

Coral Reef Habitat Assessment for U.S. Marine Protected Areas: Commonwealth of Puerto Rico

National Oceanic and Atmospheric Administration
NOAA's National Ocean Service
Management & Budget Office
Special Projects



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Project Overview

About this Effort

The United States Coral Reef Task Force (USCRTF), in both its National Action Plan to Conserve Coral Reefs (2000) and its National Coral Reef Action Strategy (2002), established a key conservation objective of protecting at least 20% of U.S. coral reefs and associated habitat types in no-take marine reserves. NOAA's Coral Reef Conservation Program has been supporting efforts to assess current protection levels of coral reefs within Marine Protected Areas (MPAs) and quantify the area of U.S. coral reef ecosystems protected in no-take reserves. The official federal definition of an MPA, signed into law by Executive Order 13158, is "any area of the marine environment that has been reserved by federal, state, tribal, territorial, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein." A significant source of information for these assessments has been the National MPA Center's Inventory of Marine Managed Areas (MMAs) in the U.S. (2006a)¹. This report provides a preliminary assessment of the areal extent of coral reef habitat and associated habitat types within MPAs, as well as the level of protection afforded them, by using GIS-based MPA boundaries from the MMA Inventory–MPA Classification System (2006a,b), and U.S. Coral Jurisdiction benthic habitat data developed by NOAA's National Centers for Coastal Ocean Science Biogeography Team (2001).

More information on the state and territory sites included in this assessment, including their goals and objectives and how they are established and managed is available in the NOAA Coral Reef Conservation Program Technical Memorandum, *Report on the Status of Marine Protected Areas in Coral Reef Ecosystems of the United States: Volume 1 Marine Protected Areas Managed by U.S. States, Territories and Commonwealths* (Wusinich-Mendez, D and C. Trappe. 2007). This document (pdf, 5.26 MB) is available for download at <http://www.coralreef.noaa.gov/Library/Publications/cr%5Fmpa%5Freport%5Fvol%5F1.pdf>.

NCCOS Habitat Mapping Effort

The National Oceanic and Atmospheric Administration (NOAA) National Ocean Service (NOS) initiated a coral reef research program in 1999 to map, assess, inventory, and monitor U.S. coral reef ecosystems (Monaco et al. 2001). These activities were implemented in response to requirements outlined in the Mapping Implementation Plan developed by the Mapping and Information Synthesis Working Group (MISWG) of the Coral Reef Task Force (CRTF) (MISWG 1999). NOS's National Centers for Coastal Ocean Science (NCCOS) Biogeography Team was charged with the development and implementation of a plan to produce comprehensive digital coral-reef ecosystem maps for all U.S. States, Territories, and Commonwealths within five to seven years. In response to Executive Order 13089 and the Coral Reef Conservation Act of 2000, NOS is conducting research to digitally map biotic resources and coordinate a long-term monitoring program that can detect and predict change in U.S. coral reefs and their associated habitats and biological communities (Monaco et al. 2001).

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The Conservation Trust of Puerto Rico

NOAA / Coral Reef Conservation Program
NOAA / National Estuarine Research Reserve System
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NOAA / NOS / Ocean and Coastal Resource Management
NOAA / NOS / National Marine Protected Areas Center
U.S. Fish and Wildlife Service

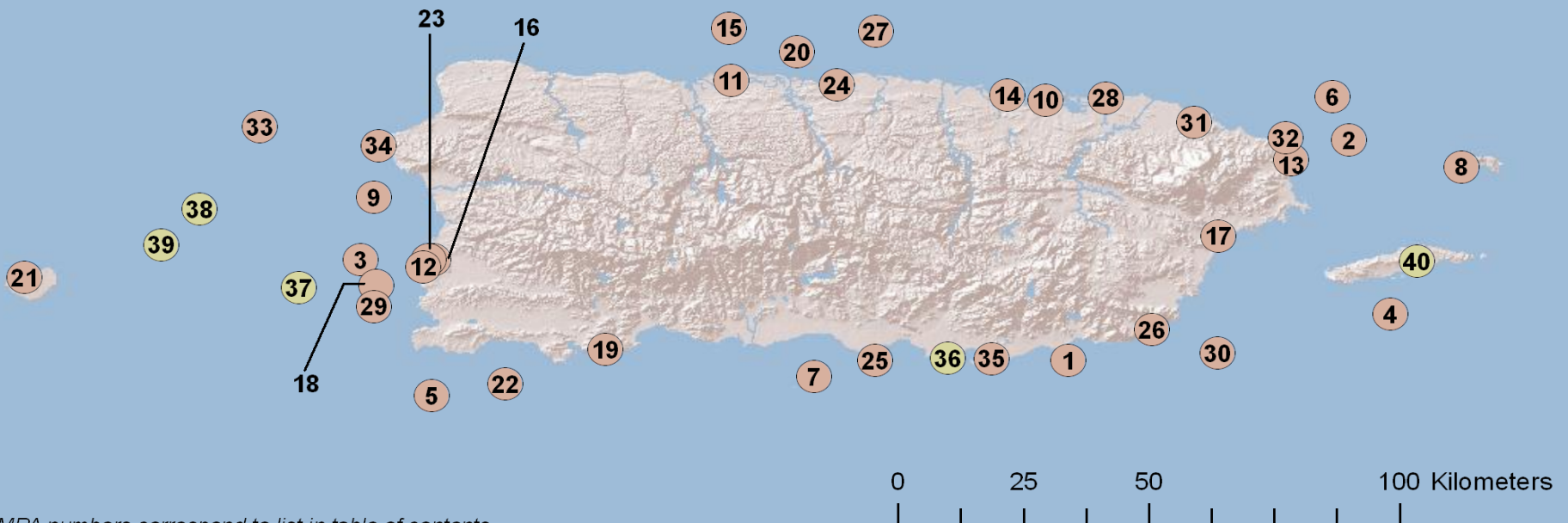
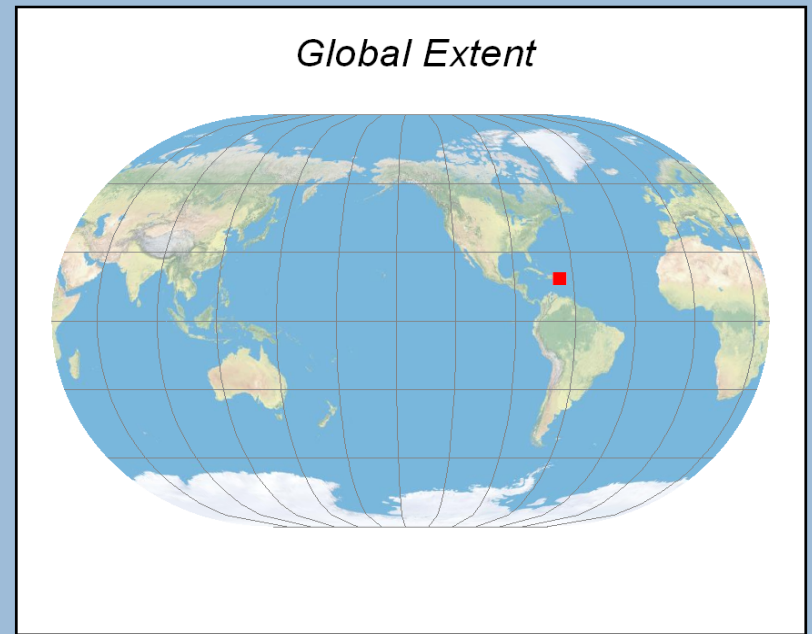
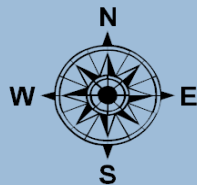
¹ Data for the MMA Inventory were collected by many individuals from a variety of sources. As a result, the content and level of detail of the overview text may vary from site to site.

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Commonwealth of Puerto Rico: Locations of MPAs

- Federal MPA
- Commonwealth MPA



Note: MPA numbers correspond to list in table of contents.

Commonwealth of Puerto Rico

Introduction

The commonwealth of Puerto Rico is part of a volcanic island platform that includes Puerto Rico and the Virgin Islands. To the east of the main island of Puerto Rico are the smaller island municipalities of Culebra and Vieques. Three uninhabited oceanic islands, Mona, Monito, and Desecheo, are located off the west coast. South of the main island lies Caja de Muertos Island and several keys and mangrove islets (Wusinich-Mendez et al. 2007). Currently there are 40 MPAs established in the commonwealth (see map on page 1) with 6 of the sites designated as no-take areas (Appendix B)¹. No-take MPAs allow human access and even some potentially harmful uses, but totally prohibit the extraction or significant destruction of natural or cultural resources.

The table below shows the total area of each biological benthic cover type: 1) for all of Puerto Rico, 2) for all MPAs in Puerto Rico, and 3) for only no-take MPAs in Puerto Rico. The percentages of the mapped benthic habitat within Puerto Rico's MPAs and Puerto Rico's no-take MPAs are also listed. Approximately 29% of the 1,556 square kilometers of mapped coral reef ecosystem (defined below) in Puerto Rico is within MPAs and 3% is within no-take MPAs. To view the totals for each individual site, see Appendix C.

¹ In this report, "No-take" MPAs are MPAs that have one of the following "Levels of Protection" under the U.S. MPA Classification System: 1) No Take, 2) No Impact, 3) No Access, or 4) Zoned Multiple-Use With No-Take Area(s). Out of 12 'Zoned Multiple-Use With No-Take Areas' in the U.S. Coral Jurisdictions only 4 had delineated No-take zones and thus were the only sites from this category to be included in the "No-take" calculations: East End Marine Park (VI), Kealakekua Bay MLCD (HI), Lapakahi MLCD (HI), and Molokini Shoal MLCD (HI).

Cover Types and Characterization

<i>Coral reef / Colonized Harbottom</i>	Substrates formed by the deposition of calcium carbonate by reef building corals and other organisms. Habitats within this category have some colonization by live coral, unlike the Uncolonized Harbottom category.
<i>Emergent Vegetation</i>	composed of red, black, or white mangroves, or some combination thereof. Mangroves are generally found in areas sheltered from high-energy waves.
<i>Macroalgae</i>	An area with 10 percent or greater coverage of any combination of numerous species of red, green, or brown macroalgae. Usually occurs in deeper waters on the bank/shelf zone.
<i>Seagrass</i>	Habitat with 10 percent or more cover of <i>Thalassia testudinum</i> , <i>Syringodium filiforme</i> , <i>Halodule wrightii</i> , <i>Halophila baillonis</i> , or some combination thereof. Examples include seagrass, patchy seagrass, and macroalgae.
<i>Unclassified</i>	Areas differentiated from other biological cover types because the major geomorphological structure is primarily terrestrial or artificially created (i.e., artificial).
<i>Uncolonized</i>	Substrates not covered with a minimum of 10% of any of the above biological cover types. This habitat is usually on sand or mud structures.
<i>Unknown</i>	Bottom type unknown due to turbidity, cloud cover, water depth, or other interference.

Benthic Habitat Type	Total Mapped Benthic Habitat (km ²)	Total Mapped within All MPAs (km ²)	Percent of Mapped Area within all MPAs	Total Mapped within No-take MPAs (km ²)	Percent of Mapped Area within No-take MPAs
Coral Reef / Colonized Harbottom	759.465	233.666	30.77%	32.277	4.25%
Emergent Vegetation	72.906	35.661	48.91%	0.403	0.55%
Macroalgae	97.056	22.918	23.61%	0.000	0.00%
Seagrass	627.210	153.395	24.46%	17.470	2.79%
Unclassified	8,889.100	263.703	2.97%	1.236	0.01%
Uncolonized	49.785	17.337	34.82%	1.476	2.96%
Unknown	5,984.369	3,028.333	50.60%	124.903	2.09%
Coral Reef Ecosystem*	1,556.637	445.640	28.63%	50.150	3.22%

* Coral Reef Ecosystem is defined as mapped coral reef / colonized harbottom, emergent vegetation, macroalgae, and seagrass.

Commonwealth of Puerto Rico

Methods

The Coral Reef Habitat Assessment for the Commonwealth of Puerto Rico was conducted between August 2005 and August 2007 through the following actions:

1. *Created a Coral Jurisdiction MPA GIS Database utilizing the U.S. Marine Managed Areas Inventory*

The Marine Managed Areas (MMA) Inventory contains information on more than 1,500 sites, and is the only such comprehensive dataset in the nation. The term “marine managed area,” which was defined through a public comment process, generally refers broadly to an area of the marine environment with a marine resource conservation purpose.

The MMA Inventory data collection is a joint collaboration between the National Oceanic and Atmospheric Administration (NOAA) and the Department of the Interior that began in 2001. Its purpose is to gather and make publicly available comprehensive information on place-based marine conservation efforts under U.S. federal, state, territorial, local, and tribal jurisdiction. For more information on the MMA Inventory, visit http://www.mpa.gov/helpful_resources/inventory.html.

2. *Identified which MPAs are No-Take Reserves utilizing the MPA Classification System*

The National Marine Protected Areas Center has developed a Classification System that provides agencies and stakeholders with a straightforward means to describe MPAs in purely functional terms using five objective characteristics common to most MPAs:

Conservation Focus – legally established goals, conservation objectives and intended purpose(s).

Level of Protection – level and type of legal protections afforded to the site’s natural and cultural resources and ecological processes.

Permanence of Protection – length of time protections remain in effect.

Constancy of Protection – year-round, seasonal or rotating.

Ecological Scale of Protection – range from entire ecosystems and their associated biophysical processes, to focal habitats, species, or other resources deemed to be of economic or ecological importance.

For most MPAs in the U.S. and elsewhere, these five functional characteristics provide an accurate picture of why the site was established, what it is intended to protect, how it achieves that protection, and how it may affect local ecosystems and local human uses.

3. *Used GIS software to identify area of spatial overlap between benthic habitat data and Coral Jurisdiction MPA boundaries*

The National Oceanic and Atmospheric Administration (NOAA) National Ocean Service (NOS) initiated a coral reef research program in 1999 to map, assess, inventory, and monitor U.S. coral reef ecosystems (Monaco et al. 2001). These activities were implemented in response to requirements outlined in the Mapping Implementation Plan developed by the Mapping and Information Synthesis Working Group (MISWG) of the Coral Reef Task Force (CRTF) (MISWG 1999). NOS’s Biogeography Team was charged with the development and implementation of a plan to produce comprehensive digital coral-reef ecosystem maps for all U.S. States, Territories, and Commonwealths within five to seven years. In response to Executive Order 13089 and the Coral Reef Conservation Act of 2000, NOS is conducting research to digitally map biotic resources and coordinate a long-term monitoring program that can detect and predict change in U.S. coral reefs and their associated habitats and biological communities. For more information on benthic habitat data produced by the NOS Biogeography Team, visit http://ccma.nos.noaa.gov/about/biogeography/proj_theme.html.

4. *Calculated areal extent of benthic habitat data within Coral Jurisdiction MPA GIS boundaries*

The areal extent of benthic habitat data within MPAs was calculated in the Eckert IV WGS84 projection, using the polygon area calculation operation in XTools Pro 3.2.0 extension for ArcMap™ 9.1 GIS software.

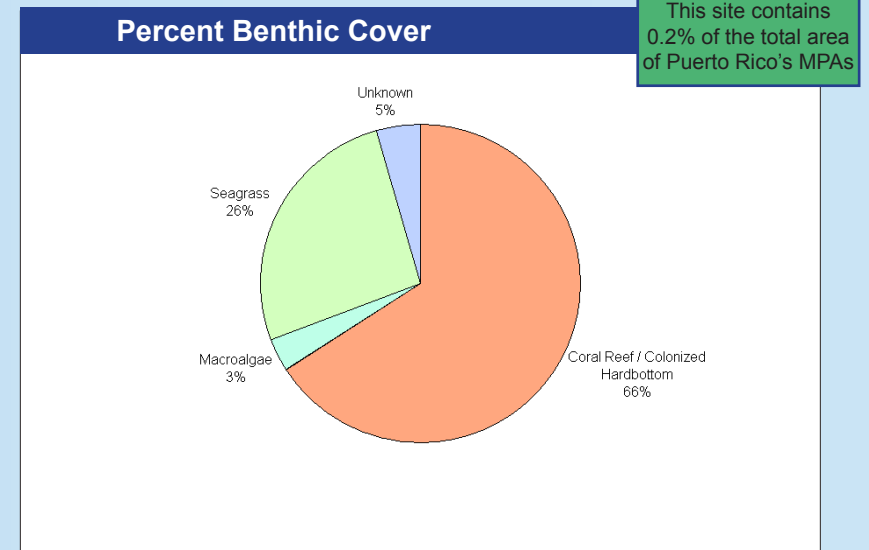
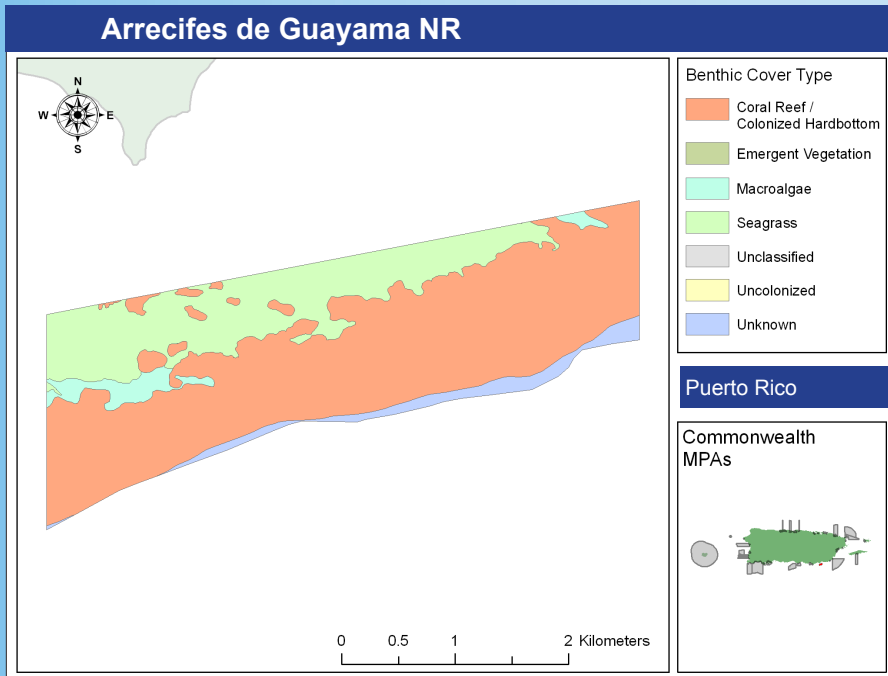
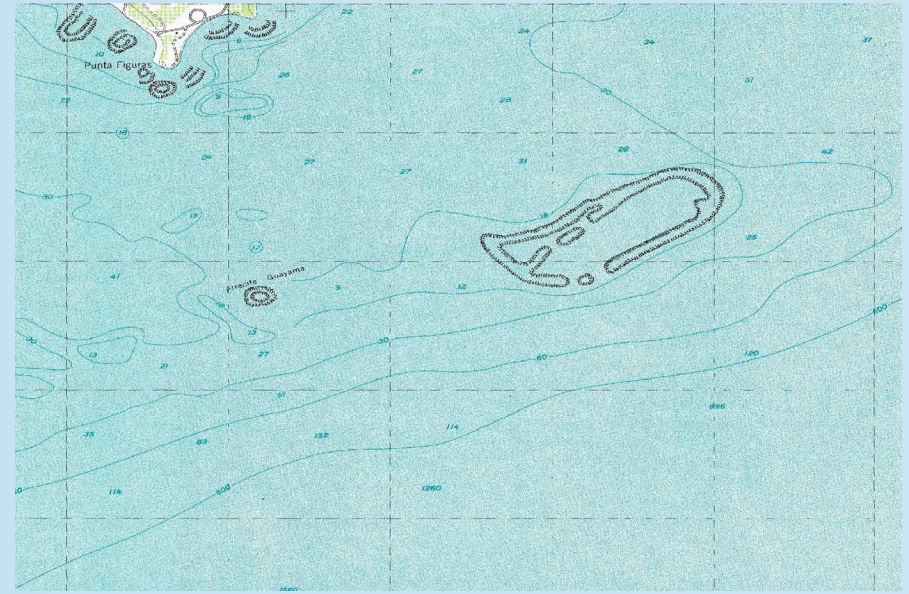
Arrecifes de Guayama Natural Reserve

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

Overview

The Arrecifes de Guayama Natural Reserve is located on the southeastern side of Puerto Rico, approximately 1.5 miles southeast of the town of Arroyo. This reserve was established to protect the physical, ecological, geographic, social, and environmental value of the natural resources in this area.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



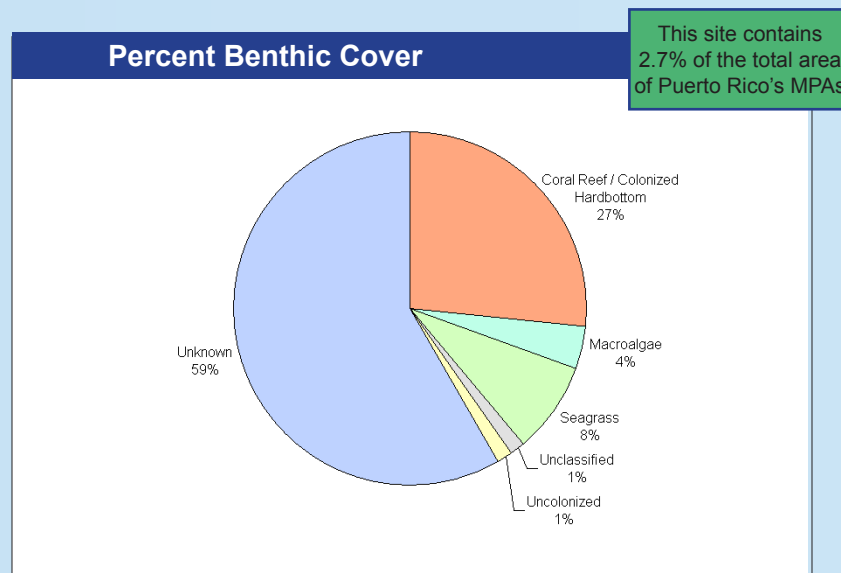
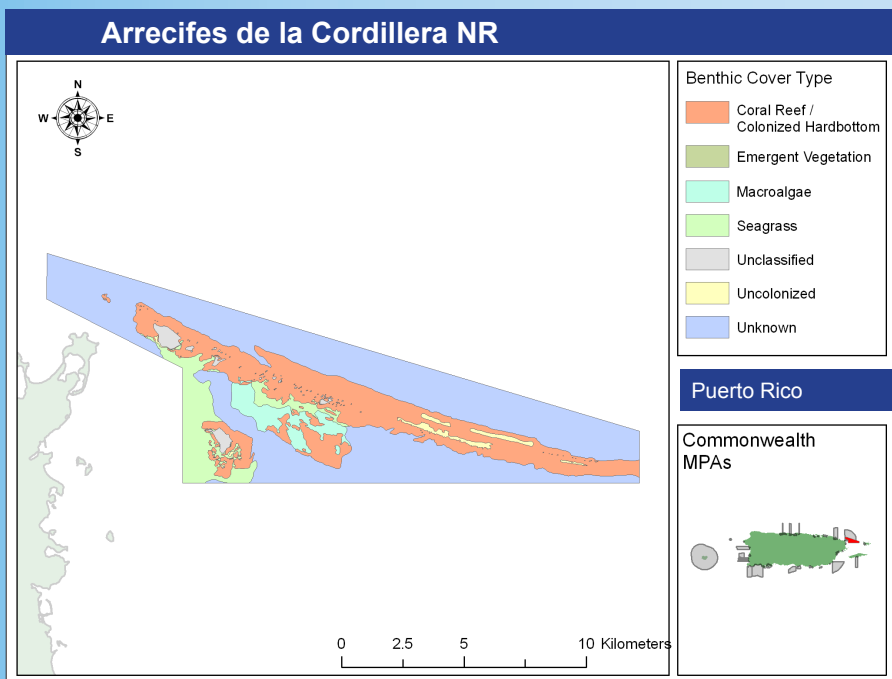
Arrecifes de la Cordillera Natural Reserve

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

Overview

The Arrecifes de la Cordillera Natural Reserve is located on the northeast side of Puerto Rico, just northeast of Fajardo. This site contains a chain of islands and keys with mangroves, lagoons, sandy beaches, and coral reef ecosystems that are critical habitat for marine species such as sea birds, sea turtles, and the West Indian Manatee.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



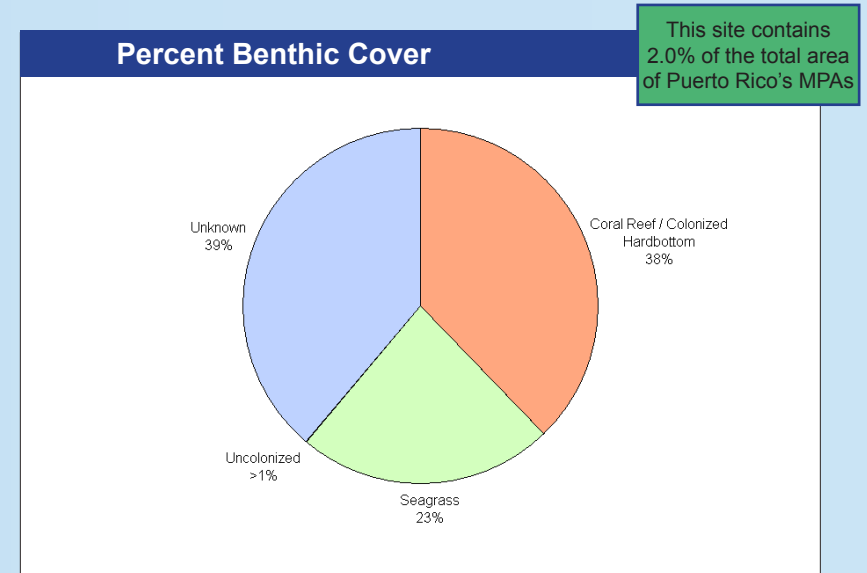
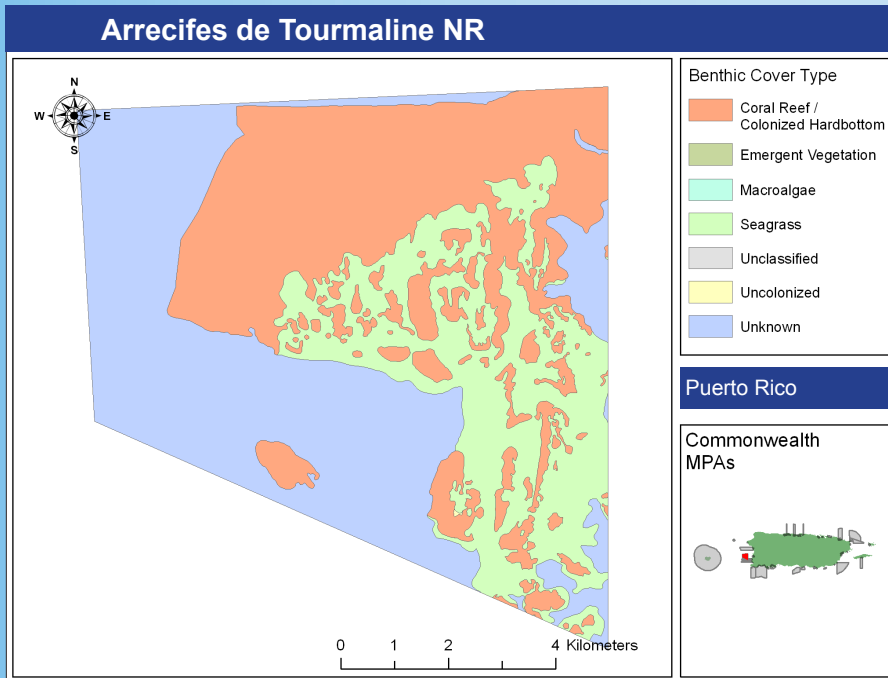
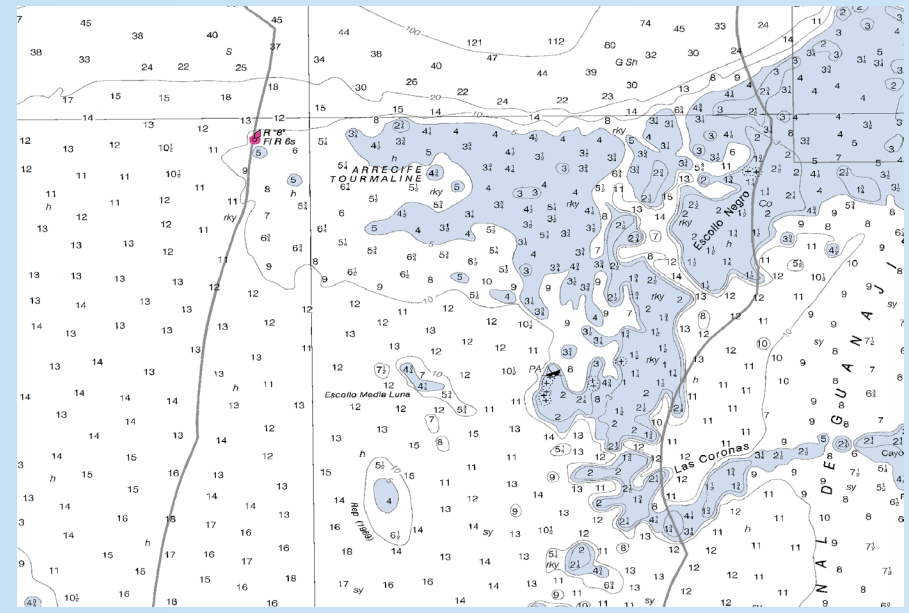
Arrecifes de Tourmaline Natural Reserve

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

Overview

The Arrecifes de Tourmaline Natural Reserve is located on the west side of Puerto Rico, about 4.5 miles off the coast between Punta Guanajibo in the north and Puerto Real in the south. This reserve includes extensive coral and rock reef habitats, and serves as a spawning aggregation area for the commercially important Red Hind (*Epinephelus guttatus*).

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



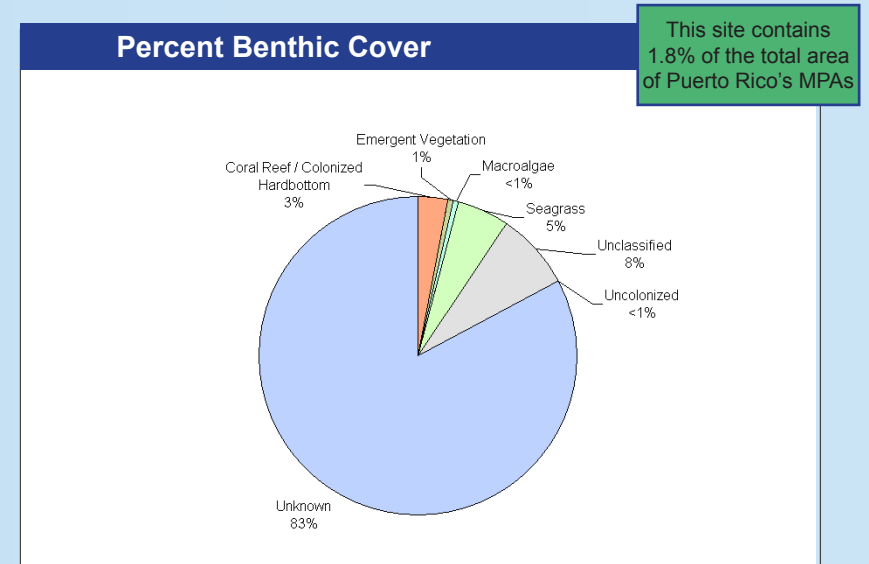
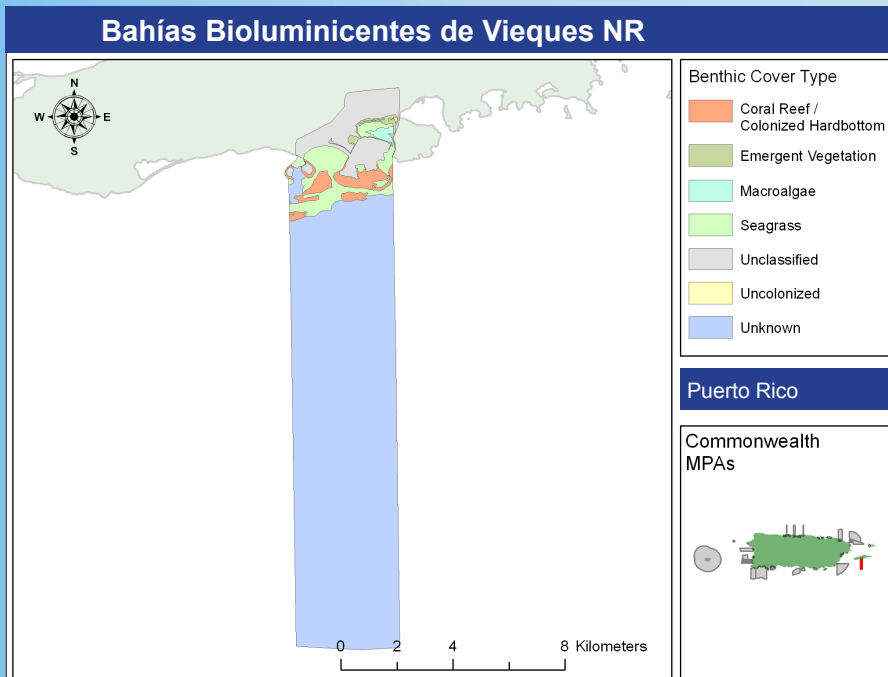
Bahías Bioluminicentes de Vieques Natural Reserve

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

Overview

The Bahías Bioluminicentes de Vieques Natural Reserve is located on the south central shore of Vieques Island (east of Naguabo, Puerto Rico). The reserve is bound in the east by the U.S. Fish & Wildlife Reserve, in the west by Esperanza, and has a seaward boundary that extends 9 nautical miles to the south. This reserve was designed to protect migratory bird habitat and sea turtle nesting areas for 3 species of endangered sea turtles (Leatherback, Hawksbill, and Green).

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



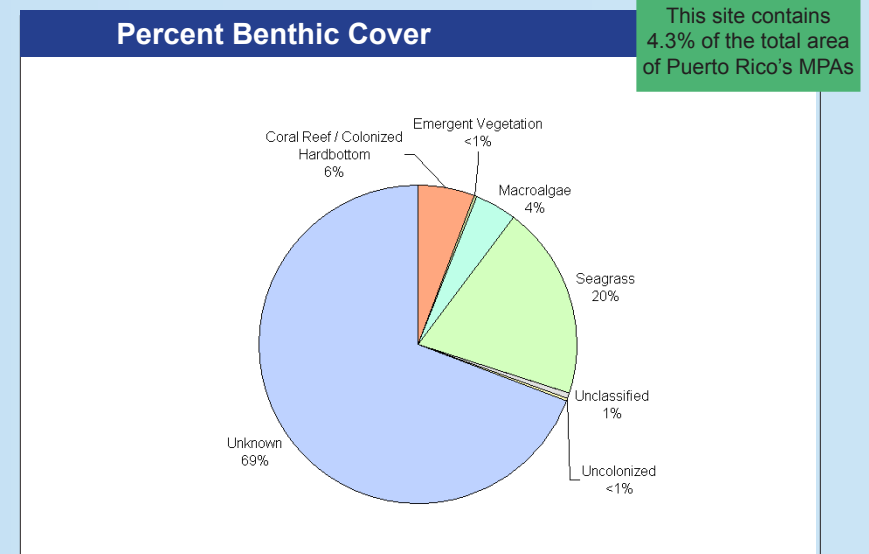
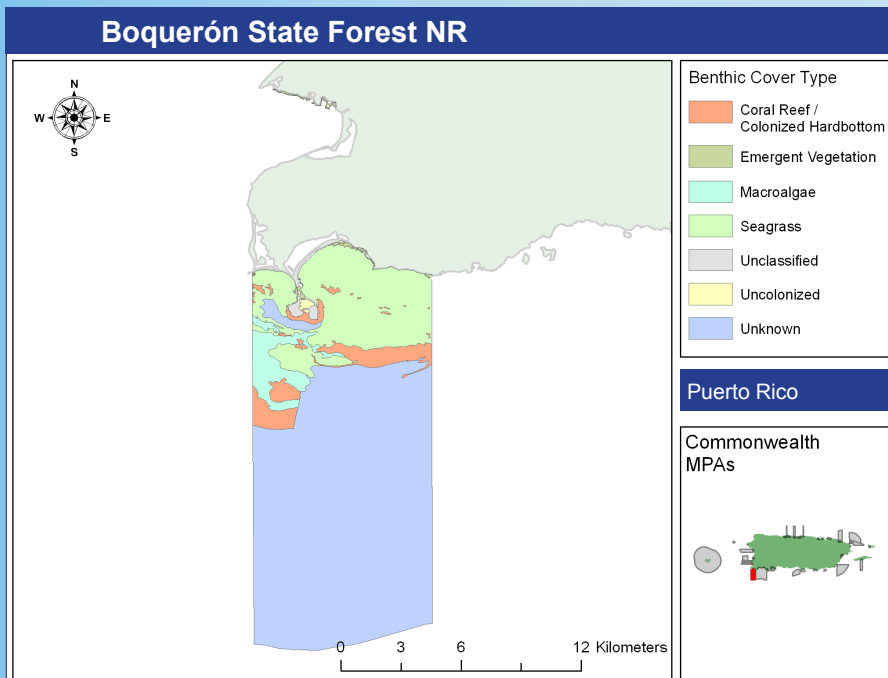
Boquerón State Forest Natural Reserve

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

Overview

The Boquerón State Forest Natural Reserve is located along the southwestern coast of Puerto Rico, in the municipality of Cabo Rojo. The reserve contains wetlands, lagoons, mangroves, and marine waters that extend out to 9 nautical miles south of Cabo Rojo. At least 135 different bird species, including migratory birds, have been identified in this reserve.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



Cabezas de San Juan Natural Reserve

Management Agency: Conservation Trust of Puerto Rico

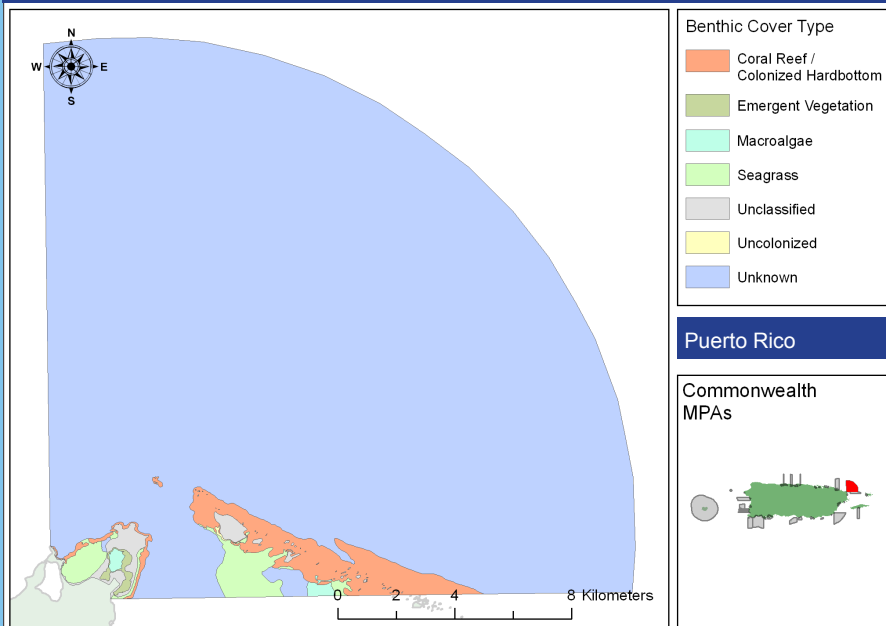
Overview

The Cabezas de San Juan Natural Reserve is located in the municipality of Fajardo on the northeastern shore of Puerto Rico, near the township of Las Croabas. The reserve is bound by Las Croabas in the southeast, private lands in the south, Seven Seas Natural Reserve in the west, and has a northeasterly seaward boundary that extends 9 nautical miles into the Atlantic Ocean. The reserve was established to conserve the biodiversity of the ecosystems and cultural resources of the area, which include: mangroves, bioluminescent lagoons, rocky and sandy shores, a xerophytic forest, Las Cabezas lighthouse, and archaeological sites.

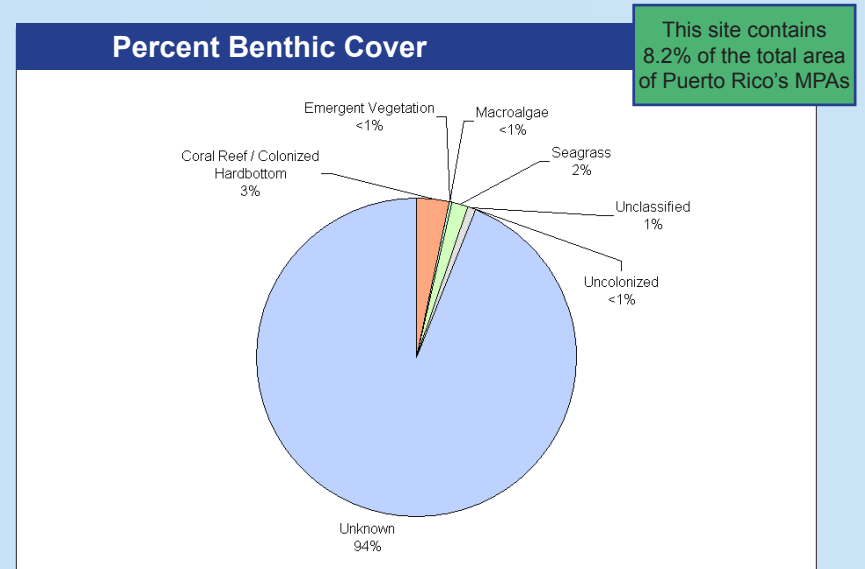
Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



Cabezas de San Juan NR



Percent Benthic Cover



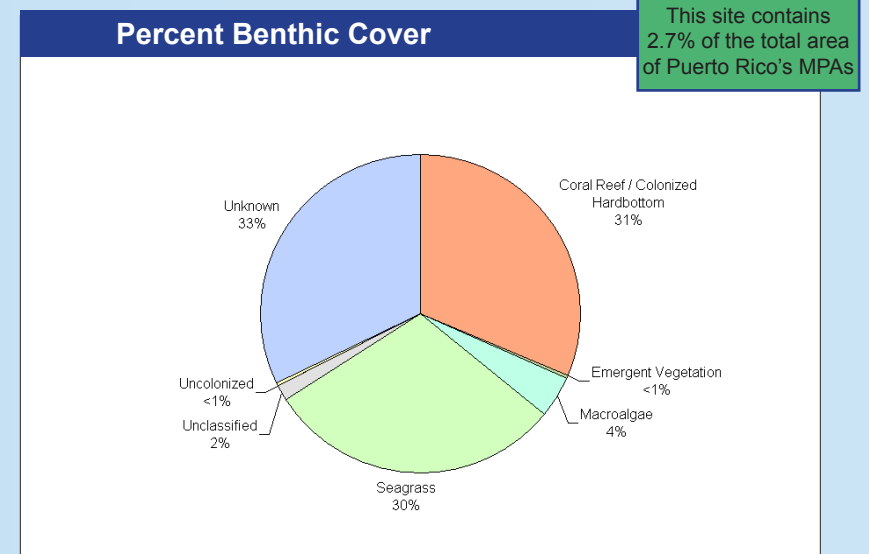
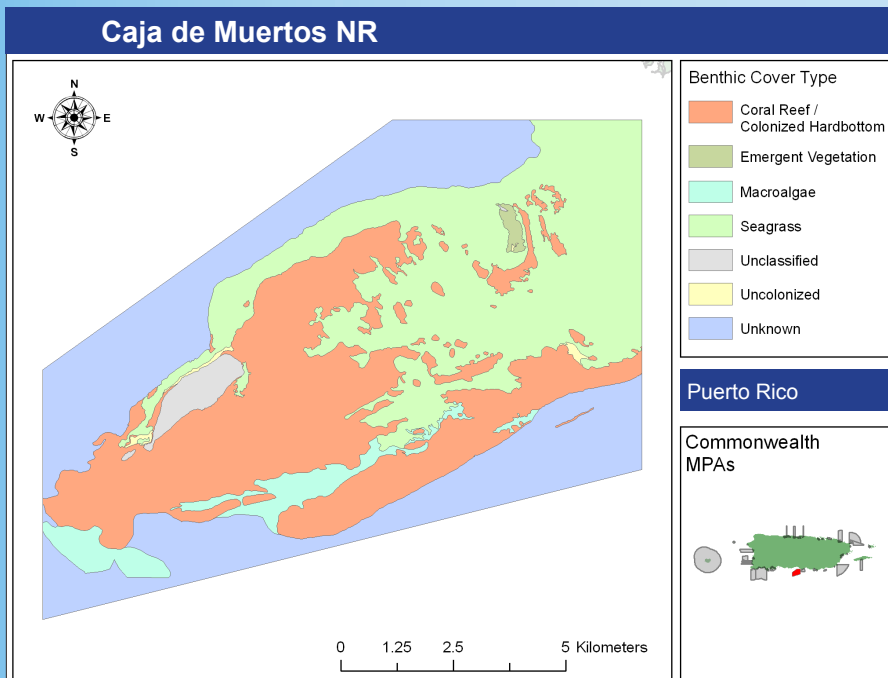
Caja de Muertos Natural Reserve

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

Overview

The Caja de Muertos Natural Reserve is located off the south central coast of Puerto Rico, just southwest of the town of Santa Isabel. The reserve includes Caja de Muertos Island, Morrillito Island, Berbería Cay, and surrounding marine benthic habitats composed primarily of seagrass and coral reef. Sea turtle and sea bird nesting areas are prominent on the reserve's islands.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



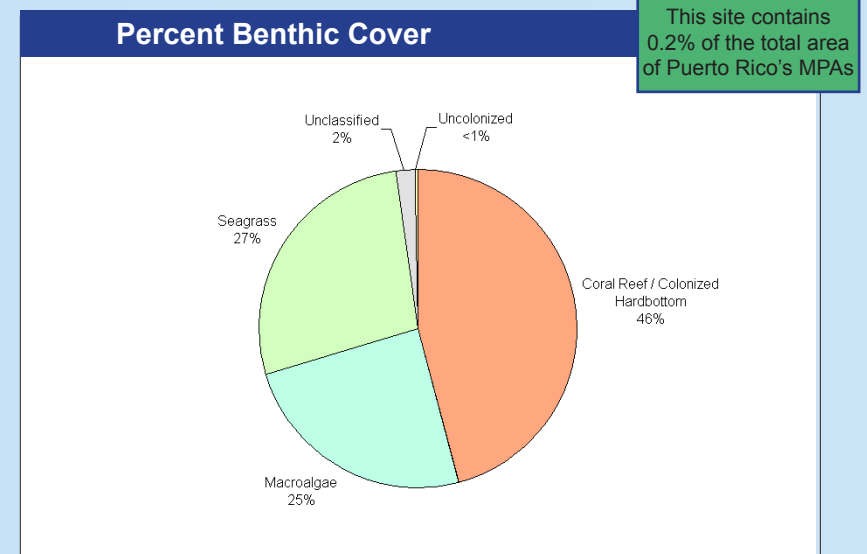
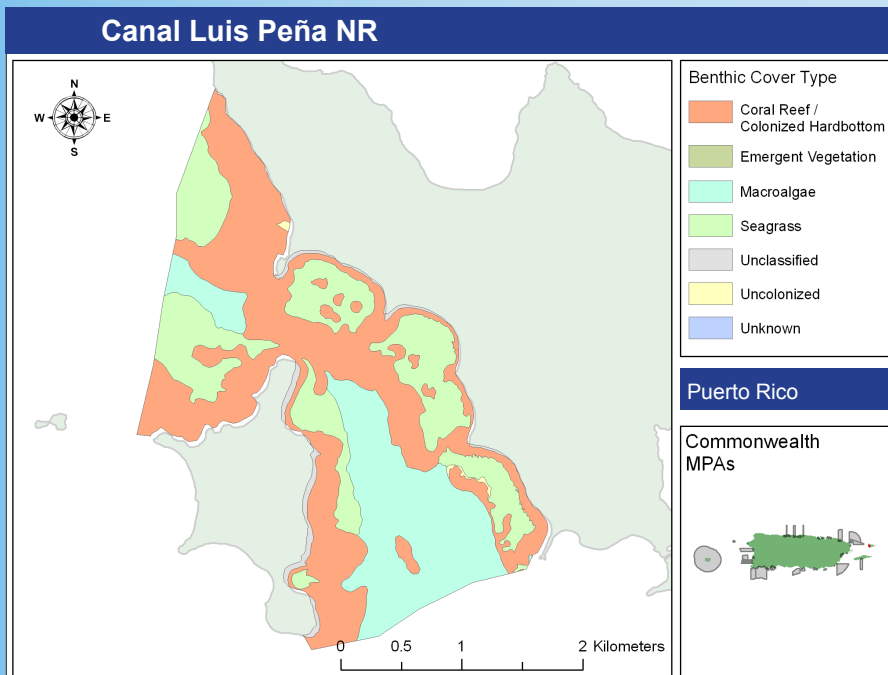
Canal Luis Peña Natural Reserve

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

Overview

The Canal Luis Peña Natural Reserve is located on the west side of the island of Culebra, about 17 miles east of Fajardo, Puerto Rico. The area is composed of 475 hectares of marine waters and submerged habitats between the island of Culebra and the smaller island of Luis Peña, just west of Culebra. This reserve has well-developed coral reef communities that support a variety of marine animals, including: fish, shellfish, and sea turtles.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



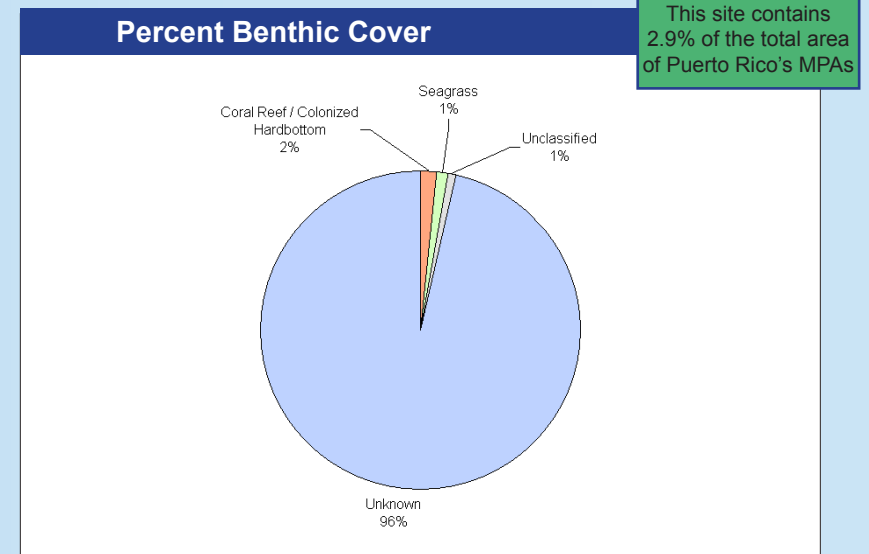
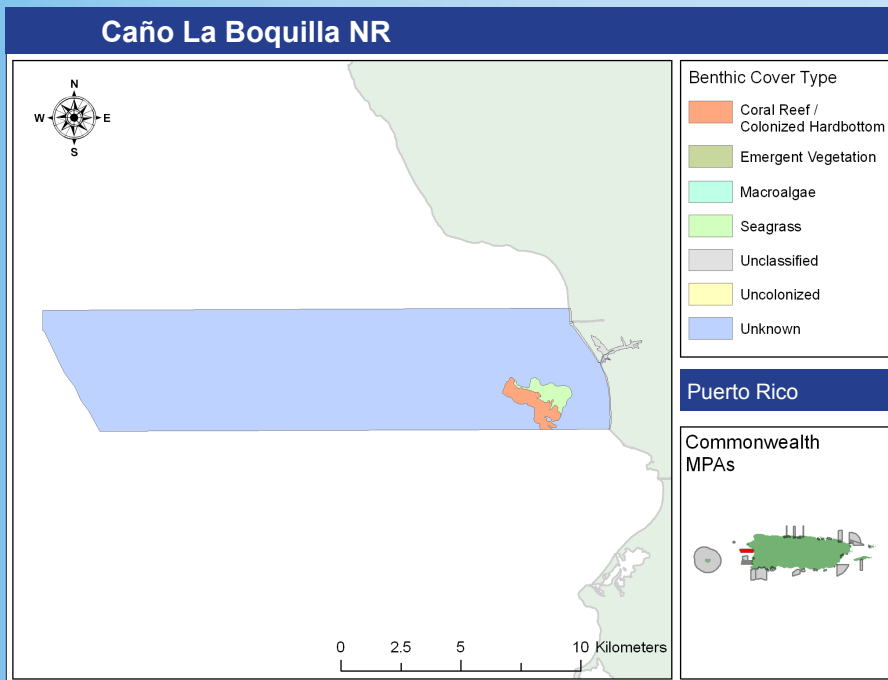
Caño La Boquilla Natural Reserve

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

Overview

The Caño La Boquilla Natural Reserve is located on the west side of Puerto Rico. The reserve is bound in the north by Bahía Añasco, in the south by Algarrobo Point, and has a westerly seaward boundary that extends 9 nautical miles into the Caribbean Sea. This area's Red, Black, and White mangrove communities provide critical habitat for a variety of marine species.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



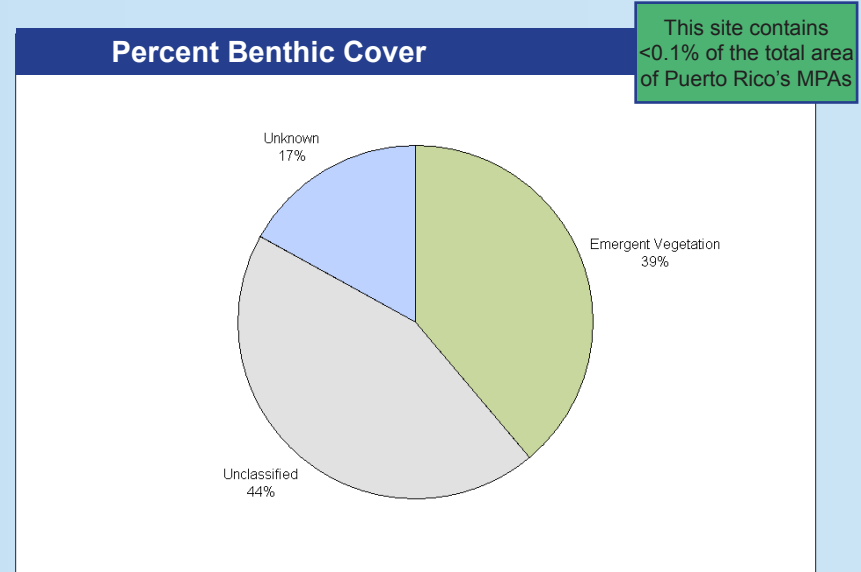
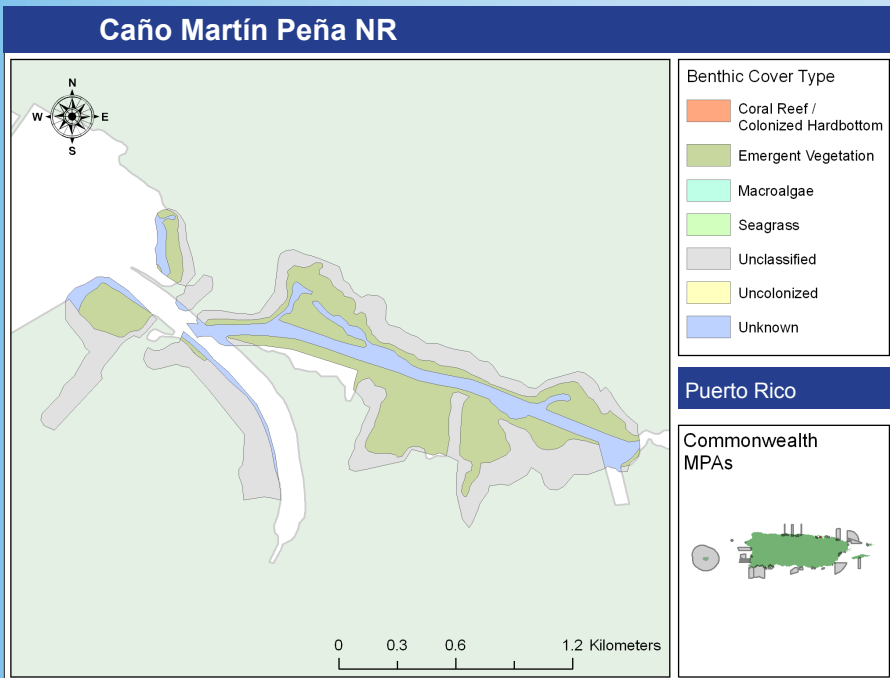
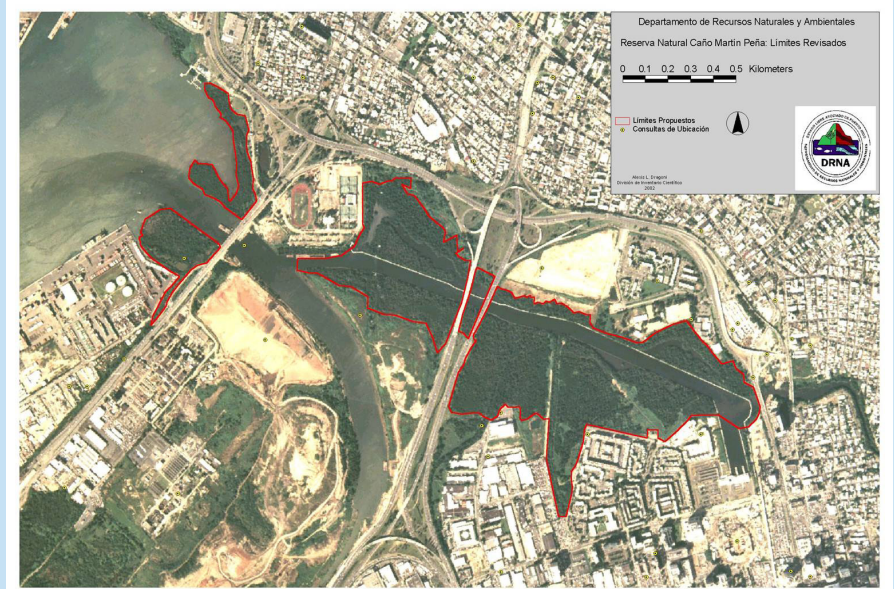
Caño Martín Peña Natural Reserve

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

Overview

The Caño Martín Peña Natural Reserve is located on the northeast side of Puerto Rico, just southeast of the capital city of San Juan. The reserve is made up of a canal, including surrounding banks, that allows water from Laguna San Jose to discharge in Bahía de San Juan.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



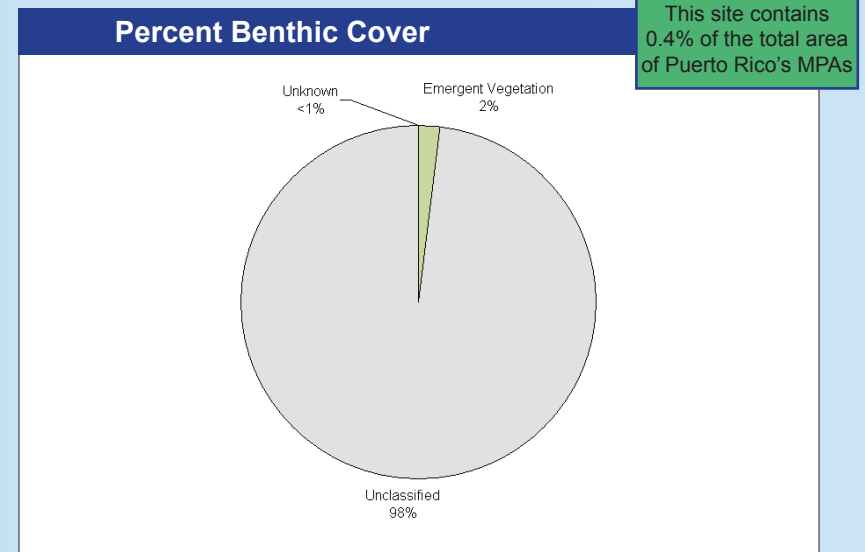
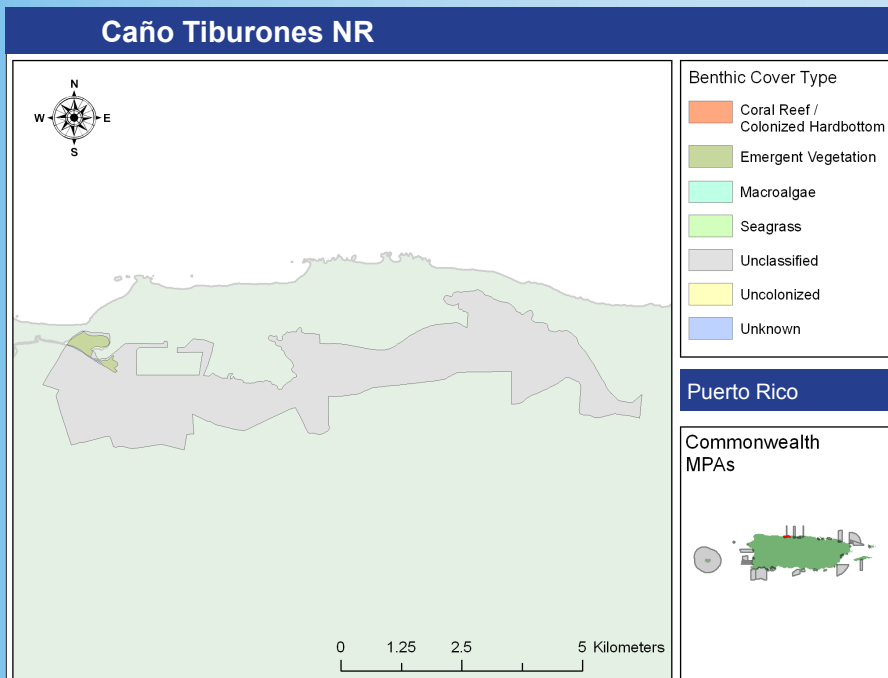
Caño Tiburones Natural Reserve

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

Overview

The Caño Tiburones Natural Reserve is located on the northern coast of Puerto Rico, between the municipalities of Barceloneta and Arecibo. Caño Tiburones is considered the largest wetland in Puerto Rico. This diverse environment includes 30-km of navigable inland channels, and 191 species of aquatic and terrestrial birds.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



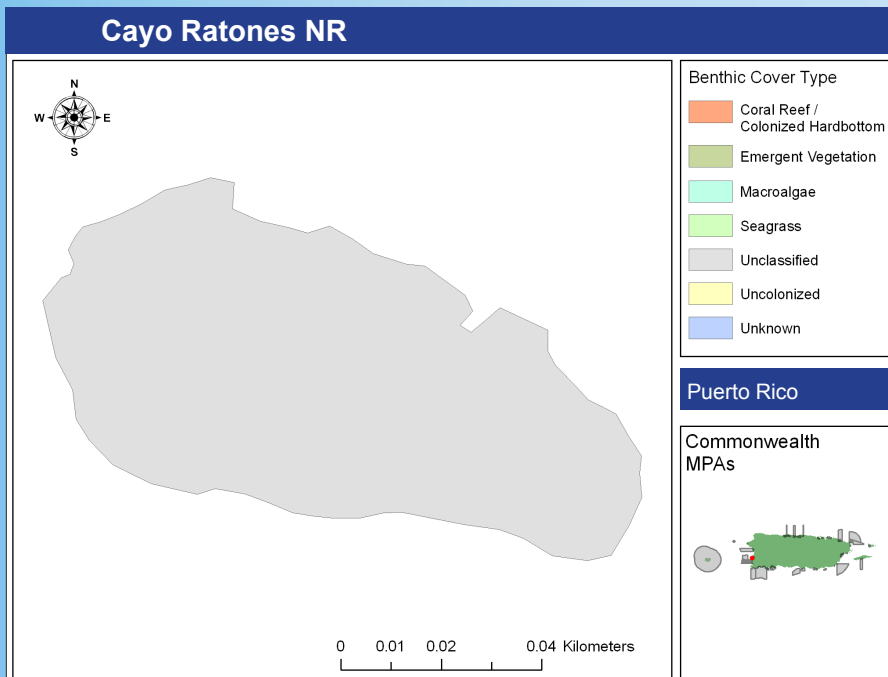
Cayo Ratones Natural Reserve

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

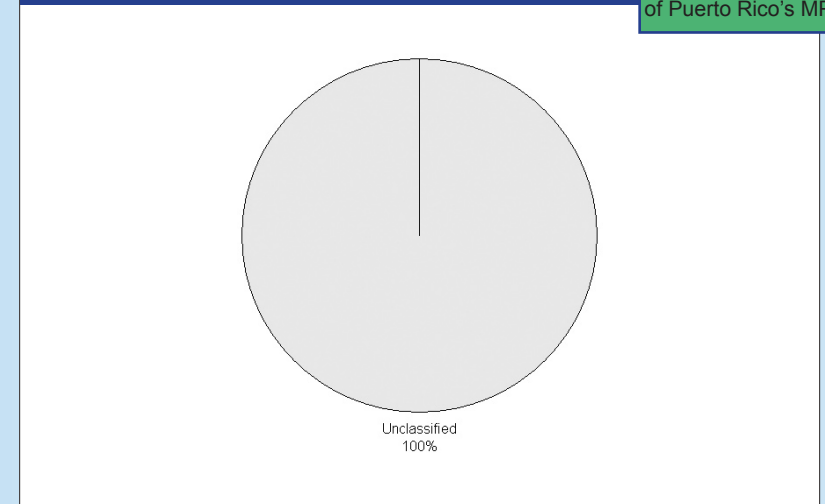
Overview

The Cayo Ratones Natural Reserve is located off the southeast coast of Puerto Rico on Cayo Ratones—a small island just west of the coastal town of Joyuda. Cayo Ratones is composed of Australian pines, sandy beaches, and surrounding waters that are popular among snorkelers and scuba divers. The island is also known for its Brown Pelican nesting sites.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



Percent Benthic Cover



This site contains <0.0% of the total area of Puerto Rico's MPAs

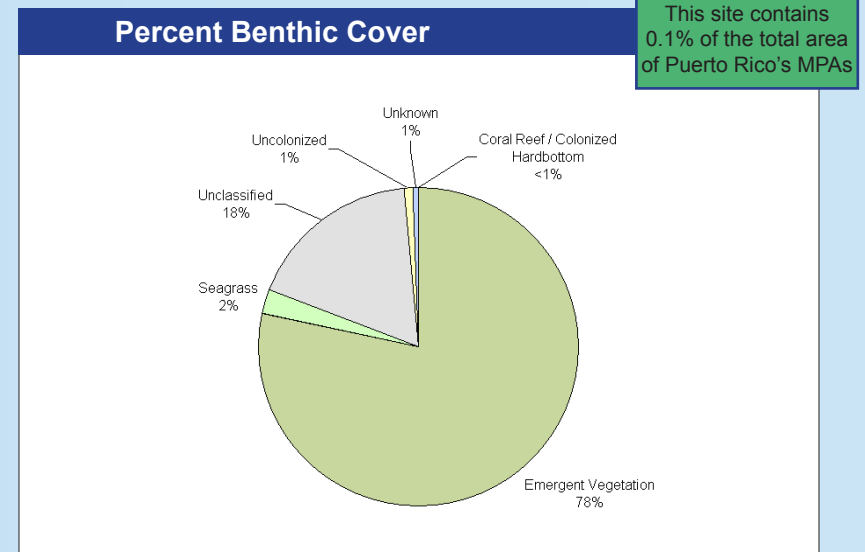
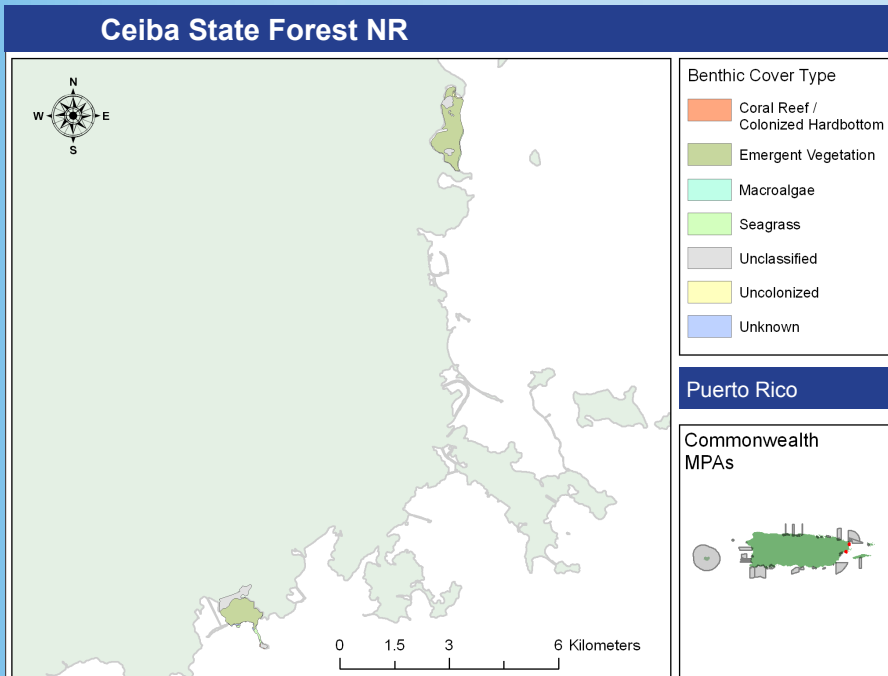
Ceiba State Forest Natural Reserve

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

Overview

The Bosque Estatal de Ceiba Natural Reserve is composed of four separate plots located in the Naguabo, Ceiba, and Fajardo municipalities, all located on the east side of Puerto Rico. This reserve was established to protect mangroves, wetlands, seagrass, and the coastal zone.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



Ciénaga de las Cucharillas Natural Reserve

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

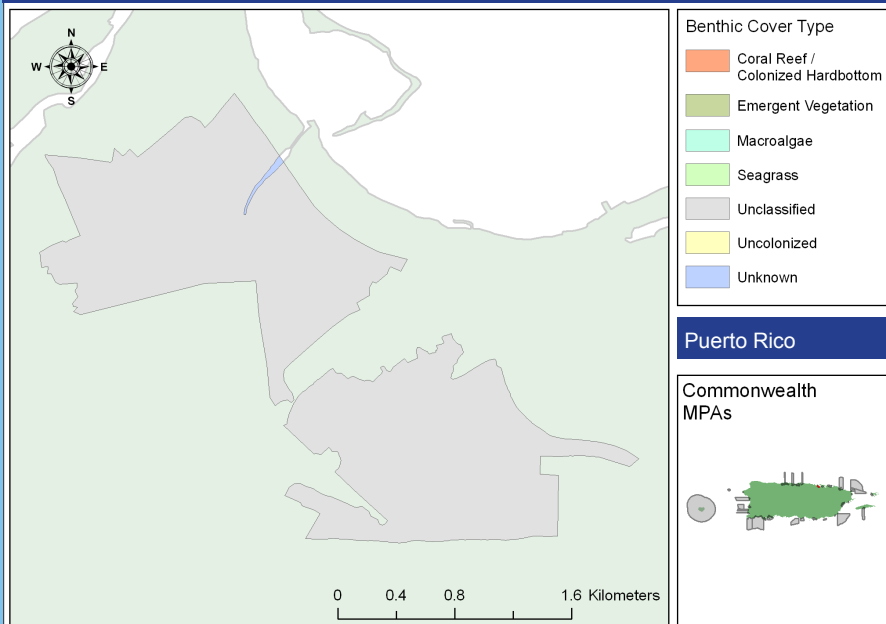
Overview

The Ciénaga de las Cucharillas Natural Reserve is located on the northeast side of Puerto Rico, just west of Cataño. This reserve is composed primarily of interior wetlands whose waters discharge to the Bahía de San Juan.

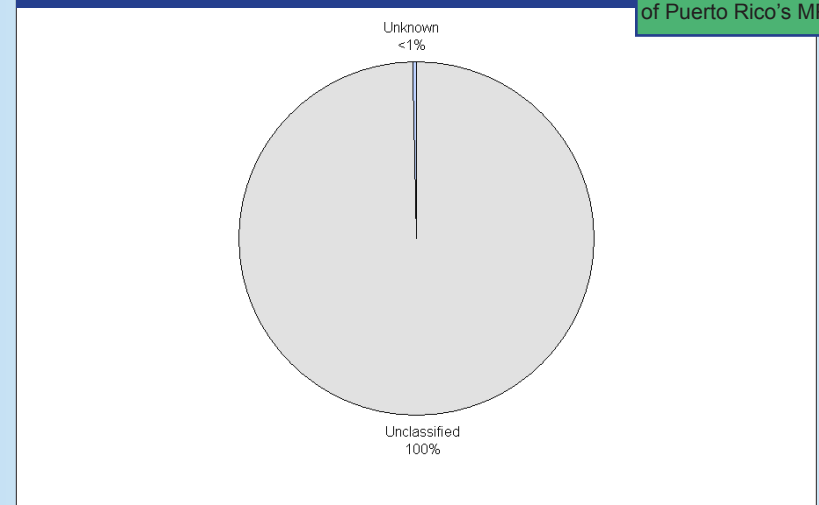
Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



Ciénaga de las Cucharillas NR



Percent Benthic Cover



This site contains 0.1% of the total area of Puerto Rico's MPAs

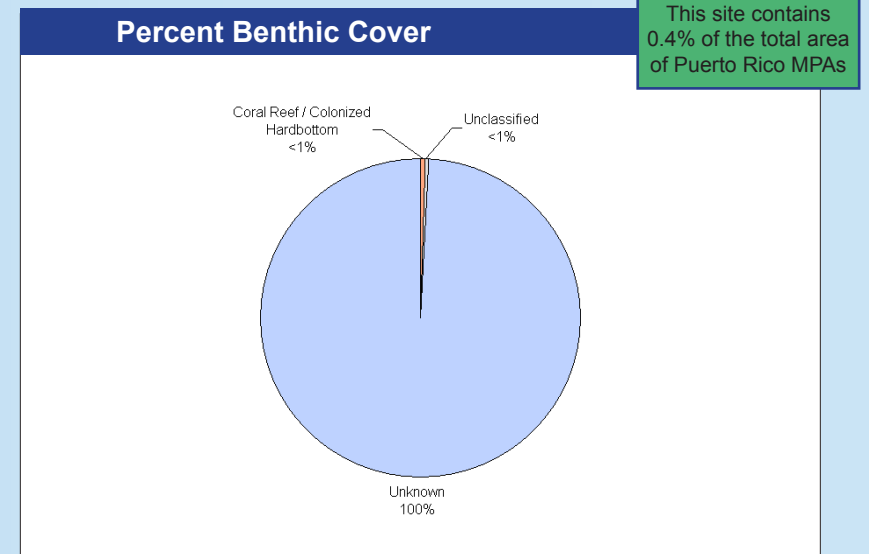
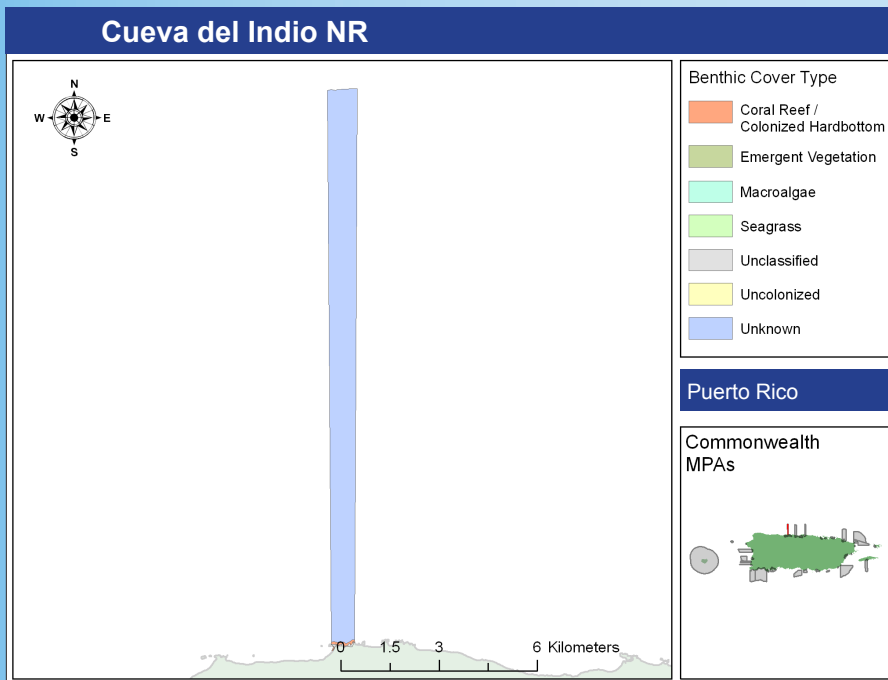
Cueva del Indio Natural Reserve

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

Overview

The Cueva del Indio Natural Reserve is located on the north central coast of Puerto Rico in the municipality of Arecibo. This reserve includes coastal forests, sandy beaches, and cemented dunes, as well as submerged coral reefs and associated benthic communities that extend 9 nautical miles north into the Atlantic Ocean. Sea turtle nesting areas and archaeological resources such as Taino indian (aboriginal) drawings are some of the important resources protected at this site.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



Ecosystems Adjacent to the Laguna Joyuda Natural Reserve

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

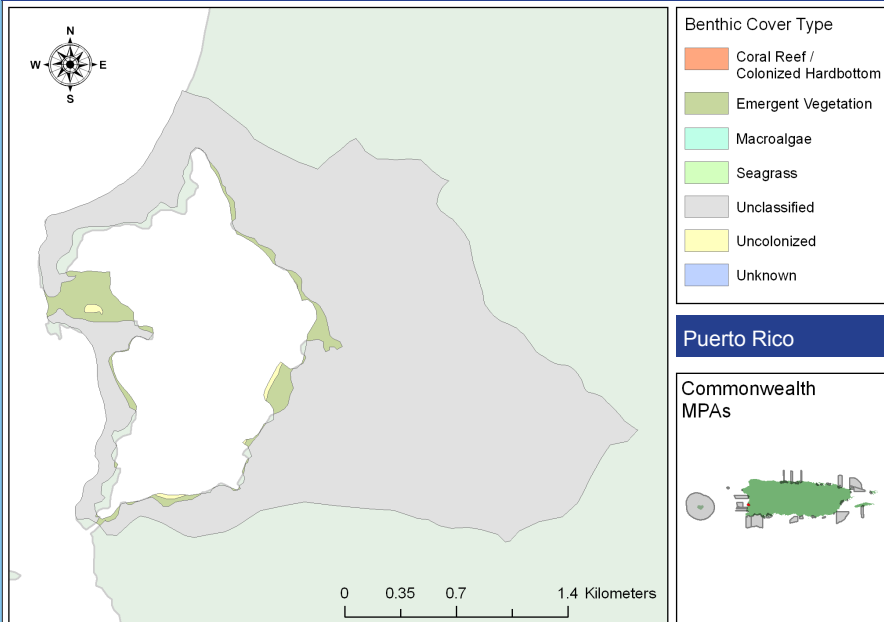
Overview

The Ecosystems Adjacent to the Laguna Joyuda Natural Reserve are located on the southwest side of Puerto Rico in the municipality of Cabo Rojo. This area is composed of Laguna Joyuda, wetlands, mangroves, and Brown Pelican nesting sites.

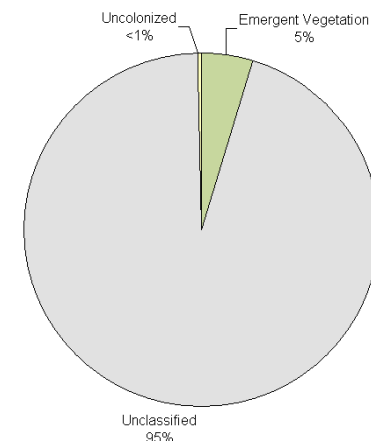
Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



Ecosystems Adjacent to the Laguna Joyuda NR



Percent Benthic Cover



This site contains 0.1% of the total area of Puerto Rico's MPAs

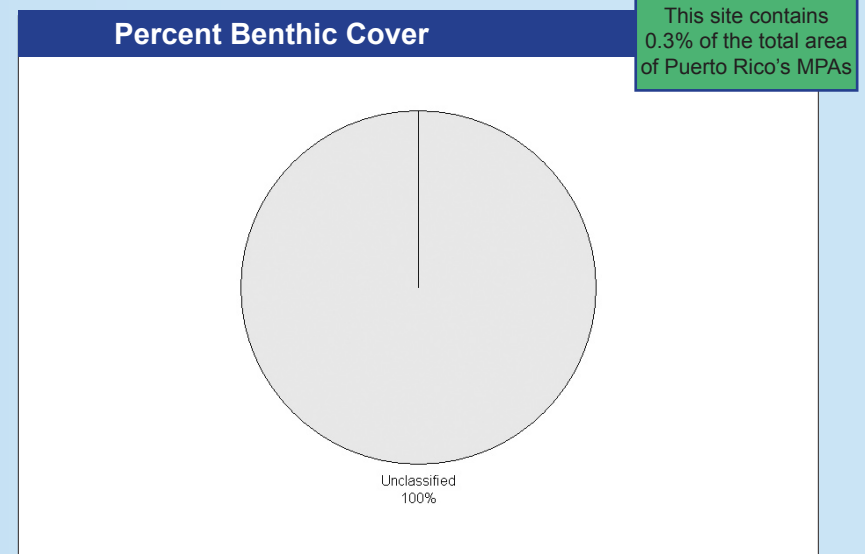
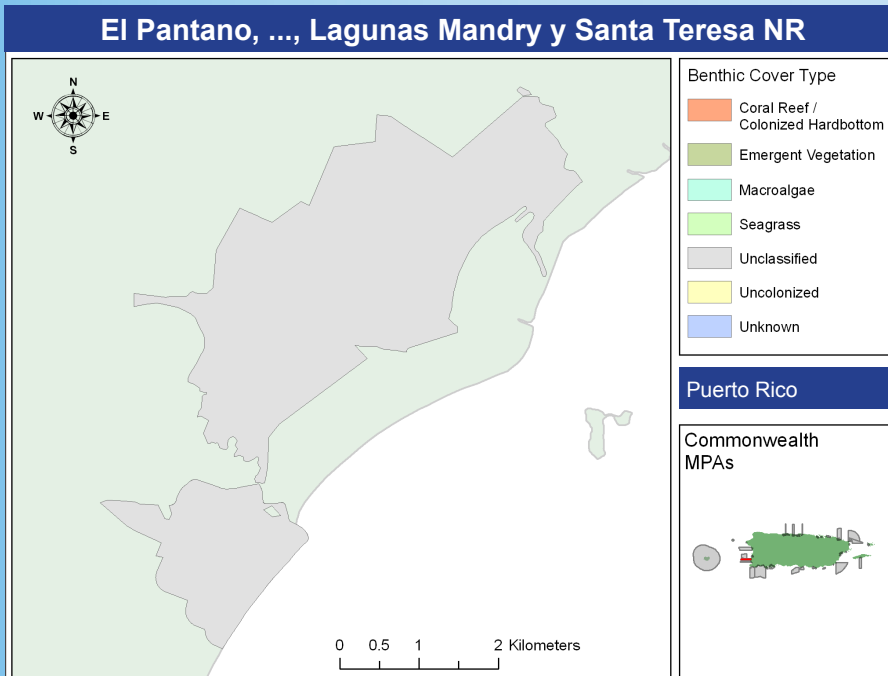
El Pantano, Bosque de *Pterocarpus*, Lagunas Mandry y Santa Teresa NR

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

Overview

The El Pantano, Bosque de *Pterocarpus* y Lagunas Mandry y Santa Teresa Natural Reserve is located on the east side of Puerto Rico in the municipalities of Naguabo and Humacao. This area contains Puerto Rico's most extensive Bloodwood (*Pterocarpus officinalis*) swamp. This reserve was designated to protect important coastal habitats such as wetlands, mangroves, and the *Pterocarpus* swamps, as well as native wildlife and waterfowl.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



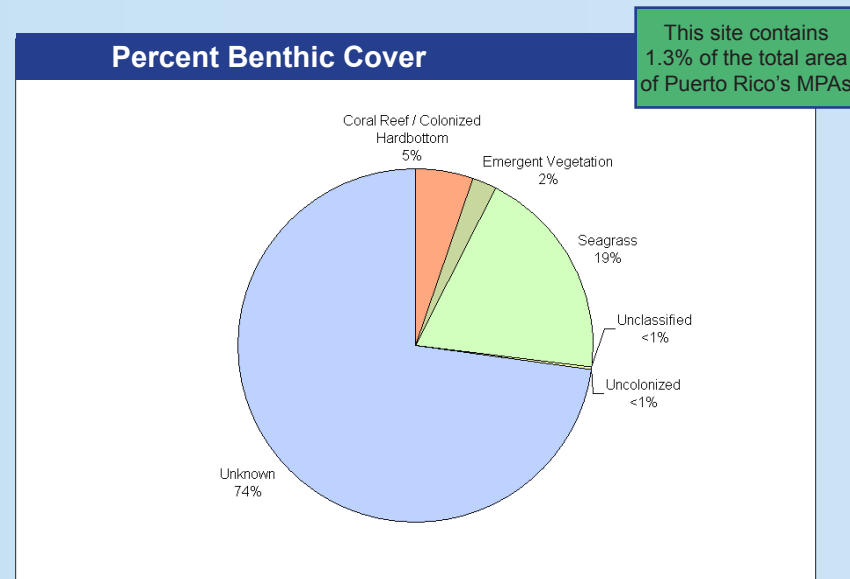
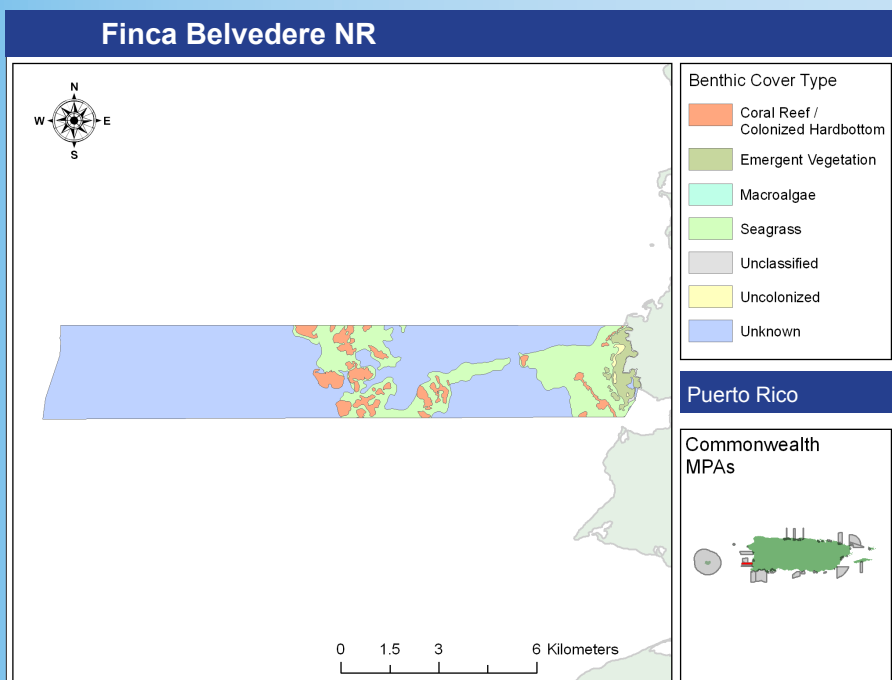
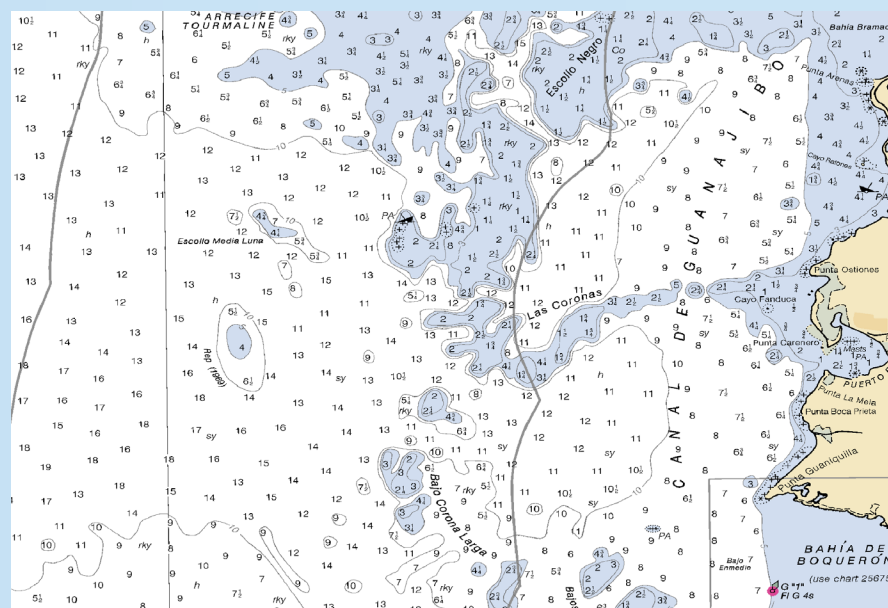
Finca Belvedere Natural Reserve

Management Agency: n/a

Overview

The Finca Belvedere Natural Reserve is located on the southwest side of Puerto Rico in the municipality of Cabo Rojo. This reserve includes wetlands, sandy beaches, and submerged coral reefs and associated benthic communities that extend 9 nautical miles west into the Caribbean Sea.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



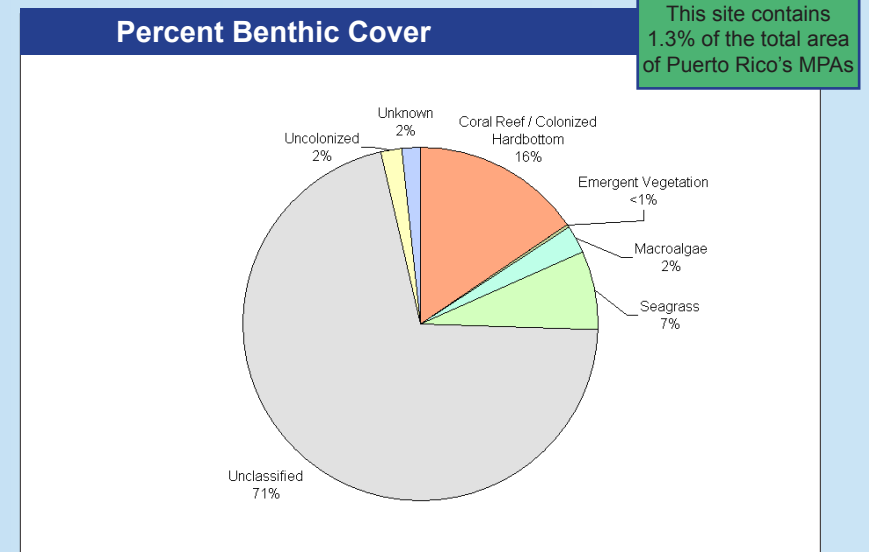
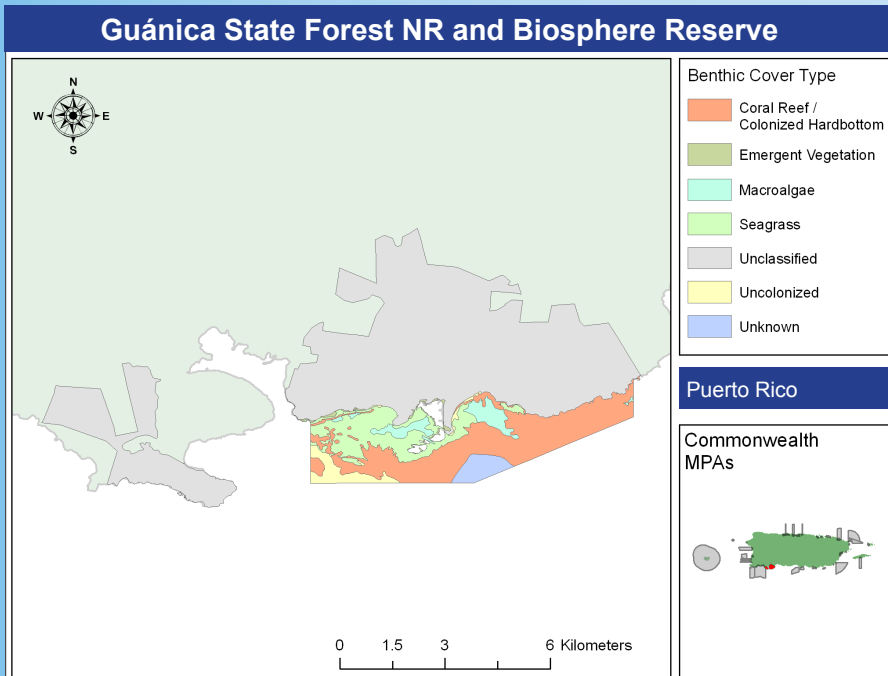
Guánica State Forest NR and Biosphere Reserve

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

Overview

The Bosque Estatal de Guánica Natural Reserve is located in southwestern Puerto Rico in the municipalities of Guánica, Yauco, and Guayanilla. The reserve is composed of Caña Gorda Keys, land areas on either side of Guánica Bay, and highly productive adjacent marine communities that include: lagoons, mangroves, seagrass beds, and coral reefs. These habitats provide refuge for at least 15 endangered species.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



Hacienda La Esperanza Natural Reserve

Management Agency: Conservation Trust of Puerto Rico

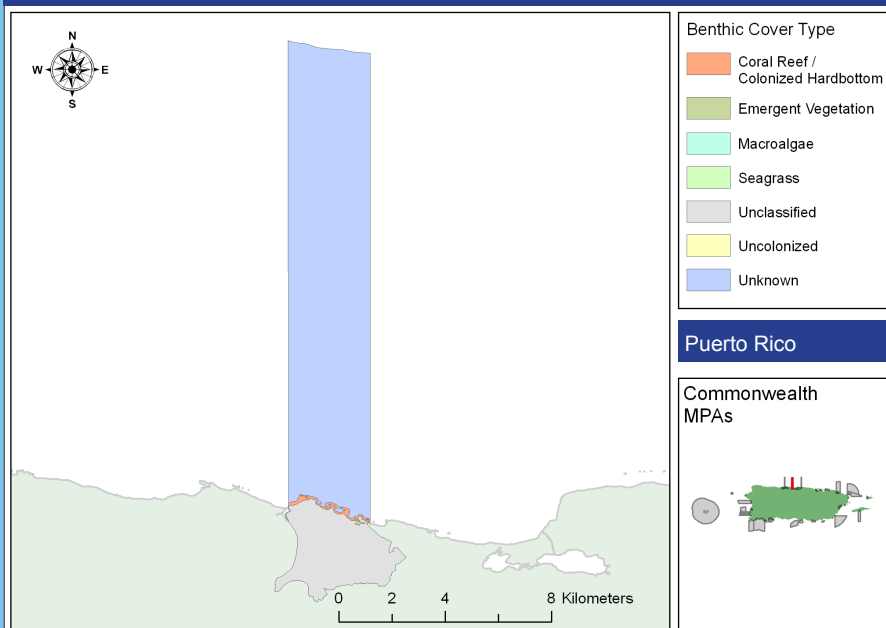
Overview

The Hacienda La Esperanza Natural Reserve is located on the north central coast of Puerto Rico in the municipality of Manatí. The reserve was established primarily to address water quality and conservation issues in the area.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.

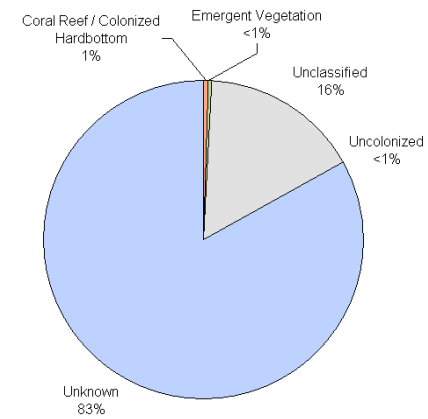


Hacienda La Esperanza NR



Percent Benthic Cover

This site contains 1.6% of the total area of Puerto Rico's MPAs



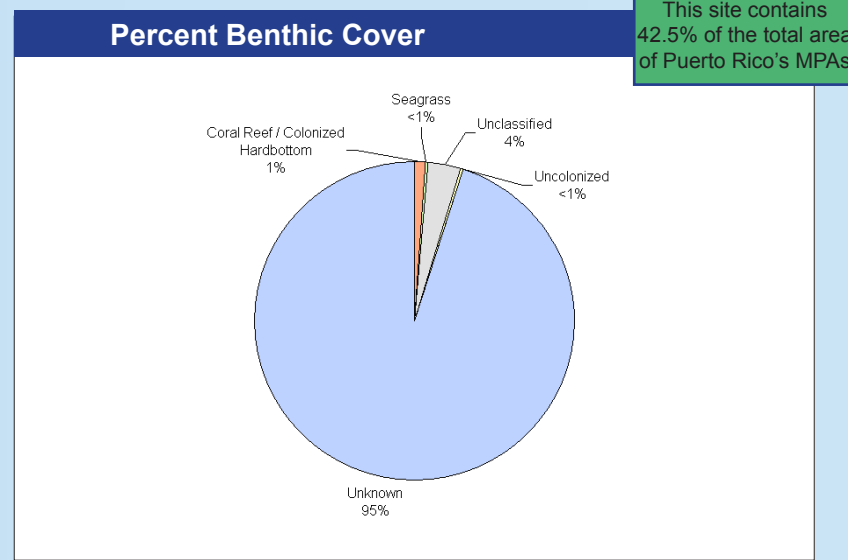
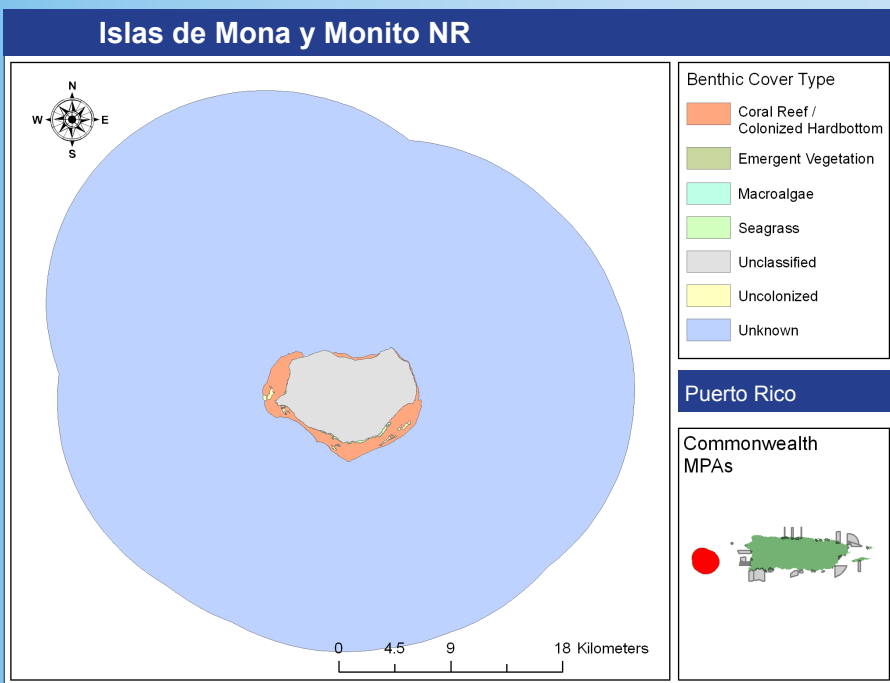
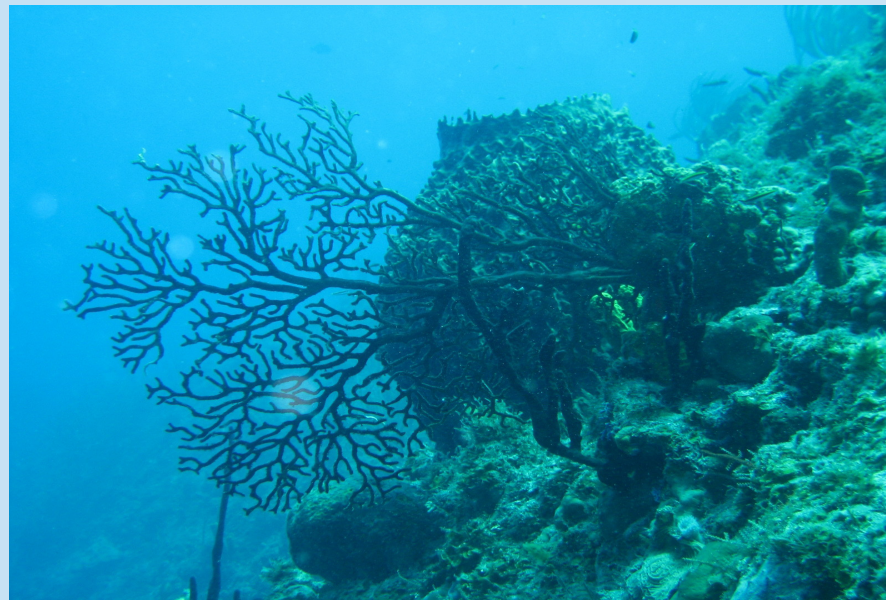
Islas de Mona y Monito Natural Reserve

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

Overview

The islands of Mona and Monito are located 42 nautical miles west of Puerto Rico in the Mona Passage of the Caribbean Sea. Mona is a karstic island, dominated by dry forest and surrounded by seagrass, coral reefs, and sandy beaches. Monito Island, located six kilometers northwest of Mona, is much smaller, and lacks beaches. The U.S. Fish and Wildlife Service has designated these islands, and their surrounding waters, support communities of sea birds and sea turtles.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



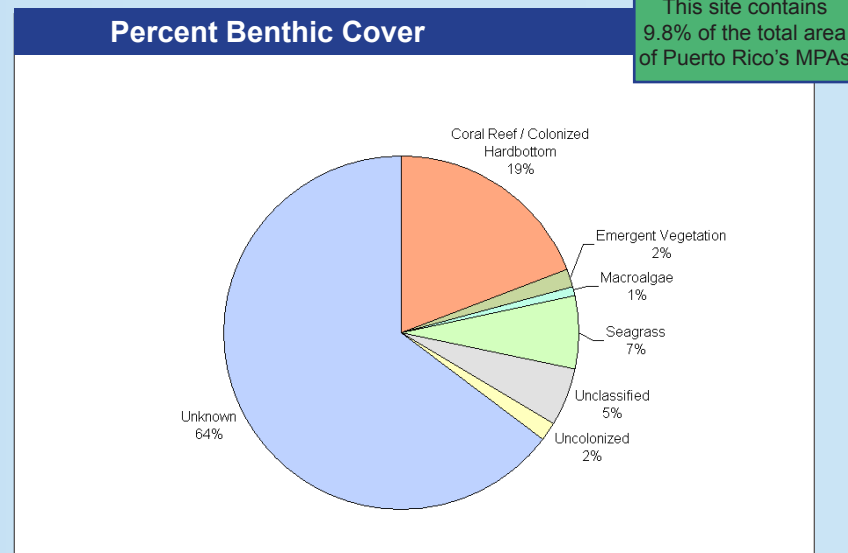
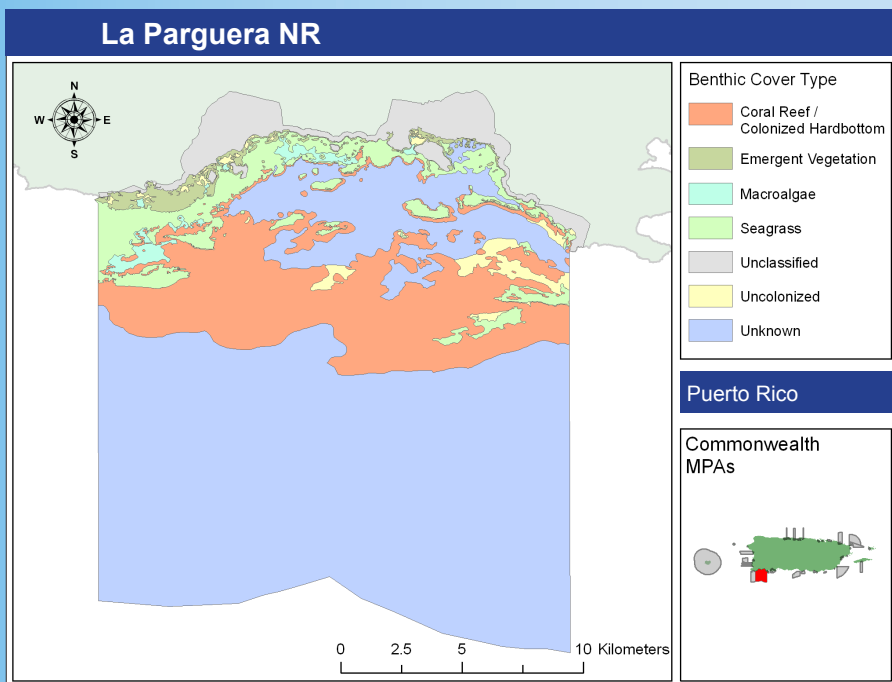
La Parguera Natural Reserve

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

Overview

La Parguera Natural Reserve is located on the southwestern coast of Puerto Rico in the municipality of Lajas. The reserve is bound in the west by Punta Pitahaya, in the east by Punta Jorobado, has a northern inland boundary roughly half a mile from the shore, and a seaward boundary that extends 9 nautical miles south into the Caribbean Sea. This protected area includes keys, islands, mangroves, salt marshes, coral reefs, and bioluminescent bays.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



Laguna Joyuda Natural Reserve

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

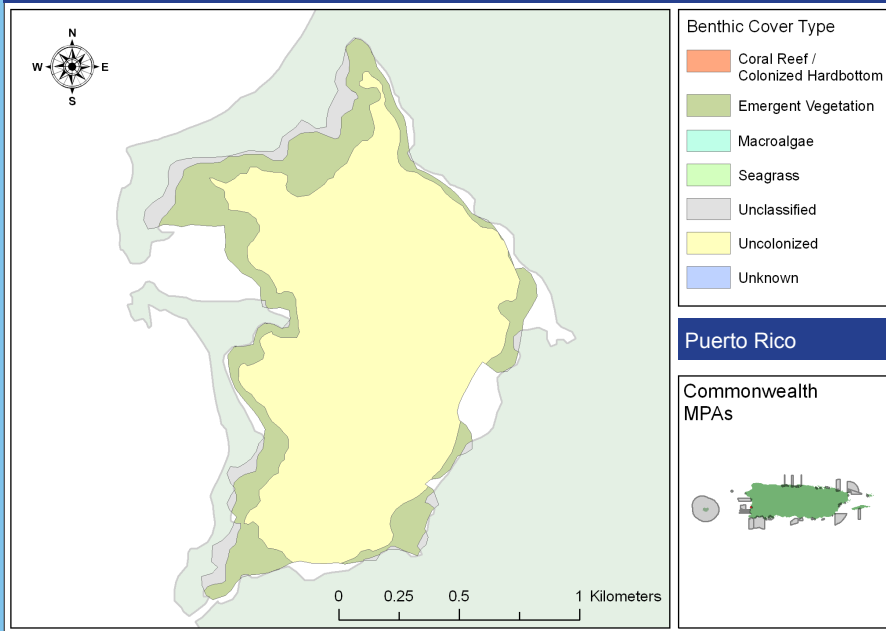
Overview

The Laguna Joyuda Natural Reserve is located on the southwest side of Puerto Rico in the municipality of Cabo Rojo. This area is composed of mangroves, lagoons, and wetlands.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.

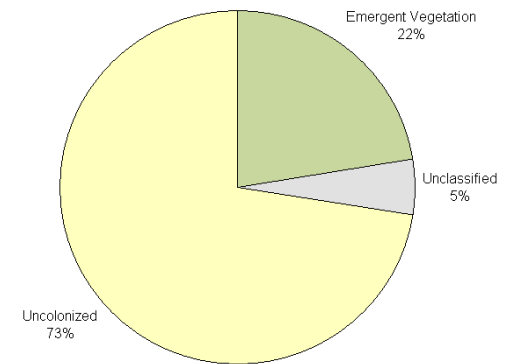


Laguna Joyuda NR



Percent Benthic Cover

This site contains <0.1% of the total area of Puerto Rico's MPAs



Laguna Tortuguero Natural Reserve

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

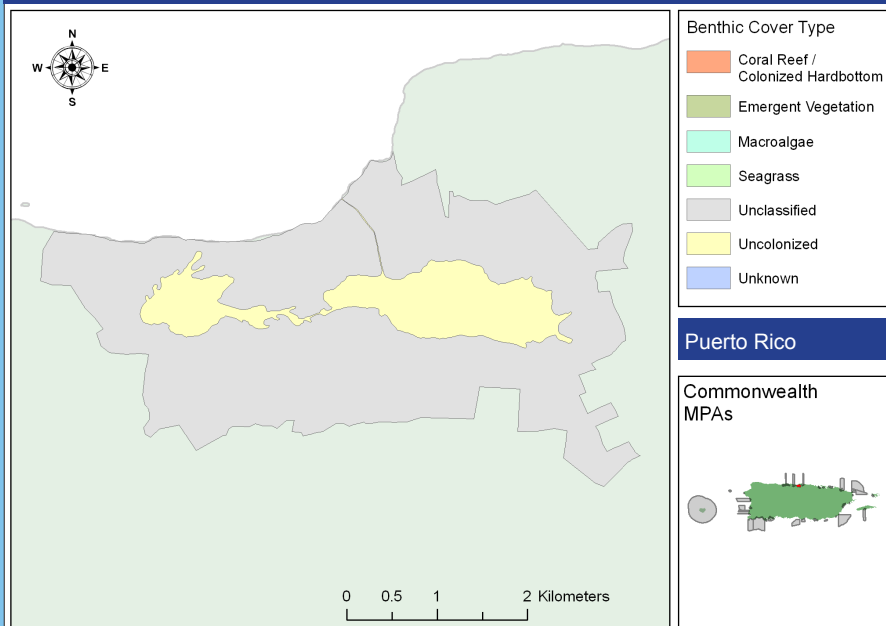
Overview

The Laguna Tortuguero Natural Reserve is located on the north central coast of Puerto Rico in the municipalities of Manatí and Vega Baja. This area is characterized as an area of high biodiversity with 717 species of plants (37 of which are found nowhere else in the world), 83 species of birds, and 23 species of fish.

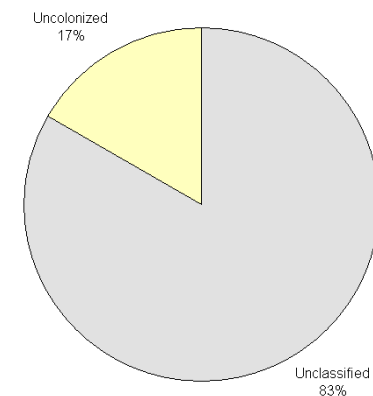
Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



Laguna Tortuguero NR



Percent Benthic Cover



This site contains 0.3% of the total area of Puerto Rico's MPAs

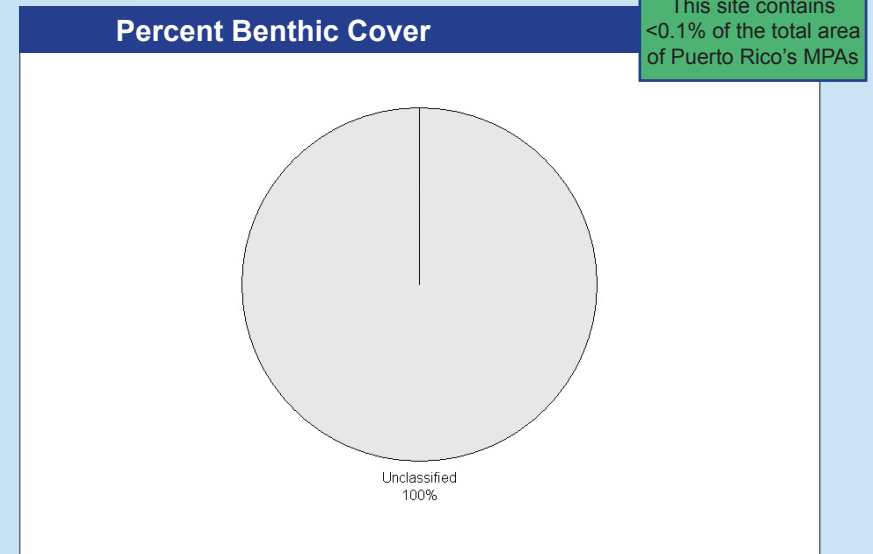
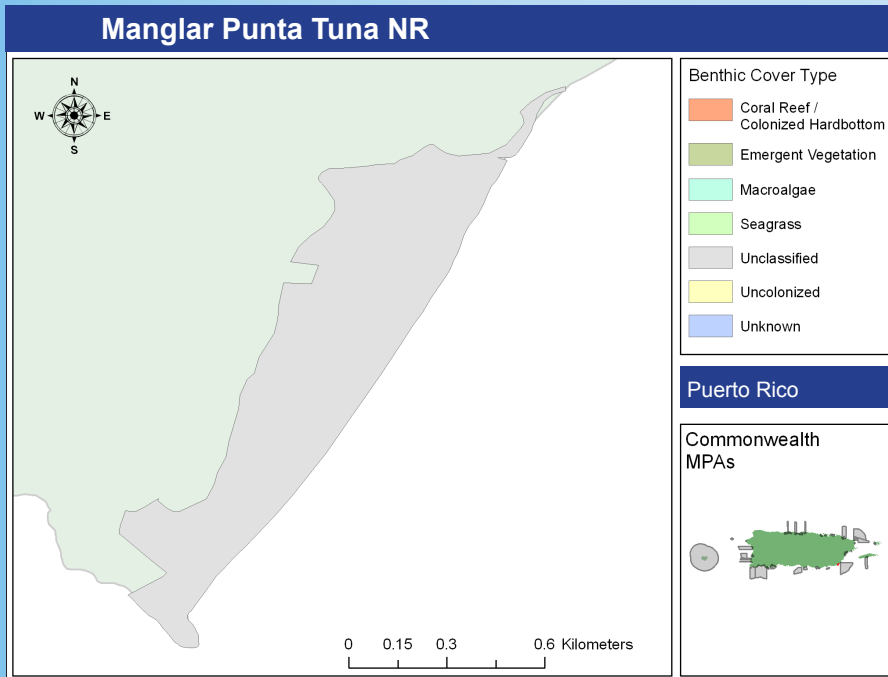
Manglar Punta Tuna Natural Reserve

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

Overview

The Manglar Punta Tuna Natural Reserve is located on the southeast coast of Puerto Rico in the municipality of Maunabo. This reserve contains sandy beaches, rocky headlands, and the Punta Tuna Lighthouse—the last lighthouse in Puerto Rico operated by the U.S. Coast Guard.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



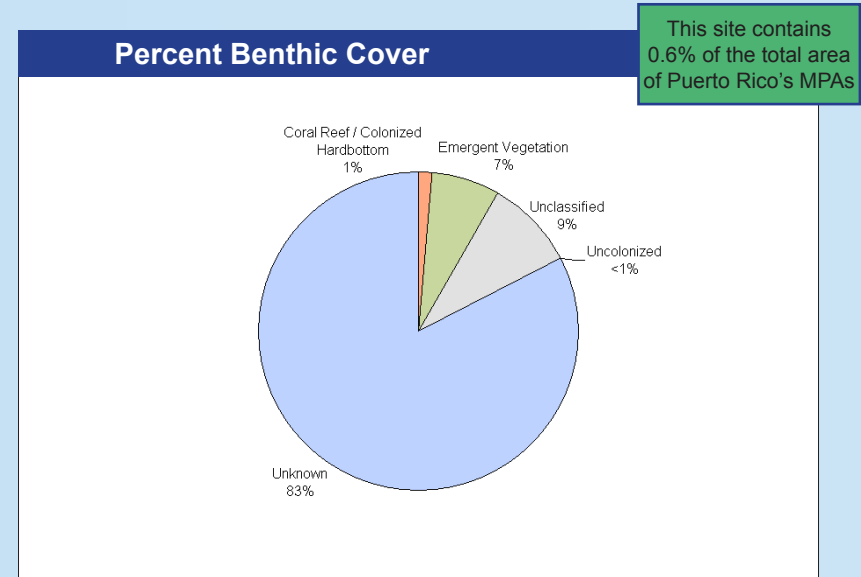
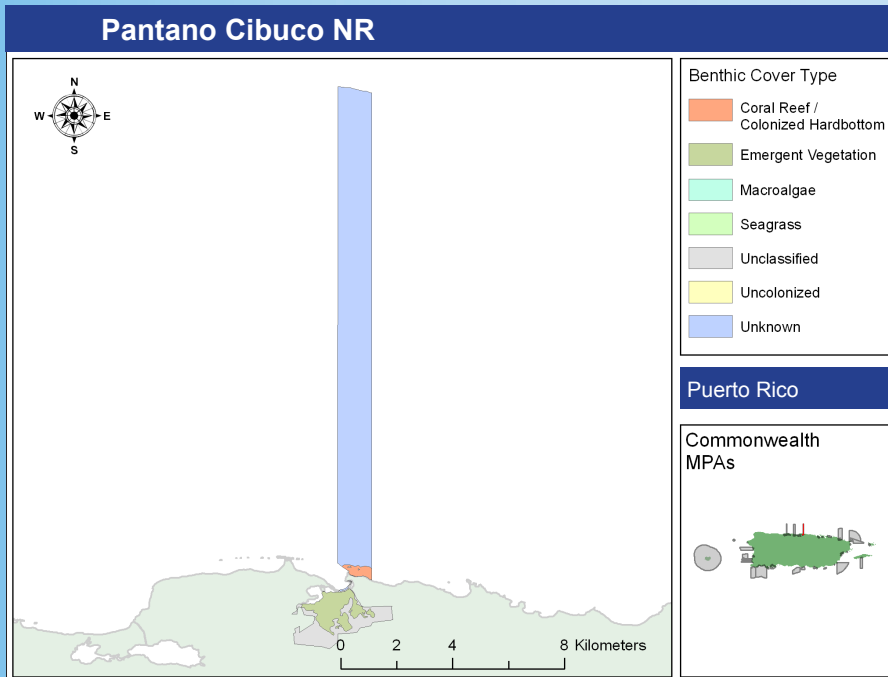
Pantano Cibuco Natural Reserve

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

Overview

The Pantano Cibuco Natural Reserve is located on the north central coast of Puerto Rico in the Vega Baja municipality. The reserve contains lagoons, mangroves, small islands, and a Bloodwood (*Pterocarpus officinalis*) swamp. Also, the reserve has a seaward boundary that extends 9 nautical miles north into the Atlantic Ocean.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



Piñones State Forest Natural Reserve

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

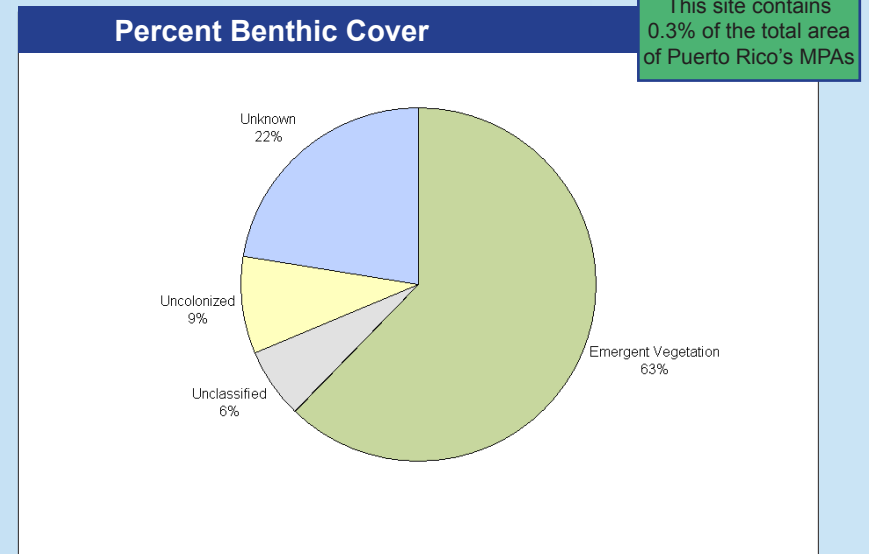
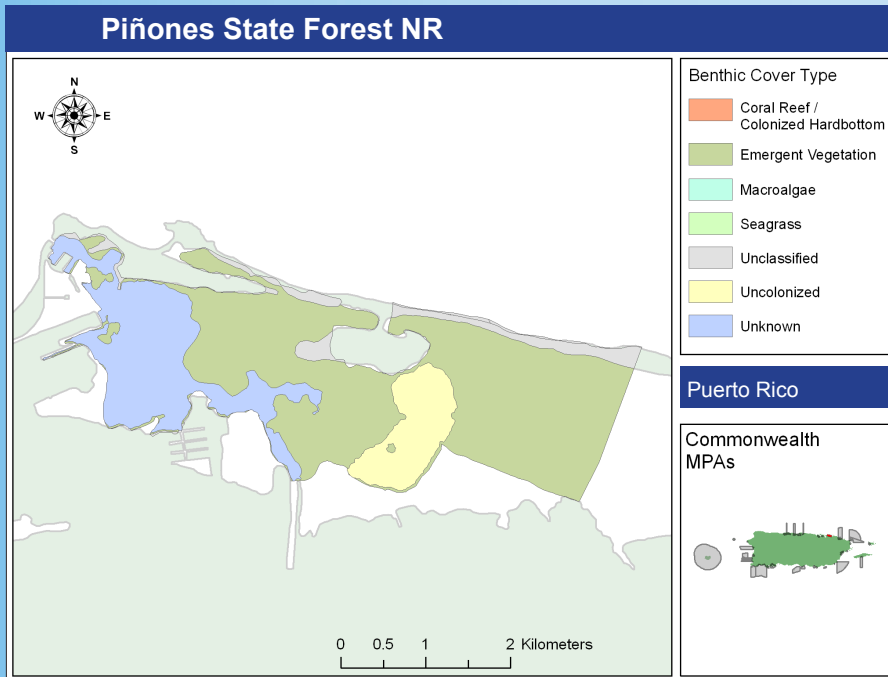
Overview

The Bosque Estatal de Piñones Natural Reserve is located on the north-eastern coast of Puerto Rico in the Loiza municipality. This protected area is bound by the Boca de Cangrejos Estuary and Torrecilla Lagoon in the west, the islet of Juan Pérez in the east, the Atlantic Ocean in the north, and the Cangrejo Abajo and Cerámica communities in the south. The reserve's bays, lagoons, mangrove forests, coral reefs, seagrass plains, and islets sustain and provide habitat for a variety of wildlife, including endangered species such as sea turtles and manatees.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



Derechos Reservados © 2006 DRNA



Punta Guaniquilla Natural Reserve

Management Agency: Conservation Trust of Puerto Rico

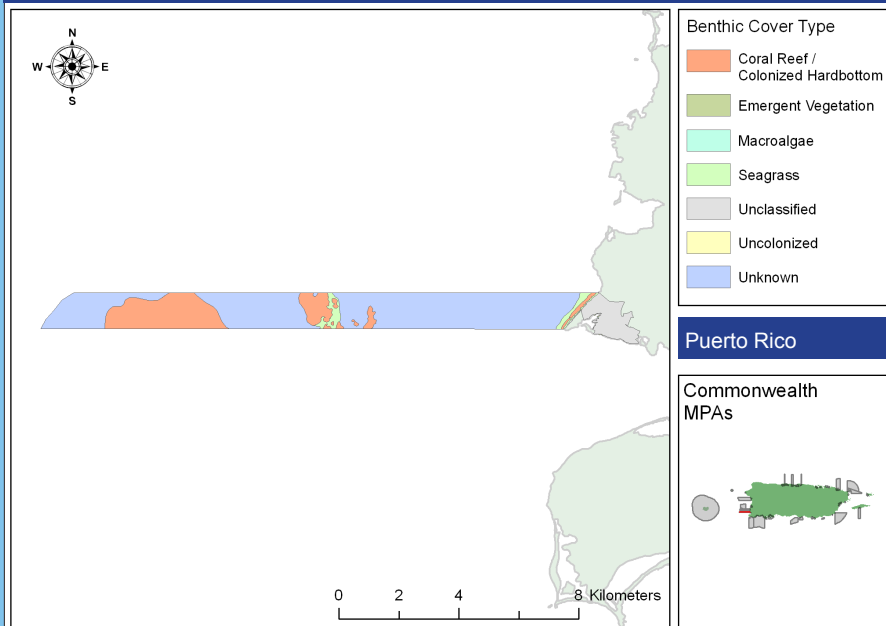
Overview

The Punta Guaniquilla Natural Reserve is located on the southwestern coast of Puerto Rico, just north of Boquerón Bay in the Cabo Rojo municipality. The reserve's western limit extends 9 nautical miles into the Mona Passage of the Caribbean Sea, the northern limit is the Guaniquilla stream, Boqueron Bay is the southern limit, and to the east, the reserve is bound by the private properties of the Pedernales Community. These limits contain mangroves, lagoons, seagrass beds, and productive fringing coral reefs.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.

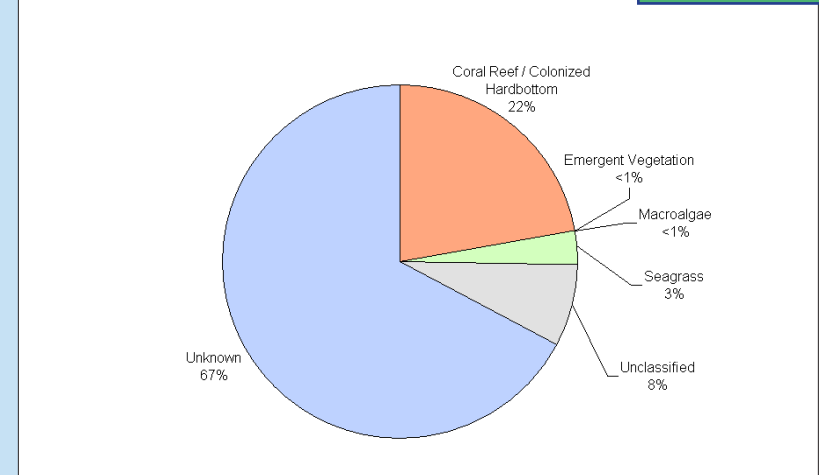


Punta Guaniquilla NR



Percent Benthic Cover

This site contains 0.6% of the total area of Puerto Rico's MPAs



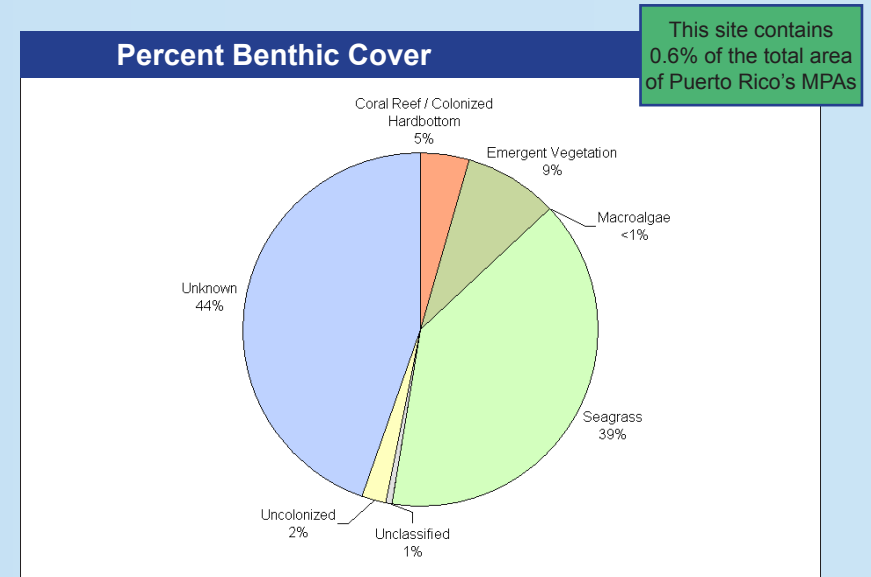
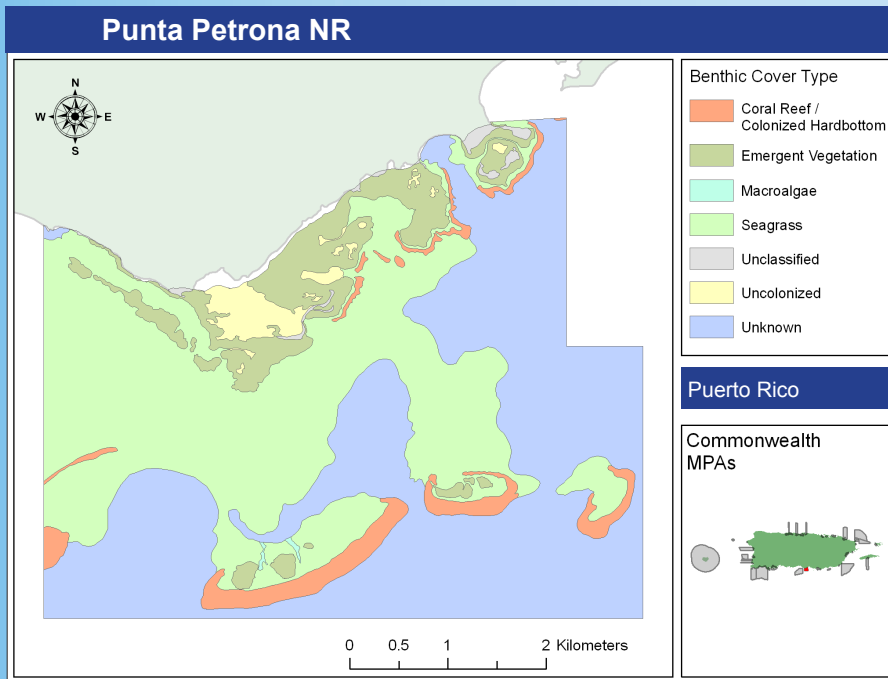
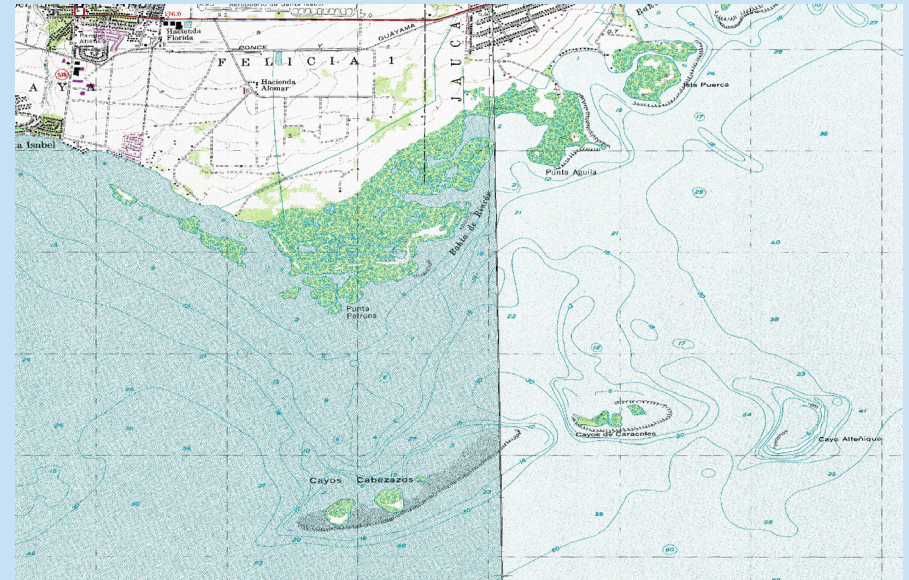
Punta Petrona Natural Reserve

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

Overview

The Punta Petrona Natural Reserve is located on the south central coast of Puerto Rico in the municipality of Santa Isabel. This reserve is bound in the east by Jauca Bay, in the west by the Playita Cortada Community, in the north by the Alomar property (private), and has a seaward boundary that extends roughly 1.5 nautical miles south into the Caribbean Sea. This reserve includes keys, sandy beaches, coastal mangroves, seagrass beds, and coral reefs.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



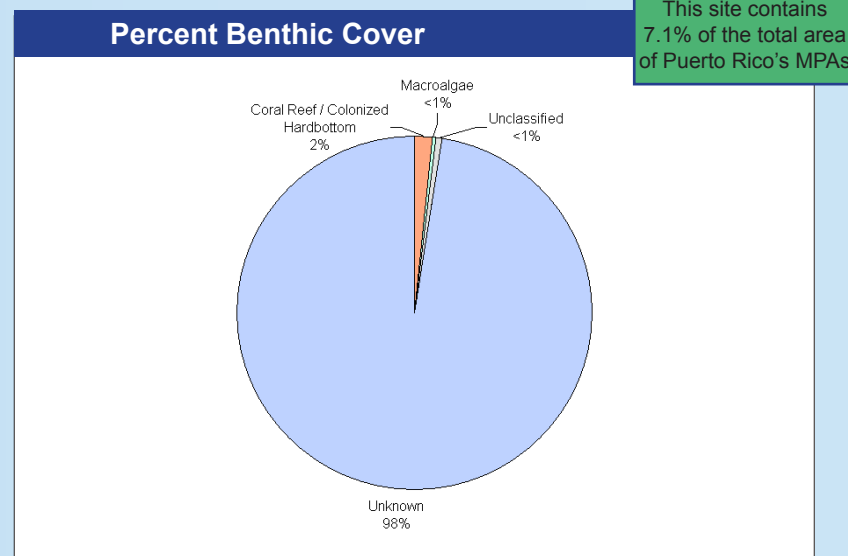
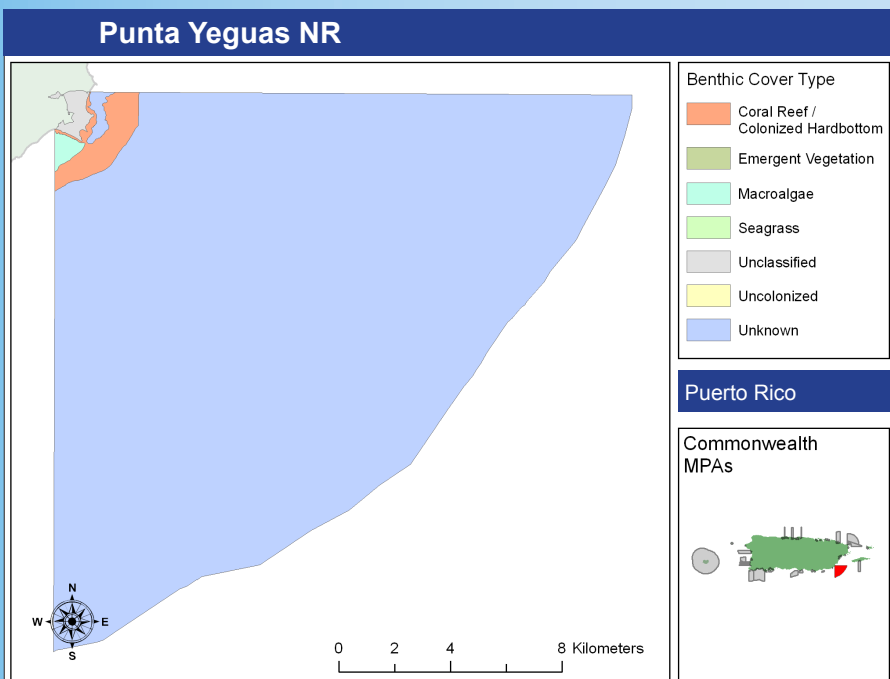
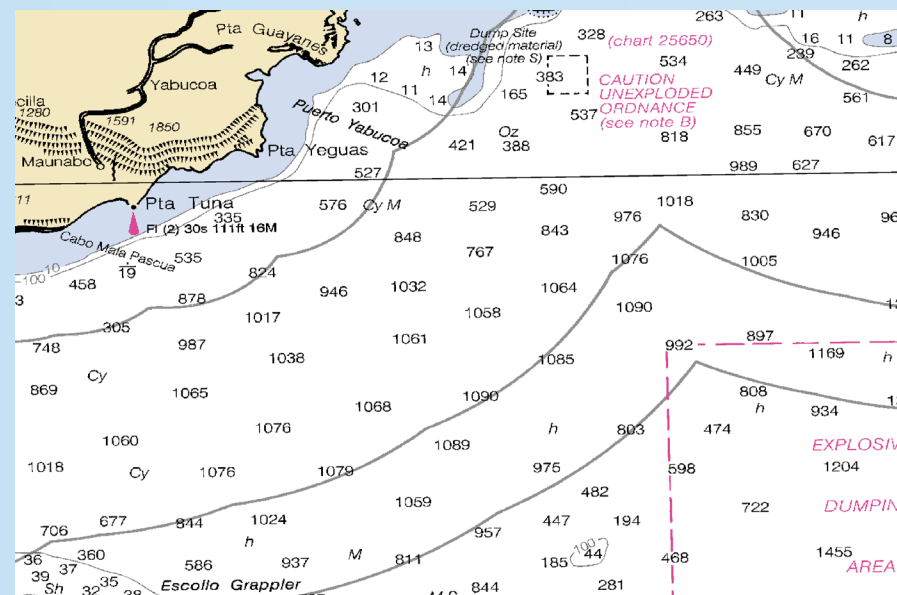
Punta Yegüas Natural Reserve

Management Agency: Conservation Trust of Puerto Rico

Overview

The Punta Yeguas Natural Reserve is located on the southeastern coast of Puerto Rico in the Yabucoa municipality. This protected area is bound by the El Negro community in the north, the El Guano community in the west, and has southern and eastern seaward boundaries that extend 9 nautical miles into the Caribbean Sea. This reserve protects a variety of habitats important for native coastal plant and animal species threatened by urban development. However, the endemic *Coccoloba rugosa* tree is the primary focus of protection as this species is found nowhere else in Puerto Rico.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



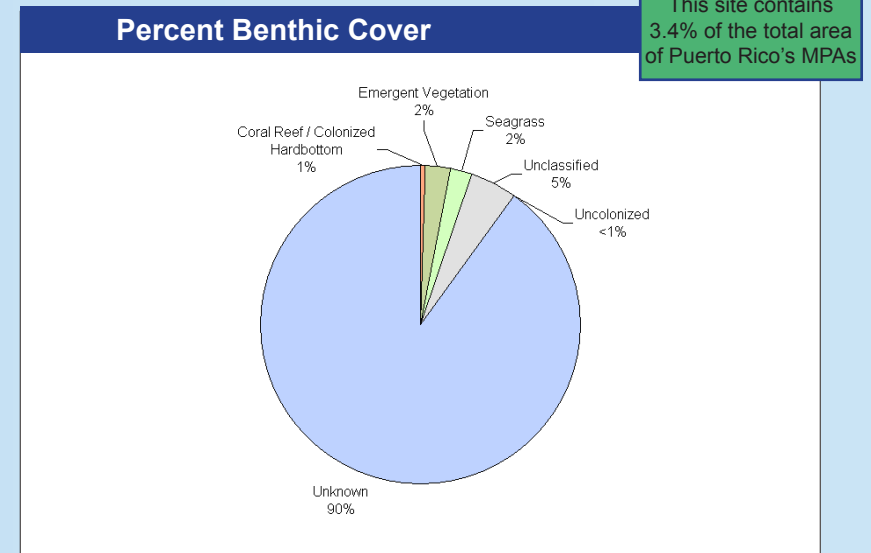
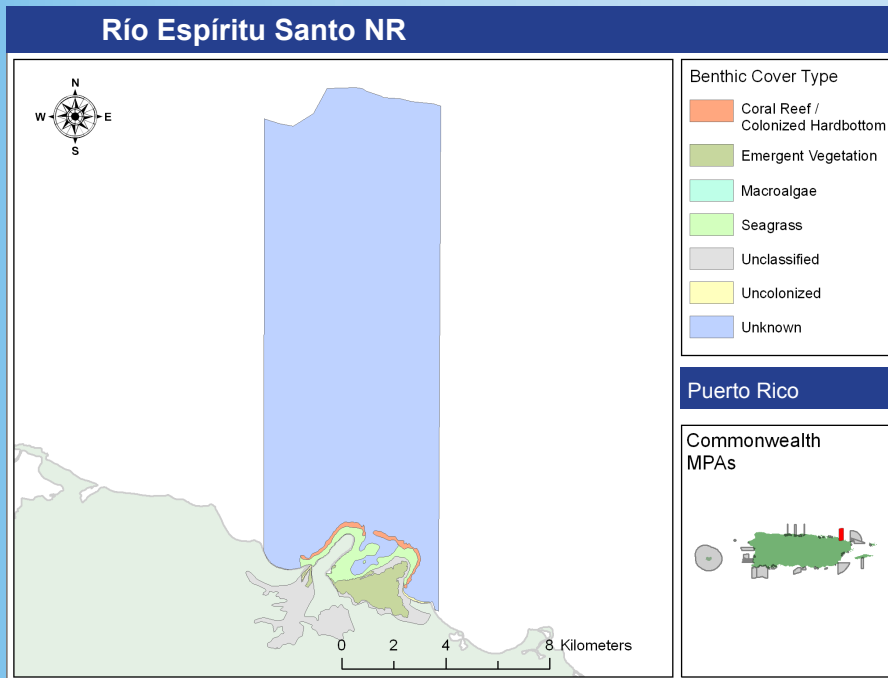
Río Espíritu Santo Natural Reserve

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

Overview

The Río Espíritu Santo Natural Reserve is located on the northeastern coast of Puerto Rico in the Río Grande municipality. This site was established to protect the Espíritu Santo River estuary, sea turtle nesting areas, and adjacent marine habitats that extend 9 nautical miles north into the Atlantic Ocean. The reserve contains lagoons, magroves, and fresh and salt water marshes.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



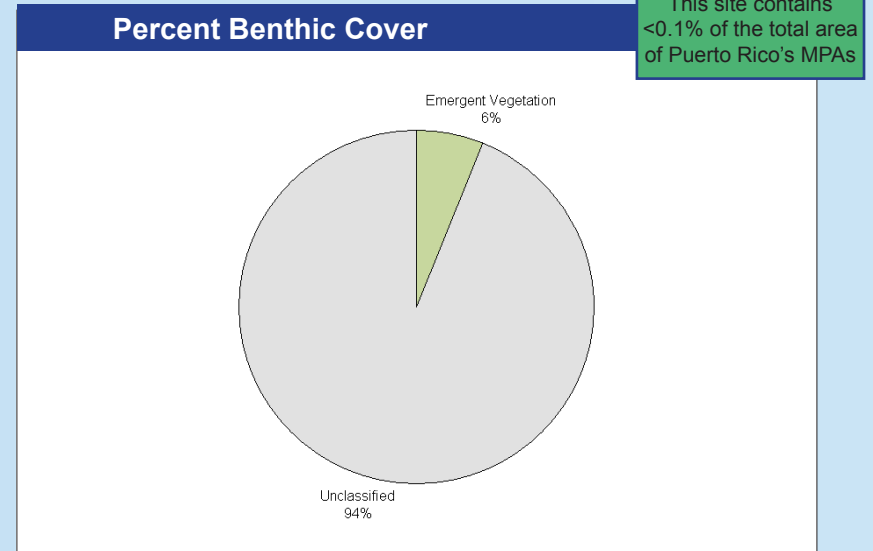
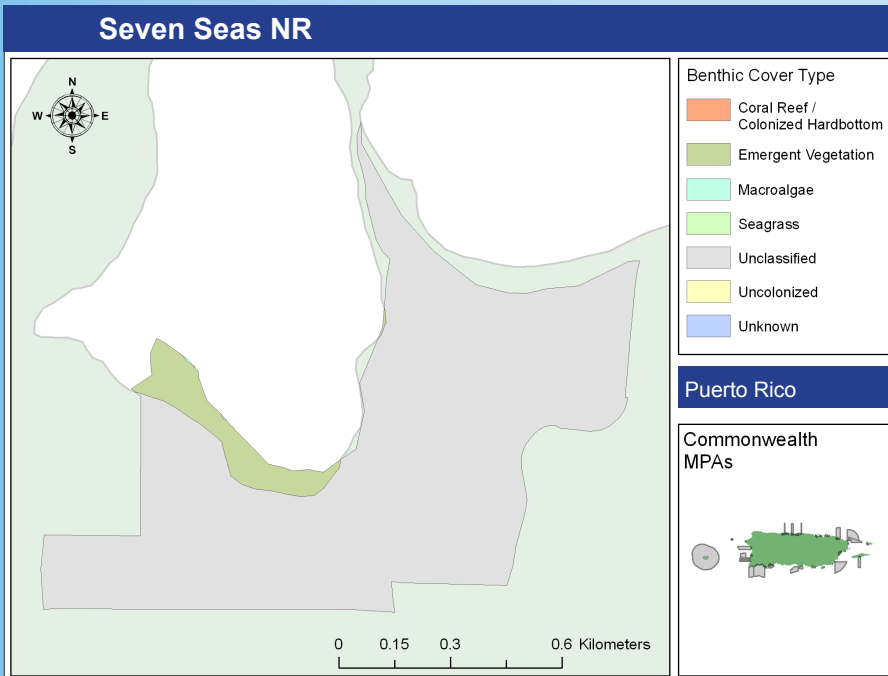
Seven Seas Natural Reserve

Management Agency: Puerto Rico National Parks Company

Overview

The Seven Seas Natural Reserve is located on the northeastern coast of Puerto Rico in the Fajardo municipality. This area contains forests, mangroves, coral reefs, seagrass beds, and sandy beaches. These habitats provide refuge and nesting areas for a variety of wildlife, such as sea birds and sea turtles.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



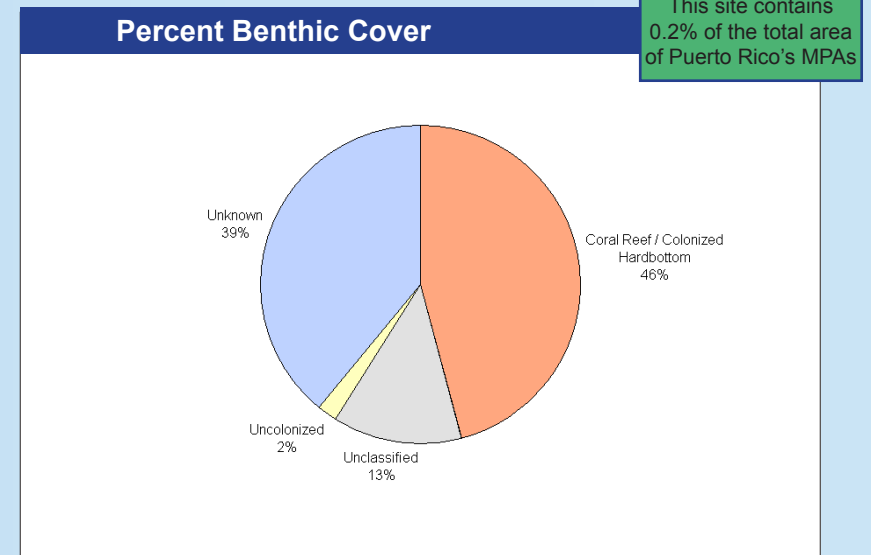
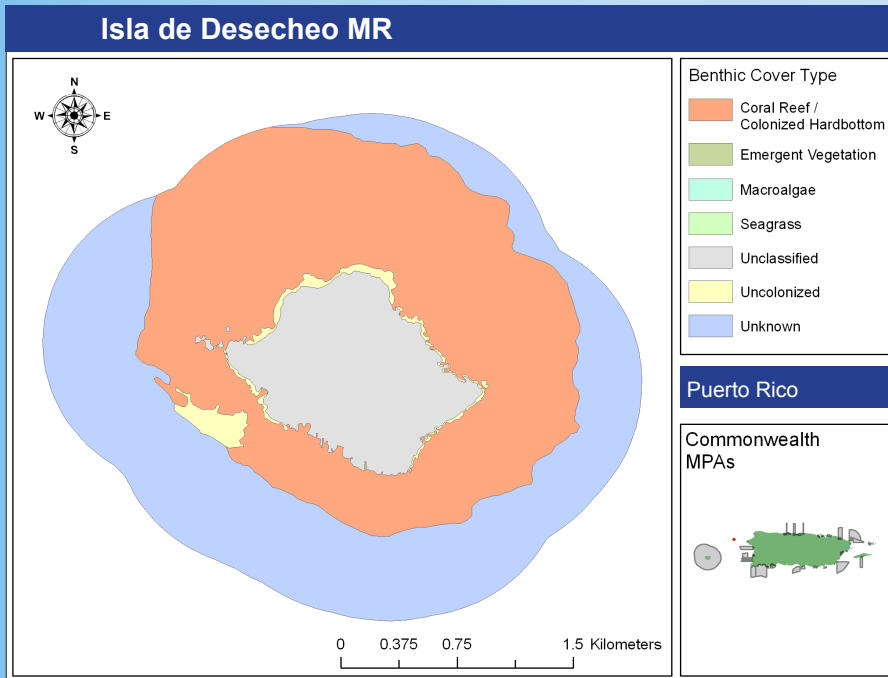
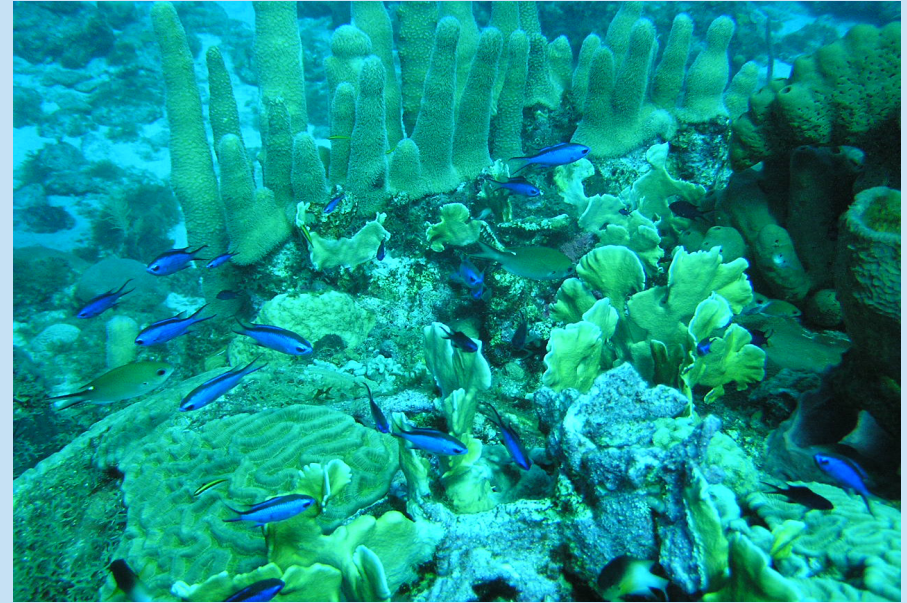
Isla de Desecheo Marine Reserve

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

Overview

The Isla de Desecheo Marine Reserve is located roughly 10 nautical miles west of Puerto Rico in the Mona Passage of the Caribbean Sea. The marine reserve is composed of marine waters and submerged marine habitat surrounding Desecheo Island from the island's shores out to half a nautical mile in the Caribbean Sea. The island itself is a national wildlife refuge managed by the U.S. Fish and Wildlife Service. The Isla de Desecheo Marine Reserve contains coral reef communities often described as among the healthiest within the Puerto Rican archipelago.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



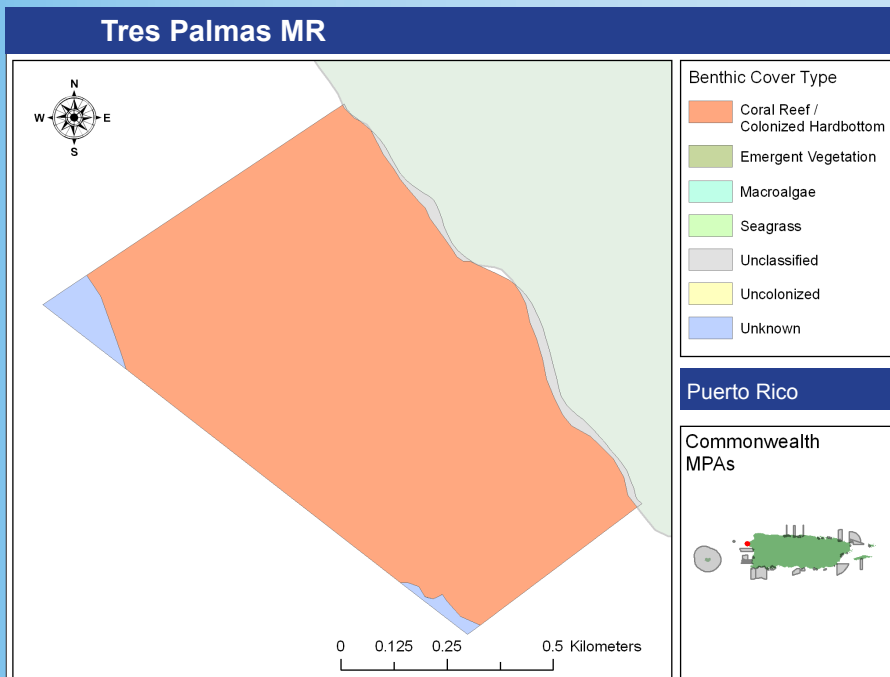
Tres Palmas Marine Reserve

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

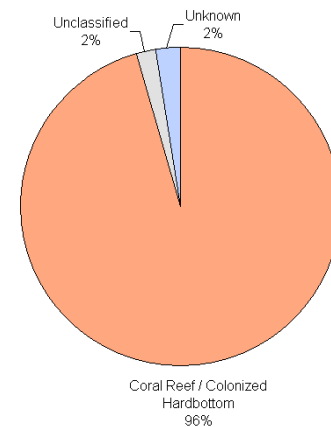
Overview

The Tres Palmas Marine Reserve is located on the west coast of Puerto Rico in the municipality of Rincón. This reserve's coastal vegetation, sandy beaches, and shallow-water coral communities—composed primarily of Elkhorn coral (*Acropora palmata*)—provide habitats and niches for a variety of wildlife. This site is also a popular surf break during winter months.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



Percent Benthic Cover



This site contains <0.1% of the total area of Puerto Rico's MPAs

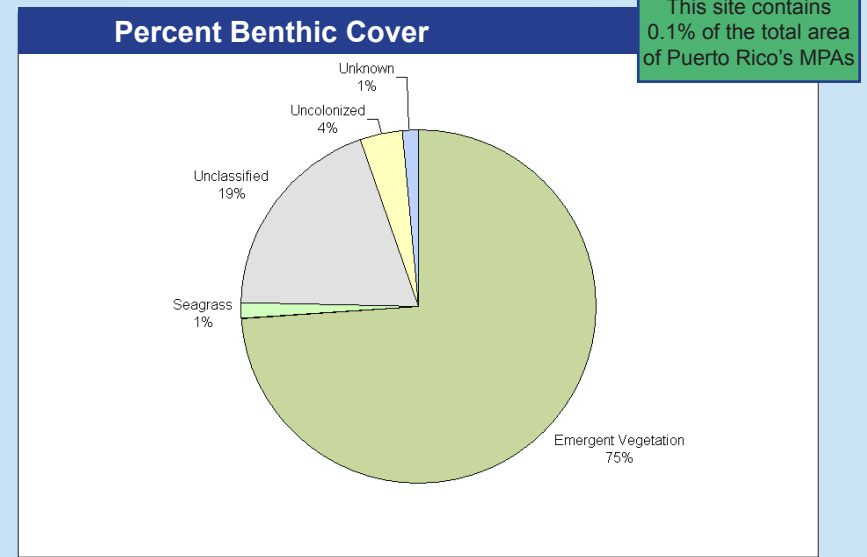
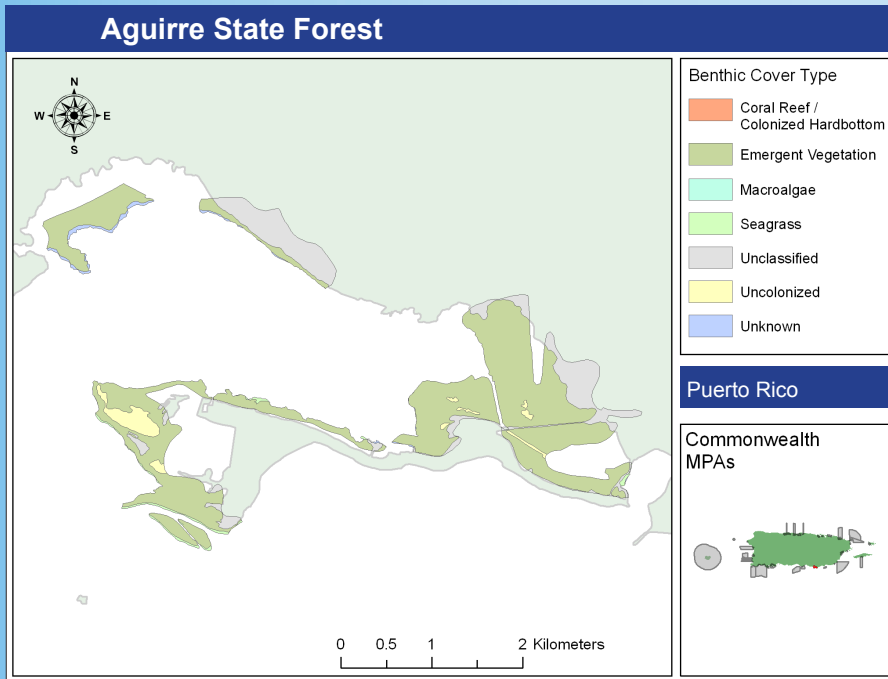
Aguirre State Forest

Management Agency: Department of Natural and Environmental Resources, Puerto Rico

Overview

The Bosque Estatal de Aguirre is located on the southeastern coast of Puerto Rico in the municipalities of Guayama and Salinas. This state forest surrounds Jobos Bay. The shores and keys of this area are dominated by submerged mangrove forests.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



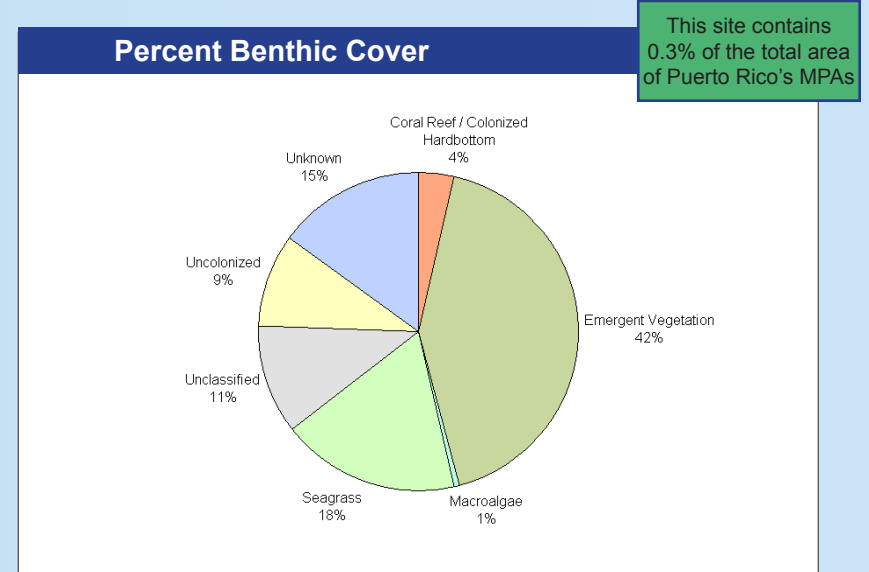
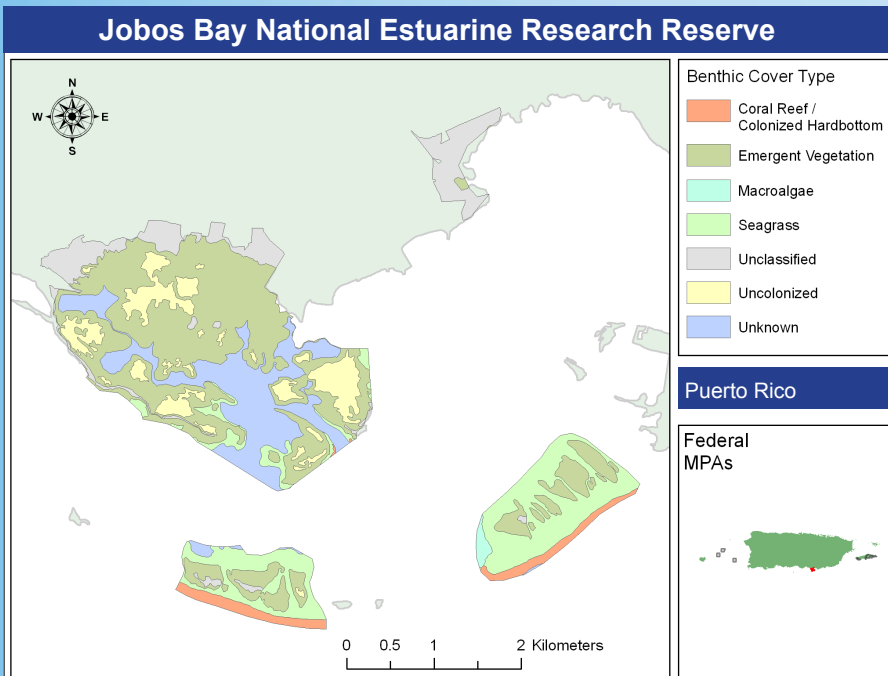
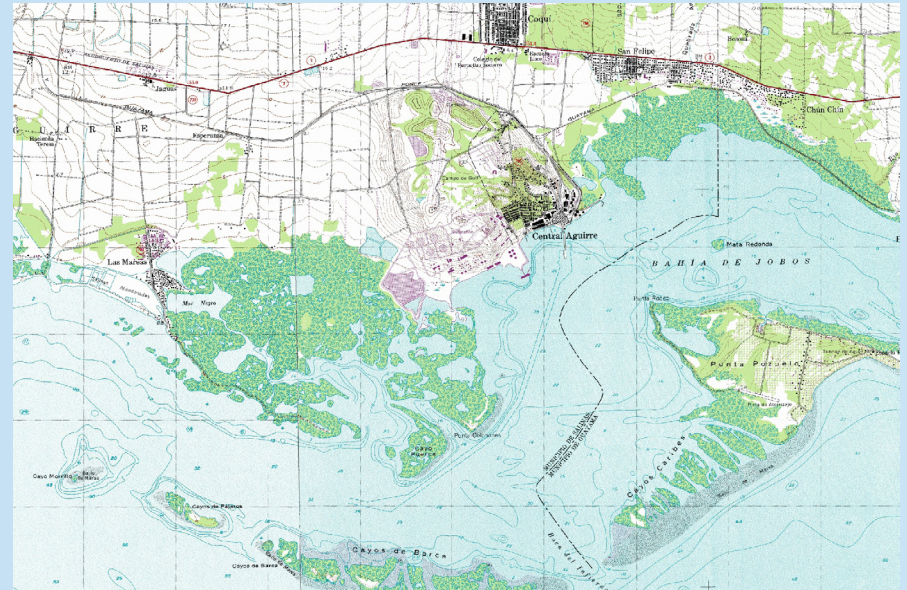
Jobos Bay National Estuarine Research Reserve

Management Agency: NOAA, and Department of Natural and Environmental Resources, Puerto Rico

Overview

The Jobos Bay National Estuarine Research Reserve is located on the southeastern coast of Puerto Rico in the municipalities of Guayama and Salinas. This reserve contains mangroves, seagrass meadows, coral reefs, salt flats, and dry forest. The Jobos Bay Reserve was established to protect and conserve estuarine resources for long-term research, monitoring, and education for improved coastal management.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



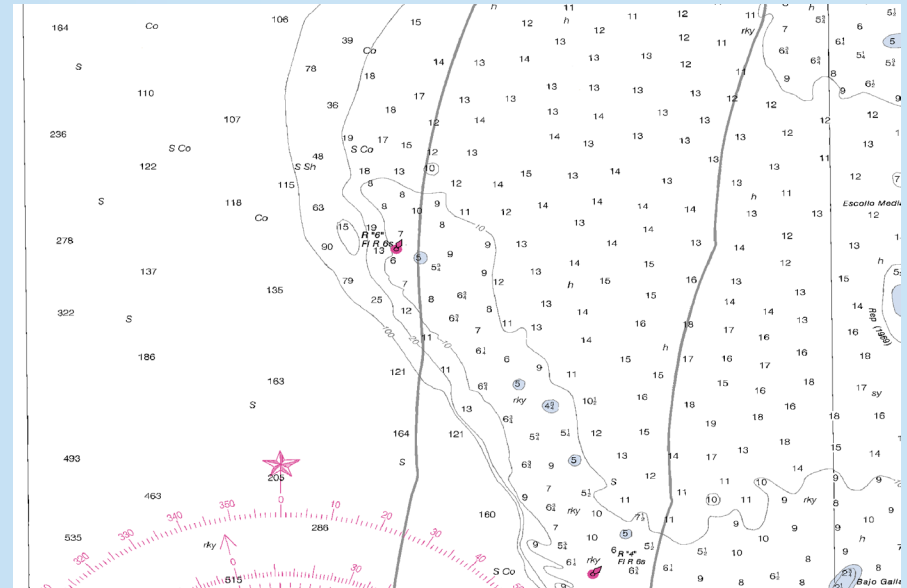
Red Hind Spawning Aggregation Areas – Abrir La Sierra Bank

Management Agency: Caribbean Fishery Management Council, and Department of Natural and Environmental Resources, Puerto Rico

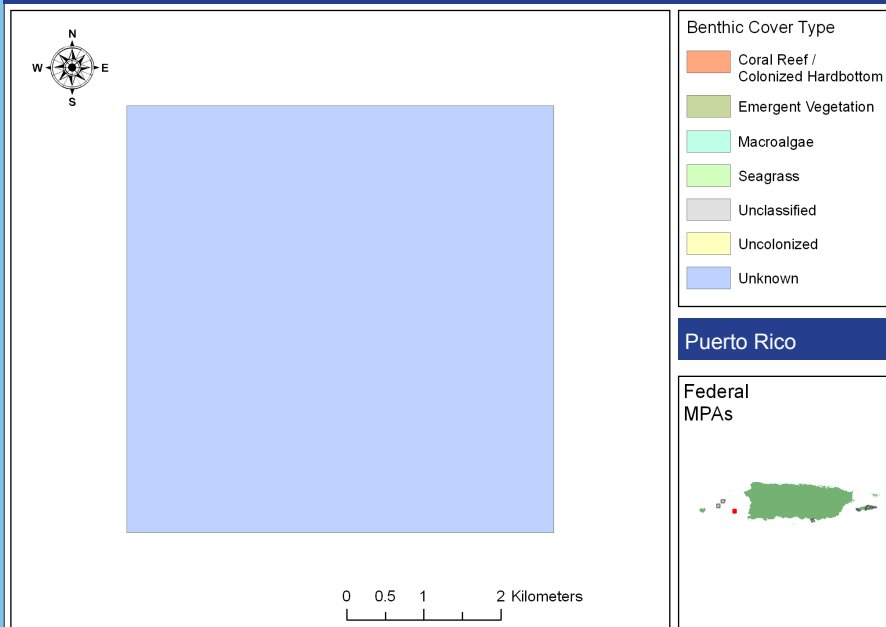
Overview

The Abrir la Sierra Bank is located off the west coast of Puerto Rico, between Puerto Rico and Mona Island. This bank has been identified as a key spawning area for the commercially viable Red Hind. Red Hind became a commercially important species following the collapse of the Nassau Group fishery. As such, the Caribbean Fishery Management Council elected to protect this area to ensure Red Hind spawning success. This area is closed to all commercial and recreational fishing during Red Hind spawning season.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.

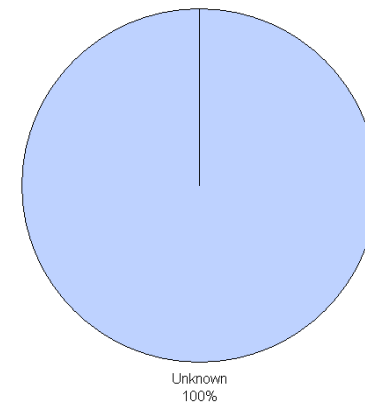


Abrir La Sierra Bank



Percent Benthic Cover

This site contains 0.8% of the total area of Puerto Rico's MPAs



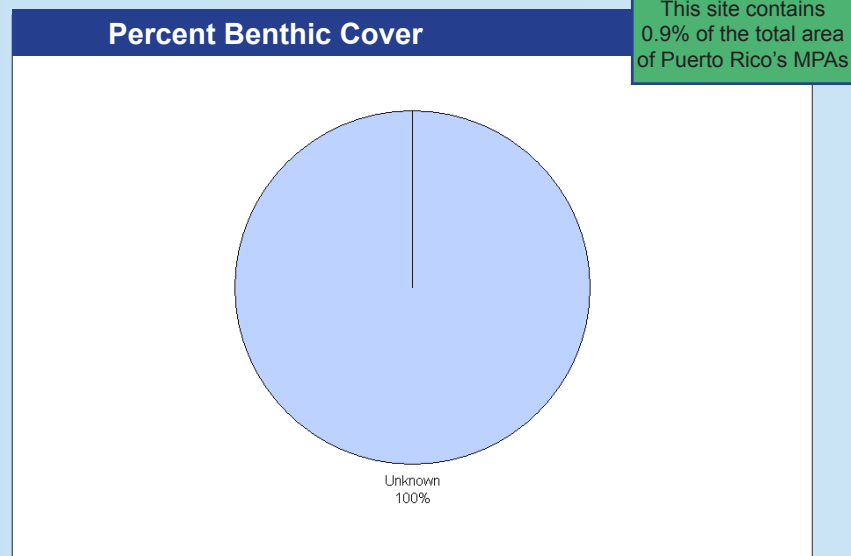
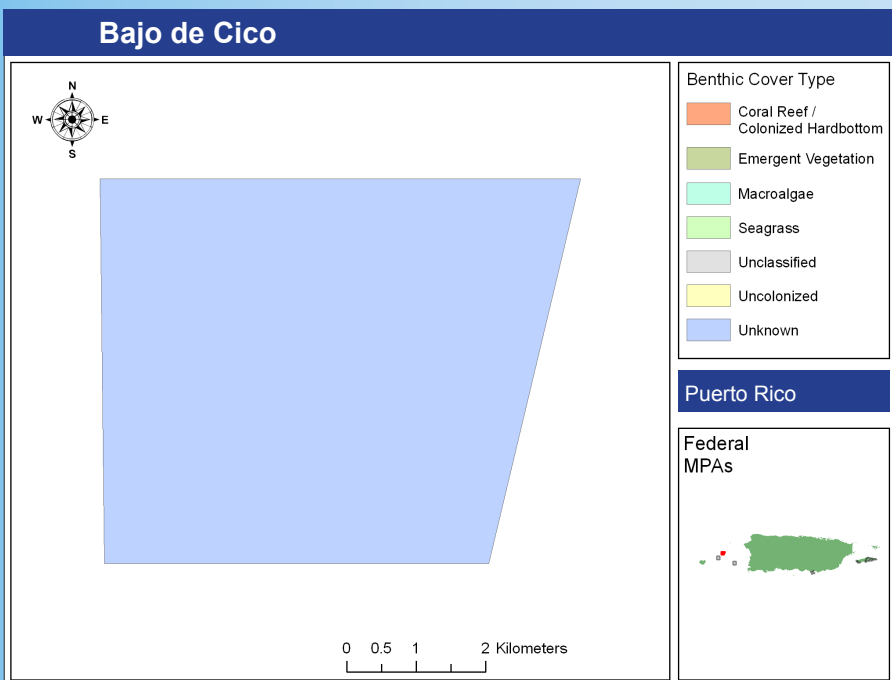
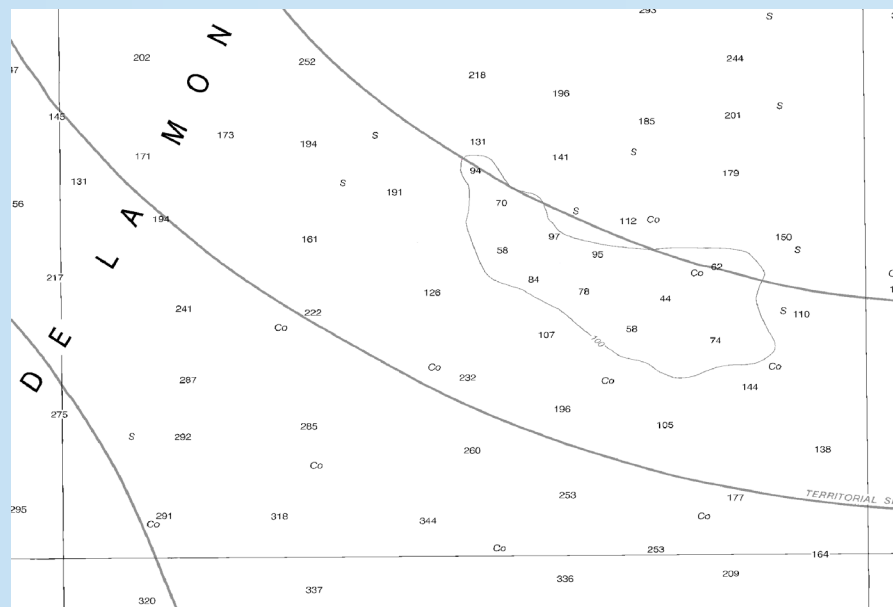
Red Hind Spawning Aggregation Areas – Bajo de Cico

Management Agency: Caribbean Fishery Management Council, and Department of Natural and Environmental Resources, Puerto Rico

Overview

Bajo de Cico is a bank located off the west coast of Puerto Rico, between Mona Island and Desecheo Island. This bank has been identified as a key spawning area for the commercially viable Red Hind. Red Hind became a commercially important species following the collapse of the Nassau Group per fishery. As such, the Caribbean Fishery Management Council elected to protect this area to ensure Red Hind spawning success. This area is closed to all commercial and recreational fishing during Red Hind spawning season.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



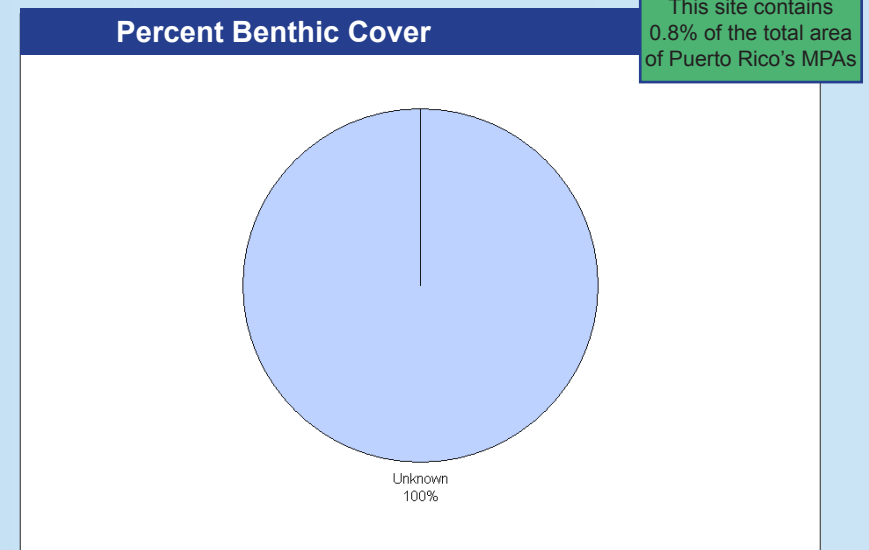
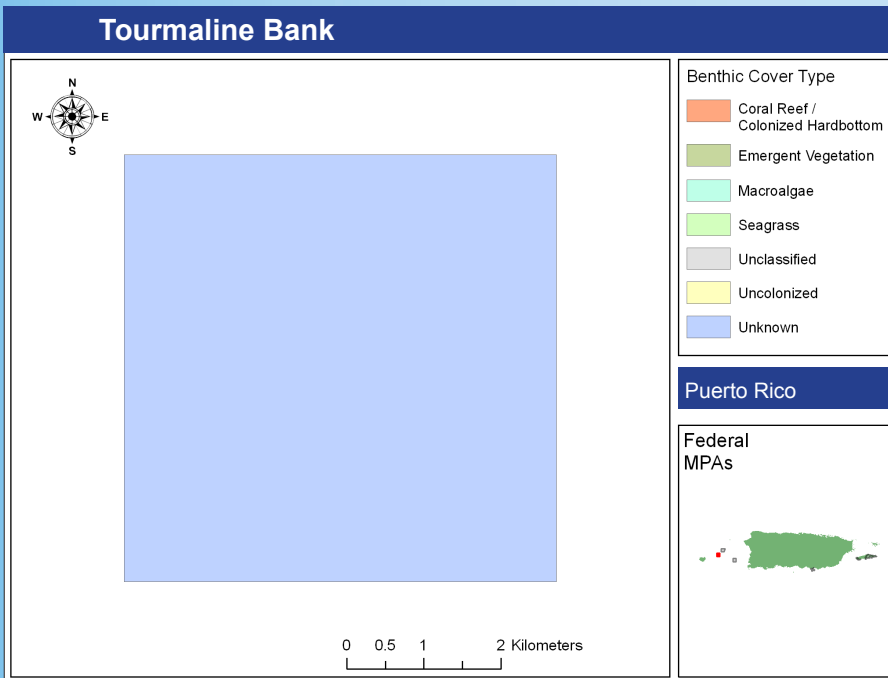
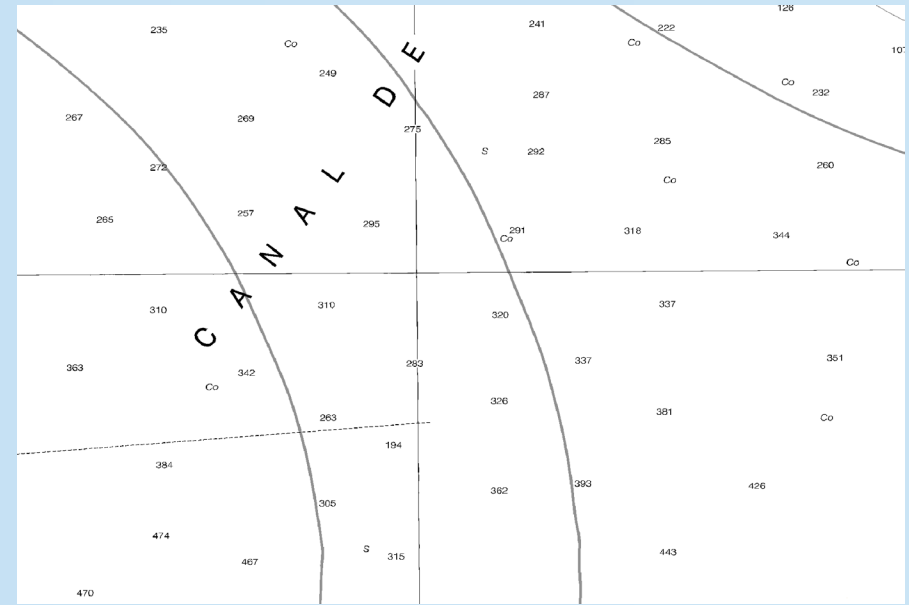
Red Hind Spawning Aggregation Areas – Tourmaline Bank

Management Agency: Caribbean Fishery Management Council, and Department of Natural and Environmental Resources, Puerto Rico

Overview

Tourmaline Bank is a coral bank located approximately 3 nautical miles west of Puerto Rico. This bank has been identified as a key spawning area for the commercially viable Red Hind. Red Hind became a commercially important species following the collapse of the Nassau Grouper fishery. As such, the Caribbean Fishery Management Council elected to protect this area to ensure Red Hind spawning success. This area is closed to all commercial and recreational fishing during Red Hind spawning season.

Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



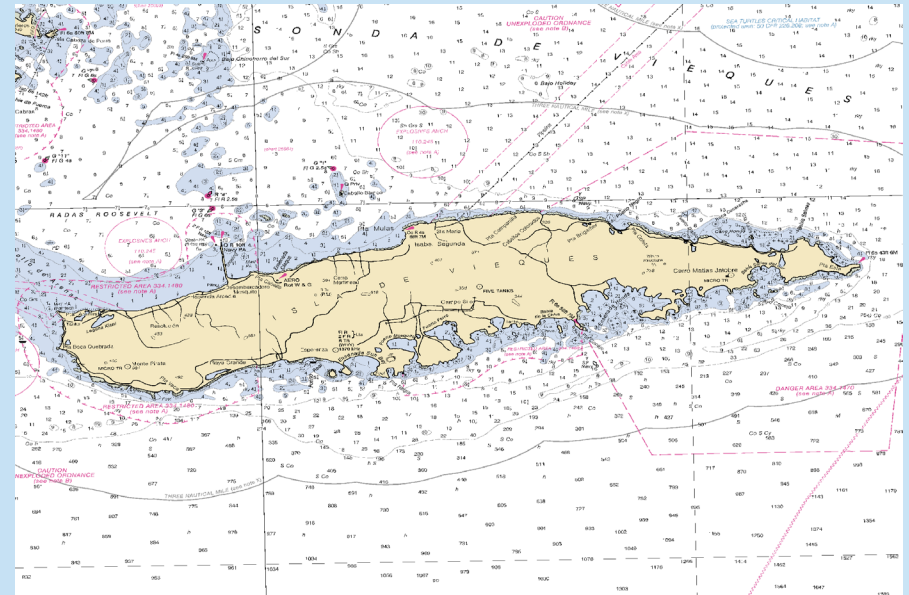
Vieques National Wildlife Refuge

Management Agency: U.S. Fish and Wildlife Service

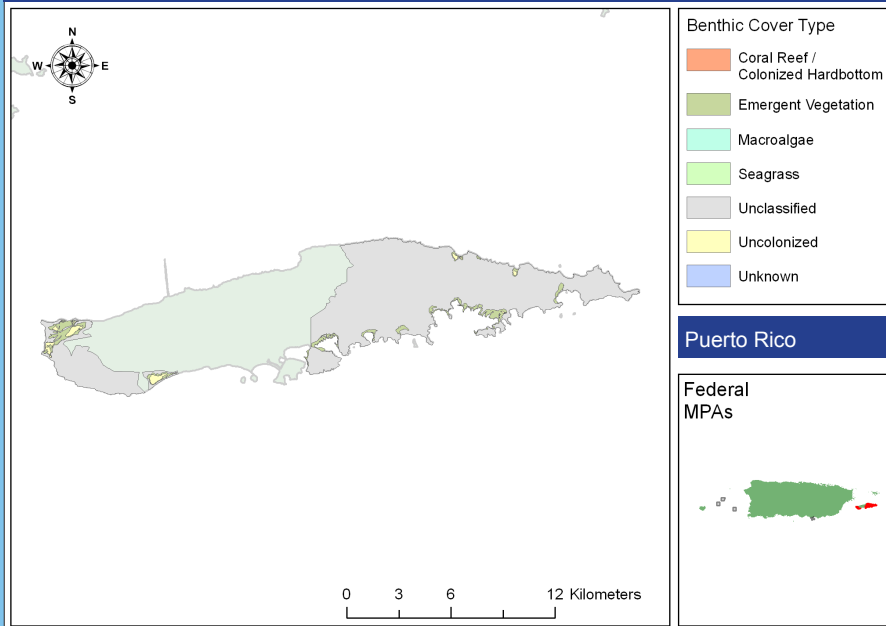
Overview

The Vieques National Wildlife Refuge is composed of 3,100 acres of land and water located at the eastern and western ends of Vieques Island. This refuge contains several ecologically distinct habitats, including: sandy beaches, coastal lagoons, mangroves, wetlands, and upland forested areas. The marine environment surrounding the refuge contains coral reefs and seagrass beds. The refuge and its surrounding waters are home to at least 4 plants and 10 animals on the federal endangered species list, including: the West Indian manatee, the brown pelican, and four species of sea turtles.

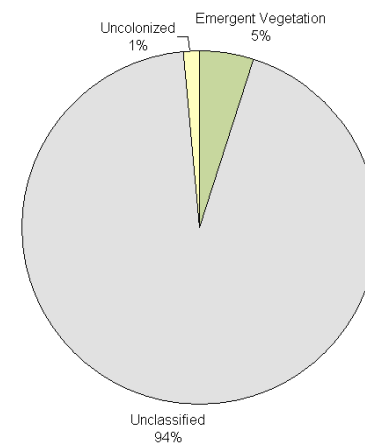
Source of Overview: U.S. Marine Managed Areas Inventory (2006a), NOAA's National Marine Protected Areas Center.



Vieques National Wildlife Refuge



Percent Benthic Cover



This site contains 1.9% of the total area of Puerto Rico's MPAs

Appendix A: National MPA Classification System

The National Classification System was developed by the National MPA Center in an effort to develop a “straightforward and consistent language to accurately describe the many types of MPAs occurring in our waters and to understand their effects on ecosystems and the people that use them” (NOAA National MPA Center, 2006b). A full description of the classification system is available at www.mpa.gov. The system describes MPAs in purely functional terms using five objective characteristics common to most MPAs:

- 1) Conservation Focus – each site was assigned one or more of the following three attributes:
 - a. *Natural Heritage* – established and managed to sustain, conserve, restore and understand the biodiversity, populations, communities, habitats, ecosystems, processes and services of an MPA or MPA zone
 - b. *Cultural Heritage* – established and managed to protect and understand submerged cultural resources
 - c. *Sustainable Production* – established and managed to support the continued extraction of renewable living resources
- 2) Level of Protection Afforded – each site was assigned one of the following six attributes:
 - a. *Uniform Multiple-Use* – Consistent level of protection and allowable activities throughout the MPA
 - b. *Zoned Multiple-Use* – Some extractive activities allowed throughout entire site, but use marine zoning to allocate specific uses to compatible places or times
 - c. *Zoned Multiple-Use with No-Take Areas* – Multiple-use MPAs that contain one or more zones where resource extraction is prohibited
 - d. *No-Take* – MPA sites that allow human access but prohibit resource extraction throughout the area
 - e. *No Impact* – MPAs that allow human access but prohibit all activities that could harm the site’s resources or disrupt the service they provide
 - f. *No Access* – MPAs that restrict all human access to the area unless specifically permitted for designated special uses
- 3) Permanence of Protection – each site was assigned one of the following three attributes:
 - a. *Permanent* – MPAs whose legal authorities provide protection in perpetuity
 - b. *Conditional* – MPAs that have the potential to persist over time but

whose legal authority has a finite duration and must be actively renewed

- c. *Temporary* – MPAs that are designed to address relatively short-term conservation and management needs by protecting a specific habitat or species for a finite duration with no expectation or mechanism for renewal
- 4) Constancy of Protection – each site was assigned one of the following three attributes:
 - a. *Year-round* – MPAs that provide constant protection throughout the year
 - b. *Seasonal* – MPAs that protected specific habitats and resources during fixed seasons or periods
 - c. *Rotating* – MPAs that cycle among a set of fixed geographic areas in order to meet short-term conservation and management goals
 - 5) Ecological Scale of Protection – each site was assigned one of the following two attributes:
 - a. *Ecosystem* – MPAs whose legal authorities and management measures are intended to protect all of the components and processes of the ecosystem(s) within its boundaries
 - b. *Focal Resource* – MPAs whose legal authorities and management measures specifically target a particular habitat, species complex, or single resource

Appendix B: Puerto Rico MPA Classification

Site Name	Conservation Goal	Level of Protection	Permanence of Protection	Constancy of Protection	Scale of Protection	Management Plan
Arrecifes de la Guyama NR*	Natural Heritage	Uniform Multiple-Use	Permanent	Year Round	Ecosystem	No
Arrecifes de la Cordillera NR*	Natural Heritage	Uniform Multiple-Use	Permanent	Year Round	Ecosystem	In Development
Arrecifes de Tourmaline NR*	Natural Heritage	Zoned Multiple Use w/ No Take Areas	Permanent	Year Round	Ecosystem	No
Bahías Bioluminiscentes de Vieques NR*	Natural Heritage	Uniform Multiple-Use	Permanent	Year Round	Ecosystem	In Development
Boquerón State Forest NR*	Sustainable Production	Uniform Multiple-Use	Permanent	Year Round	Ecosystem	No
Cabezas de San Juan NR*	Natural Heritage	Uniform Multiple-Use	Permanent	Year Round	Ecosystem	No
Caja de Muertos NR*	Natural Heritage	Zoned Multiple-Use	Permanent	Year Round	Ecosystem	No
Canal Luis Peña NR*	Natural Heritage	No-Take	Permanent	Year Round	Ecosystem	In Development
Caño La Boquilla NR*	Natural Heritage	Uniform Multiple-Use	Permanent	Year Round	Ecosystem	No
Caño Martín Peña NR*	Natural Heritage	Uniform Multiple-Use	Permanent	Year Round	Ecosystem	No
Caño Tiburones NR*	Natural Heritage	Uniform Multiple-Use	Permanent	Year Round	Ecosystem	In Development
Cayo Ratones NR*	Natural Heritage	Uniform Multiple-Use	Permanent	Year Round	Ecosystem	No
Ceiba State Forest NR*	Natural Heritage	No-Take	Permanent	Year Round	Ecosystem	No
Ciénaga de las Cucharillas NR*	Natural Heritage	Uniform Multiple-Use	Permanent	Year Round	Ecosystem	No
Cueva del Indio NR*	Cultural Heritage	Uniform Multiple-Use	Permanent	Year Round	Ecosystem	No
Ecosystems adjacent to the Laguna Joyuda NR*	Natural Heritage	Uniform Multiple-Use	Permanent	Year Round	Ecosystem	No
El Pantano, Bosque de Pterocarpus, Lagunas Mandry y Santa Teresa NR*	Natural Heritage	Uniform Multiple-Use	Permanent	Year Round	Focal Resource	No

Appendix B: Puerto Rico MPA Classification

Site Name	Conservation Goal	Level of Protection	Permanence of Protection	Constancy of Protection	Scale of Protection	Management Plan
Finca Belvedere NR*	Natural Heritage	Uniform Multiple-Use	Permanent	Year Round	Ecosystem	No
Guanica State Forest NR and Biosphere Reserve*	Natural Heritage	Uniform Multiple-Use	Permanent	Year Round	Ecosystem	No
Hacienda La Esperanza NR*	Cultural Heritage	Uniform Multiple-Use	Permanent	Year Round	Ecosystem	No
Islas de Mona y Monito NR*	Natural Heritage	Uniform Multiple-Use	Permanent	Year Round	Ecosystem	In Development
La Parguera NR*	Natural Heritage	Uniform Multiple-Use	Permanent	Year Round	Ecosystem	No
Laguna Joyuda NR*	Natural Heritage	No Take	Permanent	Year Round	Ecosystem	No
Laguna Tortuguero NR*	Natural Heritage	Uniform Multiple-Use	Permanent	Year Round	Ecosystem	No
Manglar Punta Tuna NR*	Natural Heritage	Uniform Multiple-Use	Permanent	Year Round	Focal Resource	No
Pantano Cibuco NR*	Natural Heritage	Uniform Multiple-Use	Permanent	Year Round	Ecosystem	No
Piñones State Forest NR*	Natural Heritage	Uniform Multiple-Use	Permanent	Year Round	Ecosystem	No
Punta Guaniquilla NR*	Natural Heritage	Uniform Multiple-Use	Permanent	Year Round	Focal Resource	No
Punta Petrona NR*	Natural Heritage	Uniform Multiple-Use	Permanent	Year Round	Ecosystem	No
Punta Yeguas NR*	Natural Heritage	Uniform Multiple-Use	Permanent	Year Round	Focal Resource	No
Río Espíritu Santo NR*	Natural Heritage	Uniform Multiple-Use	Permanent	Year Round	Ecosystem	No
Seven Seas NR*	Natural Heritage	Uniform Multiple-Use	Permanent	Year Round	Ecosystem	In Development
Isla de Desecho MR*	Natural Heritage	No-Take	Permanent	Year Round	Ecosystem	No
Tres Palmas MR*	Natural Heritage	Uniform Multiple-Use	Permanent	Year Round	Focal Resource	In Development
Aguirre State Forest	Natural Heritage	Uniform Multiple-Use	Permanent	Year Round	Ecosystem	No

Appendix B: Puerto Rico MPA Classification

Site Name	Conservation Goal	Level of Protection	Permanence of Protection	Constancy of Protection	Scale of Protection	Management Plan
Jobos Bay National Estuarine Research Reserve**	Natural Heritage	Uniform Multiple-Use	Permanent	Year Round	Ecosystem	Yes
Red Hind Spawning Aggregation Areas West of Puerto Rico - Abrir la Sierra Bank**	Sustainable Production	No Take	Permanent	Seasonal	Focal Resource	Yes
Red Hind Spawning Aggregation Areas West of Puerto Rico - Bajo de Cico**	Sustainable Production	No Take	Permanent	Seasonal	Focal Resource	Yes
Red Hind Spawning Aggregation Areas West of Puerto Rico - Tourmaline Bank**	Sustainable Production	No Take	Permanent	Seasonal	Focal Resource	Yes
Vieques NWR**	Natural Heritage	No Impact	Permanent	Year Round	Ecosystem	Yes

* Territory MPA

** Federal MPA

Appendix C: Benthic Cover (km²) by Site

	Coral Reef / Colonized Hardbottom	Emergent Vegetation	Macroalgae	Seagrass	Unclassified	Uncolonized	Unknown	Total
Arrecifes de la Guyama NR*	4.865	0.000	0.235	1.942	0.000	0.000	0.338	7.379
Arrecifes de la Cordillera NR*	26.574	0.000	3.931	8.387	1.381	1.332	58.329	99.934
Arrecifes de Tourmaline NR*	28.280	0.000	0.000	17.470	0.000	0.010	29.167	74.926
Bahías Bioluminiscentes de Vieques NR*	2.053	0.448	0.296	3.690	5.154	0.045	56.266	67.952
Boquerón State Forest NR*	9.196	0.597	6.641	32.134	0.872	0.334	111.569	161.345
Cabezas de San Juan NR*	9.828	0.515	0.690	4.892	2.467	0.050	285.463	303.905
Caja de Muertos NR*	31.201	0.327	4.080	30.081	1.540	0.286	32.129	99.643
Canal Luis Peña NR*	2.916	0.000	1.575	1.748	0.123	0.017	0.000	6.378
Caño La Boquilla NR*	1.786	0.000	0.000	1.284	0.764	0.000	103.248	107.082
Caño Martín Peña NR*	0.000	0.566	0.000	0.000	0.644	0.000	0.245	1.454
Caño Tiburones NR*	0.000	0.278	0.000	0.000	14.773	0.000	0.015	15.066
Cayo Ratones NR*	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.005
Ceiba State Forest NR*	0.002	1.465	0.000	0.047	0.334	0.012	0.012	1.872
Ciénaga de las Cucharillas NR*	0.000	0.000	0.000	0.000	3.965	0.000	0.012	9.976
Cueva del Indio NR*	0.058	0.000	0.000	0.000	0.035	0.000	13.122	13.215
Ecosystems adjacent to the Laguna Joyuda NR*	0.000	0.211	0.000	0.000	4.256	0.015	0.000	4.481
El Pantano, Bosque de Pterocarpus, Lagunas Mandry y Santa Teresa NR*	0.000	0.000	0.000	0.000	12.830	0.000	0.000	12.830
Finca Belvedere NR*	2.596	1.062	0.000	9.266	0.075	0.123	34.995	48.116
Guanica State Forest NR and Biosphere Reserve*	7.797	0.173	1.158	3.615	35.342	1.005	0.857	49.947
Hacienda La Esperanza NR*	0.417	0.024	0.000	0.000	9.897	0.002	50.526	60.866
Islas de Mona y Monito NR*	19.705	0.000	0.000	0.664	55.985	1.048	1500.696	1578.097
La Parguera NR*	69.815	5.623	3.440	23.834	19.754	5.887	235.934	364.285
Laguna Joyuda NR*	0.000	0.403	0.000	0.000	0.088	1.302	0.000	1.794
Laguna Tortuguero NR*	0.000	0.000	0.000	0.000	10.609	2.105	0.000	12.714

Appendix C: Benthic Cover (km²) by Site

	Coral Reef / Colonized Hardbottom	Emergent Vegetation	Macroalgae	Seagrass	Unclassified	Uncolonized	Unknown	Total
Manglar Punta Tuna NR*	0.000	0.000	0.000	0.000	0.521	0.000	0.000	0.521
Pantano Cibuco NR*	0.316	1.673	0.000	0.000	2.162	0.002	19.734	23.887
Piñones State Forest NR*	0.000	6.462	0.000	0.000	0.659	0.947	2.329	10.397
Punta Guaniquilla NR*	4.840	0.007	0.002	0.635	1.674	0.000	14.628	21.785
Punta Petrona NR*	1.062	1.989	0.020	9.175	0.145	0.485	10.470	23.346
Punta Yeguas NR*	4.437	0.000	0.796	0.000	1.237	0.000	258.647	265.117
Río Espíritu Santo NR*	0.815	2.961	0.000	2.696	5.843	0.108	112.319	124.743
Seven Seas NR*	0.000	0.049	0.000	0.000	0.751	0.000	0.000	0.800
Isla de Desecho MR*	3.997	0.000	0.000	0.000	1.148	0.164	3.417	8.726
Tres Palmas MR*	0.767	0.000	0.000	0.000	0.015	0.000	0.020	0.802
Aguirre State Forest	0.000	3.216	0.000	0.059	0.843	0.172	0.056	4.346
Jobos Bay National Estuarine Research Reserve**	0.343	4.124	0.054	1.776	1.061	0.923	1.471	9.752
Red Hind Spawning Aggregation Areas West of Puerto Rico - Abrir la Sierra Bank**	0.000	0.000	0.000	0.000	0.000	0.000	29.451	29.451
Red Hind Spawning Aggregation Areas West of Puerto Rico - Bajo de Cico**	0.000	0.000	0.000	0.000	0.000	0.000	33.104	33.104
Red Hind Spawning Aggregation Areas West of Puerto Rico - Tourmaline Bank**	0.000	0.000	0.000	0.000	0.000	0.000	29.764	29.764
Vieques NWR**	0.000	3.488	0.000	0.000	66.751	0.963	0.000	71.203

* Territory MPA

** Federal MPA

Note: Area calculated in Eckert IV, WGS84 using XTools Pro 3.2.0 extension for ArcMap™ 9.1

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