramírez Protected Natural Area	Área Natural Protegida Freddie Ramírez	Para la Naturaleza	2016	Protected Natural Area (Area Natural Protegida)	Terrestrial	174.32	0.71
Hacienda Buena Vista	Área Natural Protegida	Para la Naturaleza	1985	Protected Natural	Terrestrial	626.54	2.54
Hacienda Lago Protected Natural Area	Área Natural Protegida Hacienda Lago	Para la Naturaleza	2016	Protected Natural Area (Area Natural Protegida)	Terrestrial	57.49	0.23
Hacienda Margarita Protected Natural Area	Área Natural Protegida Hacienda Margarita	Para la Naturaleza	2018	Protected Natural Area (Area Natural Protegida)	Terrestrial	1398.68	5.66
Hacienda Pellejas Protected Natural Area	Área Natural Protegida Hacienda Pellejas	Para la Naturaleza	2016	Protected Natural Area (Area Natural Protegida)	Terrestrial	1331.08	5.39
Hermanas Sendra Protected Natural Area	Área Natural Protegida Hermanas Sendra	Para la Naturaleza	2011	Protected Natural Area (Area Natural Protegida)	Terrestrial	12.97	0.05
Jájome Protected Natural Area	Área Natural Protegida Jájome	Para la Naturaleza	2013	Protected Natural Area (Area Natural Protegida)	Terrestrial	658.34	2.66
Jorge Sotomayor del Toro Protected Natural Area	Área Natural Protegida Jorge Sotomayor del Toro	Para la Naturaleza	1975	Protected Natural Area (Area Natural Protegida)	Terrestrial	39.84	0.16
La Pitahaya Protected Natural Area	Área Natural Protegida La Pitahaya	Para la Naturaleza	2015	Protected Natural Area (Area Natural Protegida)	Terrestrial	97.81	0.40
La Robleda Protected Natural Area	Área Natural Protegida La Robleda	Para la Naturaleza	2012	Protected Natural Area (Area Natural Protegida)	Terrestrial	249.69	1.01
Los Frailes Protected Natural Area	Área Natural Protegida Los Frailes	Para la Naturaleza	2006	Protected Natural Area (Area Natural Protegida)	Terrestrial	673.51	2.73
Los Llanos Protected Natural Area	Área Natural Protegida Los Llanos	Para la Naturaleza	2015	Protected Natural Area (Area Natural Protegida)	Terrestrial	116.99	0.47
Luz Martínez de Benítez Protected Natural Area	Área Natural Protegida Luz Martínez de Benítez	Para la Naturaleza	2013	Protected Natural Area (Area Natural Protegida)	Terrestrial	126.08	0.51
Marín Alto Protected Natural Area	Área Natural Protegida Marín Alto	Para la Naturaleza	2012	Protected Natural Area (Area Natural Protegida)	Terrestrial	128.20	0.52
Medio Mundo y Daguao Protected Natural Area	Área Natural Protegida Medio Mundo y Daguao	Para la Naturaleza	2008	Protected Natural Area (Area Natural Protegida)	Terrestrial	3381.32	13.68
Ojo de Agua Protected Natural Area	Área Natural Protegida Ojo de Agua	Para la Naturaleza	2014	Protected Natural Area (Area Natural Protegida)	Terrestrial	1305.84	5.28
Paraíso de las Lunas Protected Natural Area	Área Natural Protegida Paraíso de las Lunas	Para la Naturaleza	2009	Protected Natural Area (Area Natural Protegida)	Terrestrial	13.01	0.05
Punta Cabullones Protected Natural Area	Área Natural Protegida Punta Cabullones	Para la Naturaleza	2013	Protected Natural Area (Area Natural Protegida)	Terrestrial	530.84	2.15
Punta Pozuelo Protected Natural Area	Área Natural Protegida Punta Pozuelo	Para la Naturaleza	2015	Protected Natural Area (Area Natural Protegida)	Terrestrial	124.58	0.50
Quebrada Janer Protected Natural Area	Área Natural Protegida Quebrada Janer	Para la Naturaleza	2018	Protected Natural Area (Area Natural Protegida)	Terrestrial	141.76	0.57
Río Bairoa Protected Natural Area	Área Natural Protegida Río Bairoa	Para la Naturaleza	2015	Protected Natural Area (Area Natural Protegida)	Terrestrial	518.55	2.10
Río Encantado Protected Natural Area	Área Natural Protegida Río Encantado	Para la Naturaleza	2000	Protected Natural Area (Area Natural Protegida)	Terrestrial	2292.44	9.28
Río Guaynabo Protected Natural Area	Área Natural Protegida Río Guaynabo	Para la Naturaleza	2006	Protected Natural Area (Area Natural Protegida)	Terrestrial	20.71	0.08
Río Jacaboa Protected Natural Area	Área Natural Protegida Río Jacaboa	Para la Naturaleza	2018	Protected Natural Area (Area Natural Protegida)	Terrestrial	389.31	1.58
Río Maricao Protected Natural Area	Área Natural Protegida Río Maricao	Para la Naturaleza	2004	Protected Natural Area (Area Natural Protegida)	Terrestrial	145.06	0.59
Río Sana Muerto Protected Natural Area	Área Natural Protegida Río Sana Muerto	Para la Naturaleza	2013	Protected Natural Area (Area Natural Protegida)	Terrestrial	107.76	0.44
Río Toa Vaca Protected Natural Area	Área Natural Protegida Río Toa Vaca	Para la Naturaleza	2016	Protected Natural Area (Area Natural Protegida)	Terrestrial	291.46	1.18
Río Toro Negro Protected Natural Area	Área Natural Protegida Río Toro Negro	Para la Naturaleza	2013	Protected Natural Area (Area Natural Protegida)	Terrestrial	217.01	0.88
San Juan Park Protected Natural Area	Área Natural Protegida San Juan Park	Para la Naturaleza	2012	Protected Natural Area (Area Natural Protegida)	Terrestrial	26.22	0.11
Shapiro Protected Natural Area	Área Natural Protegida Shapiro	Para la Naturaleza	1999	Protected Natural Area (Area Natural Protegida)	Terrestrial	5.55	0.02
Sierra La Pandura Protected Natural Area	Área Natural Protegida Sierra La Pandura	Para la Naturaleza	2004	Protected Natural Area (Area Natural Protegida)	Terrestrial	333.51	1.35
Sierra La Pandura Protected Natural Area	Área Natural Protegida Sierra la Pandura	Para la Naturaleza	2004-2005	Protected Natural Area (Area Natural Protegida)	Terrestrial	58.54	0.24
Ulpiano Casal Protected Natural Area	Área Natural Protegida Ulpiano Casal	Para la Naturaleza	2012	Protected Natural Area (Area Natural Protegida)	Terrestrial	340.46	1.38
Aguirre Commonwealth Forest	Bosque Estatal de Aguirre	Department of Nature and Environmental Resources (DNER)	1908	Commonwealth Forest (Bosque Estatal)	Terrestrial	1054.14	4.27
Boquerón Commonwealth Forest	Bosque Estatal de Boquerón	Department of Nature and Environmental Resources (DNER)	1918	Commonwealth Forest (Bosque Estatal)	Terrestrial	2218.06	8.98

Appendix E. Protected Areas 2018

Name in English	Name in Spanish	Administrator	Date Designated	Local Designation Category	Terrestrial/ Marine	Area (acres)	Area (km2)
Boquerón Commonwealth Forest	Bosque Estatal de Boquerón	Department of Nature and Environmental Resources (DNER)	1974	Commonwealth Forest (Bosque Estatal)	Terrestrial	183.50	0.74
Cambalache Commonwealth Forest	Bosque Estatal de Cambalache	Department of Nature and Environmental Resources (DNER)	1943	Commonwealth Forest (Bosque Estatal)	Terrestrial	1558.63	6.31
Carite Commonwealth Forest	Bosque Estatal de Carite	Department of Nature and Environmental Resources (DNER)	1935	Commonwealth Forest (Bosque Estatal)	Terrestrial	6581.37	26.63
Ceiba Commonwealth Forest	Bosque Estatal de Ceiba	Department of Nature and Environmental Resources (DNER)	1979	Commonwealth Forest (Bosque Estatal)	Terrestrial	294.47	1.19
Cerrillos Commonwealth Forest / Cerrillos Wildlife Refuge	Bosque Estatal de Cerrillos / Refugio de Vida Silvestre Embalse Cerrillos	Department of Nature and Environmental Resources (DNER)	1996	Commonwealth Forest - Wildlife Refuge (Bosque Estatal - Refugio de Vida Silvestre)	Terrestrial	542.89	2.20
Guajataca Commonwealth Forest	Bosque Estatal de Guajataca	Department of Nature and Environmental Resources (DNER)	1935	Commonwealth Forest (Bosque Estatal)	Terrestrial	2359.14	9.55
Guánica Commonwealth Forest	Bosque Estatal de Guánica	Department of Nature and Environmental Resources (DNER)	1919	Commonwealth Forest - Biosphere Reserve (Bosque Estatal - Reserva de la Biosfera)	Terrestrial	9152.48	37.04
Maricao Commonwealth Forest	Bosque Estatal de Maricao	Department of Nature and Environmental Resources (DNER)	1919	Commonwealth Forest (Bosque Estatal)	Terrestrial	9874.82	39.96
Monte Choca Commonwealth Forest	Bosque Estatal de Monte Choca	Co-management: DNER and Club Cívico Ambiental de Palos Blancos	2003	Commonwealth Forest (Bosque Estatal)	Terrestrial	245.69	0.99
Monte Guilarte Estat Forest	Bosque Estatal de Monte Guilarte	Department of Nature and Environmental Resources (DNER)	1935	Commonwealth Forest (Bosque Estatal)	Terrestrial	4032.85	16.32
Piñones Commonwealth Forest	Bosque Estatal de Piñones	Department of Nature and Environmental Resources (DNER)	1919	Commonwealth Forest - Nature Reserve (Bosque Estatal - Reserva Natural)	Terrestrial	2202.06	8.91
Río Abajo Commonwealth Forest	Bosque Estatal de Río Abajo	Department of Nature and Environmental Resources (DNER)	1943	Commonwealth Forest (Bosque Estatal)	Terrestrial	6240.98	25.26
Susúa Commonwealth Forest	Bosque Estatal de Susúa	Department of Nature and Environmental Resources (DNER)	1935	Commonwealth Forest (Bosque Estatal)	Terrestrial	3207.20	12.98
Toro Negro Commonwealth Forest	Bosque Estatal de Toro Negro	Department of Nature and Environmental Resources (DNER)	1961	Commonwealth Forest (Bosque Estatal)	Terrestrial	6805.00	27.54
Tres Picachos Commonwealth Forest	Bosque Estatal de Tres Picachos	Department of Nature and Environmental Resources (DNER)	1999	Commonwealth Forest (Bosque Estatal)	Terrestrial	4767.95	19.30
Vega Commonwealth Forest	Bosque Estatal de Vega	Department of Nature and Environmental Resources (DNER)	1951	Commonwealth Forest (Bosque Estatal)	Terrestrial	1189.88	4.82
Bosque del Pueblo de Adjuntas Commonwealth Forest	Bosque Estatal del Pueblo de Adjuntas	Co-management: DNER and Taller de Arte y Cultura de Adjuntas	1995	Commonwealth Forest (Bosque Estatal)	Terrestrial	908.76	3.68
La Olimpia Commonwealth Forest	Bosque Estatal La Olimpia	Co-management: DNER and Taller de Arte y Cultura de Adjuntas	2004	Commonwealth Forest (Bosque Estatal)	Terrestrial	458.38	1.85
San Patricio Commonwealth Forest	Bosque Estatal Urbano de San Patricio	Department of Nature and Environmental Resources (DNER)	1998	Commonwealth Forest (Bosque Estatal)	Terrestrial	98.71	0.40
Bosque Urbano del Nuevo Milenio Commonwealth Forest	Bosque Estatal Urbano del Nuevo Milenio	Department of Nature and Environmental Resources (DNER)	2003	Commonwealth Forest (Bosque Estatal)	Terrestrial	57.22	0.23
Bosque Urbano del Nuevo Milenio Commonwealth Forest / San Juan Ecological Corridor	Bosque Estatal Urbano del Nuevo Milenio/ CESJ	Department of Nature and Environmental Resources (DNER)	2003	Urban Forest - Ecological Corridor (Bosque Urbano - Corredor Ecológico)	Terrestrial	419.16	1.70
Los Capuchinos Forest/ San Juan Ecological Corridor	Bosque Los Capuchinos/ CESJ	Luis Muñoz Marín Foundation	2003	Urban Forest - Ecological Corridor (Bosque Urbano - Corredor Ecológico)	Terrestrial	184.35	0.75
El Yunque National Forest	Bosque Nacional El Yunque	USDA Forest Service	1903	National Forest (Bosque Nacional)	Terrestrial	28519.95	115.42
Doña Inés Mendoza Urban Forest /San Juan Ecological Corridor	Bosque Urbano Doña Inés Mendoza/ CESJ	Luis Muñoz Marín Foundation	2003	Urban Forest - Ecological Corridor (Bosque Urbano - Corredor Ecológico)	Terrestrial	20.82	0.08
Río Camuy Caves	Cavernas del Río Camuy	Puerto Rico National Parks Program	1986	National Park (Parque Nacional)	Terrestrial	257.98	1.04
San Juan Ecological Corridor (SJEC)	Corredor Ecologico de San Juan (CESJ)	Department of Nature and Environmental Resources (DNER)	2003	Ecological Corridor (Corredor Ecológico)	Terrestrial	66.95	0.27
El Tallonal	El Tallonal	Citizens of the Karst	2005	Private Nature Reserve (Reserva Natural Privada)	Terrestrial	257.15	1.04
Marine Extent of Vieques Bioluminescent Bays Nature Reserve	Extensión Marina de la R.N. Bahía Bioluminiscente de Vieques	Department of Nature and Environmental Resources (DNER)	1989	Marine Extent (Extensión Marina)	Marine	19979.20	80.85
Marine Extent of Caño La Boquilla Nature Reserve	Extensión Marina de la R.N. Caño La Boquilla	Department of Nature and Environmental Resources (DNER)	2002	Marine Extent (Extensión Marina)	Marine	26145.16	105.81

Appendix E. Protected Areas 2018

Name in English	Name in Spanish	Administrator	Date Designated	Local Designation Category	Terrestrial/ Marine	Area (acres)	Area (km2)
Marine Extent ot the Northeast Ecological Corridor Nature Reserve	Extensión Marina de la R.N. Corredor Ecológico del Noreste	Department of Nature and Environmental Resources (DNER)	2015	Marine Extent (Extensión Marina)	Marine	65014.49	263.10
Marine Extent of Cueva del Indio Nature Reserve	Extensión Marina de la R.N. Cueva del Indio	Department of Nature and Environmental Resources (DNER)	1992	Marine Extent (Extensión Marina)	Marine	3842.42	15.55
Marine Extent of Mona and Monito Islands Nature Reserve	Extensión Marina de la R.N. de Isla de Mona y Monito	Department of Nature and Environmental Resources (DNER)	1986	Marine Extent (Extensión Marina)	Marine	373795.40	1512.70
Marine Extent of the Río Espíritu Santo Nature Reserve	Extensión Marina de la R.N. del Río Espíritu Santo	Department of Nature and Environmental Resources (DNER)	1985	Marine Extent (Extensión Marina)	Marine	29074.64	117.66
Marine Extent of Finca Belvedere Nature Reserve	Extensión Marina de la R.N. Finca Belvedere	Department of Nature and Environmental Resources (DNER)	2003	Marine Extent (Extensión Marina)	Marine	9863.99	39.92
Marine Extent of Hacienda La Esperanza Nature Reserve	Extensión Marina de la R.N. Hacienda La Esperanza	Department of Nature and Environmental Resources (DNER)	1987	Marine Extent (Extensión Marina)	Marine	12506.01	50.61
Marine Extent of Isla Caja de Muertos Nature Reserve	Extensión Marina de la R.N. Isla Caja de Muertos	Department of Nature and Environmental Resources (DNER)	1980	Marine Extent (Extensión Marina)	Marine	13622.44	55.13
Marine Extent of La Parguera Nature Reserve	Extensión Marina de la R.N. La Parguera	Department of Nature and Environmental Resources (DNER)	1986	Marine Extent (Extensión Marina)	Marine	80026.93	323.86
Marine Extent of Las Cabezas de San Juan Nature Reserve	Extensión Marina de la R.N. Las Cabezas de San Juan	Department of Nature and Environmental Resources (DNER)	1986	Marine Extent (Extensión Marina)	Marine	65951.50	266.90
Marine Extent of Pantano de Cibuco Nature Reserve	Extensión Marina de la R.N. Pantano de Cibuco	Department of Nature and Environmental Resources (DNER)	1993	Marine Extent (Extensión Marina)	Marine	4923.63	19.93
Marine Extent of Playa Grande El Paraíso Nature Reserve	Extensión Marina de la R.N. Playa Grande El Paraíso	Department of Nature and Environmental Resources (DNER)	2016	Marine Extent (Extensión Marina)	Marine	16036.37	64.90
Marine Extent of Punta Cucharas Nature Reserve	Extensión Marina de la R.N. Punta Cucharas	Department of Nature and Environmental Resources (DNER)	2008	Marine Extent (Extensión Marina)	Marine	3413.89	13.82
Marine Extent of Punta Guaniquilla Nature Reserve	Extensión Marina de la R.N. Punta Guaniquilla	Department of Nature and Environmental Resources (DNER)	2002	Marine Extent (Extensión Marina)	Marine	2124.66	8.60
Marine Extent of Punta Petrona Nature Reserve	Extensión Marina de la R.N. Punta Petrona	Department of Nature and Environmental Resources (DNER)	1979	Marine Extent (Extensión Marina)	Marine	7638.78	30.91
Marine Extent of Punta Yeguas Nature Reserve	Extensión Marina de la R.N. Punta Yeguas	Department of Nature and Environmental Resources (DNER)	2000	Marine Extent (Extensión Marina)	Marine	64848.13	262.43
Marine Extent of Boquerón Commonwealth Forest	Extensión Marina del Bosque Estatal de Boquerón	Department of Nature and Environmental Resources (DNER)	1998	Marine Extent (Extensión Marina)	Marine	42634.72	172.54
Marine Extent of Guánica Commonwealth Forest	Extensión Marina del Bosque Estatal de Guánica	Department of Nature and Environmental Resources (DNER)	1985	Marine Extent (Extensión Marina)	Marine	3501.11	14.17
Finca El Verde	Finca El Verde	Para la Naturaleza	2006	Protected Natural Area (Area Natural Protegida)	Terrestrial	31.26	0.13
Finca Este/ Iris Alameda Wildlife Refuge in Boquerón/ Boquerón Commonwealth Forest	Finca Este/ RVS Iris Alameda de Boquerón/ BE de Boquerón	Department of Nature and Environmental Resources (DNER)	1995	Wildlife Refuge - Commonwealth Forest (Refugio de Vida Silvestre - Bosque Estatal)	Terrestrial	102.26	0.41
Finca G. Llinás & Co.	Finca G. Llinás & Co.	Department of Nature and Environmental Resources (DNER)	2014	Protected Natural Area (Area Natural Protegida)	Terrestrial	84.65	0.34
Finca Geraldo Colón	Finca Geraldo Colón	Department of Nature and Environmental Resources (DNER)	2010	Protected Natural Area (Area Natural Protegida)	Terrestrial	11.01	0.04
Finca José Santiago	Finca José Santiago	Citizens of the Karst	2010	Nature Reserve (Reserva Natural)	Terrestrial	31.41	0.13
Finca Las Orquídeas	Finca Las Orquídeas	Department of Nature and Environmental Resources (DNER)	2014	Protected Natural Area (Area Natural Protegida)	Terrestrial	384.52	1.56
Finca Luis A. Zayas	Finca Luis A. Zayas	Department of Nature and Environmental Resources (DNER)	2011	Protected Natural Area (Area Natural Protegida)	Terrestrial	71.03	0.29
Finca Mar Sin Barreras/ Iris Alameda Wildlife Refuge in Boquerón / Boquerón Commonwealth Forest	Finca Mar Sin Barreras/ RVS Iris Alameda de Boquerón / BE de Boquerón	Department of Nature and Environmental Resources (DNER)	2007	Wildlife Refuge - Commonwealth Forest (Refugio de Vida Silvestre - Bosque Estatal)	Terrestrial	13.60	0.06
Finca Nolla	Finca Nolla	Department of Nature and Environmental Resources (DNER)	2015	DNER - designation in process	Terrestrial	111.35	0.45
Finca San Salvador Fase I	Finca San Salvador Fase I	Department of Nature and Environmental Resources (DNER)	1989	Protected Natural Area (Area Natural Protegida)	Terrestrial	22.58	0.09
Finca Vizcarrondo	Finca Vizcarrondo	Department of Nature and Environmental Resources (DNER)	2008	Protected Natural Area (Area Natural Protegida)	Terrestrial	205.55	0.83
Botanical Garden of the University of Puerto Rico / San Juan Ecological Corridor	Jardín Botánico de la Universidad de Puerto Rico/ CESJ	University of Puerto Rico	1971	Botanical Garden - Ecological Corridor (Jardin Botanico - Corredor Ecológico)	Terrestrial	330.02	1.34
Las Casas de la Selva	Las Casas de la Selva	Tropic Ventures Education and Research Foundation	1983	Sustainable Forestry & Rainforest Enrichment Project	Terrestrial	855.04	3.46

Appendix E. Protected Areas 2018

Name in English	Name in Spanish	Administrator	Date Designated	Local Designation Category	Terrestrial/ Marine	Area (acres)	Area (km2)
Caguana Indigenous Ceremonial Park	Parque Ceremonial Indígena de Caguana	Institute of Puerto Rican Culture	1965	Ceremonial Park (Parque Ceremonial)	Terrestrial	8.58	0.03
Guajataca Wildlife Refuge	Refugio de Vida Silvestre Embalse Guajataca	Department of Nature and Environmental Resources (DNER)	1982	Wildlife Refuge (Refugio de Vida Silvestre)	Terrestrial	673.20	2.72
La Plata Wildlife Refuge	Refugio de Vida Silvestre Embalse La Plata	Department of Nature and Environmental Resources (DNER)	2004	Wildlife Refuge (Refugio de Vida Silvestre)	Terrestrial	212.32	0.86
Luchetti Wildlife Refuge	Refugio de Vida Silvestre Embalse Luchetti	Department of Nature and Environmental Resources (DNER)	1990	Wildlife Refuge (Refugio de Vida Silvestre)	Terrestrial	231.86	0.94
Iris Alameda Wildlife Refuge in Boquerón / Boquerón Commonwealth Forest	Refugio de Vida Silvestre Iris Alameda de Boquerón / BE de Boquerón	Department of Nature and Environmental Resources (DNER)	1974	Wildlife Refuge - Commonwealth Forest (Refugio de Vida Silvestre - Bosque Estatal)	Terrestrial	576.10	2.33
Cabo Rojo National Wildlife Refuge	Refugio Nacional de Vida Silvestre de Cabo Rojo	US Fish and Wildlife Service (USFWS)	1974	Wildlife Refuge (Refugio de vida silvestre)	Terrestrial	2243.49	9.08
Culebra National Wildlife Refuge	Refugio Nacional de Vida Silvestre de Culebra	US Fish and Wildlife Service (USFWS)	1985	Wildlife Refuge (Refugio de vida silvestre)	Terrestrial	1443.23	5.84
Culebra National Wildlife Refuge/ Culebrita Lighthouse	Refugio Nacional de Vida Silvestre de Culebra/ Faro de Culebrita	Para la Naturaleza	1985	Wildlife Refuge (Refugio de vida silvestre)	Terrestrial	4.50	0.02
Desecheo National Wildlife Refuge	Refugio Nacional de Vida Silvestre de Desecheo	US Fish and Wildlife Service (USFWS)	1976	Wildlife Refuge (Refugio de vida silvestre)	Terrestrial	324.07	1.31
Vieques National Wildlife Refuge	Refugio Nacional de Vida Silvestre de Vieques	US Fish and Wildlife Service (USFWS)	2001	Wildlife Refuge (Refugio de vida silvestre)	Terrestrial	17497.09	70.81
Laguna Cartagena National Wildlife Refuge	Refugio Nacional de Vida Silvestre Laguna Cartagena	US Fish and Wildlife Service (USFWS)	1989	Wildlife Refuge (Refugio de vida silvestre)	Terrestrial	1011.17	4.09
El Buey Natural Wildlife Refuge	Refugio Natural de Vida Silvestre El Buey	Para la Naturaleza	2001	Wildlife Refuge (Refugio de vida silvestre)	Terrestrial	797.36	3.23
Desecheo Island Coastal Waters Marine Reserve	Reserva Marina Aguas Costeras de Isla Desecheo	Department of Nature and Environmental Resources (DNER)	2000	Marine Reserve (Reserva Natural Marina)	Marine	1820.64	7.37
Isla Verde Reef Marine Reserve	Reserva Marina Arrecife de la Isla Verde	Department of Nature and Environmental Resources (DNER)	2014	Marine Reserve (Reserva Natural Marina)	Marine	231.57	0.94
Tres Palmas Marine Reserve	Reserva Marina Tres Palmas	Department of Nature and Environmental Resources (DNER)	2004	Marine Reserve (Reserva Natural Marina)	Marine	219.56	0.89
Jobos Bay National Estuarine Research Reserve	Reserva Nacional de Investigación Estuarina de Bahía de Jobos	Co-management: DNER / NOAA	2000	National Estuarine Research Reserve (Reserva Nacional de Investigación Estuarina)	Terrestrial	1456.28	5.89
Guayama Reef Nature Reserve	Reserva Natural Arrecifes de Guayama	Department of Nature and Environmental Resources (DNER)	1980	Marine Reserve (Reserva Natural Marina)	Marine	1993.42	8.07
Cordillera Reef Nature Reserve	Reserva Natural Arrecifes de La Cordillera	Department of Nature and Environmental Resources (DNER)	1980	Marine Reserve (Reserva Natural Marina)	Marine	24914.67	100.83
Tourmaline Reef Nature Reserve	Reserva Natural Arrecifes de Tourmaline	Department of Nature and Environmental Resources (DNER)	1998	Marine Reserve (Reserva Natural Marina)	Marine	18438.13	74.62
Pterocarpus Forest Nature Reserve	Reserva Natural Bosque Pterocarpus	Para la Naturaleza	1990	Nature Reserve (Reserva Natural)	Terrestrial	874.79	3.54
Canal Luis Peña Nature Reserve	Reserva Natural Canal Luis Peña	Department of Nature and Environmental Resources (DNER)	1999	Marine Reserve (Reserva Natural Marina)	Marine	1555.95	6.30
Caño La Boquilla Nature Reserve	Reserva Natural Caño La Boquilla	Department of Nature and Environmental Resources (DNER)	2002	Nature Reserve (Reserva Natural)	Terrestrial	173.42	0.70
Caño Martín Peña Nature Reserve	Reserva Natural Caño Martín Peña	Department of Nature and Environmental Resources (DNER)	2003	Nature Reserve (Reserva Natural)	Terrestrial	357.45	1.45
Caño Tiburones Nature Reserve	Reserva Natural Caño Tiburones	Department of Nature and Environmental Resources (DNER)	1998	Nature Reserve (Reserva Natural)	Terrestrial	3696.24	14.96
Cayo Ratones Nature Reserve/ Boquerón Commonwealth Forest	Reserva Natural Cayo Ratones/ BE de Boquerón	Department of Nature and Environmental Resources (DNER)	1972	Nature Reserve - Commonwealth Forest (Reserva Natural - Bosque Estatal)	Terrestrial	1.30	0.01
Ciénaga Las Cucharillas Nature Reserve	Reserva Natural Ciénaga Las Cucharillas	Department of Nature and Environmental Resources (DNER)	1976	Nature Reserve (Reserva Natural)	Terrestrial	695.71	2.82
Northeast Ecological Corridor Nature Reserve	Reserva Natural Corredor Ecológico del Noreste	Department of Nature and Environmental Resources (DNER)	2013	Nature Reserve (Reserva Natural)	Terrestrial	2780.13	11.25
Cueva del Indio Nature Reserve	Reserva Natural Cueva del Indio	Department of Nature and Environmental Resources (DNER)	1992	Nature Reserve (Reserva Natural)	Terrestrial	13.60	0.06
Mona and Monito Islands Nature Reserve	Reserva Natural de Isla de Mona y Monito	Department of Nature and Environmental Resources (DNER)	1986	Nature Reserve (Reserva Natural)	Terrestrial	14050.16	56.86
Vieques Bioluminescent Bays Nature Reserve	Reserva Natural de las Bahías Bioluminiscentes de Vieques	Department of Nature and Environmental Resources (DNER)	1989	Nature Reserve (Reserva Natural)	Terrestrial	1251.25	5.06
Río Cialitos Nature Reserve	Reserva Natural del Río Cialitos	Department of Nature and Environmental Resources (DNER)	2018	Nature Reserve (Reserva Natural)	Terrestrial	3085.53	12.49

Appendix E. Protected Areas 2018

Name in English	Name in Spanish	Administrator	Date Designated	Local Designation Category	Terrestrial/ Marine	Area (acres)	Area (km2)
Río Espíritu Santo Nature Reserve	Reserva Natural del Río Espíritu Santo	Department of Nature and Environmental Resources (DNER)	1985	Nature Reserve (Reserva Natural)	Terrestrial	1851.98	7.49
Efraín Archilla Diez Nature Reserve in Humacao	Reserva Natural Efraín Archilla Diez de Humacao - Pantano, Bosque Pterocarpus, Lagunas Mandry y Santa Teresa	Department of Nature and Environmental Resources (DNER)	1986	Nature Reserve - Wildlife Refuge (Reserva Natural - Refugio de Vida Silvestre)	Terrestrial	2109.16	8.54
Finca Belverede Nature Reserve	Reserva Natural Finca Belverede	Department of Nature and Environmental Resources (DNER)	2003	Nature Reserve (Reserva Natural)	Terrestrial	23.97	0.10
Finca Belverede Nature Reserve/ Boquerón Commonwealth Forest	Reserva Natural Finca Belverede/ BE de Boquerón	Department of Nature and Environmental Resources (DNER)	2003	Nature Reserve - Commonwealth Forest (Reserva Natural - Bosque Estatal)	Terrestrial	238.55	0.97
Seven Seas Nature Reserve	Reserva Natural Finca Seven Seas	Department of Nature and Environmental Resources (DNER)	1999	Nature Reserve (Reserva Natural)	Terrestrial	52.52	0.21
Seven Seas Nature Reserve/ Northeast Ecological Corridor	Reserva Natural Finca Seven Seas/ RN Corredor Eco del Noreste	Department of Nature and Environmental Resources (DNER)	1999	Nature Reserve (Reserva Natural)	Terrestrial	152.07	0.62
Hacienda La Esperanza Nature Reserve	Reserva Natural Hacienda La Esperanza	Para la Naturaleza	1975	Nature Reserve (Reserva Natural)	Terrestrial	2287.17	9.26
Punta Vientos Nature Reserve	Reserva Natural Humedal de Punta Vientos	Department of Nature and Environmental Resources (DNER)	2008	Nature Reserve (Reserva Natural)	Terrestrial	246.10	1.00
Inés María Mendoza (Punta Yeguas) Nature Reserve	Reserva Natural Inés María Mendoza (Punta Yeguas)	Para la Naturaleza	1975	Nature Reserve (Reserva Natural)	Terrestrial	305.99	1.24
Isla Caja de Muertos Nature Reserve	Reserva Natural Isla Caja de Muertos	Department of Nature and Environmental Resources (DNER)	1980	Nature Reserve (Reserva Natural)	Terrestrial	465.28	1.88
La Parguera Nature Reserve	Reserva Natural La Parguera	Para la Naturaleza	1972	Nature Reserve (Reserva Natural)	Terrestrial	1659.92	6.72
La Parguera Nature Reserve	Reserva Natural La Parguera	Department of Nature and Environmental Resources (DNER)	1972	Nature Reserve (Reserva Natural)	Terrestrial	218.85	0.89
La Parguera Nature Reserve/ Boquerón Commonwealth Forest	Reserva Natural La Parguera/ BE de Boquerón	Department of Nature and Environmental Resources (DNER)	1972	Nature Reserve - Commonwealth Forest (Reserva Natural - Bosque Estatal)	Terrestrial	9.82	0.04
Laguna Joyuda Nature Reserve	Reserva Natural Laguna de Joyuda	Department of Nature and Environmental Resources (DNER)	1980	Nature Reserve (Reserva Natural)	Terrestrial	337.72	1.37
Laguna Joyuda Nature Reserve/ Boquerón Commonwealth Forest	Reserva Natural Laguna de Joyuda/ BE de Boquerón	Department of Nature and Environmental Resources (DNER)	1980	Nature Reserve - Commonwealth Forest (Reserva Natural - Bosque Estatal)	Terrestrial	103.17	0.42
Laguna del Condado Nature Reserve	Reserva Natural Laguna del Condado	Co-management: San Juan Bay National Estuary Program and DNER	2013	Estuary Reserve (Reserva Natural Estuarina)	Marine	100.52	0.41
Laguna Tortuguero Nature Reserve	Reserva Natural Laguna Tortuguero	Department of Nature and Environmental Resources (DNER)	1979	Nature Reserve (Reserva Natural)	Terrestrial	3125.23	12.65
Las Cabezas de San Juan Nature Reserve	Reserva Natural Las Cabezas de San Juan	Para la Naturaleza	1975	Nature Reserve (Reserva Natural)	Terrestrial	561.60	2.27
Las Piedras del Collado Nature Reserve	Reserva Natural Las Piedras del Collado	Department of Nature and Environmental Resources (DNER)	2000	Nature Reserve (Reserva Natural)	Terrestrial	20.06	0.08
Punta Tuna Nature Reserve	Reserva Natural Manglar de Punta Tuna	Department of Nature and Environmental Resources (DNER)	2000	Nature Reserve (Reserva Natural)	Terrestrial	106.79	0.43
Mata de Plátano Field Station and Nature Reserve	Reserva Natural Mata de Platano Field Station	Citizens of the Karst	2000	Private Nature Reserve (Reserva Natural Privada)	Terrestrial	106.04	0.43
Pantano Cibuco Nature Reserve	Reserva Natural Pantano de Cibuco	Department of Nature and Environmental Resources (DNER)	1992	Nature Reserve (Reserva Natural)	Terrestrial	946.10	3.83
Planadas - Yeyesa Nature Reserve	Reserva Natural Planadas - Yeyesa	Department of Nature and Environmental Resources (DNER)	2007	Nature Reserve (Reserva Natural)	Terrestrial	2457.32	9.94
Playa Grande El Paraíso Nature Reserve	Reserva Natural Playa Grande El Paraíso	Department of Nature and Environmental Resources (DNER)	2016	Nature Reserve (Reserva Natural)	Terrestrial	52.19	0.21
Punta Ballenas Nature Reserve / Guánica Commonwealth Forest	Reserva Natural Punta Ballenas/ BE de Guánica	Para la Naturaleza	1991	Commonwealth Forest - Nature Reserve (Bosque Estatal - Reserva Natural)	Terrestrial	244.28	0.99
Punta Cucharas Nature Reserve	Reserva Natural Punta Cucharas	Department of Nature and Environmental Resources (DNER)	2008	Nature Reserve (Reserva Natural)	Terrestrial	737.76	2.99
Punta Guaniquilla Nature Reserve	Reserva Natural Punta Guaniquilla	Para la Naturaleza	1977	Nature Reserve (Reserva Natural)	Terrestrial	433.67	1.76
Punta Guaniquilla Nature Reserve/ Boquerón Commonwealth Forest	Reserva Natural Punta Guaniquilla/ Bosque Estatal de Boquerón	Para la Naturaleza	1977	Nature Reserve - Commonwealth Forest (Reserva Natural - Bosque Estatal)	Terrestrial	40.28	0.16
Punta Petrona Nature Reserve	Reserva Natural Punta Petrona	Department of Nature and Environmental Resources (DNER)	1979	Nature Reserve (Reserva Natural)	Terrestrial	433.01	1.75
Aguas Buenas Caverns and Cave Systems Nature Reserve	Reserva Natural Sistema de Cuevas y Cavernas de Aguas Buenas	Department of Nature and Environmental Resources (DNER)	2002	Nature Reserve (Reserva Natural)	Terrestrial	1752.79	7.09

Appendix E. Protected Areas 2018

Name in English	Name in Spanish	Administrator	Date Designated	Local Designation Category	Terrestrial/ Marine	Area (acres)	Area (km2)
Río Hondo Community Forest	Río Hondo Community Forest	Co-management: Proyecto Agro Eco Turístico del Barrio Rio Hondo, Inc. and the Municipality of Mayagüez	2018	Community Forest (Bosque Comunitario)	Terrestrial	68.25	0.28
Tropical Forest at Palmas del Mar Conservation Easement	Servidumbre de Conservación Bosque Tropical Palmas del Mar	Para la Naturaleza	2010	Conservation Easement (Servidumbre de Conservación)	Terrestrial	107.35	0.43
Centro Espíritu Santo Conservation Easement	Servidumbre de Conservación Centro Espríritu Santo	Para la Naturaleza	2012	Conservation Easement (Servidumbre de Conservación)	Terrestrial	5.29	0.02
El Rabanal Conservation Easement	Servidumbre de Conservación El Rabanal	Para la Naturaleza	2002	Conservation Easement (Servidumbre de Conservación)	Terrestrial	15.75	0.06
El Tambor Conservation Easement	Servidumbre de Conservación El Tambor	Para la Naturaleza	2007	Conservation Easement (Servidumbre de Conservación)	Terrestrial	222.82	0.90
Finca Gulín Conservation Easement	Servidumbre de Conservación Finca Gulín	Para la Naturaleza	2013	Conservation Easement (Servidumbre de Conservación)	Terrestrial	25.92	0.10
Finca Ledesma Moulier Conservation Easement	Servidumbre de Conservación Finca Ledesma Moulier	Para la Naturaleza	2013	Conservation Easement (Servidumbre de Conservación)	Terrestrial	35.61	0.14
Finca María Luisa Conservation Easement	Servidumbre de Conservación Finca María Luisa	Para la Naturaleza	2013	Conservation Easement (Servidumbre de Conservación)	Terrestrial	759.01	3.07
Foreman Conservation Easement	Servidumbre de Conservación Foreman	Para la Naturaleza	1971	Conservation Easement (Servidumbre de Conservación)	Terrestrial	34.56	0.14
Picaflor Conservation Easement	Servidumbre de Conservación Picaflor	Para la Naturaleza	2017	Conservation Easement (Servidumbre de Conservación)	Terrestrial	165.22	0.67
Siembra Tres Vidas Conservation Easement	Servidumbre de Conservación Siembra Tres Vidas	Para la Naturaleza	2012	Conservation Easement (Servidumbre de Conservación)	Terrestrial	10.59	0.04
Montes Oscuros Scenic Easement	Servidumbre Escénica Montes Oscuros	Para la Naturaleza	1992	Conservation Easement (Servidumbre de Conservación)	Terrestrial	7554.01	30.57
Karst Conservation Zone	Zona de Conservacion del Carso	Public and private owners, following the Karst Special Planning Area Regulation and Plan	1999	Karst Restricted Area Conservation Zone (Zonas de Conservación en Area Restringida del Carso, PRAPEC)	Terrestrial	159047.93	643.64

Appendix F. International Union for the Conservation of Nature (IUCN) protected areas management categories.

Category	Denomination	Description	Primary objective
Category Ia	**Strict Nature Reserve**	Protected areas that are strictly set aside to protect biodiversity and also possibly geological/geomorphological features, where human visitation, use, and impacts are strictly controlled and limited to ensure protection of the conservation values. Such protected areas can serve as indispensable reference areas for scientific research and monitoring.	To conserve regionally, nationally, or globally outstanding ecosystems, species (occurrences or aggregations), and/or geodiversity features: these attributes will have been formed mostly or entirely by nonhuman forces and will be degraded or destroyed when subjected to all but very light human impact.
Category Ib	**Wilderness Area**	Protected areas that are usually large unmodified or slightly modified areas, retaining their natural character and influence, without permanent or significant human habitation, which are protected and managed so as to preserve their natural condition.	To protect the long-term ecological integrity of natural areas that are undisturbed by significant human activity, free of modern infrastructure, and where natural forces and processes predominate, so that current and future generations have the opportunity to experience such areas.
Category II	**National Park**	Large natural or near natural areas set aside to protect large-scale ecological processes, along with the complement of species and ecosystems characteristic of the area, which also provide a foundation for environmentally and culturally compatible spiritual, scientific, educational, recreational, and visitor opportunities.	To protect natural biodiversity along with its underlying ecological structure and supporting environmental processes, and to promote education and recreation.
Category III	**Natural Monument or Feature**	Protected areas set aside to protect a specific natural monument, which can be a landform, seamount, submarine cavern, geological feature, such as a cave or even a living feature such as an ancient grove. They are generally quite small, protected areas and often have high visitor value.	To protect specific outstanding natural features and their associated biodiversity and habitats.
Category IV	**Habitat/Species Management Area**	Protected areas aiming to protect particular species or habitats, and management reflects this priority. Many category IV protected areas will need regular, active interventions to address the requirements of particular species or to maintain habitats, but this is not a requirement of the category.	To maintain, conserve, and restore species and habitats.

Category V	**Protected Landscape/Seascape**	A protected area where the interaction of people and nature, over time, has produced an area of distinct character with significant ecological, biological, cultural, and scenic value and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values.	To protect and sustain important landscapes/seascapes and the associated nature conservation and other values created by interactions with humans through traditional management practices.
Category VI	**Protected area with sustainable use of natural resources**	Protected areas that conserve ecosystems and habitats, together with associated cultural values and traditional natural resource management systems. They are generally large, with most of the area in a natural condition, where a proportion is under sustainable natural resource management and where low-level nonindustrial use of natural resources compatible with nature conservation is seen as one of the main aims of the area.	To protect natural ecosystems and use natural resources sustainably, when conservation and sustainable use can be mutually beneficial.

Note: This table was prepared based on IUCN documents.

Appendix G. Species listed as critically endangered, endangered, threatened or vulnerable by Federal and State laws in Puerto Rico, and designated Critical Habitat by each government

(*) = Federal laws in Puerto Rico. (^) = State laws in Puerto Rico. (^{C}) = designated Critical Habitat by each government.Note: Common names are provided for some species. Current species status might have changed by the date of this publication.

Scientific name	Common Name (English/Spanish)	Status (Fed*, DNER^)
Amphibians		
Eleutherodactylus cooki	Puerto Rican rock frog/coquí guajón	Threatened (*^{C}) Vulnerable (^)
Eleutherodactylus eneidae	Eneida's coqui/coquí de Eneida	Critically Endangered (^)
Eleutherodactylus jasperi	Golden coqui/coquí dorado	Threatened (*^{C}) Critically Endangered (^^{C})
Eleutherodactylus juanariveroi	Plain coqui /coquí llanero	Endangered (*^{C}) Critically Endangered (^^{C})
Eleutherodactylus karlschmidti	Webbed footed coqui/coquí palmeado	Critically Endangered (^)
Eleutherodactylus locustus	Warty coqui/coquí martillito	Vulnerable (^)
Eleutherodactylus portoricensis	Puerto Rican mountain coqui/coquí de la montaña	Vulnerable (^)
Eleutherodactylus richmondi	Ground coqui/coquí caoba	Vulnerable (^)
Peltophryne lemur	Puerto Rican crested toad/sapo concho puertorriqueño	Threatened (*) Endangered (^)
Reptiles		
Anolis cooki	Cook's anole/ lagartijo de Cook	Endangered (^)
Anolis poncensis	Dryland grass anole/lagartijo de las hierbas de tierras secas	Vulnerable (^)
Anolis roosevelti	Culebra giant anole/lagartijo gigante de Culebra	Endangered (*^{C}) Critically Endangered (^^{C})
Caretta caretta	Loggerhead sea turtle/	Threatened (*)

	caguama o cabezona	
Cyclura cornuta stejnegeri	Mona ground iguana/iguana de Mona	Threatened (*[C]) Endangered (^[C])
Chelonia mydas	Green sea turtle/peje blanco o tortuga verde	Threatened (*) Endangered (^)
Chilabothrus inornatus (*Epicrates inornatus*)	Puerto Rican boa/boa Puertorriqueña	Endangered (*) Vulnerable (^)
Chilabothrus granti (*Epicrates monensis granti*)	Virgin Islands tree boa/boa de Islas Vírgenes	Endangered (*[C]) Critically Endangered (^)
Chilabothrus monensis (*Epicrates monensis monensis*)	Mona boa/boa de Mona	Threatened (*) Endangered (^[C])
Dermochelys coriacea	Leatherback sea turtle/tinglar	Endangered (*[C]^)
Eretmochelys imbricate	Hawksbill sea turtle/carey de concha	Endangered (*[C]^)
Mabuya mabouya sloanii	Slipperyback skink	Vulnerable (^)
Sphaerodactylus micropithecus	Monito gecko/salamanquita de Monito	Endangered (*[C]) Critically Endangered (^)
Birds		
Accipiter striatus venator	Puerto Rican sharp-shinned hawk/falcón de sierra	Endangered (*) Critically Endangered (^)
Agelaius xanthomus	Yellow-shouldered blackbird/mariquita	Endangered (*[C]^[C])
Amazona vittata vittata	Puerto Rican parrot/cotorra Puertorriqueña	Endangered (*) Critically Endangered (^)
Anas bahamensis	white-cheeked pintail/pato quijada colorada	Vulnerable (^)
Antrostomus noctitherus	Puerto Rican nightjar/guabairo	Endangered (*^)
Buteo platypterus brunnescens	Puerto Rican Broad-winged hawk/guaraguaito de bosque	Endangered (*) Critically Endangered (^)
Calidris canutus rufa	Rufa red knot/chorlo gordo	Threatened (*)
Corvus leucognaphalus	White-necked crow/cuervo pescueciblanco	Extirpated (*)
Charadrius alexandrines	Snowy plover/chorlo nevado	Endangered (*) Critically Endangered (^)

Charadrius melodus	Piping plover/ player melódico	Endangered (*) Critically Endangered (^)
Dendrocygna arborea	West Indian whistling duck	Critically Endangered (^)
Fulica caribaea	Caribbean coot	Vulnerable (^)
Nomonix dominica	Masked duck	Endangered (^)
Oxyura jamaicensis	Ruddy duck	Vulnerable (^)
Patagioenas inornata wetmorei	Puerto Rican plain pigeon/Paloma sabanera	Endangered (*^)
Pelecanus occidentalis	Brown pelican/pelícano pardo	Endangered (^)
Setophaga angelae	Elfin-woods warbler/reinita de bosque enano	Threatened (*) Vulnerable (^)
Sterna dougallii dougallii	Roseate tern	Threatened (*) Vulnerable (^)
Mammals		
Erophylla sezekorni	Brown flower bat	Vulnerable (^)
Stenoderma rufum	Red fruit bat	Vulnerable (^)
Trichechus manatus	Antillean manatee/manatí antillano	Endangered (*^)
Invertebrates		
Alloweckelia gurnee		Critically Endangered (^)
Atlantea tulita	Harlequin Butterfly	Candidate (*) Critically Endangered (^)
Panulirus laevicauda		Vulnerable (^)
Typhlatya monae		Critically Endangered (^)
Trees and Shrubs		
Auerodendron pauciflorum		Endangered (*) Critically Endangered (^)
Banara vanderbiltii	Palo de Ramón	Endangered (*) Critically Endangered (^)
Buxus vahlii	Vahl's boxwood/diablito de tres cuernos	Endangered (*^)
Callicarpa ampla	Capá rosa	Endangered (*) Critically Endangered (^)

Calyptronoma rivalis	Palma de manaca	Threatened (*) Endangered (^)
Catesbaea melanocarpa		Endangered (*C)
Chamaecrista glandulosa var. mirabilis		Endangered (*^)
Cornutia obovata	Palo de nigua	Endangered (*) Critically Endangered (^)
Crescentia portoricensis	Higüero de sierra	Endangered (*) Critically Endangered (^)
Daphnopsis helleriana		Endangered (*) Critically Endangered (^)
Eugenia haematocarpa	Uvillo	Endangered (*^)
Eugenia woodburyana		Endangered (*) Critically Endangered (^)
Goetzea elegans	Beautiful goetzea/matabuey	Endangered (*^)
Gonocalyx concolor		Endangered (*C)
Ilex cookie	Cook's holly	Endangered (*) Critically Endangered (^)
Ilex sintenisii		Endangered (*^)
Juglans jamaicensis	West Indian walnut/nogal	Endangered (*) Critically Endangered (^)
Lyonia truncata var. proctorii		Endangered (*) Critically Endangered (^)
Mitracarpus polycladus		Endangered (*^)
Mitracarpus maxwelliae		Endangered (*^)
Myrcia paganii		Endangered (*) Critically Endangered (^)
Ottoschulzia rhodoxylon	Palo de rosa	Endangered (*) Critically Endangered (^)
Pleodendron macranthum	Chupacallos	Endangered (*) Critically Endangered (^)
Schoepfia arenaria		Threatened (*) Endangered (^)
Solanum drymophilum	Erubia	Endangered (*^)
Stahlia monosperma	Cóbana negra	Threatened (*) Vulnerable (^)
Styrax portoricensis	Palo de jazmín	Endangered (*)

		Critically Endangered (^)
Ternstroemia luquillensis	Palo colorado	Endangered (*) Critically Endangered (^)
Ternstroemia subsessilis		Endangered (*) Critically Endangered (^)
Trichilia triacantha	Bariaco	Endangered (*) Critically Endangered (^)
Varonia bellonis		Endangered (*^)
Varonia rupicola		Threatened (*C)
Vernonia proctorii		Endangered (*) Critically Endangered (^)
Zanthoxylum thomasianum	St. Thomas prickly ash	Endangered (*^)
Ferns		
Adiantum vivesii		Endangered (*) Critically Endangered (^)
Cyathea dryopteroides	Elfin tree fern/helecho arbóreo de bosque enano	Endangered (*^)
Elaphoglossum serpens		Endangered (*) Critically Endangered (^)
Polystichum calderonense		Endangered (*) Critically Endangered (^)
Tectaria estremerana		Endangered (*) Critically Endangered (^)
Thelypteris inabonensis		Endangered (*) Critically Endangered (^)
Thelypteris verecunda		Endangered (*) Critically Endangered (^)
Thelypteris yaucoensis		Endangered (*) Critically Endangered (^)
Cacti		
Harrisia portoricensis	Higo chumbo	Threatened (*) Vulnerable (^)
Leptocereus grantianus		Endangered (*) Critically Endangered (^)

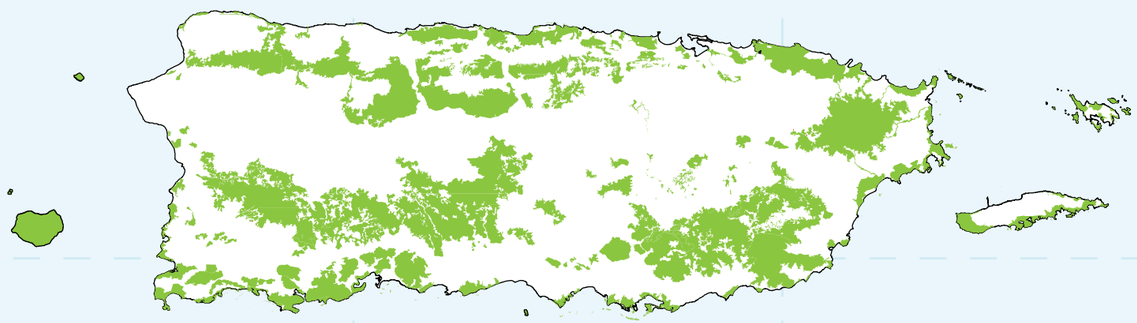
Orchids		
Cranichis ricartii		Endangered (*) Critically Endangered (^)
Lepanthes eltoroensis		Endangered (*) Critically Endangered (^)
Herbaceous plants and Herbs		
Aristida chaseae		Endangered (*^)
Aristida portoricensis	Pelos del diablo	Endangered (*) Critically Endangered (^)
Gesneria pauciflora		Threatened (*) Vulnerable (^)
Peperomia wheeleri	Wheeler's peperomia	Endangered (*^)

(*) = Federal laws in Puerto Rico. (^) = State laws in Puerto Rico. (C) = designated Critical Habitat by each government.Note: Common names are provided for some species. Current species status might have changed by the date of this publication.

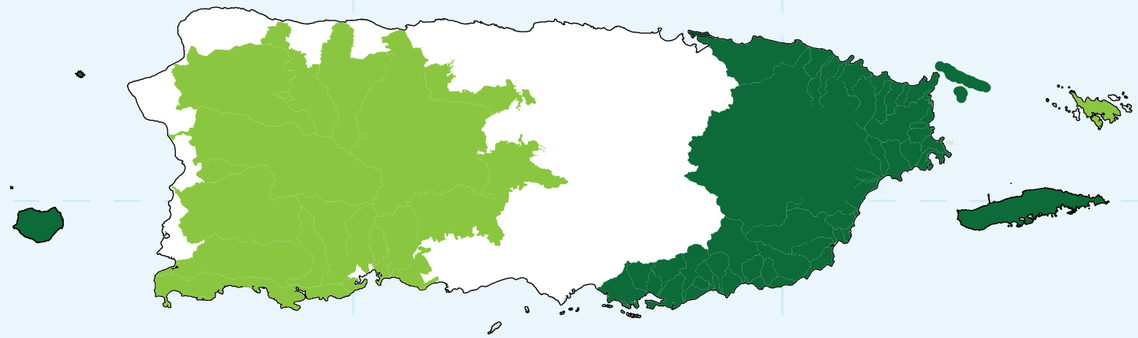
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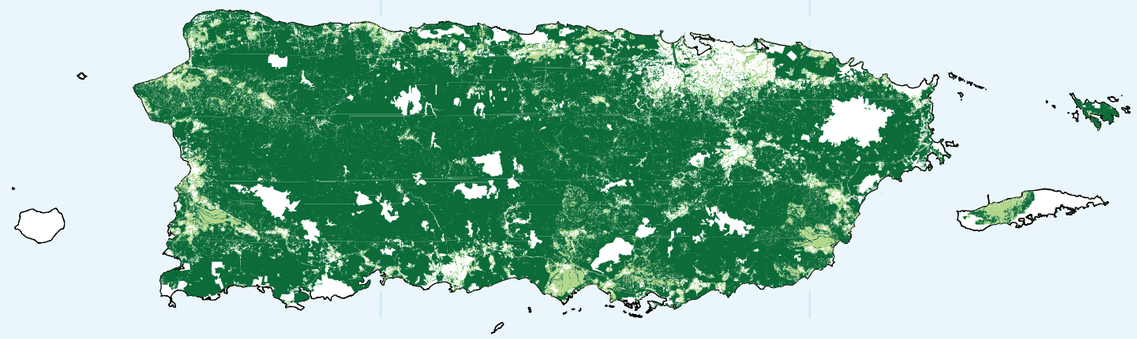
Humacao and Maricao/Guánica Joint Priority Landscapes
(state and federal multi-agency effort)



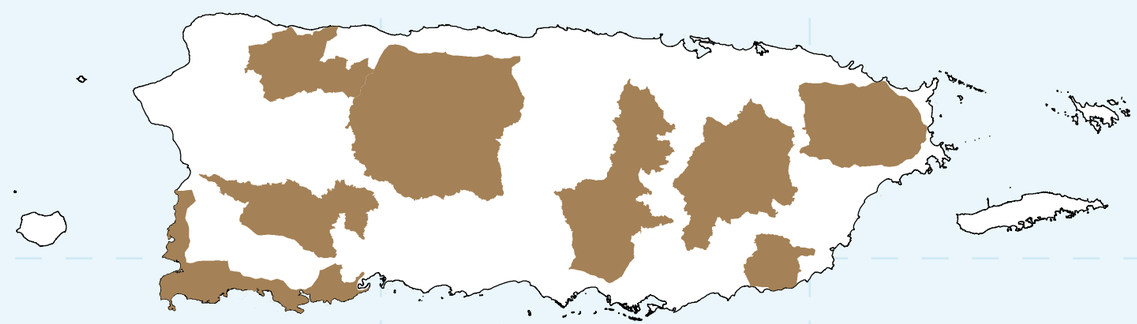
Priority Areas for Conservation (DNER)



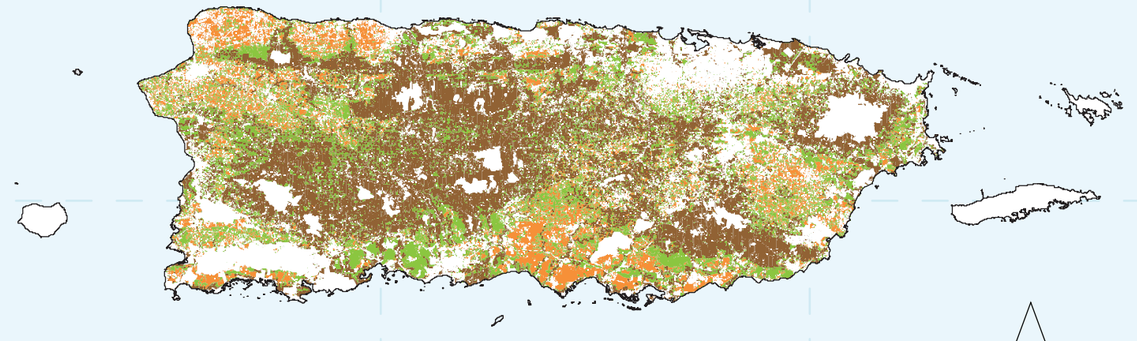
Puerto Rico Coastal Focus Areas (USFWS)
Puerto Rico Partners Focus Areas (USFWS)



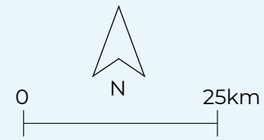
Forest Stewardship Program (USFS)
Priority Lands High Priority Lands



Forest Legacy Program (USFS)
Priority Lands



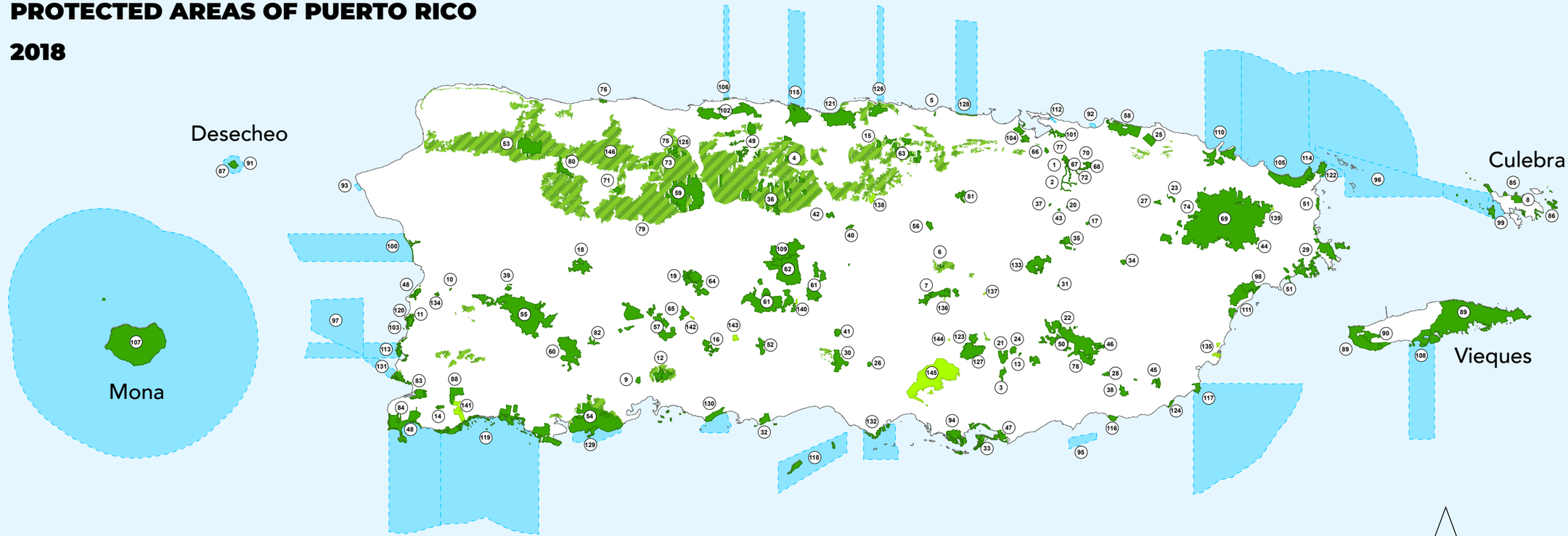
Map 33 (Para la Naturaleza)
Low Medium High



Appendix H: Maps of priority areas for conservation in Puerto Rico. Different spatial layers are used by governmental and nongovernmental agencies in Puerto Rico to prioritize where to allocate funds to acquire land, designate new protected areas, and/or focus conservation incentive programs.

PROTECTED AREAS OF PUERTO RICO

2018



Marine Protected Areas

Terrestrial Protected Areas*

Karst Conservation Zone

Conservation Easements

* Terrestrial protected areas include: Nature Reserves, State Forests, Wildlife Refuges (state and federal), National Forest, Urban Forests, National Estuarine Research Reserve, among others. DNER lands acquired through the Forest Legacy Program and other mechanisms have been added to the management unit of the nearest Commonwealth Forest.

1. Antiguo Acueducto del río Piedras / SJEC
2. Cupey Arboretum/ SJEC
3. Guayama Research Area
4. Manatí Research Area
5. Bosque de Pterocarpus de Dorado Protected Natural Area
6. Cañón Las Bocas Protected Natural Area
7. Cañón San Cristóbal Protected Natural Area
8. Cerro Feliz Protected Natural Area
9. Cerro La Tuna Protected Natural Area
10. Cerro Las Mesas Protected Natural Area
11. Cordillera Sabana Alta Protected Natural Area
12. Cuevas El Convento Protected Natural Area
13. Culebras Protected Natural Area
14. El Conuco Protected Natural Area
15. Freddie Ramírez Protected Natural Area
16. Hacienda Buena Vista Protected Natural Area
17. Hacienda Lago Protected Natural Area
18. Hacienda Margarita Protected Natural Area
19. Hacienda Pellejas Protected Natural Area
20. Hermanas Sendra Protected Natural Area
21. Jájome Protected Natural Area
22. Jorge Sotomayor del Toro Protected Natural Area
23. La Pitahaya Protected Natural Area
24. La Robleda Protected Natural Area
25. Los Frailes Protected Natural Area
26. Los Llanos Protected Natural Area
27. Luz Martínez de Benítez Protected Natural Area
28. Marín Alto Protected Natural Area
29. Medio Mundo y Daguao Protected Natural Area
30. Ojo de Agua Protected Natural Area
31. Paraíso de las Lunas Protected Natural Area
32. Punta Cabullones Protected Natural Area
33. Punta Pozuelo Protected Natural Area
34. Quebrada Janer Protected Natural Area
35. Río Bairoa Protected Natural Area
36. Río Encantado Protected Natural Area
37. Río Guaynabo Protected Natural Area
38. Río Jacaboa Protected Natural Area
39. Río Maricao Protected Natural Area
40. Río Sana Muerto Protected Natural Area
41. Río Toa Vaca Protected Natural Area
42. Río Toro Negro Protected Natural Area
43. San Juan Park Protected Natural Area
44. Shapiro Protected Natural Area
45. Sierra La Pandura Protected Natural Area
46. Ulpiano Casal Protected Natural Area
47. Aguirre Commonwealth Forest
48. Boquerón Commonwealth Forest
49. Cambalache Commonwealth Forest
50. Carite Commonwealth Forest
51. Ceiba Commonwealth Forest
52. Cerrillos Commonwealth Forest / Cerrillos Wildlife Refuge
53. Guajataca Commonwealth Forest
54. Guánica Commonwealth Forest
55. Maricao Commonwealth Forest
56. Monte Choca Commonwealth Forest
57. Monte Guilarte Commonwealth Forest
58. Piñones Commonwealth Forest
59. Río Abajo Commonwealth Forest
60. Susúa Commonwealth Forest
61. Toro Negro Commonwealth Forest
62. Tres Picachos Commonwealth Forest
63. Vega Commonwealth Forest
64. Bosque del Pueblo de Adjuntas Commonwealth Forest
65. La Olimpia Commonwealth Forest
66. San Patricio Commonwealth Forest
67. Bosque Urbano del Nuevo Milenio Commonwealth Forest / SJEC
68. Los Capuchinos Forest
69. El Yunque National Forest
70. Doña Inés Mendoza Urban Forest / SJEC
71. Río Camuy Cave System
72. San Juan Ecological Corridor (SJEC)
73. El Tallonal
74. Finca El Verde
75. Finca José Santiago
76. Finca Nolla
77. Botanical Garden of the University of Puerto Rico
78. Las Casas de la Selva
79. Caguana Indigenous Ceremonial Park
80. Guajataca Wildlife Refuge
81. La Plata Wildlife Refuge
82. Luchetti Wildlife Refuge
83. Iris Alameda Wildlife Refuge in Boquerón
84. Cabo Rojo National Wildlife Refuge
85. Culebra National Wildlife Refuge
86. Culebra National Wildlife Refuge / Culebrita Lighthouse
87. Desecheo National Wildlife Refuge
88. Laguna Cartagena National Wildlife Refuge
89. Vieques National Wildlife Refuge
90. El Buey Nature and Wildlife Refuge
91. Desecheo Coastal Waters Marine Reserve
92. Arrecife de Isla Verde Marine Reserve
93. Tres Palmas Marine Reserve
94. Jobos Bay National Estuarine Research Reserve
95. Arrecifes de Guayama Nature Reserve
96. Arrecifes de La Cordillera Nature Reserve
97. Arrecifes de Tourmaline Nature Reserve
98. Bosque Pterocarpus Nature Reserve
99. Canal Luis Peña Nature Reserve
100. Caño La Boquilla Nature Reserve
101. Caño Martín Peña Nature Reserve
102. Caño Tiburones Nature Reserve
103. Cayo Ratones Nature Reserve / Boquerón CF
104. Ciénaga Las Cucharillas Nature Reserve
105. Northeast Ecological Corridor Nature Reserve (NECNR)
106. Cueva del Indio Nature Reserve
107. Isla de Mona y Monito Nature Reserve
108. Vieques Bioluminiscent Bays Nature Reserve
109. Río Cialitos Nature Reserve
110. Río Espíritu Santo Nature Reserve
111. Efraín Archilla Diez Nature Reserve in HumacaoPantano, Bosque de Pterocarpus, Lagunas Mandry y Santa Teresa
112. Laguna del Condado Estuarine Reserve
113. Finca Belverede Nature Reserve / Boquerón CF
114. Finca Seven Seas Nature Reserve / NECNR
115. Hacienda La Esperanza Nature Reserve
116. Humedal de Punta Vientos Nature Reserve
117. Inés María Mendoza (Punta Yeguas) Nature Reserve
118. Isla Caja de Muertos Nature Reserve
119. La Parguera Nature Reserve / Boquerón CF
120. Laguna Joyuda Nature Reserve / Boquerón CF
121. Laguna Tortuguero Nature Reserve
122. Las Cabezas de San Juan Nature Reserve
123. Las Piedras del Collado Nature Reserve
124. Manglar de Punta Tuna Nature Reserve
125. Mata de Platano Field Station and Nature Reserve
126. Pantano Cibuco Nature Reserve
127. Planadas - Yeyesa Nature Reserve
128. Playa Grande El Paraíso Nature Reserve
129. Punta Ballenas Nature Reserve / Guánica CF
130. Punta Cucharas Nature Reserve
131. Punta Guaniquilla Nature Reserve / Boquerón CF
132. Punta Petrona Nature Reserve
133. Aguas Buenas Cave System Nature Reserve
134. Río Hondo Community Forest
135. Tropical Forest at Palmas del Mar Conservation Easement
136. Centro Espríritu Santo Conservation Easement
137. El Rabanal Conservation Easement
138. El Tambor Conservation Easement
139. Finca Gulín Conservation Easement
140. Finca Ledesma Moulier Conservation Easement
141. Finca María Luisa Conservation Easement
142. Foreman Conservation Easement
143. Picaflor Conservation Easement
144. Siembra Tres Vidas Conservation Easement
145. Montes Oscuros Scenic Easement
146. Karst Conservation Zone

Ortiz-Maldonado, C., Quiñones, M., Castro-Prieto, J. & Gaztambide-Arandes, S. 2019. Protected Natural Areas of Puerto Rico. In: Castro-Prieto, Jessica; Gould, William A.; Ortiz-Maldonado, Coralys; Soto-Bayó, Sandra; Llerandi-Román, Ivan; Gaztambide-Arandes, Soledad; Quiñones, Maya; Cañón, Marcela; Jacobs, Kasey R. 2019. A Comprehensive Inventory of Protected Areas and other Land Conservation Mechanisms in Puerto Rico .Gen. Tech. Report IITF-GTR-50. San Juan, PR: U.S. Department of Agriculture Forest Service, International Institute of Tropical Forestry.166 p.

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